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REPORTS

1929-1930.

MANCHURIAN PLAGUE PREVENTION SERVICE.

EDITED BY

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of China; Author of "A
Treatise on Pneumonic
Plague", etc., etc.



Being Volume VII of the Series

MANCHURIAN PLAGUE PREVENTION SERVICE.

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REPORT OF THE INTERNATIONAL PLAGUE CONFERENCE Mukden, April, 1911. Bureau of Science, Manila. Printed on art paper with numerous colored and half-tone plates as well as charts. pp. 483	6.00	12.00
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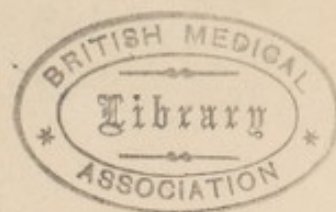
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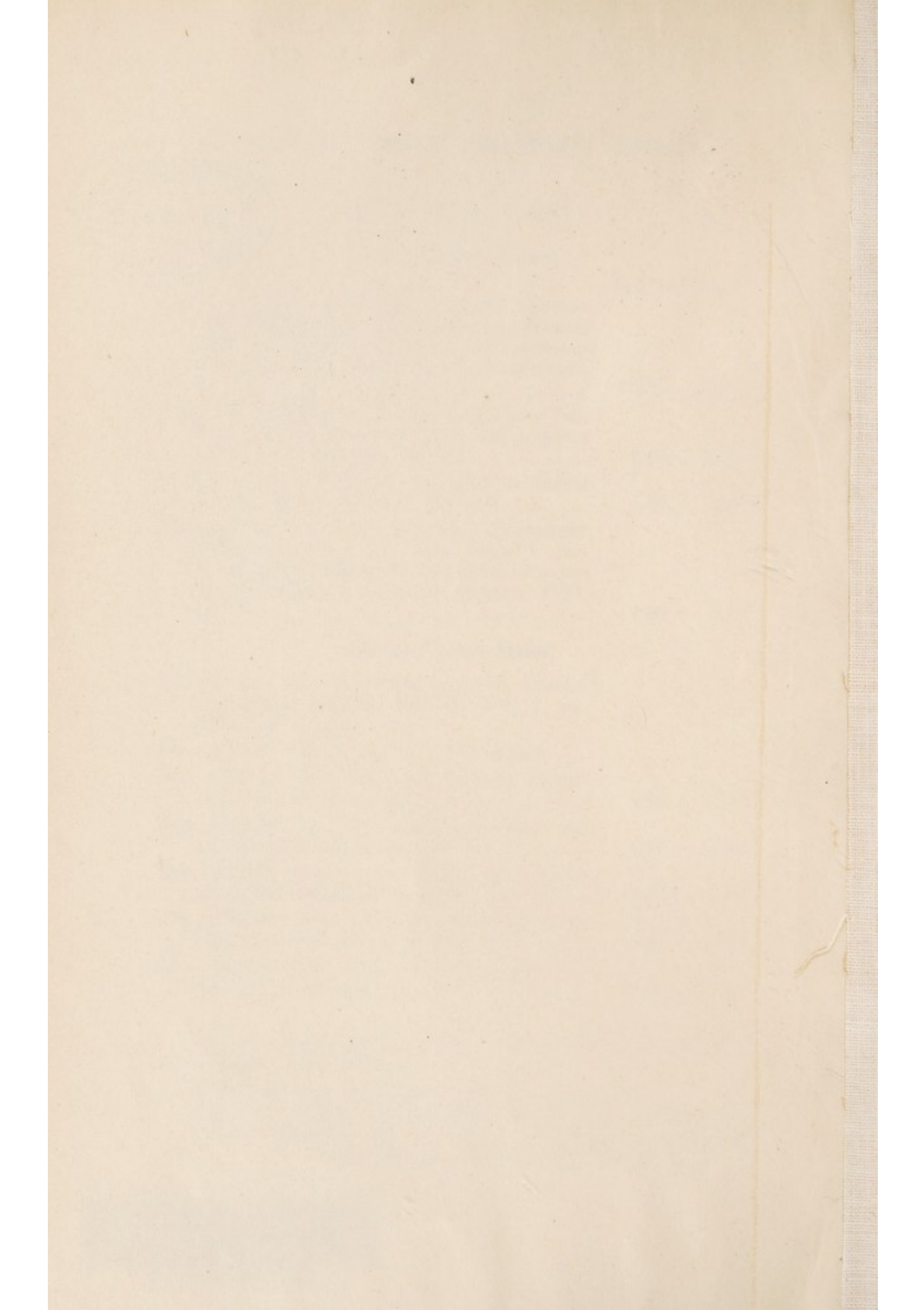


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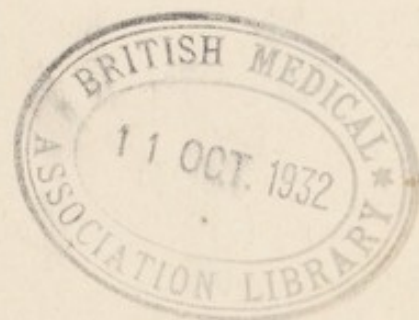






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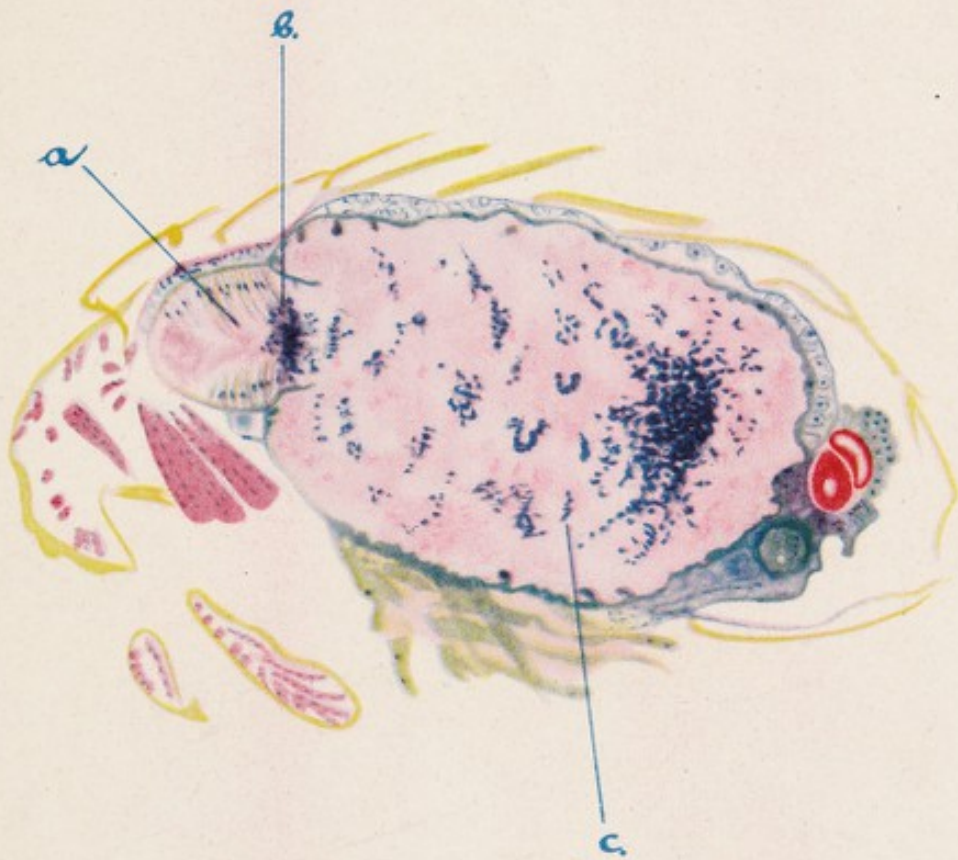


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COLORED PLATE A. Longitudinal section of *xenopsylla cheopis* 11/2, showing a relatively early stage of infection. (Magn. 130 diam.)

色版 A. *Xenopsylla cheopis* 蝨之長方剖面觀. 11/2, 示染疫較初之期.
(直徑放大一百三十倍)



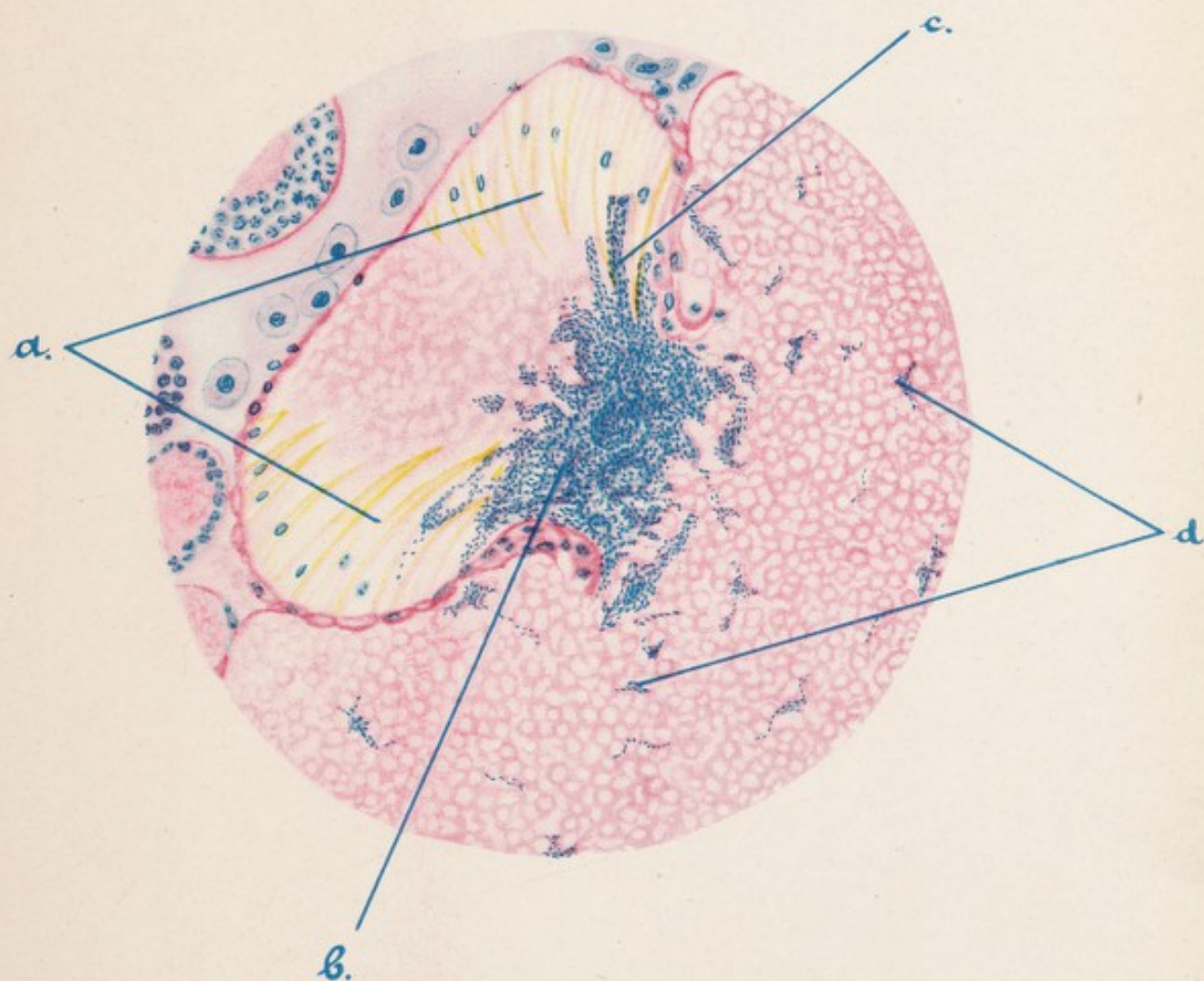
- a) Proventriculus with spinelike cells.
- b) Plug of plague bacilli at the junction of the proventriculus and stomach.
- c) Stomach containing blood and clusters of plague bacilli.

- a) 前胃及尖形細胞.
- b) 鼠疫菌叢聚於前胃及正胃之互接間.
- c) 正胃含血及鼠疫菌叢聚.



COLORED PLATE B. *Xenopsylla cheopis* 1/2. Longitudinal section showing the proventriculus and anterior part of the stomach. (Reichert obj. histol. immers. ocul. 2.)

色版 B. *Xenopsylla cheopis* 蝨 1/2. 長方剖面觀. 示前胃及正胃之前面.
(Reichert 組織學油鏡頭放大. ocul. 2. 號)



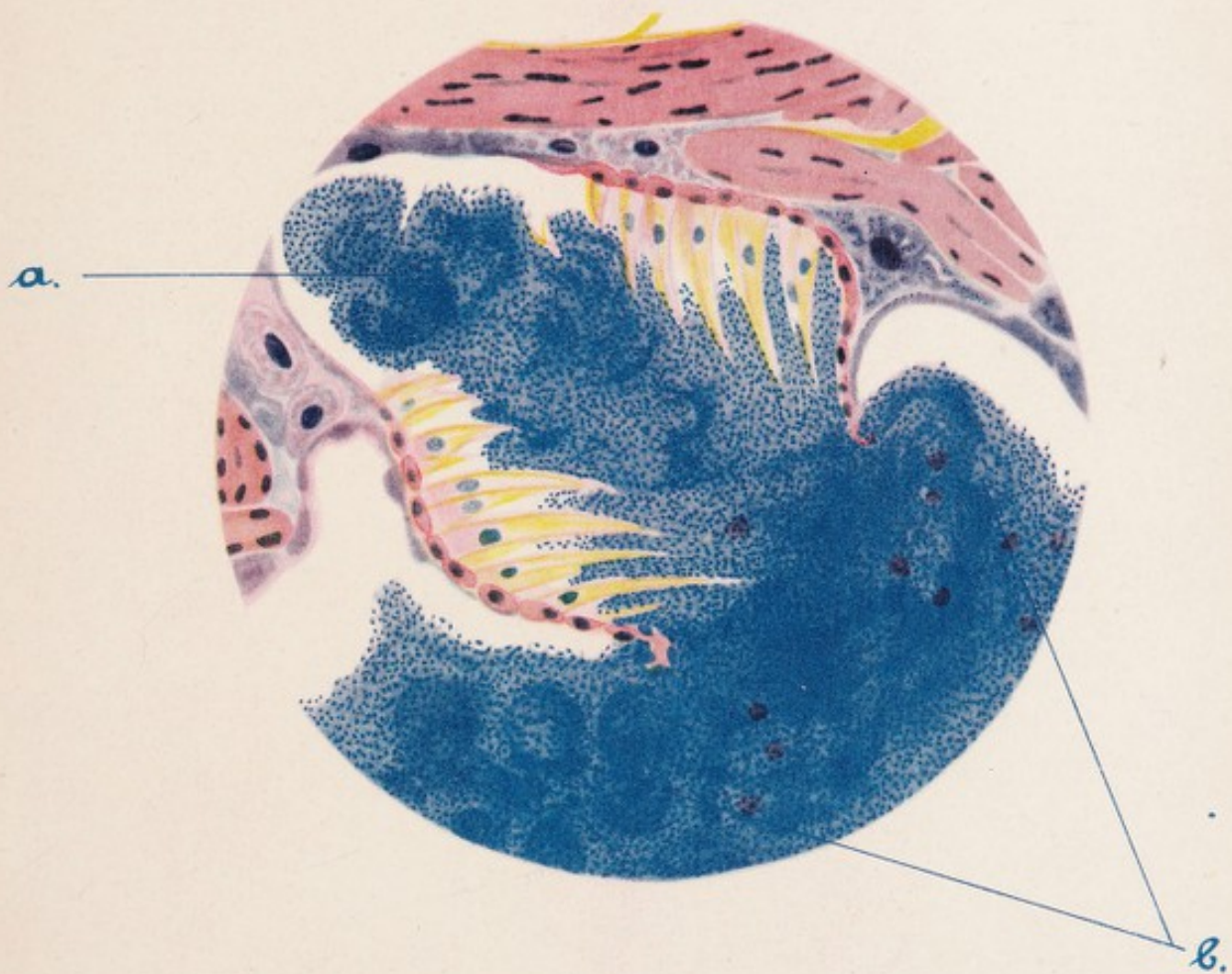
- a) Proventriculus.
- b) Plug of plague bacilli at the junction of the proventriculus and stomach.
- c) Bacilli growing into the recesses of the posterior spinelike cells.
- d) Stomach containing numerous but comparatively small clusters of plague bacilli.

- a) 前胃.
- b) 鼠疫菌叢聚於前胃及正胃互接處.
- c) 細菌延後部尖形細胞隙處滋生.
- d) 正胃含無數而小之鼠疫細菌團.



COLORED PLATE C. *Xenopsylla cheopis* 11/7. Longitudinal section.
(Reichert histol. immers. ocul. 2.)

色版 C. *Xenopsylla cheopis* 蝨 11/7. 長方剖面觀.(Reichert 組織學油
鏡頭放大. ocul. 2. 號)



a) A compact plug of plague bacilli filling up the proventriculus and growing into the enlarge oesophagus.

b) Stomach containing a pure culture of plague bacilli enclosing here and there violet-red stained remnants of blood.

a) 鼠疫菌叢聚,塞滿蝨之前胃,延及寬大之食管.

d) 胃中純藏鼠疫菌,內雜散數染紫色之殘血.





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Being Volume VII of the Series

PREFACE.

This present Report, comprising the seventh series of the biennial publications of the Manchurian Plague Prevention Service, should have appeared before the end of 1930, but owing to unavoidable circumstances arising mainly from the establishment of the National Quarantine Service with headquarters in Shanghai (of which I have been appointed Director), this has been delayed.

It is sometimes said that 'Revolutions which are frequently announced seldom take place'. This truism comes to one's mind when considering the plague situation on the Transbaikalian frontier, for in spite of gloomy predictions upon a periodical recurrence of the pest in 1930—twenty years after the great Manchurian epidemic of 1910-11, and ten years after the second limited outbreak of 1920-21—the tarabagan regions, which have hitherto displayed almost annual manifestations, have been entirely quiescent during the last season.

Although we ourselves had some misgivings and consequently adopted special precautions in the field, these fears were not based merely upon a general pessimistic attitude but upon scientific considerations. From a theoretical viewpoint, it seemed possible that, as proved by parallel happenings in other parts of the world, a periodic exacerbation of the epizootics among Siberian marmots might be an important means to restore the balance of nature.

However, the fact that an artificial element had been brought into the situation by wholesale hunting of the animals was always in our minds. And, although we do not wish to underrate the precautionary measures adopted by hunters in response to our instructions, we believe that the non-appearance of plague may largely be ascribed to destruction of these valuable fur-bearing rodents during recent years.

Nevertheless, we have not yet enjoyed the chance of a plague-free season, for the newly discovered focus in the Tungliao district of South Manchuria already alluded to in Volume VI of our Reports (1927-8) continues to be a source of anxiety. Plague is indeed a versatile foe for:

- (a) while formerly threatening us from the north-west, it now attempts to create havoc from the south-west;
- (b) while formerly we had to fight directly the wild rodents in sparsely populated regions, now we have to deal with the ubiquitous rat in crowded settlements;
- (c) while formerly we were constantly haunted by the spectre of the pneumonic form, the recent Tungliao outbreaks show a remarkable tendency to remain true to their original bubonic type.

It will thus be seen that our organisation has had to adapt itself to a changed strategic situation, partly by closing certain stations in

North Manchuria and opening new ones in South Manchuria, such as, Tungliao and Chengchia-tun. The stress of this transitional period may explain why our usual output of original papers on plague has not been reached in this Volume, the more so as some exhaustive studies upon the problem in North China have already been published as a separate Series in 1929.¹

The activities of our staff have also been claimed by the Central Anti-cholera Bureau established in Shanghai, where a limited outbreak of cholera enabled them to study the infection closely and to lay a foundation for future research work in this connection.²

We should have liked to present along with this Report a *History of Medicine in China*, upon the preparation of which several years have been spent. After some hesitation, it has been thought wiser to publish the *History* independently so as not to further delay the appearance of this Report.

The Manchurian Plague Prevention Service by a decree of the National State Council of April 4, 1931, now comes under the Central Health Administration (*Wei Sheng Shu*) of the Ministry of Interior, Nanking. Its activities, like those of the National Quarantine Service and the Central Epidemic Bureau of Peiping, will be expanded during the next three years, and its usual appropriation of \$112,500, which has for years remained stationary, will be increased to \$250,000, so that its activities may cover a wider area and perform the true functions of a Field Health Station for all Manchuria and Mongolia.

With greater opportunities thus offered, we earnestly hope that even more comprehensive work than we have hitherto done may be accomplished with benefit to China and the world.

Since the publication of the last Report, Dr. Rajchman, Director of the Health Section of the League of Nations, has been appointed Adviser on Health matters to the Central Government, and has visited China on two occasions (1929-30 and 1930-31). Thanks to this close association, other experts have also been sent by the League, and a fresh impetus as a result been given to public health work throughout the country. Our close ties with that splendid organisation have been strengthened in a most gratifying manner.

As on former occasions a Chinese edition is being published separately.

WU LIEN-TEH.

Harbin, May, 1931.

¹ STUDIES UPON THE PLAGUE SITUATION IN NORTH CHINA by Wu Lien-Teh, R. Pollitzer, Lin Chia-Swee and H. M. Jettmar. National Medical Journal of China, June, 1929, Vol. XV, No. 3, pp. 273-402.

² PRELIMINARY REPORT UPON CHOLERA INVESTIGATIONS IN SHANGHAI, SUMMER 1930 by Dr. Wu Lien-Teh (with the assistance of Dr. R. Pollitzer). Publications of the National Quarantine Service, Republic of China, Series I, 1931, pp. 1-57.



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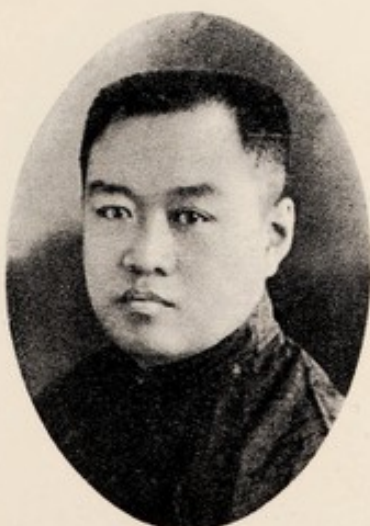
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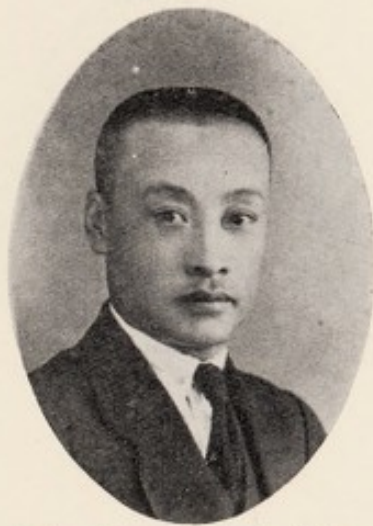
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黃厚寬 漢文秘書





TABLE OF CONTENTS.

	PAGES.
1. Rodents of Manchuria and Mongolia and their Significance in Disease	1-8
2. Surgical Aspects in the Treatment of Bubonic Plague ...	9-14
3. Report on some Investigations during the Plague Outbreak in the Tungliao District in August, 1929	15-22
4. Mites as Plague Carriers?	23
5. Bartonellosen und Grahamellosen unter Ostasiatischen Wilden Nagetieren (German)	24-26
6. Ueber Blutgruppenuntersuchungen an Mandschurischen Haussaeugetieren (with English summaries to articles 5 & 6)	27-31
7. Blutgruppenuntersuchungen in der Nordostmongolei und der Nordmandschurei (with English summary)	32-44
8. Contributions to the Serology of the Blood of Yacks and Cattle (English summary only)	45-46
9. Etude Experimentale de l'Ergosterol Irradie (French text with English summary)	47-59
10. La Calcification des Lesions d'Encephalite Chronique sous l'Influence de l'Ergosterol Irradie (Sterogyl) (French text with English summary)	60-64
11. Etude Experimentale de la Calcification des Lesions Tuberculeuses sous l'Influence de l'Ergosterol Irradie (French text with English summary)	65-77
12. Le Traitement Bismutique de la Spirochetose Spontanee des Lapins en general et du Castorrex en particulier (French text with English summary)	78-83
13. Cycle Evolutif du Treponema Pallidum, du Spirochaeta Pertenuis et du Spirochaeta Cuniculi (French text with English summary)	84-88
14. Opium Problem reaches Acute Stage	89-92
15. Ancient Chinese Contributions to Surgery	93-100
16. Early Days of Western Medicine in China	101-126
17. The History of Certain Infectious Diseases in China ...	127-136
18. The Prevention of Infectious Diseases in China	137-142
19. On the Causes of Epidemics	143-147

	PAGES.
20. Is Tuberculosis Curable?	148-155
21. A Report on the Bubonic Plague Epidemic in the Tung- liao Area, 1929	156-165
22. A Report of Plague Work in the Tungliao District, 1929	166-171
23. A Report on the Bubonic Plague Outbreak in South Manchuria, 1930	172-176
24. Observations on Some European Clinics	177-187
25. A Report on My Trip to Attend the Microbiological Conference in Paris	188-193
26. Summary of the Harbin Hospital Reports from September 1928 to August 1930	194-199
27. A Brief Account of the Quarantine Hospital, New- chwang	200-206
28. Report of the Antung Quarantine Hospital (for 1929- 1930)	207-211
29. Summary of Seventeenth Annual General Report, 1929	212-216
30. Summary of Eighteenth Annual General Report, 1930	217-223
31. Annual Report of the Newchwang Quarantine Hospital	224-228
32. Summary of In-Patient Diseases	229-232
33. List of Operations from September, 1928 to August 1930, Harbin Hospital	233
34. Summary of Out-Patient Diseases	234

LIST OF ILLUSTRATIONS.

	Attached to page
1-3. Frontispieces (coloured).	
4-8. Staff of P. P. Service	ii
9. Plan of Plague Infected Region of Transbaikalia and Adjacent Territories	4
10. Rodents of Transbaikalia, etc.	8
11. Outside wall of a hut in Chenchiatien	22
12-17. Photomicrographs of sections through fleas	„
18-19. Blood-Parasites of the Grey Hamster	26
20. Map of North-East Mongolia and North Manchuria showing blood groups of different races	33
21. Sketch map showing habitat of Goldi	40
22-23. Photomicrographs of sections through the brain of rabbits with chronic encephalitis treated with ergosterol	57
24. Ditto	60
25. Ditto	61
26. Photomicrograph of Preputial Lesion due to <i>Spirocheta</i> cuniculi	84
27. Photomicrograph of Chancre pianique of rabbit	85
28. Photomicrograph of section of brain (General Paralysis)	86
29. Graph of Infectious Diseases in Harbin Railway Area ..	143
30. Map of Plague Region, South Manchuria, 1929	165
31. Map of Plague Region, South Manchuria, 1930	176
32. Map showing Plague Outbreaks in South Manchuria during the last six years	„
33-35. Photos from Plague Area in South Manchuria	„
36. Photograph of patient with large Ovarian Cyst	199



RODENTS OF MANCHURIA AND MONGOLIA AND THEIR SIGNIFICANCE IN DISEASE.

Reprinted from Peking Society of Natural History Bulletin 1929-30,
Vol. 4, No. II, p. 95.

I. INTRODUCTION.

From the Volga and the Caspian Sea to the Hingan Range of mountains reaching northwards as far as the Siberian Taiga and southwards to the Himalayan Mountains and the big Chinese rivers, there extends an enormous area of steppes, that is, land devoid of forests and trees.

The ground here is not suitable for cultivation and the few aborigines living in this desolate territory hunt and breed such animals as are contented with the grass of the steppes.

Ruminants of various kinds from the big camel to the small gazelle enable man to exist and earn a scanty livelihood in these parts.

Further, the representatives of a particular group of mammals have chosen this huge territory for their habitation, namely, the wild rodents. These can be found in immense numbers and in various species. The steppes often present a characteristic appearance, being literally tunnelled by numberless underground burrows. Sometimes the animals damage the scanty vegetation of a district, sometimes they help to till the soil and thus play an active role in the transformation of the landscape.

For instance the small rat-hare exercises an important influence upon the alteration of the ground. According to the report of Prshevalski countless millions of rat-hares inhabiting the steppes of the Koko Nor region, by digging loamy earth out of their burrows supply the material for the loess-dust which is blown by severe storms from the steppes into North China and is gradually filling up the Koko Nor Lake itself. In certain regions of Tibet the earth loosened by the rat-hare is washed away by heavy rains and deposited down in the valleys thus partly filling them up and contributing to a general leveling of the country.

Often regions of Inner Asia are raked up by the burrowing of rodents to such a degree that travelling especially on horse-back is rendered highly difficult.

The fertility of these rodents is great and they would perhaps have multiplied to infinity if natural enemies attracted by the abundance of their prey had not reduced their numbers. In many areas snakes keep in check the surplus population of rodents while in others birds of prey

swarm around their burrows. Mammals, from the fitchet to the desert wolf and bear, also hunt rodents, especially the bigger ones. Finally man uses his superior intelligence to trap and hunt those species which produce a rich fur.

But all these enemies would not have been able to reduce the surplus population of the most fertile of all mammals if great catastrophes and widespread epizootics did not restore the balance of nature.

Thus, in June 1880 after heavy rains in the region of the Koko Nor Steppes there perished millions of rat-hares. Their corpses covered the steppes everywhere but were quickly devoured by numerous birds of prey hovering around.

II. EPIZOOTICS IN GENERAL.

Very little is known of the cause and the course of most epizootics among rodents; in the literature vague information is often abundant while exact bacteriological data are as a rule missing.

Thus Satunin records some epizootics among the mice of the Transcaucasian steppes (*Microtus socialis*) which reduced their number to such a degree that regions covered with their holes were entirely deserted and not a single mouse could be seen. Blasius records an unusual invasion of field mice (*Microtus arvalis*) especially along the lower Rhine about 1820 caused by their uncommon multiplication and resulting in most of the harvest being ruined. But soon afterwards a devastating epizootic appeared among these rodents in the form of a skin disease so that the coat peeled off in clusters and the animals died out within 2-4 weeks. The few survivors were noticed to escape from this district.

The so called "Schwanzraeude" (scab of the tail) described in 1876 by Homeyer often reduced the number of rodents. The most important clinical feature of this disease is the excretion of a sticky juice along the back and tail resulting in a complete shedding of the fur. This disease is probably identical with the repeatedly observed "Rattenkoenig" (rats grown together by the tail).

Another small rodent, the lemming (*Lemmus lemnus* L.) suffers from a definite disease occurring at the height of their superabundance every three or four years, the causative organism being called *B. pestis lemni*.

From the above review it is clear that little is known about natural epizootics among rodents.

Our knowledge concerning their diseases in Eastern Asia is still scarcer. However, a thorough investigation of these wild rodents is of great importance because this region is visited almost every year by one of the most dreadful of human diseases, namely bubonic plague. For many substantial reasons we believe that the spread of this disease is

dependent upon the epizootics occurring among the rodents of these regions

It may, therefore, be advisable to deal briefly with the biology and pathology of the wild rodents found in Manchuria and Mongolia.

III. THE MARMOT (TARABAGAN.)

A. *Geographical Distribution and Varieties.*

The Tarabagan, the biggest and most important wild rodent in Eastern Asia, is encountered in hilly steppes strewn with stones. According to the catalogue of mammals of Trouseart its geographical distribution extends from Galicia in an eastern direction through Central Asia to the Amur river. There are no exact data regarding the borders of the inhabited area. This may be explained by the presence of other species and subspecies which makes it difficult to establish the exact geographical distribution of the "pure" tarabagan (*Arctomys bobac* Pall.)

Thus in 1843 a species *Arctomys* (*Marmota*) *baibacina* Brandt was encountered in Siberia by Brandt who did not, however, supply accurate information about its geographical distribution.

In 1901 Kashchenko, a zoologist of Tomsk University, described another species of marmots, the *Marmota bungei* Kasc. which is also found along the lower Lena and in the Verkhoyansk Mountains.

The variety *Marmota sibirica*, described by Radde inhabits the Altai Mountains and the northern borders of the Gobi. This species has given rise to much misunderstanding as its differentiation from the *Arctomys bobac* Pall. is rather difficult.

Among other Central Asiatic marmots the following species should be mentioned :

a. The *Marmota dichrous* Anders. inhabits the Tienshan Range and the borders of Eastern Turkestan and Siberia. This species, the "two-coloured marmot", is characterised by a reddish fur on the abdomen.

b. The aureate marmot (*Marmota aurea* Blanf.) is encountered upon the Pamir Plateau and in Chinese Turkestan.

c. The long-tailed marmot (*Marmota caudata* Is. Geoffr.) of Kashmir is a portly animal with reddish fur and long hairy black tail.

TABLE OF MARMOTS OF CENTRAL AND EASTERN ASIA.

Name :	Distribution :
<i>Arctomys bobac</i> Pall.	From Galicia in Eastern direction through Central Asia to the Amur river.
<i>Marmota sibirica</i> Radde.	South-eastern Siberia, Outer Mongolia.
<i>Arctomys baibacina</i> Brandt.	In Siberia (south-western parts).
<i>Marmota bungei</i> Kasc.	Central and North-eastern parts of Siberia, also along lower Lena and in Verkhoyansk Mountains.
<i>Marmota dichrous</i> Anders.	Tienshan; borders between Eastern Turkestan and Siberia.
<i>Marmota aurea</i> Blanf.	Pamir Plateau and Chinese Turkestan.
<i>Marmota caudata</i> Is. Geoffr.	Kashmir.

B. *Marmots attacked by Plague.*

Among these marmots the *Arctomys bobac* Pall. or the *Marmota sibirica* Radde is specially responsible for the spread of plague to human beings resulting almost every year in smaller or bigger outbreaks.

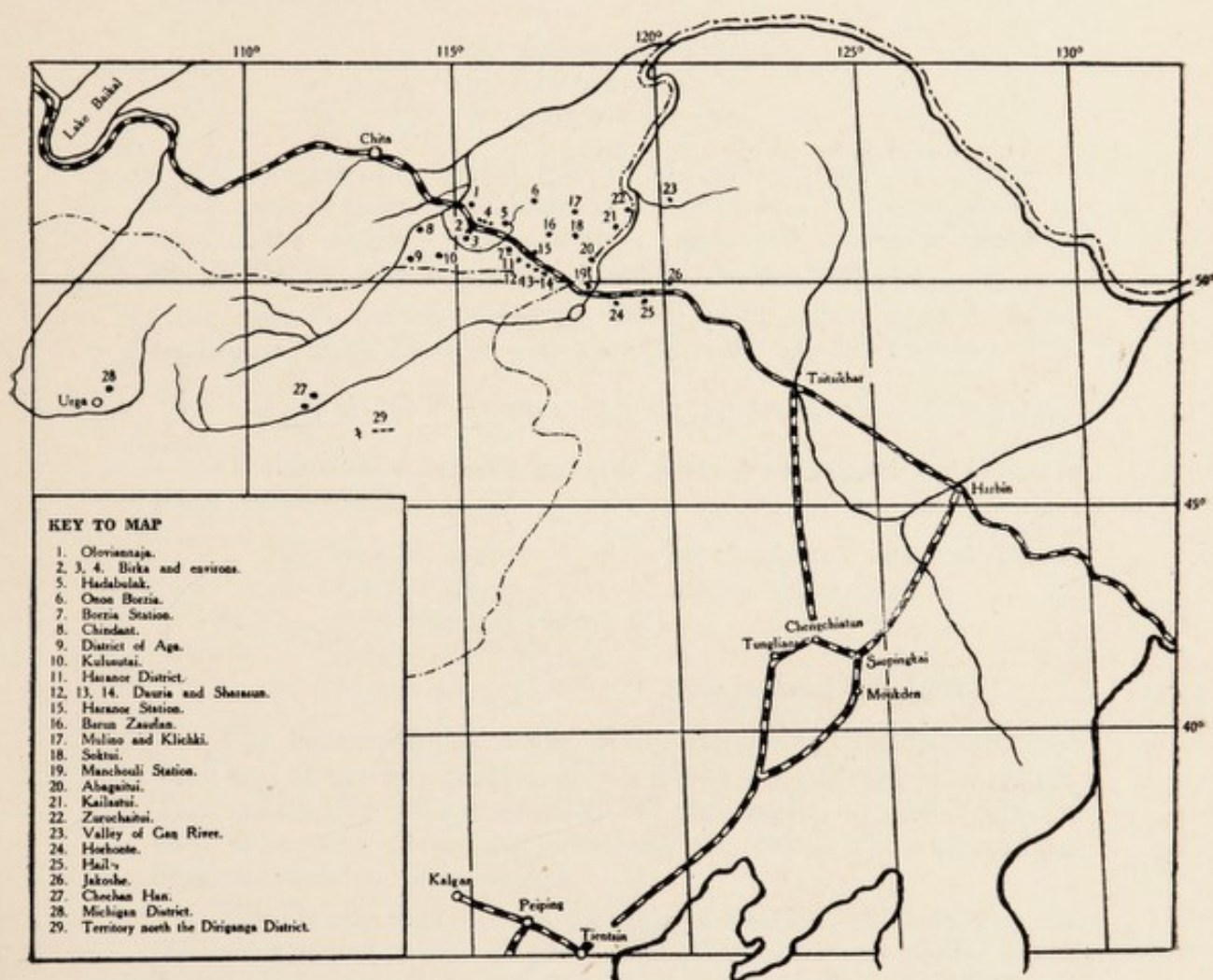
It has been known for ages among tarabagan hunters that contact with sick tarabagans is dangerous and that any animal encountered away from its hole and showing no fear of human beings should be avoided. Many ancient legends about the tarabagan show the connection of this rodent with human plague cutbreaks.

Exact bacteriological proof was furnished by Zabolotny and Pisemski in 1911 who found naturally infected tarabagans near the Manchurian-Mongolian border. These findings have been repeatedly confirmed by members of the Manchurian Plague Prevention Service.

Enzootic plague foci exist in various parts of Transbaikalia as well as in certain localities of Manchuria and Mongolia where human plague has been caused by infected tarabagans. The accompanying plan shows plague foci in Eastern Asia inhabited by the tarabagan.

The real enzootic area is much larger and coincides with the whole region inhabited by steppe rodents. In the deserts of Mongolia plague cases among man often occur and are probably due to infected tarabagans, but information about these rarely reaches any centre of civilisation as the inhabitants of the infected camps seldom give any notice of the outbreak, while the dwellers in neighbouring yurts move away leaving the infected families to fate.

PLAN OF PLAGUE INFECTED REGION OF TRANS- BAIKALIA AND ADJACENT TERRITORIES.



On account of these strict quarantine measures as well as the vast steppes and scanty population, the aborigines as a rule manage to stop the spread of plague.

The plague sick tarabagans can be distinguished from healthy ones and all experienced hunters avoid them. The first cases of infection, therefore, occur often among children or inexperienced people.

C. Other diseases.

With regard to other tarabagan diseases we have found different intestinal parasites :

- a) *Entamoeba bobaci* Li
- b) *Ascaris spec.*
- c) *Enteromonas spec.*

These probably do not lead to any serious illness in the animal. Once some cysticerci were found in the heart of a tarabagan picked up dead in the steppes. These cysticerci apparently caused the death of the animal, because they entirely blocked the pericardium.

There is nothing definitely known about other diseases among tarabagans. Blood parasites were not observed in the Manchurian variety.

IV. SISELS OF DAURIA, MONGOLIA & MANCHURIA.

Of the sisels inhabiting the area under consideration the following three species are known :

- | | |
|---|---------------------------------------|
| 1. Siberian Sisel | <i>Spermophilus Eversmanni Brandt</i> |
| 2. Daurian Sisel | <i>Spermophilus dauricus</i> |
| 3. Sisel dwelling in Mongolia and Western Manchuria | <i>Spermophilus mongolicus</i> |

The Eversmann-sisel living in the steppes of Transbaikalia near the Taiga border may possibly play a role in the transmission of plague. This species is a natural antagonist of the smaller but fiercer Daurian sisel, so that one species always excludes the other. Their geographical limits are therefore quite distinct.

The Daurian sisels live in the steppes inhabited by tarabagans and are known to suffer from plague. The presence of this disease among these animals was proved bacteriologically by Skorodumoff in 1927 near Birka (Transbaikalian Railway not far from Oloviannaja). The sisels are encountered also near Manchouli in large numbers and may spread the plague to man as they are sometimes hunted by children.

This sisel, when caught in summer time, often falls into a state of lethargy ending in death. Sometimes it harbours large numbers of ectoparasites. Thus more than 100 fleas were once collected by us from the fur of a young sisel. This factor may facilitate the spread of plague from one animal to another.

The Mongolian sisel has not yet been proved to be naturally infected but it is very susceptible to experimental infection, the mortality reaching 100 per cent.

Blood parasites and other diseases have not been detected among local sisels.

V. SPRING HARES (ALACTAGA AND DIPODIPUS.)

The most important spring hare in the regions bordering the Gobi desert is the *Alactaga mongolica* Radde. This animal is encountered in the Daurian steppes as well as the district around Manchouli. It is also common near Urga in Mongolia and in the environs of San Peitzu. It has repeatedly been found suffering from plague under natural conditions. In 1926 Pavloff discovered a plague infected spring hare near Borzia, full bacteriological proof being furnished by Dr. Kukushkin. In 1927 near Hadabulak (Transbaikalian Railway) another plague infected spring hare was found.

The native inhabitants of the steppes consider the spring hare as very dangerous and always to be avoided. Ancient Mongolian legends describe the *alactaga* as the horse of the hero Tarabagan transformed into a rodent while the proud hero himself was changed into a big marmot by his enraged god. (Hence the name Tarabagan for marmot).

The spring hares leave their holes only at night time and cover a great distance. When chased they may jump at a speed of 20 miles an hour.

Besides plague, spring hares may suffer from two different forms of blood diseases. One is caused by the *hepatozoon jaculi*, producing severe changes in the liver, the other by *bartonella bacilliformis*. Both diseases do not seem to be infectious to man.

In the steppes near Tungliao our staff found another kind of spring hare, a *Dipodipus spec.* Spontaneous plague among these animals under natural conditions has not been established.

VI. RAT-HARES.

The rat-hare (*Ochotoma daurica* and other species) is distributed all over the eastern part of Central Asia. It is encountered in great numbers in the Daurian steppes, around Manchouli and also in the environs of Urga.

Although *Ochotoma daurica* lives in the immediate neighbourhood of the tarabagan, spontaneous plague among this species has not been noticed under natural conditions.

It harbours various kinds of fleas, including those of the sisel. It is, therefore, likely that this rodent also suffers from plague as sisels are susceptible to spontaneous plague.

VII. SMALL HAMSTER (CRICETULUS).

The Mongolian steppes are also inhabited by numerous small hamsters. Kashchenko describes four kinds in the Daurian steppes:

- a. *Cricetulus songarus* Pall.
- b. *Cricetulus griseus* A.M. Edw.
- c. *Cricetulus obscurus* A.M. Edw.
- d. *Cricetulus furunculus* Pall., found also in great numbers in Northern Manchuria.

Near Urga among other species of small hamsters the *Cricetulus campbelli* is found. In South-Eastern Manchuria the big *Cricetulus triton de Winton* is reported.

In the Tungliao region we discovered *Cricetulus griseus* var. *fumatus* and one still undertermined kind of small hamster living in sand dunes.

Many small hamsters have been proved to suffer from *Bartonella bacilliformis* and trypanosomiasis, but spontaneous plague is not known. It is probable, however, that sooner or later plague under natural conditions will also be found in them.

VIII. VOLES.

Various voles are encountered in the Dauria steppes. Among these the *Microtus Brandti* and *Microtus Raddei* are susceptible to plague under natural conditions, as ascertained by Prof. Skorodumoff (1928 near Oloviannaja).

IX. RATS AND MICE.

Rats and mice (*Epimys norvegicus* and *Mus musculus*) are encountered only in or near villages and towns. The vast steppes are free from them. Plague infected rats were found at Vladivostok during the outbreak of pneumonic plague in 1921 and recently near Chien-chia-tien during the bubonic outbreak of 1928. Their habits and characteristics are the same as elsewhere in the world.

X. OTHER RODENTS.

For the sake of completeness mention must be made of the following:—

- (a) Manchurian hare (*Lepus manchuricus*)
- (b) Mole-rat (*Syphneus aspalax*)
- (c) Jumping mouse (*Zapus spec.*) found in the Tungliao region.

Nothing is known of the diseases from which these rodents may suffer. It is unlikely, however, that they are involved in the spread of plague.

XI. CONCLUDING REMARKS.

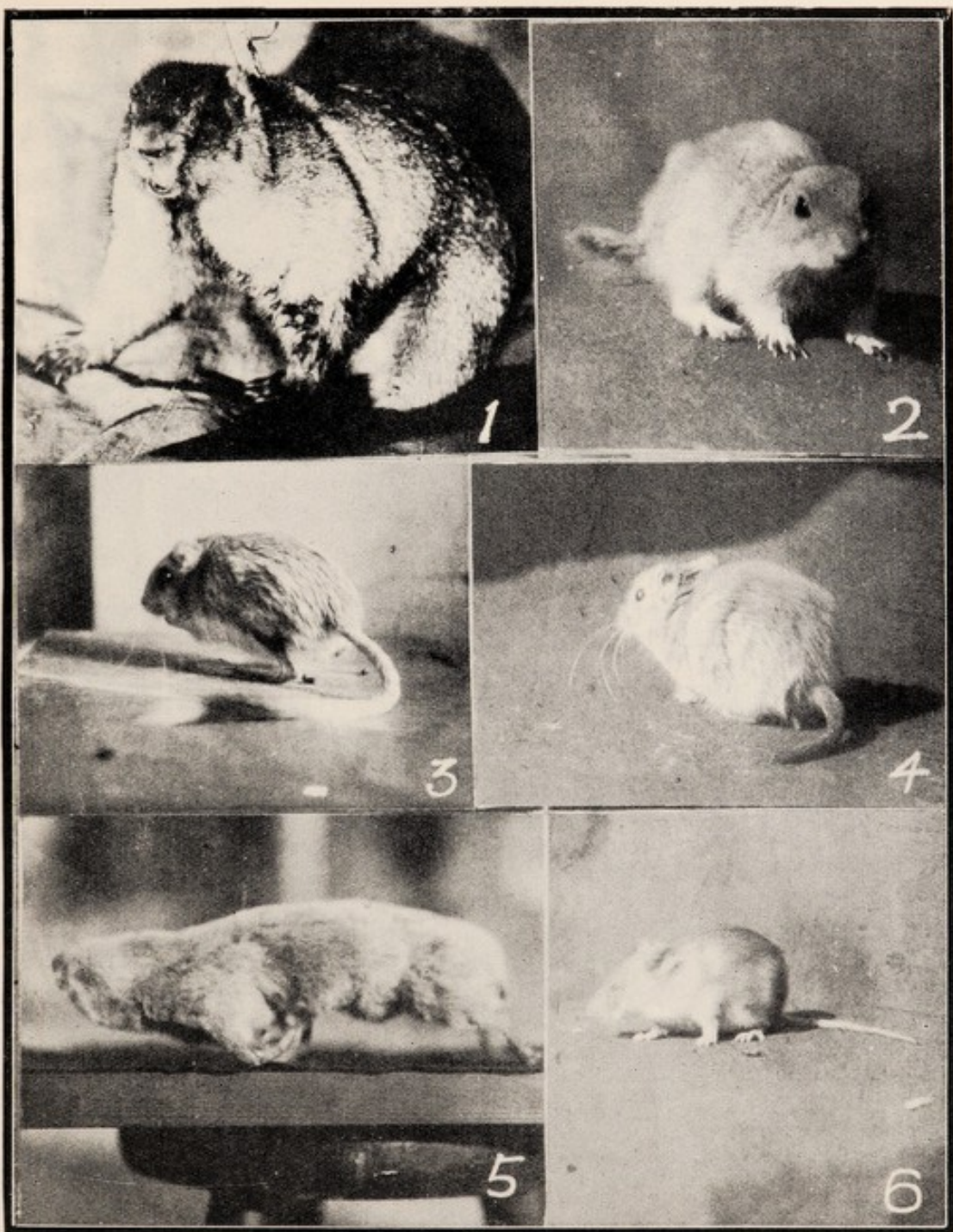
Summarising we may say that the problem of plague in the regions under discussion is a very complicated one. As far as Transbaikalia, Mongolia and the adjacent parts of North Manchuria are concerned there is no doubt that the main role in the spread of plague to man is played by the tarabagan. Extensive researches in our Harbin Laboratory have also convinced us that these animals, by harbouring the disease during hibernation, carry over the infection from one plague season to another. However, we have seen that some species of smaller rodents have been found with plague in the fields, while a third group is so susceptible to artificial infection that the disease is likely to occur among them under suitable natural conditions. To prove this and to elucidate the role of the smaller rodent species in general will be the object of further researches.

In the Tungliao region of South Manchuria we have succeeded in finding plague among the domestic rats and in establishing that these animals play an important role in the spread of the outbreaks. It may be that the rats in their turn derive infection from some wild rodents but proof for this hypothesis is still wanting. Our attention is now focussed upon this region.

WU LIEN TEH.

EXPLANATION OF FIGURES.

1. *Arctomys bobac* (Tarabagan).
2. *Citellus mongolicus* (Suslik).
3. *Dipus sowerbyi* (Spring hare).
4. *Meriones kuraochii* (Spring mouse).
5. *Siphneus aspalax* (Grey mole rat).
6. *Micromys agrarius* (Striped field mouse).
7. *Cricetulus grieseus* var. *fumatus* (Striped grey hamster).
8. *Phodopus praedilectus* (Tungliao sand hamster).
9. *Cricetulus campbelli* (Mongolian hamster).
10. *Cricetulus furunculosis* (Yellow hamster).
11. *Cricetulus triton* (Rat hamster).



- 1.—*Arctomys bobac* (Tarabagan).
滿洲里產旱獭
2.—*Citellus mongolicus* (Suslik).
通遼產小豆鼠
3.—*Dipus sowerbyi* (Spring hare).
錢家店產跳兔子

- 4.—*Meriones kuraochii* (Spring mouse).
田跳鼠中國俗稱跳鼠
5.—*Siphneus aspalax* (Grey Mole Rat).
三姓產灰鼠
6.—*Micromys agrarius* (Striped field mouse).
哈爾濱產野鼠





7.—*Cricetulus griseus* var. *fumatus* (Striped grey hamster).

灰色小咸士特鼠

8.—*Phodopus praedilectus* (Tungliao sand hamster).

通遼產砂咸士特鼠

9.—*Cricetulus campbelli* (Mongolian hamster).

蒙古附近產咸士特鼠

10.—*Cricetulus furunculosis* (Yellow hamster).

三姓產小咸士特鼠

11.—*Cricetulus triton* (Rat hamster).

三姓產小咸士特鼠



SURGICAL ASPECTS IN THE TREATMENT OF BUBONIC PLAGUE.

(Reprint from Proceedings of the First Pan-Pacific Surgical Conference, Honolulu, Hawaii, August 14-24, 1929.)

The surgical aspects in the treatment of bubonic plague may be discussed in two ways :

- (a) Strict operative measures, e.g. incision or excision of the buboes.
- (b) Local application of a vast array of substances.

One is tempted to deal comprehensively with the second subject both in regard to its ancient history and interesting modern aspects, but this would unduly prolong my lecture. For quite a number of the remedies recommended for local treatment are likewise applied in other ways (e.g. orally, intravenously). Hence, in order to do full justice to them it would have been necessary to dwell upon the value of anti-plague serum, iodine, carbolic acid, etc., in the general therapy of plague as well as in their local application. It is wiser therefore in this paper to limit myself to the strictly surgical aspects of the problem.

I have not gone deeply into the history of operative methods dealing with the treatment of plague. No doubt, these were practised long before our times. Russell, for instance, in his "Treatise on the Plague Containing an Account on the Plague at Aleppo 1760-1762" (London, 1791) discusses this question thoroughly and quotes a number of authors who are for or against surgical interference. Russell himself, while recommending incision of suppurating buboes, is absolutely against any early operation, whether simple incision or extirpation of the diseased glands. It appears also that French surgeons with the army in Palestine in 1799 practised as a routine method early incision of the buboes (1). Rocher, in his studies upon plague in Yunnan (1878-1879), mentions that incision is occasionally performed by Chinese practitioners though never accompanied by much success.

At the end of the 19th century when the renewed activity of plague first at Hongkong and then in India again attracted general attention upon this almost forgotten disease, the same dissension of opinions was noted as during and before Russell's time. The Indian Plague Commission (2) came to the conclusion that

"while buboes are still in the early stage it has been found that no benefit, but rather injury resulted from cauterising or incising them or from the application of leeches."

The Report of the German Plague Commission (3) says that most of the patients were in such a desperate condition that it mattered little subjectively or objectively what was done to them. Sticker (4), one of the members of the Commission, however, later on took a decisive

stand against early incision and uttered a warning as to the pseudo-fluctuation of buboes which might lead to a wrong diagnosis of suppuration and hence to premature operation. Mueller, in the Report of the Austrian Plague Commission (5) also stresses this difficulty and considers early incision quite useless. Nevertheless, like Yamagiwa (6), he thinks an early and complete excision of the buboes to be the principal object of a rational therapy. He argues that the primary bubo represents a localisation of the infection and is in its turn responsible for the invasion of the blood stream, the formation of metastases as well as for the toxæmia. Primary carbuncles should be tackled along the same lines, the buboes beneath them to be removed simultaneously or to be thoroughly cauterised.

In his book (7) Mueller again advocates early and thorough surgical treatment but admits the difficulty of excluding an already present bacteræmia. Possibly, if the general condition of the patient is still satisfactory (a *sine qua non* for the operation) he could successfully struggle against the bacteria which had already entered the general system.

The other standard text books appearing soon after the onset of the present pandemic were mostly not in favor of early operation. Thus Jennings (8) fears that this may facilitate the entry of the infective agent into the circulation. Simpson (9) aptly remarks that the buboes

"have been incised, blistered and cauterised with the object of hastening their development on the principle that the sooner they reached maturity the earlier would the virulence of the disease diminish, for it was noticed that with the suppuration of the buboes and the maturation of the carbuncles the patients began to convalesce. A sign of the acute stage of the illness being nearly at an end was evidently mistaken for the cause producing that happy termination. The only occasions on which the knife is found to be useful are when pus has formed in the bubo and when masses of necrosed glands are lying in suppurating buboes."

Extirpation of the glands Simpson considers (10)

"limited in its application, nor can it be applied to buboes within the abdominal wall. It appears not always to have been unaccompanied with risks to the patients."

It is safe to say that the above quoted and similar statements published by other compilers voice the opinion held by the majority of anti-plague workers. On the other hand strenuous advocates of an active surgical therapy are not totally wanting.

Mention must be made first of Terni's work (11). This author argues similarly to Mueller that the *B. pestis* finds no favorable conditions for propagation in the lymph vessels and that consequently the buboes form the only real focus of infection which should be eliminated before infection penetrates into the general system. Combined with an early extirpation of the buboes other measures should be taken, such as,

application of compresses moistened in sublimate solution, local injection of 1 in 1,000 sublimate solution, intravenous injection of the same as recommended by Baccelli and, last but not least, serotherapy. The results of this combined treatment during the 1900-01 epidemic at Rio de Janeiro were very favorable, only 10-15% of the different groups of 642 surgically treated patients (including serious cases) ending fatally; the maximum of casualties was among the sufferers who were ill more than five days. Of great interest is the fact that the excision of but one bubo in cases of double buboes (though combined with serotherapy) led only to a temporary improvement followed by rapid recovery when the other bubo was removed as well.

Equally remarkable are Masuyama's results obtained in the epidemics at Osaka during 1899-1907 (12). These may be summarised thus:

<i>Mode of Treatment</i>	<i>No. Cases</i>	<i>Died</i>	<i>Recovered</i>	<i>Per cent Recoveries</i>
By drugs	129	125	4	3.1
Serum	78	69	9	11.5
Incision	25	6	19	76.0
Excision	57	29	28	49.2
Serum plus incision ...	32	7	25	78.1
Serum plus excision ...	32	22	10	31.2
Totals	353	258	95	26.9

It can be seen that the best results were obtained by a combination of incision and serum therapy (78.1%), almost as good ones by incision alone (76.0%) whereas the results of combined excision and serotherapy were worse than those with excision alone (31.2% as against 49.2%). As a study of the text shows, it is an open question how early the incisions were undertaken: Masuyama claims to have obtained "surprisingly favorable results" in cases where "the buboes had suppured or so strong adhesions had formed that an enucleation of the glands was impossible." He explains this by saying that—contrary to the more radical method—incision leaves the deeper layers of the tissue intact. One is led to ask whether these cases had not already passed the most critical stage of the illness and the incision merely speeded their recovery. In fact in his concluding remarks Masuyama recommends (a) the injection of serum in sufficient doses (b) waiting until there is fluctuation and then (c) careful incision. In spite of the comparatively good results he evidently does not advise removal of the buboes. This method was, nevertheless, strongly advocated by so high an authority as Kitasato (13).

Nesfield (14) is in favor of an early incision of the buboes. Like some of the doctors quoted by Russell he thinks that this will allow of the escape of the toxins. He claims that by this method he saved at Lucknow in 1907 45 out of 62 patients (12.9% mortality) though some hopeless cases were included. He made crucial incisions and dressed the wounds with iodine lotion (1 dr. in 2 oz. of water). Treatment

should be undertaken within the first 24 hours. None of Nesfield's assistants were infected but this danger has to be kept in mind.

When one considers the above favorable reports it seems at first glance surprising that surgical methods are not more generally adopted today in the treatment of bubonic plague. As a matter of fact most modern textbooks are silent in regard to them except the obvious advice to incise when pus has formed. Only rarely one finds in periodicals reference to surgically treated cases.*

In order to understand the reasons for this apparent inactivity we must revise our problem in the light of our modern conceptions of bubonic plague and its treatment.

Let us first consider the method of *incision*. As we have seen a few authors object to this for fear that it might facilitate an invasion of the blood stream. Perhaps others who minimize the possibility of such danger are right though the manipulations necessary to keep the wound open for proper drainage may be fraught with some risk. But even if the method is in accord with our foremost principle to avoid anything which might harm the patient we cannot very well see how an incision could be of benefit apart from affording some relief to the pain-stricken victims. For it leaves the bubo in its place and is therefore obviously unable to prevent the main danger threatening the patient, the invasion of the blood stream. It is true that a few observers have reported satisfactory results with this method. Being familiar with the great variations in the character of the disease occurring both in individual cases and during whole outbreaks, as well as with the influence of proper nursing upon the general prognosis, we need not be surprised at this. Therefore what proves most successful in the hands of one worker may fail completely when tried by others. In the highly virulent 1928 outbreak of bubonic plague in the Tungliao region of South Manchuria we did not obtain any permanent success with early incisions and soon gave up the method though often urged by the patients themselves to operate upon them. In this epidemic we saw 597 cases of which about 85% showed manifest buboes. The case fatality was 92%.

Turning now to the method of *excision* of the diseased glands one feels safe in stating that this method also is not fraught with particular dangers. Masuyama says that in cases so treated, plague bacilli were still present in the wounds for a few days (up to one week) after operation and yet such patients recovered. As we have seen the Dublin patient recovered though yielding a positive blood culture after operation. Apparently the really important thing in plague bacteremia is not so

* One interesting instance is recorded in the Lancet in 1921 (15): A female patient was admitted in Dublin with a history of three days pain in the groin. She appeared seriously ill and had a bubo size of a walnut. Excision was performed. The temperature remained high until the 6th day of the disease and rose again on the 11th for 48 hours; then uneventful recovery. A blood culture made on the 7th day of the disease gave a positive result of plague.

much whether an invasion of the blood stream occurs at all but how massive it is and how long it continues. Considering the advantages of the operation we must admit that it has a sound theoretical foundation. Many cases of bubonic plague may be considered to pass through a stage where the danger is concentrated in the lymph glands while the blood is still free from invasion. If it were possible to take advantage of this propitious moment and to remove all the diseased glands, then indeed we would have done much for the patient.

Unfortunately both these *desiderata* are difficult of fulfillment:

- (a) The presence or absence of a bacteremia can be exactly established by blood cultures alone; but to wait for results from such would be preposterous, as invasion of the blood stream is likely to occur in the interval. Perhaps the question whether to operate or not could be decided by a clinical appreciation of the circumstances, e.g. general condition, pulse.
- (b) The question how far a complete removal of the diseased glands is possible is a much more involved one. Several glands may be primarily invaded, some of which may remain unnoticed. Early secondary invasion of others may already have occurred. Part of the glands may be difficult of access or it may be even unreasonable to attempt their removal (internal inguinal buboes associated with external ones). These and similar difficulties will be felt the more if—as would be necessary—the operations cannot be conducted in a well equipped theatre but must perforce be done amid primitive conditions.

Thus it can be seen that the method of excision, though theoretically sound, is fraught with so many practical difficulties as to be recommended only if no simpler and equally successful procedure exists. Now recent experiences have shown that the serum treatment of bubonic plague cases is a much more powerful weapon than was imagined during and soon after the first decade of the present century (1900-1910). We have learnt that the serum, though far from being ideal, is likely to save many lives if (a) its administration is started at the earliest possible moment, (b) it is applied in sufficient amounts intravenously and (c) repeated doses are given conformable to individual requirements. No wonder, therefore, that modern plague workers lay most stress upon this method and pay little attention to side issues.

Perhaps it may not be wise to neglect altogether the method of gland excision which might be tried with advantage under certain conditions, e.g. if no serum is available. There exist few if any diseases displaying such varying clinical aspects as plague. It would seem as if the plague bacillus, itself extremely polymorphous in character, is able to create a range of widely different clinical pictures. It is but reasonable that in our therapeutical endeavours we should here, still more than in any other disease, adapt ourselves to the requirements of the case as well as to the remedies available.

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DR. WU LIEN TEH,

Director and C. M. O.

REPORT ON SOME INVESTIGATIONS DURING THE PLAGUE OUTBREAK IN THE TUNGLIAO DISTRICT IN AUGUST, 1929.

On the 11th of August I was sent to spend 3 weeks in the plague infected area along the Tungliao-Chengchiatun section of the Ssu-Tao Railway. Though routine work in the plague infected villages took up much of my time, yet I managed to make some biological investigations which may be dealt with here.

As the plague infected localities were situated 20-40 km. from the railway line, distances which had to be covered on horseback, the laboratory outfit was necessarily a very limited one, such as could be easily packed into an alpine bag.

Another circumstance that hampered me a good deal was that plague outbreaks occurred very often simultaneously in several villages far away from each other. Thus it was quite impossible to spend a sufficiently long time in one place for research work.

The following plague infected villages were investigated:

(1) Wu-Chia-Tzu; visited 3 times during the height of the plague outbreak, which killed 27 out of a population of 40. There was only one case of recovery.

(2) Big San-Chia-Tzu, visited twice; at the onset, and at the height of the outbreak.

(3) Little San-Chia-Tzu, repeatedly visited but only after the end of the outbreak.

(4) Jaoboshtu, visited three times; only one plague case, imported from another village.

(5) Eastern Bayintala, visited twice.

(6) Aoli, visited only once, after the end of the outbreak.

(7) Sichiagantulika, repeatedly visited by Dr. Liu, who also collected parasitological material there, according to the instructions given to him.

Finally we tried twice to investigate the Mongol village Chasintala, as several suspicious cases of death had been reported from there. It was impossible, however, to perform any investigations at this place. The inhabitants refused to let us enter their houses, maintaining that they did not want any interference either by the Chinese authorities or by foreign doctors, and would prefer to take exclusively their lamas' advice. When we tried to convince them, they showed us their guns, and threatened to shoot if we did not leave the place.

As to the plague cases investigated bacteriologically during this trip the following may be mentioned here:—

Dry agar slants without visible traces of condensation water were used in order not to spoil the growth of the isolated plague colonies during the transport on horseback.

The finger blood (one loopful) of four patients in different stages of the disease was investigated. All were positive. Bacteremia proved to be present rather early. The virulence of the four strains showed a slight difference only as may be demonstrated by the following table:

TABLE NO. I.

<i>Kind of material investigated :</i>	<i>Result of the bacteriological investigation :</i>	<i>Animal experiment :</i>
Finger blood of a 33 years old patient from Wu-Chia-Tzu, 3rd day of illness; died 3 d. later; inguinal bubo.	On dry agar after 48 h. at room t° numerous typical colonies of bac. pestis	Intracut. infected guinea pig died after 116 h. of acute bub. pl.
Finger blood of a 60 years old patient from Wu-Chia-Tzu, 2nd day of illness, died 3 days later; inguinal bubo.	On dry agar after 48 h. at room t°: about 20 isolated colonies of bac. pestis.	Intracut. infected g. p. died after 90 h. from typical acute bubonic plague.
Finger blood of a 20 years old patient from San-Chia-Tzu; late stage of illness; died about 12 h. later; no distinct palpable buboes.	On dry agar plentiful colonies of bac. pestis.	Intracut. infected g. p. died after 174 h. of typ. acute bubonic pl.
Finger blood of a 33 years old patient from East Bayintala; 2nd day of illness. Died 2½ days later; ing. bub.	Three single colonies of bac. pestis.	Intracut. infected g. p. died after 104 h. of typ. acute bub. plague.

All plague infected villages consist exclusively of clay huts, the walls of which were perforated by numerous rat holes (see photo). Very often the inhabitants told us that they had observed frequent deaths among rats one or two months ago. During this time dead rats were repeatedly brought into their houses by cats; on the whole during my stay dead rats were rarely to be seen, and the rat population seemed to have been somewhat reduced. Several times dead rats were found by me near the houses and investigated on the spot. But as the weather was very hot, the specimens were already decomposed to such a degree that no conclusion as to the cause of their death could be drawn. By reason of uncontrollable circumstances, experiments on animals with the material of these carcasses could only be performed after my return to Harbin. Guinea pigs infected with parts of the material preserved

REPORT ON SOME INVESTIGATIONS DURING THE PLAGUE 17
OUTBREAK IN THE TUNGLIAO DISTRICT IN AUGUST, 1929.

in glycerin, succumbed partly, but never showed any certain plague lesions at their post mortems.

One house mouse which had been brought by a cat upon the k'ang (sleeping platform) during my stay at Jaoboshtu, and which died soon afterwards, also did not prove to be plague infected, but such incidents, quite usual in this region, prove how dangerous cats may be to man owing to their habit of depositing their prey (rats) on the human sleeping places. Time and circumstances did not allow me to obtain living rats in the plague infected villages.

Numerous wild rodents such as sisels, small hamsters, gerboas etc. were dug out and investigated. They all proved to be free from plague.

Thus my investigations were limited to studying ectoparasites collected on man and animals in or near the plague infected houses of some of the villages.

The following table gives a survey of the material investigated.

TABLE NO. II.

<i>Habitat of the parasite :</i>	<i>Species of the flea :</i>	<i>Remarks :</i>
Dog from Tju-Chia-Tzu.	11 pulex irritans.	
7 dogs from Jaoboshtu.	119 pulex irritans.	
Dog from Sichiagantulika.	5 pulex irritans.	Investigated histolog. no plague bac.
Dog from Wu-Chia-Tzu, belonging to a plague infected house.	8 pulex irritans.	Investigated histolog. no plague bacilli.
Dog from Wu-Chia-Tzu, belonging to a plague infected house.	16 pulex irritans.	4 g.p. inf. each with an emuls. of 4 fleas in sal. sol. : no pl.
Healthy man from Wu-Chia-Tzu, living in a pl. inf. house.	1 pulex irritans.	Guinea p. inf. with the fleas emulsion rem. healthy.
Human clothes, Wu-Chia-Tzu.	4 pulex irritans.	Histol. invest. : no. pl.
Clothes & sleeping platform. Pl. inf. house, Wu-Chia-Tzu.	6 pulex irritans 3 xenopsylla cheopis.	4 pul. irr., 1 xen. cheop. invest. histol. Only the xen cheopis pl. infc.
Sleeping platform, Sichiagantulika. No human pl. cases occurring afterwards in this house.	1 pulex irritans 5 xenopsylla cheopis.	Histol. invest. 4 xen. cheop. plague pos. ; 1 pul. irr. : plague neg.
Sleeping platform, Sichiagantulika. One human plague case had occurred in this house.	3 pulex irritans 9 xenopsylla cheopis.	Investigated histol. : 1 pul. irr. : plague neg. 6 xen. cheop. : plague pos.

This table shows the following points:

(1) *The dog fleas.* In accordance with the observations made last year in the same district, the local village dogs harboured only the human flea (*Pulex irritans*).

Among 159 fleas from 11 dogs belonging to four small villages not a single *Ctenocephalus canis* could be found. (10 of these dogs were kept outside the houses).

These findings correspond to the results obtained by Joff on the dogs of the Kirghese*. This author investigated the fleas incidence on Kirghese dogs and examined 1600 specimens. Summarizing he found that in conditions existing in the Kirghese steppes the *Ctenocephalus canis* is absent on dogs during the cold season and is fully substituted by *pulex irritans*. In towns (Saratov) 90% of fleas found on dogs are *Ctenocephalus canis*. It has to be mentioned, however, that Joff's observations refer to the winter months while our observations were made in August. We made also some investigations in Harbin, but the number of fleas obtained is not big enough as yet to draw any definite conclusions. At any rate it can be said that *Ctenocephalus canis* is harboured in considerable numbers by Harbin dogs, but *pulex irritans* is very frequent as well.

By making a search (not exhaustive) for fleas on village dogs, I found that in most cases the flea rate was higher than 50.

Although the dogs in the plague area are very numerous, their role as plague spreaders seems to me rather problematic.

On the one hand no rat fleas, *Xenopsylla cheopis*, the most dangerous plague transmitters were found on them. On the other hand, harbouring numerous human fleas, and devouring human plague corpses they may of course catch fleas that have sucked bacteriemic blood. But dogs themselves are not susceptible to plague. Besides experiments of various authors show that the transmission of the disease by *pulex irritans* is not very frequent, moreover this flea loses relatively soon its power of infection.

Serial sections of eight human fleas caught on dogs at Wu-Chia-Tzu did not reveal the presence of *B. pestis* in the alimentary tract. Further I did not succeed in infecting guinea pigs with the emulsion of 16 other fleas (*pulex irritans*), collected on dogs of the same village, though human plague cases had occurred in every house, and almost three quarters of all the inhabitants had died out. Five *pulex irritans* from dogs of Sichiagantulika, a severely plague infected village, investigated histologically, were free of plague bacilli as well. Thus the role of the dog as plague carrier in this region seems to be an occasional rather than an important one.

In addition, I tried repeatedly to study the flea fauna upon the local domestic cats, but all the cats investigated were free of fleas.

* Vjestnik Microbiol. and Epidemiol. 1925, VI, No. 4, p. 54.

(2) *The flea fauna on men and upon the sleeping platforms.*

These fleas were collected upon the k'angs, under clothes and carpets in plague infected houses.

At Wu-Chia-Tzu the fleas were collected towards the end of the outbreak of plague that afflicted 27 out of the 40 inhabitants of the village. Out of 14 fleas from this place 11 were *pulex irritans* and only 3 *xenopsylla cheopis*. In Sichiagantulika the fleas were collected at the beginning of the outbreak, when only 8 of the 27 cases that occurred there, had been registered. In this place the percentage of *xenopsylla cheopis* was a much higher one. Out of 18 fleas 14 were *xenopsylla cheopis* and 4 *pulex irritans*. The large number of rat fleas upon the k'angs in this village is rather striking. It seems to me that the considerable prevalence of rat fleas is probably only a transient occurrence and perhaps in connection with a preceding epizootic among rats. The fact that plague infected rat fleas prevailed in a house where plague cases among men had not yet occurred, supports this view. The nests of these rodents, situated at a distance of only a few feet from the surface of the sleeping platform, may have lost all their inhabitants, and their whole flea population was forced to wander in search of another host. Unfortunately circumstances did not allow of obtaining evidence of the epizootic by investigating the rats of this village.

Histological investigation of fleas collected from the sleeping platforms and clothes in the houses of the plague infected villages.

Technic: Immediately after collected, the fleas were preserved in alcohol. After my return to Harbin they were treated with Diaphanol in order to soften the chitin, and mounted in paraffin. Serial sections were made of every specimen and stained after Kossel's method. Thus a detailed histological study of the infective power of these fleas was possible.

The following material has been investigated:

(A) 7 specimens of *pulex irritans* and 1 *xenopsylla cheopis* of the fleas collected at Wu-Chia-Tzu:

None of the 7 *pulex irritans* showed plague bacilli in its alimentary tract. The *xenopsylla cheopis* contained dense clusters of plague bacilli in the proventriculus, and generally scattered plague bacilli as well as numerous clusters in the stomach.

(B) Fleas collected at Sichiagantulika:

(1) One *pulex irritans* and 4 *xenopsylla cheopis* from a house being still free of plague.

1. Female *pulex irritans*: Stomach filled with autolyzed blood, only in a few places the outlines of the erythrocytes are still discernible. No bacilli to be seen.

2. Male *xenopsylla cheopis* (see drawing No. 2). The proventriculus is extended in transversal direction. Valve widely open. In the anterior part of the lumen a pink coloured granular mass is to be seen. The recesses between the anterior rows of the spinelike cells are free

of bacteria while in the posterior recesses an abundant growth of bipolar coccobacilli is to be seen. In this region the lumen is entirely obstructed by clumps of plague bacilli growing partly in the form of curved bands into the spatia between the posterior spinelike cells. (See photomicrograph No. 3).

The stomach is filled with blood, the erythrocytes of which are still morphologically well discernible. The leucocytes also are in relatively good condition. No phagocytosis is to be seen. Plague bacilli are generally scattered, but some clusters are to be found throughout the whole lumen, the bigger ones situated more centrally. The area close to the wall of the stomach is almost free of them. The bacilli show various assortment of forms, here and there small chains prevail.

3. Male *xenopsylla cheopis*. Similar to No. 2. In the stomach the plague bacilli are distributed partly individually, and partly in numerous small clusters. The blood has already lost its structure.

4. Female *xenopsylla cheopis*. More advanced stage of plague infection. A plug of dense bacillary growth is blocking the proventriculus in its posterior part. From there stripes of plague bacilli are growing into the spatia between the posterior spinelike cells. The stomach is filled with a very badly stained material, presumably autolysed blood, and numerous clumps of plague bacilli. The latter show sometimes distinct bipolar staining and contain many large (involution) forms.

5. Male *xenopsylla cheopis*. Advanced stage of plague infection. Compact block of plague bacilli in the posterior part of the proventriculus. Some small groups of plague bacilli are to be seen in its anterior part. The stomach contains autolysed blood and generally scattered plague bacilli as well as big clumps.

(II) One *pulex irritans* and 6 *xenopsylla cheopis* from a house where one plague case had already occurred.

1. *Pulex irritans*: The stomach contains a granular mass; no plague bacilli are to be seen.

2. *Xenopsylla cheopis*: Proventriculus filled with a pink-coloured coagulated material. On the border between the proventriculus and the stomach dense clusters of plague bacilli cohering to each other and forming a kind of wall are to be seen. This clings to the posterior spinelike cells and partly to the fold of the basement membrane which separates the proventriculus from the midgut. In the stomach erythrocytes partly unaltered in structure were present. Clusters of plague bacilli varying in size and often of sausagelike form are dispersed everywhere. In the posterior part of the stomach a big clump of them is to be seen. It contains some leucocytes which show no phagocytosis, and are in relatively good condition. Leucocytes are met with also outside the clump. They never contain any plague bacilli but very often a small group of bacilli lays close to them. The bacilli show fairly well stained diplobacillary forms as well as involution forms. (See drawing No. 1 and photomicrograph No. 1).

3. *Xenopsylla cheopis*. Histological features similar to No. 2. Open valve. The lumen of the proventriculus contains a pink coloured granular mass and clusters of plague bacilli penetrating the posterior recesses. The stomach is filled with blood; the erythrocytes are in part well discernible especially in the central and posterior region, while in the anterior part the degeneration of the ingested blood is more advanced. The blood is interspersed with clusters of plague bacilli forming big sausagelike clumps in the central part of the stomach while the periphery is free from them. Single plague bacilli or small groups of them are scattered everywhere. Leucocytes show no phagocytosis.

4. *Xenopsylla cheopis*. Small clumps of plague bacilli situated in the centre of the stomach. The periphery is free from them. Blood changed into a granular mass (See photomicrograph No. 2).

5. *Xenopsylla cheopis*. Similar to No. 2 and No. 3. The stomach contains numerous clusters of plague bacilli scattered everywhere in the digested blood.

6. *Xenopsylla cheopis*. Similar to No. 2 and No. 3. Well preserved red blood corpuscles in the stomach. Plague bacilli often arranged in long chains running parallel to each other. These stripes are frequently situated near the endothelial lining but never adhere to it.

7. *Xenopsylla cheopis*. Proventriculus filled up with compact masses of plague bacilli. An especially dense plug of them is growing far into the enlarged oesophagus. Plague bacilli are growing in the form of broad dense stripes between the spinelike cells. There are two centers of the compact mass: The smaller one is the already mentioned plug, the bigger one is situated at the junction of the ventriculus and stomach. The stomach is filled with a pure culture of plague bacilli. No well-preserved blood lumps, stained red violet, and corpuscles are to be seen, only homogeneous masses are left amidst the dense culture, (see drawing No. 3 and photomicrograph No. 4).

The results obtained by the histological examination of these fleas confirm on the whole the statements made by Bacot and Martin in their classical paper on artificially infected rat fleas*. The plague bacilli multiply in the stomach forming scattered clusters that never cling to the endothelial lining and often stick together in big clumps situated mostly centrally. At the same time clusters of plague bacilli develop at the junction of the proventriculus and stomach. Sometimes one has the impression that not all clusters of this "membrane" are due to the multiplication of bacilli deposited there with the ingested blood. It seems that the spinelike cells of the closed valve, helped by the peristaltic movements of the stomach, act as a kind of rake which catches the passing clusters of bacteria. Sometimes the clusters seem to develop

* Bacot, A. W. and Martin C. J. On the Mechanism of the Transmission of Plague by Fleas. J. Hyg. Pl. Suppl. III, 423.

Bacot, A. W. Further Notes on the Mechanism of the Transmission of Plague by Fleas. J. Hyg. Plague Suppl. IV, 777.

primarily in the recess between the last posterior row of the spinelike cells and the fold of the basement membrane which separates the proventriculus from the stomach. From there they grow into the recesses between the posterior spinelike cells. Sometimes there is still a second region of the gizzard where plague bacilli seem to develop primarily. In some fleas, the anterior part of the proventriculus at its junction with the oesophagus shows very dense clumps of plague bacilli, while the middle part contains much less. Unfortunately no good sections of non-infected *xenopsylla cheopis* are at my disposal. There are, however, findings on normal *pulex irritans* and *ophthalmopsylla jettmari* which might give an explanation of this phenomenon. The anterior rows of the spinelike cells are much shorter than the posterior ones, and thus a conical space is left around the insertion of the oesophagus. In the above mentioned two species of fleas this space is often filled with blood. The bloody mass is here sometimes extending to the posterior part of the oesophagus (see photomicrographs No. 5 and 6). On the other hand, this blood often communicates directly with the contents of the stomach through a small canal that is left between the spinelike cells even when the gizzard is contracted.

If we assume a similar condition for *xenopsylla cheopis*, it is clear that if the blood remaining in the anterior part of the proventriculus and the end of the oesophagus contains plague bacilli, multiplication of them takes place there as well as at the junction of gizzard and midgut. This leads at a relatively early time to a complete blockade of the proventriculus, because it starts from two sides.

SUMMARY.

1. A great number of fleas was collected from dogs of plague infected villages. All proved to be *pulex irritans*; no *ctenoccephalus canis* was found.

2. Numerous fleas caught in the plague stricken villages were investigated histologically :

(A) Out of the investigated human fleas (*pulex irritans*) collected on men and dogs as well as upon the sleeping platforms of plague infected houses not a single specimen proved to be infected.

(B) All investigated rat fleas (*xenopsylla cheopis*) caught upon the sleeping platforms and on human clothes in the plague infected huts contained plague bacilli in their alimentary tract.

(C) Even in a hut where plague cases among men had not yet occurred, but took place some days after the material had been collected, all *xenopsylla cheopis* proved to be plague infected.

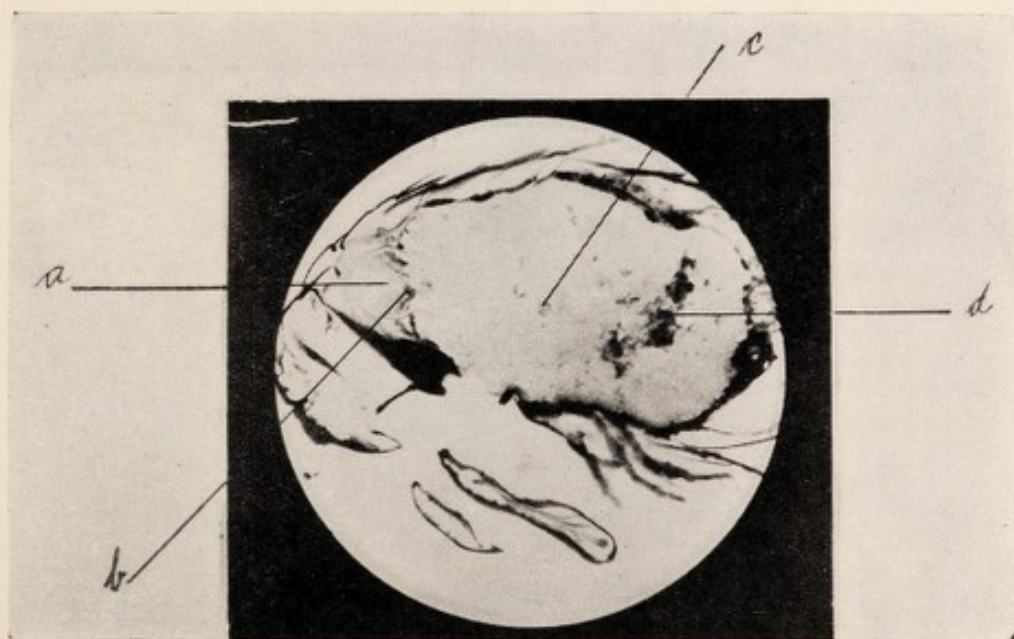
3. A detailed histological description of the plague infected fleas is given, and the question of the primary development of the blockade of the proventriculus is discussed.

H. M. JETTMAR,
(Serologist of the Service).



Outside wall of a hut in Chengchiatien. Note the 3 rat holes near the ground.

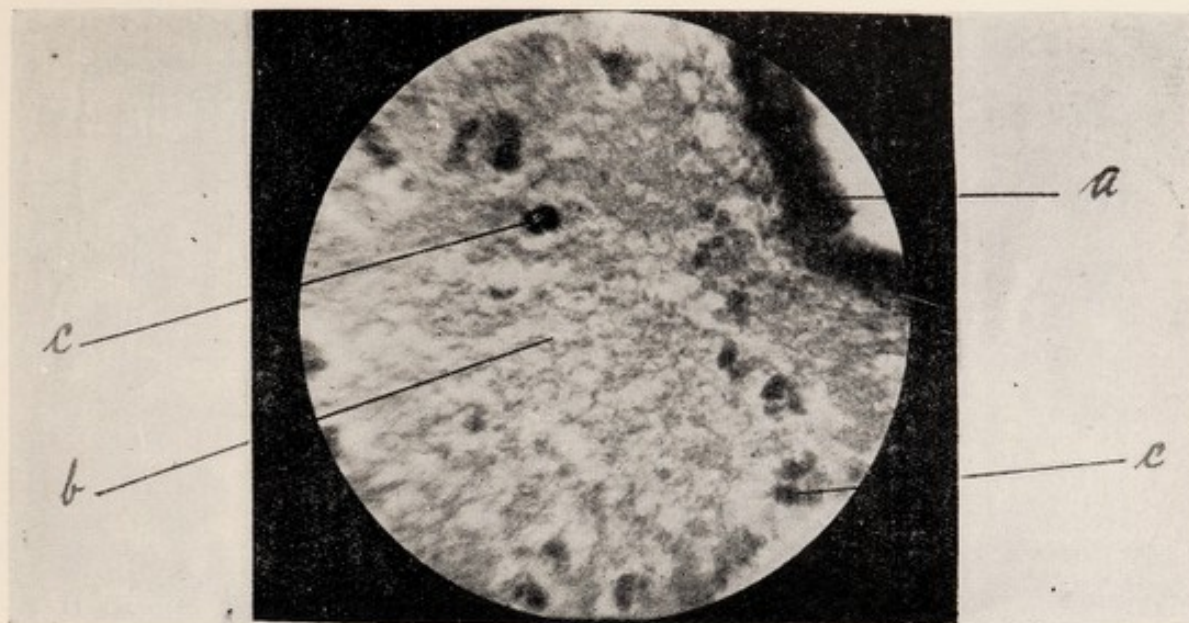
Photomicrograph I. Longitudinal section through a *xenopsylla cheopis* (Sichiangantulika, plague infected hut.) Early stage of disease. (Magn. 120 diam.).



- (a) Proventriculus.
- (b) Junction of the proventriculus and stomach: beginning blockade of plague bacilli.
- (c) Stomach filled with blood; scattered small clusters of plague bacilli.
- (d) Big clusters of plague bacilli in the posterior part of the stomach.

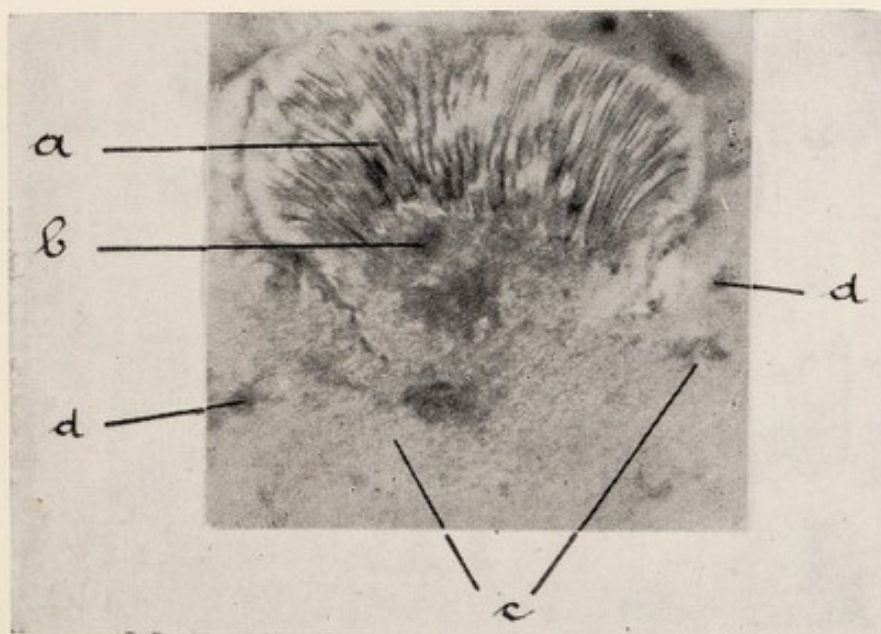


Photomicrograph II. Section through a plague infected *xenopsylla cheopis*. *Sichiagantulika*. (Magn. 600 diam.).



- (a) Wall of the stomach.
- (b) Stomach containing blood and dispersed plague bacilli.
- (c) Clusters of plague bacilli in the stomach.

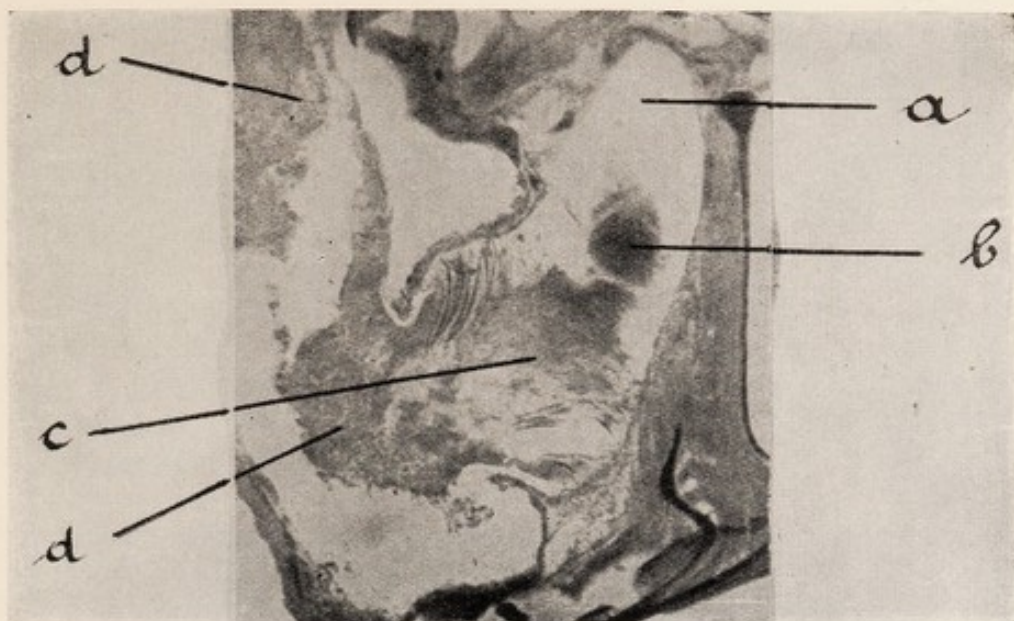
Photomicrograph III. Plague infected *xenopsylla cheopis*. *Sichiagantulika*. (Magn. 300 diam.).



- (a) Spinelike cells of the proventriculus.
- (b) Agglomeration of plague bacilli at the entrance to the stomach.
- (c) Anterior part of the stomach filled with recently sucked blood.
- (d) Small clusters of plague bacilli in the stomach.

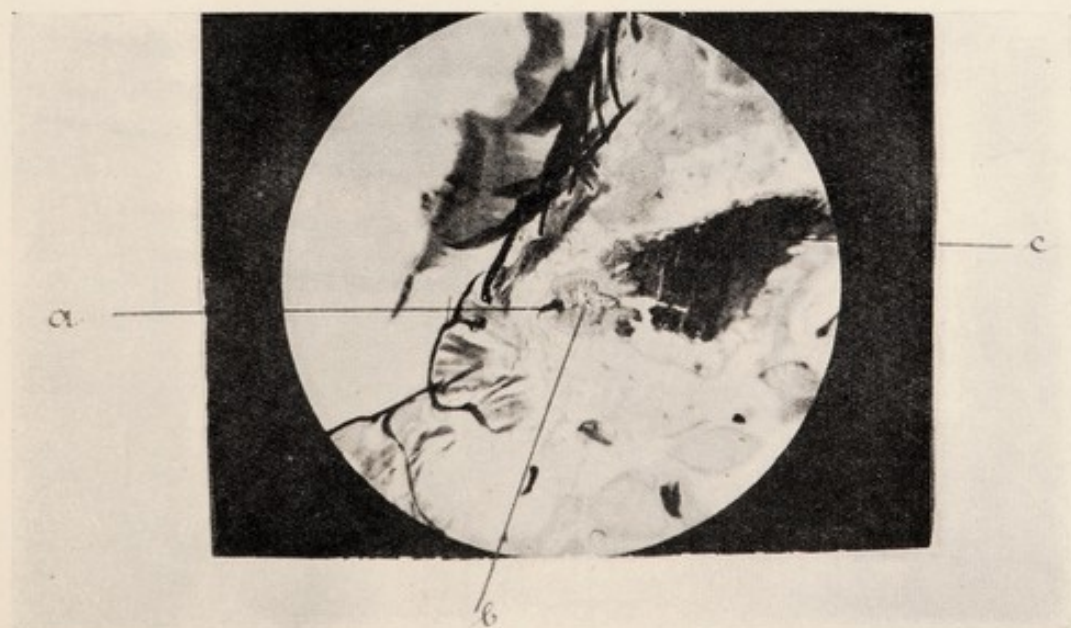


Photomicrograph IV. Longitudinal section. Plague infected *xenopsylla cheopis*. 11/7. from Sichiagantulika. (Magn. 180 diam.).



- (a) Enlarged oesophagus.
- (b) Plug of plague bacilli projecting into the oesophagus.
- (c) Open proventriculus filled up with a pure culture of plague bacilli; the rows of spinelike cells distended.
- (d) Stomach filled with pure culture of plague bacilli.

Photomicrograph V. *Pulex irritans* from a dog at Wu-Chia-Tzu. (Magn. 120 diam.).

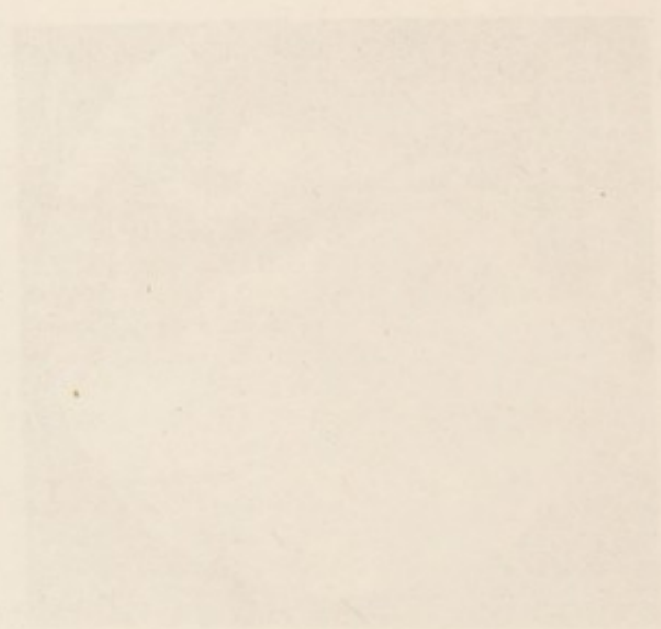


- (a) Plug of blood projecting into the oesophagus.
- (b) Proventriculus.
- (c) Stomach filled with blood.

Photomicrograph VI. Longitudinal section through a *pulex irritans* from a dog at Sichiagantulika. (Magn. 300 diam.).



- (a) Posterior portion of the oesophagus filled with blood up to its junction with the proventriculus.
- (b) Proventriculus containing blood.
- (c) Stomach.



MITES AS PLAGUE CARRIERS?

from : Zoologische Jahrbuecher, Bd. 60
Heft 3/4, 1930 p. 381-428.

15 illustrations, 60 references.

The mites collected by one of the members of the Manchurian Plague Prevention Service in the nests of different small rodents in Northern Manchuria are thoroughly studied, and some new species are described.

The study of these collections shows that the acarofauna in the nests of different small East-Asiatic rodents is quite similar to the fauna of mites found under equal conditions in the nests of small European rodents. Only the species are different. The genera *Eulaelaps* and *Haemogamasus* are the most common representatives of mites in the nests of the investigated Eastern Asiatic rodents.

The following species of mites were found and described in the present paper :

Name :	Found :
1. <i>Parasites celzer</i> (C. L. Koch)	Nest of <i>Dipus sowerbyi</i> .
2. <i>Poecilochirus necrophori</i> n. sp.	On a necrophorus-like beetle in the nest of <i>Citellus mongolicus</i> .
3. <i>Nothrolapsis decoloratus</i> (C. L. Koch)	Nest of <i>Dipus sowerbyi</i> .
4. <i>Haemogamasus manchuricus</i> n. sp.	Nest of <i>Phodopus bedfordiae</i> Thomas and <i>Dipus sowerbyi</i> Thomas.
5. <i>Laelaps jettmari</i> n. sp.	Nests of <i>Cricetulus griseus</i> and <i>Apodemus agrarius</i> .
6. <i>Eulaelaps cricetuli</i> n. sp.	Nests of <i>Phodopus bedfordiae</i> and <i>Dipus sowerbyi</i> .
7. <i>Hypoaspis cricetophilus</i> n. sp.	Nest of <i>Phodopus bedfordiae</i> .
8. <i>Cilliba eulaelaptis</i> n. sp.	On <i>Eulaelaps cricetuli</i> in nest of <i>Dipus sowerbyi</i> .
9. <i>Ereynetes sittardiensis</i> Oudemans.	Nest of <i>Dipus sowerbyi</i> .

Five of these mites were unknown until now. The description of them is of special value because it has helped very much to elucidate some questions of classifications of these insects.

In the conclusions the author compares the European with the East-Asiatic acarofauna, and emphasizes that out of the whole collection comprising hundreds of mites only one specimen of *laelaps* proved to have sucked blood. But according to the experience made until now it is not likely that a representative of the genus *laelaps* ever would suck human blood.

The author draws therefore the conclusion that all the species of mites described could hardly play any role in the spread of a plague epidemic even if the epidemic is the result of an epizootic among the rodents in question.

H. GRAF VITZTHUM,
(Berlin).

BARTONELLOSEN UND GRAHAMELLOSEN UNTER OSTASIATISCHEN WILDEN NAGETIEREN.

(Read before the International Congress of Microbiology, Paris, 1930.)

Unter einer Reihe von Nagetieren der mandschurischen und mongolischen Steppen wurden folgende Blutparasiten beobachtet:

I. *Bartonellen*. Sie wurden bei folgenden entmilzten Tieren festgestellt: Bei dem Zwerghamster *Cricetulus griseus fumatus*, der Brandmaus *Apodemus agrarius*, und dem *Phodopus praedilectus*. Entmilzte Ziesel (*Citellus mongolicus ramosus*), Rennmaeuse (*Meriones kurauchii*) und Springhasen (*Dipus sowerbyi*) blieben frei.

Was nun die bartonellapositiven Tiere anlangt, so decken sich unsere Befunde bei *Cricetulus griseus fumatus* mit der Angabe von Noguchi, der bei drei entmilzten Tieren dieser Art Bartonellen nachweisen konnte. Von uns wurden gegen 30 Tiere untersucht, die fast alle positiv wurden, und zwar zumeist in der ersten Woche nach der Operation. Dabei kam es zur Ausbildung einer verschieden starken Anaemie, die jedoch nicht zum Tode fuehrte. Rezidive in den naechsten Wochen waren nicht selten. Morphologisch wiesen diese Hamsterbartonellen alle fuer *Bartonella muris ratti* beschriebenen Formen auf.

Im Gegensatz dazu scheint die *Bartonella* des *Phodopus* eher feiner zu sein. Auffallend war, dass trotz schwerer Bartonelleninvasion sich das Blutbild bei *Phodopus* nicht wesentlich aenderte.

Andererseits fuehrte die durch Entmilzung provozierte Bartonelleninvasion bei den Brandmausen (*Apodemus agrarius*) fast in der Haelfte der Faelle unter den Symptomen einer schwersten Anaemie zum Tode.

Kulturversuche an Bartonellen misslangen.

Ausser Bartonellen wurden bei sehr vielen Nagern auch

II. *Grahamellen* gefunden, und zwar bei:

1. Mongolischen Springhasen (*Alactaga mongolica* Radde),
2. Südmandschur. Springhasen (*Dipus sowerbyi* Thomas),
3. *Microtus raddei* (bereits von Dudtschenko beschrieben),
4. der Brandmaus (*Apodemus agrarius* Pall),
5. *Cricetulus griseus* (in Uebereinstimmung mit Patton & Hindle),
6. bei *Cricetulus turunculosus* Pallas (*Cric. barabensis*),
7. *Cricetulus triton* de Winton, und
8. *Phodopus praedilectus* Mori.

Hingegen konnten beim Tarbagan (*Arctomys bobac* Pall), beim mongolischen Ziesel (*Citellus mongolicus ramosus*), der Rennmaus (*Meriones kurauchii*), dem Pfeifhasen (*Ochotoma dahurica*) und bei

Blindmaeusen (*Siphneus aspalax*) Grahamellen nicht nachgewiesen werden.

Es verdient besonders hervorgehoben zu werden, dass bei den mit Grahamellen so regelmaessig behafteten Springhasen nach der Entmilzung niemals eine Bartonelleninvasion beobachtet werden konnte.

Bei allen grahamellenpositiven Nagern zeigten die Parasiten ungefaehr das gleiche morphologische Verhalten. Sie lagen NIE im polychromen Erythrozyten und faerbten sich nach Giemsa-zum Unterschied von den leuchtend roten Bartonellen intensiv dunkelviolett. Im Makro- und Mikrozyten hingegen wurden sie gefunden.

Die detaillierten Untersuchungen ueber den Verlauf der Infektion wurden von uns an jungen Hamstern und Springhasen gemacht.

Die Grahamellen treten bereits in den ersten Lebenstagen im Blute auf. Junge Hamster bekommen in ihren ersten Lebenswochen nicht selten eine oft ausserordentliche Zunahme der Parasiten. Auf dieses akute Stadium folgt ein chronisches, in welchem die befallenen Erythrozyten selten werden und sich zeitweise der Beobachtung entziehen. Im spaeteren Leben kommt es dann manchmal ohne sichtbaren Grund zu einem bedeutenden neuerlichen Anfall. Manchmal scheint die Infektion *gleichzeitig* eine groessere Zahl von Erythrozyten zu befallen. Man findet dann im Beginne der Zunahme die Mehrzahl der infizierten Blutkoerperchen nur mit wenigen Parasiten besetzt, dann vermehren sie sich intrazellulaer so stark, dass sie schliesslich den Erythrozyten zum Platzen bringen und frei im Plasma liegen. Ihr Entwicklungsgang im roten Blutkoerperchen scheint 4-7 Tage zu beanspruchen.

Handelt es sich um Mischinfektion von Bartonellen und Grahamellen, so stoesst man nicht selten auf Erythrozyten, welche beide Parasiten enthalten, die sich durch ihre Farbe und Form deutlich voneinander unterscheiden.

Im Gegensatz zu den Bartonellen werden die Grahamellen durch die Milzexstirpation nicht deutlich beeinflusst.

Es wurde nun versucht, die Grahamellen rein zu zuechten.

Tatsaechlich gelang es mit grosser Regelmaessigkeit, aus dem Herzblute von infizierten Tieren auf Meerschweinchen-Serum-Blut-Agar (8g Agar und 1g defibriniertes Meerschweinchenblut) nach 6taeg. Inkubation bei 32 bis 37 Grad eine Reinkultur zahlreichster kleinster Kolonien zu zuechten, welche aus Mikroorganismen bestanden, die morphologisch und faerberisch auffallende Aehnlichkeit mit den Blutgrahamellen aufwiesen. Merkwuerdig war im Ausstrich ihre Lagerung zu kleinsten Haefchen von der Groesse eines Blutkoerperchens und darueber mit etwa 100 Einzelindividuen. Uebertragungsversuche mit diesen Kulturen auf andere, nicht grahamellenbehaftete Nagetiere schlugen fehl.

III. *Hepatozoen*. Diese fanden sich bei den untersuchten Springhasenarten mit grosser Regelmässigkeit. Sie waren ebenfalls schon bei ganz jungen und blinden Tieren auffindbar. Die Milzexstirpation beeinflusste sie nicht.

IV. *Trypanosomen*. Weiters beherbergte ein wechselnder Prozentsatz aller untersuchten Cricetulusarten, sowie die Brandmaeuse-diese nur sehr selten-*Trypanosomen*. Nach Milzexstirpation, kam es in einem Falle zu einer rasch verschwindenden Zunahme der Parasiten. Bei anderen Tieren hatte die Milzexstirpation keinerlei Einfluss auf die Infektion.

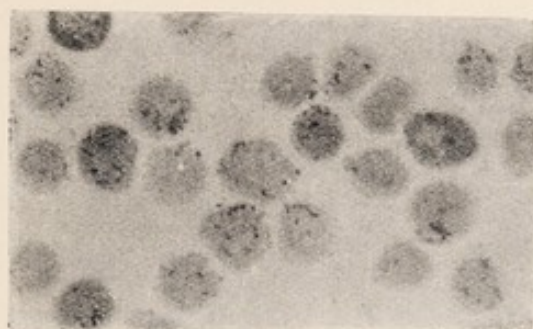
Eine eingehendere Beschreibung dieser Untersuchungen ist einer weiteren Publikation vorbehalten.

DR. WU LIEN TEH,

DR. H. M. JETTMAR.

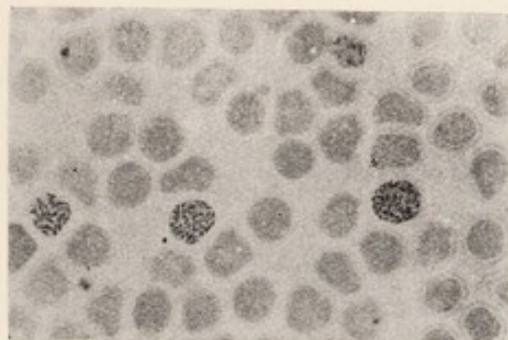
BLOOD-PARASITES OF THE GREY HAMSTER:
CRICETULUS GRISEUS var. FUMATUS.

灰色小咸士特鼠之血的寄生蟲



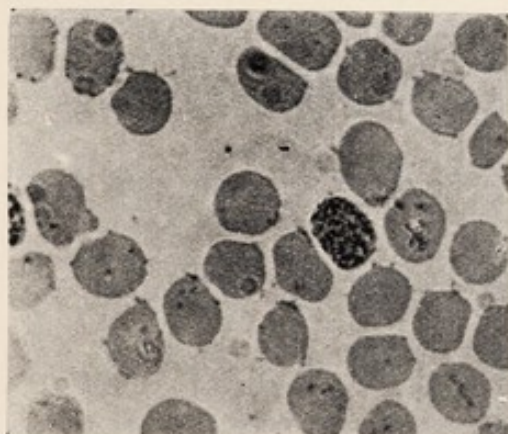
1.—Splenectomized hamster pure bartonella-infection.

1. 咸士特鼠割去脾血內存有 (巴篤尼來)



2.—Young hamster (not splenectomized) severely infected with Grahamellae. Note the Jolly bodies in some of the erythrocytes.

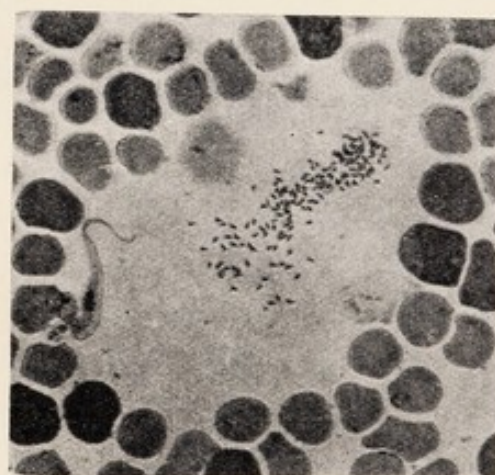
2. 咸士特雄鼠 (不割脾) 血內存有多數 (故藍磨利來) 虫并于赤血球中含有 (戴利) 的物



3.—Splenectomized hamster. Mixed infection: Bartonellosis and Grahamellosis.

(x) Erythrocyte, containing both parasites.

3 咸士特鼠 (割去脾) 血內含有 (巴篤尼來) 并 (故藍磨利來)

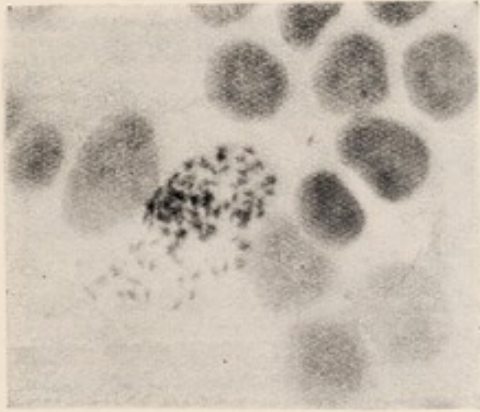


4.—Splenectomized hamster. 3 kinds of blood-parasites:

- (a) a swarming group of Grahamellae,
- (b) Bartonellae in almost 100% of the erythrocytes.
- (c) Trypanosoma criceti.

4. 咸士特鼠 (割去脾) 血內含有三類血虫
甲. 多數 (故藍磨利來)
乙. 每赤血球內有含有 (巴篤尼來)
丙. (篤利巴維疏米)





5.—Groups of Grahamellae, leaving a recently broken erythrocyte, being severely infected with Grahamellae.

5. 多數 (故藍磨利來)
由赤血球中突出



6.—Swarming Grahamellae (2nd stage) in the blood of the hamster.

6. 咸士特鼠之血內第二期多
數 (故藍磨利來)



UEBER BLUTGRUPPENUNTERSUCHUNGEN AN MANDSCHURISCHEN HAUSSAEUGETIEREN.

Zu unseren Studien wählten wir:

Rinder ausschliesslich mandschurischer Rasse, mongolische Fettschwanzschafe und reinrassige mandschurische Schweine.

Technik: Die Sera wurden nach dem Abscheiden scharf zentrifugiert; das defibrinierte Blut durch Watte in enge Röhrchen durchgeseiht und in 1% Aufschwemmung angewandt. Es wurden zumeist je 25 Blute in allen ihren Kombinationen untersucht (0.3ccm Serum gegen 0.30ccm der 1% Blutaufschwemmung.). Die gut durchgeschüttelten Röhrchen wurden 2h bei 30°C gehalten, dann kamen sie in einen kühlen Raum von 15°C; das Resultat wurde am nächsten Morgen, also meist innerhalb der ersten 24 Stunden nach der Blutentnahme abgelesen.

Kurz zusammengefasst sind unsere Ergebnisse folgende:

(1).—*Rinderblute.*

Es wurden im ganzen die Blute von 228 Rindern in ueber 6000 Kombinationen geprüft. Nur gesunde unvorbehandelte Rinder wurden verwendet. Von diesen 228 Rindern zeigten 224 mehr weniger typische Reaktionen, so dass sie in das bekannte Gruppenschema von Ottenberg-Friedman: I=aO, II=oA und III=oO eingeteilt werden konnten. Bei vier Rinderbluten, welche sowohl Isoagglutinine als auch Isoagglutinogene besaßen, waren die Reaktionen so unregelmässig, dass eine Einteilung in das Gruppenschema nicht möglich war.

Von den 224 Rindern gehoerten der isoagglutinhaltigen aO-Gruppe 30.4, der isoagglutinogenhaltigen oA-Gruppe 50.5, und der oO-Gruppe 19.1% an.

Ueber die charakteristischen Eigenschaften der Rinderisoagglutinine ist folgendes zu bemerken: Manche Erythrozyten adhaerieren in der Waerme ziemlich bald nach ihrer Mischung mit den aO-Seren so fest an die Glaswand, dass ein Abschuetteln von derselben kaum möglich ist, andere Erythrozyten zeigen bloss reine Agglutination. Isohaemolyse wurde niemals, Autohaemagglutination nur in einem einzigen Falle bei einem unregelmässig reagierenden Blute beobachtet. Die Isoagglutinine des Rinderserums sind wenig haltbar; sie sind bereits nach einigen Tagen nicht mehr deutlich nachweisbar.

(2).—*Schafblute.*

Es wurden ausschliesslich reinrassige gesunde Fettschwanzschafe und zwar 154 Stueck in ueber 4000 Kombinationen untersucht. Davon reagierten 5 so unregelmässig, dass sie nicht in das 3-Gruppenschema eingeteilt werden konnten.

Von den restlichen 149 Bluten gehoerten der.

Gruppe aO	46, also 30.87%, der
Gruppe oA	65, also 43.63%, und der
Gruppe oO	38, also 25.50% an.

Die Agglutination aeussert sich beim Schafblut meist in der Form eines typischen gezackten Niederschlages, der dem Boden des Roehrchens lose aufliegt und beim Aufschuetteln mehr weniger zusammenhaengende Flocken erkennen laesst. Kohesion an die Glaswand wird nur sehr selten beobachtet. Zum Unterschied vom Rinde kommt Isohaemolyse beim Schafblut nicht so selten vor.

(3).—Schweineblute.

Es kamen ausschliesslich gesunde reinrassige schwarze mandschurische Schweine zur Untersuchung. Im ganzen wurden 229 Stueck in ueber 8700 Kombinationen geprueft, doch konnten, wie spaeter noch eroertert wird, nach dem 3-Gruppenschema nur 117 Tiere bestimmt werden, da bei den uebrigen Tieren die Untersuchung erst spaeter als 36 Stunden nach der Blutentnahme erfolgte.

Wie bekannt, geben Szymanowsky, Stetkiewicz und Wachler an, dass die Schweineerythrozyten (polnischer Rassen) bei laengerem Lagern eine groessere Agglutinierbarkeit zeigen, wodurch die Einteilung in das 3-Gruppenschema erleichtert wird.

Wir konnten tatsaechlich bestaetigen, dass bei laengerem Lagern der Schweineerythrozyten die positiven Reaktionen viel haeufiger wurden, so dass es schliesslich auch oft zu wechselseitigen Isoreaktionen kam, welche dann die zu erwartenden Gruppenreaktionen verwischten. Eine Einteilung in das 3-Gruppenschema liess sich ziemlich regelmaessig nur bei ganz frischen Bluten feststellen, doch auch hier fanden sich nicht selten Blute mit recht unregelmaessigen Reaktionen; diese Blute enthielten sowohl Isoagglutinine als auch Isoagglutinogene, beide zeigten recht zahlreiche Unregelmaessigkeiten.

Von den in den ersten 24 Stunden nach der Blutentnahme untersuchten 131 Bluten zeigten 14 so unregelmaessige Reaktionen, dass sie in das Dreigruppenschema nicht eingeteilt werden konnten. Von den uebrigen mehr weniger regelmaessig reagierenden Bluten gehoerten der.

aO-Gruppe 41%, der oA-Gruppe 47% und der oO-Gruppe 12% an.

Die Isoreaktion verlief bei den Schweinen rascher und meist auch kraeftiger als bei den Schafen und Rindern. Das Optimum der Ablesezeit ist bereits nach 4 Stunden erreicht. Die Reaktion aeussert sich bei den Schweinen in einer losen mehr weniger kraeftigen Haemagglutination, welcher in der Haelfte der Faelle Haemolyse folgt. Ein Adhaerieren des Blutes an der Glaswand wurde nicht beobachtet.

Die Haltbarkeit der Schweineisoagglutinine ist eine viel beträchtlichere als die der Schafe und Rinder. So behielt filtriertes Schweineserum monatelang seine isoagglutinatorischen Fähigkeiten bei.

Schliesslich sei noch kurz ueber Absaettigungsversuche berichtet, welche alle nach ein und derselben Technik ausgefuehrt wurden.

Die zur Absaettigung dienenden Erythrozyten wurden dreimal in physiolog. Kslg. gewaschen. Hierauf wurde 2ccm Bodensatz mit 10ccm des jeweiligen Serums gemischt und unter kraeftigem wiederholten Umschuettern zwei Stunden bei 25—30 Grad gehalten. Hierauf kam die Mischung noch in ein Eisbad, wo sie weitere zwei Stunden gehalten wurde. Hernach wurde scharf zentrifugiert und das reine Serum in der Menge von 0.3ccm gegen 0.3ccm der 1% Erythrozytenaufschwemmung nach der eingangs angefuhrten Technik gepueft.

Es wurden folgende Kombinationen untersucht:

(1) *Rindersera aO durch Menschenblutkoerperchen abgesaettigt.*

Das mit Menschenblutkoerperchen der Gruppe bA abgesaettigte Rinderserum verliert fast in jedem Falle seine isoagglutinatorische Komponente fuer isoagglutinable Rinderblutkoerperchen, waehrend dasselbe Rinderserum mit aB-Menschenblutkoerperchen abgesaettigt keine Abschwaechung seiner isoagglutinatorischen Fähigkeiten zeigt. Bei Absaettigung mit abO ging in der Regel ein Teil der Isoagglutinine verloren.

(2) *Rindersera aO, durch Hammelblutkoerperchen abgesaettigt.*

Werden die aO-Rindersera allein durch aO-Hammelblutkoerperchen abgesaettigt, so bleiben die Isoagglutinine in voller Staerke erhalten. Werden die aO-Rindersera aber durch oA-Hammelblutkoerperchen abgesaettigt, dann sind solche Rindersera nicht mehr imstande, die oA-Rinderblutkoerperchen zu isoagglutinieren.

(3) *aO-Rindersera durch Schweineerythrozyten abgesaettigt.*

Die typischen aO-Schweineerythrozyten vermochten nicht die Spur die Rinderisoagglutinine zu binden, waehrend nach Absorption mit 2 mehr weniger unregelmässig reagierenden Schweinebluten, welche neben Isoagglutininen starke Isoagglutinogene enthielten, die aO-Rindersera ihre isoagglutinierende Komponente gegen die oA-Rinderblutkoerperchen voellig eingebuesst hatten. Eine Mittelstellung nahm ein sonst typisches oA-Schweineblut mit etwas schwaecheren Isoagglutinogenen ein: Rindersera der aO-Gruppe, mit diesen Schweinenblutkoerperchen abgesaettigt, vermochte noch zum kleinen Teil die oA-Rindererythrozyten zu agglutinieren.

(4) *aO-Hammelsera durch Rinderblutkoerperchen abgesaettigt.*

Identische Befunde wie bei entgegengesetzter Absaettigung (vide 2) Starke Reduktion oder Vernichtung der Hammelisoagglutinine nach Absaettigung mit Rinderblutkoerperchen der Gruppe oA, waehrend aO-, oder oO-Rindererythrozyten wirkungslos blieben.

(5). *aO-Schweinesera durch Menschenblutkörperchen abgesaettigt.*

In Uebereinstimmung mit den Befunden von Szymanowsky, Stetkiewicz und Wachler verlieren *typische* aO-Schweinesera, welche mit Menschenblutkörperchen der Gruppe A abgesaettigt wurden, vollstaendig ihre Isoagglutinine gegen fast alle isoagglutinogenhaltigen Schweineerythrozyten. Eine Absaettigung mit menschlichen B-Erythrozyten beeinflusst die isoagglutinatorischen Faehigkeiten nicht. Anders verhalten sich *die unregelmässig* reagierenden Schweinesera, welche *sowohl* Isoagglutinine *als auch* Isoagglutinogene enthalten: Hier wurden die isoagglutinatorischen Faehigkeiten *weder* durch menschliches A-Blut, *noch* durch menschliches B-Blut beeinflusst.

DR. WU LIEN TEH,

DR. H. M. JETTMAR.

BARTONELLOSIS AND GRAHAMELLOSIS AMONG WILD
RODENTS OF THE FAR EAST.

ENGLISH SUMMARY.

In the blood of numerous kinds of wild rodents from Manchuria and Mongolia grahamellae are found while bartonellae appear as a rule in considerable numbers only after splenectomy in hamsters and wild mice (*Epimys agrarius*).

Morphologically these bartonellae are similar to those found in rats and white mice (*Bartonella muris musculi* and *bartonella muris ratti*).

The mortality from bartonellosis was great among *epimys agrarius* while hamsters and *phodopus* survived.

With regard to grahamellae we maintain that these microorganisms are present in the blood of the animals already in the first days of life.

The multiplication of the grahamella microorganisms in the erythrocytes takes as a rule about one week, and leads to the destruction of the affected red blood corpuscles. The "free living" grahamellae enter new blood corpuscles or disappear apparently destroyed *pari passu* as specific antibodies develop.

We succeeded in obtaining pure cultures from the heart blood of different gerboas and hamsters, while cultivation of grahamellae did not give any positive results.

ON INVESTIGATIONS OF THE BLOOD GROUPS AMONG
SOME MANCHURIAN DOMESTIC ANIMALS.

ENGLISH SUMMARY.

The isoagglutinins of Manchurian cattle,
Mongolian sheep and
Manchurian pigs have been investigated
with the following results:

(1) Manchurian cattle (224 individuals examined in more than 6000 combinations):

group aO	30,4%
group oA	50,5%
group oO	19,1%

(3) Mongolian sheep (149 individuals in more than 4000 combinations):

group aO	30,87%
group oA	43,63%
group oO	25,50%

(3) Manchurian pigs (there were investigated 229 individuals in more than 8700 combinations; among them only 117 individuals could be divided into the 3-group scheme with certainty):

group aO	41%
group oA	47%
group oO	12%

Autoagglutination has been observed only in a very small number of cases.

The features of the isoreaction among the different animals are described.

By numerous absorption-experiments dealing with almost all combinations possible it was stated that the haemagglutinin a of these mammals correspond in a considerable degree to each other and to the human isoagglutinin b of the human bA group.

DR. WU LIN TEH and

H. M. JETTMAN.

BLUTGRUPPENUNTERSUCHUNGEN IN DER NORDOSTMONGOLEI UND DER NORDMANDSCHUREI.

Reprinted from *"Mitteilungen der Anthropologischen Gesellschaft in Wien"* Band LX, Seite 39 ff.

ALSO AN ENGLISH SUMMARY.

Während meines Aufenthaltes in Urga und gelegentlich einer Forschungsreise in die nördliche Mandschurei machte ich es mir zur Aufgabe, auch die Blutgruppen der verschiedenen Völker, welche dieses wenig erforschte Gebiet bewohnen, zu untersuchen.

Bei diesen Studien verwendete ich ausschliesslich die Objektträgermethode nach Lee-Vincent und stets dieselben hochwertigen Testsera, welche ich alle zwei Monate erneuerte. Dies auszuführen war ich deshalb in der Lage, da das Serum A von meinem Laboratoriumsdiener, das Serum B von mir selbst geliefert wurde. Da diese Sera sehr hochwertig und spezifisch waren, die Untersuchungen alle mit derselben Technik ausgeführt wurden und stets eindeutige Resultate ergaben, ausserdem auch eine möglichst repräsentative Auswahl aus der Bevölkerung des Herkunftsgebietes getroffen wurde, halte ich es für wert, das Resultat dieser Untersuchungen hier mitzuteilen, obwohl die Anzahl der untersuchten Personen relativ gering ist.

Dies hat wieder seinen Grund in den grossen Schwierigkeiten, welche sich bei derartigen Untersuchungen ergeben: Die wenig kultivierte Bevölkerung dieser schütter besiedelten Gebiete gibt nur ausserordentlich schwer ihre Einwilligung zur Blutuntersuchung, selbst wenn es gelingt, einflussreiche Persönlichkeiten aus dem zu untersuchenden Volksstamme zu gewinnen.

In der Mongolei leistete mir bei diesen Arbeiten ein einflussreicher Tushemyl (mongolischer Regierungsbeamter) grosse Hilfe und ermöglichte es mir, einen guten Teil der Bevölkerung des unteren Tolatales zu untersuchen. Trotzdem stiess ich auch hier auf Schwierigkeiten, da die Mongolen sich als sehr misstrauisch und ängstlich erwiesen und sich nicht selten durch die Flucht und Zurücklassung der leeren Jurten dieser Untersuchung entzogen.

Relativ leicht hatte ich es bei der Untersuchung der Nordchinesen in Harbin, da es mir hier möglich war, eine grössere Anzahl von Leuten, wie Schulkinder und Bedienstete grosser Warenhäuser, auf einmal zu untersuchen.

Die Untersuchungen der Sungari-Ussuri-Golden, eines aussterbenden tungusischen Volksstammes, welcher gegenwärtig kaum mehr als anderthalb tausend Köpfe zählt, war ebenfalls mit beträchtlichen Schwierigkeiten verbunden. Bei der Untersuchung der kleinen Siedlung

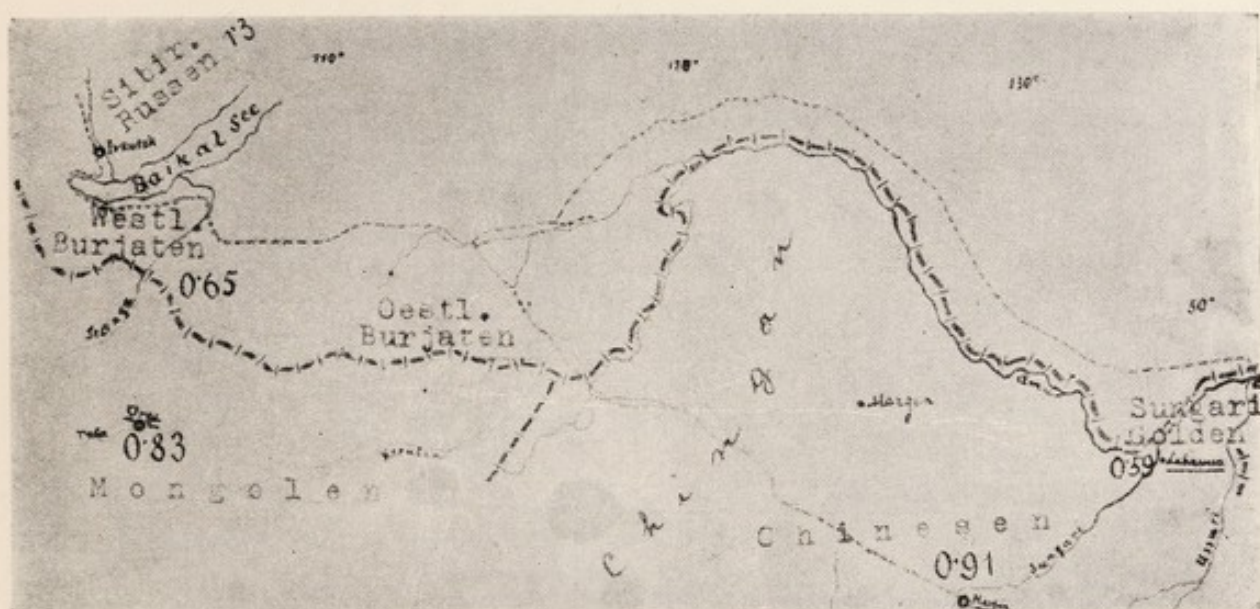


Abb. 1. Verteilung der Blutgruppen in der nordöstlichen Mongolei und in der nördlichen Mandschurei. Die Orte, an denen die Untersuchungen ausgeführt wurden, sind unterstrichen.



Chichikha an der Mündung der Sungari in den Amur wurde ich sehr feindselig empfangen und viele weigerten sich, sich der Untersuchung zu unterziehen da sich das Gerücht verbreitet hatte, ich wolle aus dem so gewonnenen Blute ein Geheimmittel herstellen, um es dann in Harbin teuer zu verkaufen. In Gaidikhaudza, einer Goldensiedlung am Amur, etwa 50 km unterhalb der Einmündung der Sungari, war ein Grossteil der Bevölkerung in die Wälder gelaufen, da am Abend vor meiner Ankunft ein reisender Chinese der Bevölkerung gesagt hatte, dass die Golden, welche man wie Hunde behandeln könne, am nächsten Tage der Besuche eines ausländischen Arztes, begleitet von zwei Soldaten, gewärtig sein müssen, welcher Goldenblut in Flaschen abzapfen werde. Wer sich widersetzt, wird zu Tode geprügelt. All diese Umstände und die äusserst schütterte Bevölkerung in ganz kleinen, oft Dutzende Kilometer voneinander entfernten Siedlungen machen es verständlich, dass die Zahl der untersuchten Personen recht unbedeutend ist.

Zum Glück haben die Golden grosses Vertrauen zur Pockenimpfung und ich konnte mir durch gleichzeitige Gratisvakzination bei ihnen eine gewisse Popularität erwerben.

Meine bis jetzt ausgeführten Untersuchungen erstrecken sich auf eine Bevölkerung, welche ein Gebiet bewohnt, das vom 46. bis 48. Grad nördlicher Breite und vom 106. bis 133. Grad östlicher Länge eingeschlossen ist. Es umfasst demnach Urga und den nordöstlichen Zipfel der Mongolei und die beiden mandschurischen Provinzen Heilungkiang und Kirin mit Harbin und reicht nach Osten bis über die Mündung der Sungari in den Amur hinaus.

Dieses Gebiet ist gegenwärtig von drei verschiedenen Völkern bewohnt, und zwar: der westliche Teil des Streifens bis zum 120. Längengrad von reinrassigen Mongolen; das Gebiet des Sungaribeckens von Nordchinesen, welche diesen Landstrich in den letzten Jahrzehnten dicht besiedelten und die wenigen Mandschuren, welche dieses Gebiet ursprünglich bewohnten, völlig absorbierten; und schliesslich das östlichste Gebiet, das früher nur entlang des Flusses, und zwar ausschliesslich von den Golden, einem Tungusenstamme bewohnt war, in den letzten Jahren aber von den chinesischen Emigranten besiedelt wird.

Diese drei Völker sind, was Sprache, Sitten und Lebensgewohnheiten anlangt, voneinander sehr verschieden.

Bezüglich der seltenen Mischehen unter diesen drei Völkern ist folgendes zu bemerken: Mischehen zwischen Chinesinnen und Mongolen oder Golden sind, wenn sie überhaupt vorkommen, so selten, dass sie die Rasse in keiner Weise beeinflussen. Dies findet seine Erklärung in folgenden zwei Gründen: Die beiden Völkerschaften, namentlich die Golden, werden von den Chinesen als Barbaren angesehen, und es würde sich kaum eine Chinesin finden, die eine derartige Mischehe eingehen wollte; auch würden die meisten Mongolen und besonders die Golden, welche fast ausnahmslos sehr arm sind, niemals das für eine

Chinesin nötige Kaufgeld aufbringen können. Ferner bestehen die chinesischen Kolonisten, welche mit diesen beiden Völkern in Berührung kommen zum grössten Teil aus Männern, während die Frauen in der Minderzahl sind.

Mischehen zwischen Chinesen und Mongolinnen sind um Urga derzeit recht selten, solche zwischen Chinesen und Goldminen häufiger, wobei die Kinder ausschliesslich rein chinesische Erziehung erhalten und für den Goldenstamm endgültig verloren gehen. Derartige Mischehen gehen jedoch in dem groben Strom der immer mehr anwachsenden chinesischen Emigrantengeneration spurlos unter, da die Zahl viel zu gering ist, um die Rassenmerkmale der Nordchinesen in der Mandschurei zu beeinflussen.

Wir können demnach sagen, dass wir es hier mit drei durch Sprache, Sitten und Lebensgewohnheiten isolierten und reinen Bevölkerungen zu tun haben.

Was die Untersuchungen selbst anlangt, so ist hier folgendes zu bemerken :

I. Bei den Mongolen wurden die Untersuchungen in der Umgebung von Urga ausgeführt.

Der Vorteil bei diesen Untersuchungen war, dass dank der Hilfe eines mongolischen Regierungsbeamten wahllos die ganze Jurtenbevölkerung eines Tales untersucht werden konnte, und nicht durch "Siebungsvorgänge" gesammelte Bevölkerungsschichten, welche nach Scheidt das Bild der Heimatbevölkerung in dem schliesslich und endlich ausgesiebten Teil (Soldaten, Kriegsgefangene, Spitalsinsassen, Wassermann-Patienten usw.) verzerren können.

Durch genaue Anamnese, welche sich auf Eltern und Voreltern erstreckte, wurde die Rassenreinheit und Herkunft der Untersuchten festgestellt. Dies ist um so wichtiger, da namentlich in der Urgaer Population burjatische Kolonisten nicht selten vorkommen. Es wurden nur reinrassige Mongolen in die Liste aufgenommen und die untersuchten Burjaten, welche häufig auch russischen Einschlag zeigten, gesondert behandelt.

Die folgende Tabelle zeigt die Resultate dieser Untersuchungen :

GRUPPEN IN PROZENTEN :

	Fälle	O	A	B	AB	Index
Gesamtzahl	166	26.6	27.7	30.7	15.1	0.93
Reine Mongolen	114	28.6	23.2	31.3	16.9	0.83

(Der relativ hohe Prozentsatz der AB-Gruppe erklärt sich durch die Einbeziehung einer grossen Mongolenfamilie in die Untersuchung, deren Angehörige in einem grossen Prozentsatz dieser Gruppe angehörten.)

Wir ersehen aus dieser Tabelle dass der der Index der nordöstlichen Mongolen beträchtlich niedriger ist als 1.0 und dem der Chinesen der nordöstlichen Provinzen nahesteht. Es ist anzunehmen, dass in früheren Jahrhunderten, als noch die Mongolen Nordchina beherrschten, eine

6

weitgehende Mischung dieser beiden Völker stattfand, wobei sich der höhere, beträchtlich über 1.0 befindliche Index der "reinen" Chinesen (vgl. B. Liang) für die Nordchinesen erniedrigte und sich dem mongolischen assimilierte, welcher seinerseits durch Aufnahme zahlreicher chinesischer A-Gruppen-Angehöriger einen Anstieg erfuhr.

Die Mischung der Mongolen mit den Chinesen in den früheren Jahrhunderten ist vielleicht auch ein Grund, dass gegenwärtig der Index der Mongolen ein etwas höherer ist als der bei den reinen Burjaten, welche in viel geringerem Grade mit chinesischem Blute gemischt sind. In den letzten Jahrzehnten mischen sich die Burjaten häufig mit Russen, so dass wahrscheinlich auch bei diesem Volke der biologische Index bald ansteigen dürfte.

II. Was die in Harbin ausgeführten Untersuchungen der Chinesen anlangt, so wurde das Blut folgender Personen geprüft:

1. 55 Studenten und Studentinnen einer Medizinschule,
2. 22 Angestellte des Harbinger Pestspitals,
3. 59 ambulante Patienten beiderlei Geschlechtes,
4. 127 Kinder aus einem Waisenhaus und
5. 405 Angestellte verschiedener grosser Warenhäuser.

In toto: 668 Personen.

Diese Leute stammten aus verschiedenen nordöstlichen Provinzen Chinas, von welchen Kirin, Fengtien, Chihli und Shantung am häufigsten vertreten waren.

Von den 668 Fällen gehörten.

der Gruppe O 180 = 28.1%,
 „ „ A 197 = 29.5%,
 „ „ B 222 = 33.2%, und
 „ „ AB 61 = 9.1% an.

Wenn man die Fälle nach den vier Provinzen einteilt, welchen die Mehrzahl der Untersuchten entstammte, ergibt sich folgende Tabelle:

Provinz	Zahl der Fälle	Gruppe O%	Gruppe A%	Gruppe B%	Gruppe AB%	Index
Kirin	99	33.3	26.3	33.3	7.1	0.82
Fengtien	103	32.0	27.2	31.1	9.7	0.90
Chihli	334	27.8	28.4	34.7	9.1	0.85
Shantung	114	22.9	31.6	36.9	8.7	0.88

Die Ergebnisse sind demnach konform mit den Resultaten anderer Autoren, nach welchen die Nordchinesen einen Index haben, welcher zwischen 0.8 und 0.9 schwankt (vgl. die Uebersichtstabelle am Schluss).

III. Was nun die Untersuchung der im Osten, an der Sungari- und Ussurimündung angesiedelten Golden anlangt, so ist folgendes zu bemerken:

Die Nordmandschurei wird von folgenden Tungusenstämmen bewohnt:

1. Mandschuren, welche ursprünglich das Sungaribecken besiedelten, nun aber mit den Chinesen so verschmolzen sind, dass es kaum gelingen kann, ihre Kopfzahl auch nur annähernd zu bestimmen. Unvermischte, wirklich reinrassige Mandschuren dürfte man in diesem Gebiete kaum mehr antreffen.

2. Orotschonen. Dies ist ein tungusischer Jägerstamm, der in einer Kopfzahl von 895 (Kormasoff 1928) die nordwestlich vom Chingan gelegene Provinz Barga besiedelt. Sie reichen in einer geringen Anzahl auch in das von mir gewählte Gebiet hinein. Die südöstlichen Hänge des Chingan werden von diesem Stamm nur in sehr geringer Anzahl besiedelt. Sie führen meist ein nomadisierendes Leben in sehr kleinen Gemeinschaften, welche sich in schwer zugänglichen Bergwäldern befinden.

3. Die Solonen. Dieser kleine Volksstamm, der hauptsächlich die westlichen Hänge des Chingans—nördlich von Mergen (Nunkiang) bis zu den Ufern des Amur reichend—bewohnt, zählt derzeit etwa 1000 Köpfe. Auch sie bewohnen in diesen sehr entlegenen Gebieten nur ganz kleine Siedlungen.

Die grösste derselben, Charithun (etwa 60 km nördlich von Nunkiang), welche über 30 Einwohner zählt, wurde von mir aufgesucht, doch konnte ich dort nur 20 Personen untersuchen. Da das nächste etwa 20 Einwohner zählende Solonendorf über 30 km entfernt war und die Wege infolge der Regenperiode schwer gangbar waren, musste ich wegen Zeitmangels den Plan einer Indexbestimmung bei diesem Tungusenstamme aufgeben.

Die Bevölkerung, die sich ausschliesslich von Schamanen behandeln lässt, ist auf europäische Ärzte nicht gut zu sprechen und hält auch nicht viel von der Pockenimpfung. Für die wenigen medizinischen¹⁾ und Blutuntersuchungen, die ich in Charithun an Solonen ausführen konnte, bin ich vor allem dem Forschungsreisenden Herrn W. Stoetzner, der gerade damals mit seiner Expedition in Charithun weilte, und mir die Protektion des dortigen Stammoberhauptes, des Solonenoffiziers Kwan Tsen Hai sicherte, zu grossem Danke verpflichtet.

¹⁾ Vgl. Jettmar H. M., Biological investigations among aboriginal tribes in North Manchuria. Plague Prev. Service Reports 1927/28, Harbin.

Von den 20 auf Blutgruppen Untersuchten (13 Männer und 7 Frauen) gehörten der Gruppe O = 13, A = 4, B = 2 und AB = 1 Person an.

4. Die Dauren sind ein Tungusenstamm, der mit Mongolen und in der letzten Zeit auch mit Chinesenblut ziemlich gemischt ist. Auch ihre Sprache hat viel mehr mongolischen Einschlag als die anderen Tungusensprachen. Sie bewohnen in etwas grösseren Siedlungen (bis über 100 Köpfe) die Umgebung von Nunkiang. Die Gesamtkopfzahl, welche einige Tausend betragen mag (wenn man es mit der Reinerassigkeit nicht allzu genau nimmt), wurde noch nie genau festgestellt. Eine Untersuchung dieses Stammes von Nunkiang (Mergen) aus wäre unschwer durchzuführen; doch herrschten im Sommer 1928 in diesem Gebiete katastrophale Uebeschwemmungen welche die Ausführung dieser Arbeiten verhinderten.

5. Die Golden. Dieser früher über 10.000 Köpfe zählende Stamm bewohnt ausschliesslich die Ufer der grossen Ströme Amur und seiner rechten Nebenflüsse Sungari und Ussuri an ihrem untersten Laufe und teilt sich in zwei Zweige:

(a) Die Sungari-Ussuri-Gruppe (Nabojé) bewohnt gegenwärtig nur einige kleine Siedlungen an der Sungari- und Ussurimündung und am rechten Amurufer zwischen der Mündung dieser beiden Flüsse. Die Kopfzahl beträgt nicht viel über 1000.

(b) Die untere Gruppe (Chodin Bojé, die "Fischhauttataren"), welche den untersten Teil des Amur nordöstlich von Habarowsk bewohnt. Dieser Stamm hat derzeit eine Kopfzahl von 3500 (Bunak). Er bewohnt ausschliesslich russisches Gebiet und unterscheidet sich von der Sungari-Ussuri-Gruppe durch Kleidung und Dialekt²).

Von den die Mandschurei bewohnenden Tungusenstämmen scheinen die Sungari-Ussuri-Golden sich am reinsten erhalten zu haben, und ich verwendete daher viele Mühe, um möglichst zahlreiche Vertreter dieses aussterbenden Volksstammes zu untersuchen. Leider war ich verhindert, die Mündung des Ussuri zu bereisen, wo sich Goldensiedlungen noch etwas häufiger vorfinden, und ich musste meine Untersuchungen auf das Mündungsgebiet der Sungari und das rechte Amurufer bis abwärts nach Telotochi beschränken. In diesem Gebiete wurde allerdings nicht eine Goldensiedlung ununtersucht gelassen und etwa die Hälfte der dortigen Gesamtbevölkerung geprüft.

Es wurden im ganzen 196 Personen geprüft, also etwa ein Sechstel des ganzen Stammes. Es wurden untersucht: Die Goldensiedlungen Dathun, Tushcho Nuergu, die Goldenkolonie in der chinesischen Stadt

² Es ist nicht uninteressant, an dieser Stelle auch die Kopfzahlen der übrigen aussterbenden Tungusenstämmen, welche das Gebiet der linken Nebenflüsse des Amur bewohnen, zu vergleichen. Ich berufe mich hier auf die Angaben von W. Bunak (1926) und J. Gorjunoff (1928) (s. folg. S.).

Lahasusu, ferner die Goldensiedlungen Chichikha, Molochurkhó, Chai, Gaidikhauza und Derkhi (Telotshi). Im ganzen wurden 75 Maenner und 121 Frauen geprüft. Kinder unter drei Jahren wurden von der Untersuchung ausgeschlossen.

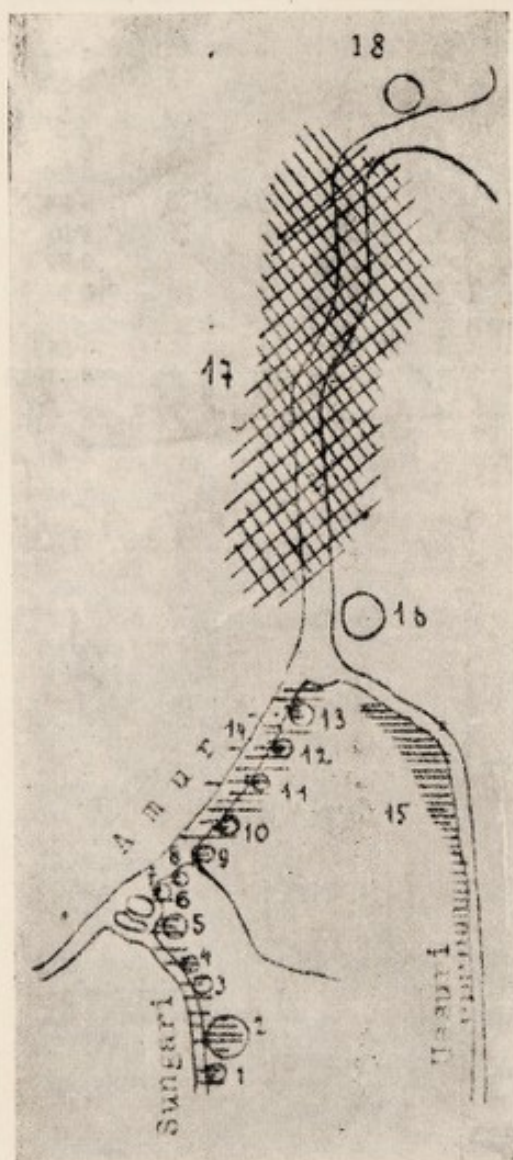
Verzeichnis der Tungusenstämme des Amurgebietes, ihrer gegenwärtigen Kopfzahl und ihrer Verbreitung:

Volksstämme	Kopfzahl nach		Andere Angaben	Vorkommen
	Bunak (1926)	Gorjunoff (1928)		
1. Eigentliche Tungusen		Gesamtzahl aller Tungusen : 78.000 bis 79.000		Transbaikalien, Ostsibirien
2. Lamuten				
Orotschonen			Orotschonen in Barga : 895 (Kormasoff)	Amurprovinz, nördliche Mandschurei
Manegren	An der Sejamündung 160			
3. Golden				
a. Ussuri-Sungari-Gruppe			1500 (J)	Rechtes Amurufer, zw. Sungari und Ussuri
b. Untere Golden	3500	Insgesamt : 5016		Am Amur, unterhalb von Harbarowsk
Orotschen (Tasen oder Udüge)	2500	2407		
Oltschen oder Mangunen	1500	1455		Nebenflüsse des unteren Amur
Oroken	750	479		
Negidalzen	(auf Sachalin !) 425	423		
Samagiren	(am Amgun) —	425		Am Amur und am Gorin
4. Mandschuren	—	3340		
Dauren	Bei Blagowestschensk 450	446	Zwischen Mergen und Tsitsikar : einige Tausend (J)	Mandschurei und südlich an die Mandschurei grenzender Streifen Sibiriens
Solonen	—	75 (in Sow.-Russland)	Südöstliche Chinganhänge : etwa tausend	Fast ausschließlich im Chingan, nördlich von Mergen bis zum Amur

BLUTGRUPPENUNTERSUCHUNGEN IN DER NORDOSTMONGOLEI 39
UND DER NORDMANDSCHUREI.

Die Resultate sind in der folgenden Tabelle wiedergegeben :

Ort	Anzahl	m.	w.	O	A	B	AB	Biolog. Index.
Dathun	35	6	29	13	10	9	3	1·08
Tushehó	34	11	23	5	5	20	4	0·33
Nuergu	15	7	8	12	1	2	0	0·5
Lahasusu	13	4	9	1	4	8	0	0·5
Chichikha	20	10	10	11	2	7	0	0·29
Molochunkhó ...	30	13	17	8	4	15	3	0·39
Chai	8	5	3	4	3	0	1	(4·0)
Gaidikhaudza	11	4	7	6	2	3	0	0·67
Derkhi (Telotshi)	30	16	14	17	6	7	0	0·86
Total :	196	76	120	77	37	71	11	0·585
Prozent :	100	38·8	61·2	39·3	18·9	36·2	5·6	0·58—0·59



Das Verteilungsgebiet der oberen Golden (Sungari-Ussuri-Gruppe, oder Naboje) ist einfach schraffiert; Das Verteilungsgebiet der Unteren Golden (Chodin Boje) ist durch gekreuzte Schraffierung gekennzeichnet.

- 1=Dathun, die südlichste Kolonie des Naboje-Stammes (etwa 80 Köpfe).
- 2=Die grosse chinesische Stadt Fudsin, welche von etwa 50 Naboje bewohnt ist.
- 3=Tusheho (100 Einwohner) und
- 4=Nuergu (30 Einwohner), beides reine Goldensiedlungen.
- 5=Die chinesische Stadt Tungkiang (Lahasusu) an der Sungarimündung gelegen. Sie enthält eine kleine Goldenkolonie (etwa 40 Köpfe).
- 6=Chichicikha und
- 7=Molochunkhó, reine Goldensiedlungen, zusammen 80 Einwohner.
- 8=Chai, eine kleine Goldensiedlung, 15 Einw.
- 9=Gaidikhaudza, eine Goldensiedlung vermischt mit chinesischen Kolonisten (etwa 50 Golden).
- 10=Derkhi (Telctshi). Fast reine Goldensiedlung (etwa 80 Köpfe).
- 11=Etu,
- 12=Kaidali und andere Goldensiedlungen am rechten Amurufer, näher der Ussurimündung gelegen (etwa 200 Golden).
- 13=Die chinesische Stadt Sui-Yuan.
- 14=Vereinzelte, isolierte Goldenkolonien am russischen Amurufer (kaum 50 Einwohner).
- 15=Goldensiedlungen am linken Ussuriufer, etwas dichter besiedelt (insgesamt 500—600 Pop.).
- 16=Habarovsk.
- 17=Siedlungen der unteren Golden zu beiden Seiten des Amur zwischen den Städten Habarovsk und Nikolajewsk, mit einer Bevölkerung von über 3000 Golden. (Die unteren Golden, die echten Fischhauttataren oder Chodin Boje.).
- 18=Die chinesische Stadt Sui-Yuan.

Abb. 2. Skizze, welche die gegenwärtige Verteilung der Golden anzeigt.

Die Zahl der Untersuchten ist natürlich viel zu gering, um die Teilindizes zu verwerten. Wir ersehen aus ihnen bloss, dass die Unterschiede zwischen den Sippen der einzelnen Dörfer oft recht beträchtlich sind und dass in den Siedlungen, welche nahe der Mündung der Sungari gelegen sind (Tushehó, Nuergu, Lahasusu, Chichikha und Molochunkho) die Vertreter der B-Gruppe ganz besonders über die Vertreter der A-Gruppe prädominieren. Der Gesamtindex liegt zwischen 0.58 und 0.59; er ist demnach beträchtlich niedriger als der der chinesischen Emigrantenbevölkerung. Auch der hohe Prozentsatz der O-Gruppe ist bemerkenswert.

Zum Schlusse ist eine Tabelle wiedergegeben, welche die neuen Befunde mit den Ergebnissen anderer Autoren, welche an Nachbarvölkern ausgeführt wurden, vergleicht.

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BLUTGRUPPENUNTERSUCHUNGEN IN DER NORDOSTMONGOLEI 43
UND DER NORDMANDSCHUREI.

Ort der Untersuchung und		Zahl der Unter- suchten	Gruppen in Prozent				Index
Autor	Volksguppe		O	A	B	AB	
Melkich u. Gringot	Juden in Irkutsk	217	31.7	41.0	19.0	8.3	1.80
Melkich u. Gringot	Russen in Irkutsk (total)	3186	34.8	34.0	22.5	8.7	1.37
Melkich u. Gringot	davon europäische Russen	1430	33.7	36.0	22.8	7.5	1.43
Melkich, Gorjeff u. Gringot	davon angest. sibir. Russen	1756	35.7	32.4	22.2	9.7	1.3
Bunak	Westliche Burjaten	282	34.1	21.6	35.8	8.5	0.65
Shinkine	Burjat. Schulkinder (Moskau)	62	33.9	19.3	40.3	6.5	0.55
Jettmar	Burjaten	1542	30.4	21.9	37.8	9.9	0.67
Jettmar	Urga und Umgebung	166	26.5	27.7	30.7	15.1	0.93
Bais u. Verhoeff	Nordöstliche Mongolen (rein)	114	28.6	23.2	31.2	16.9	0.83
Kilgore u. Liu	Chinesen, hauptsächlich aus Südchinz, unters. auf Sumatra	592	40.2	25.0	27.6	7.2	0.92
Liu u. Wang	Chinesen (Shanghai)	100	28.0	36.0	25.0	11.0	1.3
Coca u. Deibert	Chinesen, Kranke, Peking	1000	30.7	25.1	34.2	10.0	0.79
Backiang Liang	Chinesen in Amerika	111	29.0	32.0	29.0	10.0	0.78
	Chinesen (unters. in Shanghai)	1000	38.3	30.0	25.7	6.0	1.13
	davon aus Provinz Shantung		21.1	31.6	36.8	10.5	0.89
	„ „ „ Anwhei		47.9	21.7	21.7	8.7	1.00
	„ „ „ Kiangsu		39.0	29.7	26.4	4.9	1.11
	„ „ „ Szechwan		44.8	28.9	23.7	2.6	1.19
	„ „ „ Chekiang		37.0	29.8	22.5	10.7	1.22
	„ „ „ Kwangtung		40.0	31.4	23.8	4.8	1.26
Li Chi Pan	Südchinesen (Changsha)	1500	31.3	38.1	20.7	9.9	1.5
Li Chi Pan	„ (nur aus Honan)	1296	31.9	38.9	19.5	9.8	1.6
Jettmar u. Lin	Chinesen (Harbin)	668	28.1	29.5	33.2	9.1	0.91
	davon aus Provinz Kirin	99	33.3	26.3	33.3	7.1	0.82
	„ „ „ Fengtien	103	32.0	27.2	31.1	9.7	0.90
	„ „ „ Chihli	334	27.8	28.4	34.7	9.1	0.85
	„ „ „ Shantung	114	22.9	31.6	36.9	8.7	0.88
D. Huie	Chinesen (Peking)	1296	28.6	26.6	32.0	12.8	0.88
D. Huie	„ (nur aus Prov. Chihli)	385	31.5	23.7	34.0	10.9	0.77
Fukamachi	Chinesen	80	37.7	33.7	25.0	7.6	1.2
Fukamachi	Koreaner	363	28.2	32.8	26.4	12.6	1.1
Kirihara	Koreaner	948	26.3	32.7	32.2	8.8	1.01
Kirihara u. Haku	Mandschuren (Mukden)	236	30.9	25.9	33.9	9.3	0.81
Fukamachi	Mandschuren (Mukden)	199	26.6	26.6	28.2	8.6	0.75
Jettmar	Sungari-Golden	196	39.3	18.9	36.2	5.6	0.59

Investigations about the blood-groups in North-east-Mongolia and in North-Manchuria.

ENGLISH SUMMARY.

Investigations have been made about the blood-groups of the population of North-east-Mongolia and North-Manchuria during a stay in Urga and a journey through North-Manchuria. This territory is inhabited by three different tribes: 1. Mongols. 2. Northern-Chinese. 3. Manchus.

(1) Among the Mongols the percentage of the four blood-groups was as follows:

Total cases (166) O=26,6%, A=27,7%, B=30,7%, AB=15,1%
Index=0,93.

Pure Mongols (114) O=28,6%, A=23,2%, B=31,3%, AB=16,9%
Index=0,83.

(2) Among the Northern-Chinese (668 cases):

O=28,1%, A=29,5%, B=33,2%, AB=9,1%, Index ca=0,85.

Probably the resemblance of the index of the Mongols and the Northern-Chinese may be due to the fact that in the past centuries these tribes have been mixed promiscuously.

(3) Among the Manchus only the Goldi could be investigated. The percentage is as follows: (196 cases).

O=39,3%, A=18,9%, B=36,2%, AB=5,6%, Index=0,585.

H. M. JETTMAR.

CONTRIBUTIONS TO THE SEROLOGY OF THE BLOOD OF YACKS AND CATTLE.

(English summary of a paper appearing in the Zeitschrift f. Immunitaetsforschung, Vol. 65, 1930).

1. Studying the serology of the blood of Manchurian and Mongolian cattle (*Bos taurus*), tame yacks (*Bos [Pocophagus] grunniens*) and haynyks (cross breed between the two last mentioned) as well as the effects of their sera upon one another it was established:—

- (a) Mongolian and Manchurian domestic cattle can be well divided into the three groups aO, oA, oO. Out of 100 Manchurian cattle belonged to groups:

aO—26 per cent.; oA—46 per cent., oO—28 per cent.

- (b) In the case of the haynyks as well as of the tame yacks it was not possible, to establish such a scheme, because no blood belonging to the group aO was found. Nevertheless the varying reaction of the blood corpuscles of yacks and haynyks enabled one to demonstrate a biochemical differentiation of the blood corpuscles structure.
- (c) There is no regular hetero-agglutination of the blood of yacks and haynyks through the sera of Mongolian cattle; but sera of such cattle belonging to the first group were found which clustered almost without exception all blood corpuscles of the yacks and haynyks examined.
- (d) The normal iso-agglutinins of the cattle act but slowly, the optimum being reached after 12 hours. They are not thermostabile and very labile in general. Therefore it was not possible to keep test sera of the different groups for prolonged periods.

2. Isohemagglutinins were obtained after intravenous immunisation with the blood from yacks and Mongolian cattle in 100 per cent. of Mongolian cattle and were very potent. Without any exception they acted strongly against all sera of haynyks and yacks examined and agglutinated with few exceptions also all red blood corpuscles of cattle regardless of group. They were more stable than the normal iso-agglutinins.

3. Hyperimmunised haynyks showed in only about a quarter of cases iso-hemagglutination. With one exception this was weak and directed against the erythrocytes of a limited number of individuals.

4. No trace of iso-hemagglutinins was found in a hyperimmunised yack.

5. These results explain the regular appearance of an anaphylactic shock during the intravenous injection of immune cattle as well as the absence of such when immunising haynyks.

6. Erythrocytes of normal and immunised cattle display no difference in regard to agglutinability; likewise untreated and washed erythrocytes of cattle react almost identically in iso-agglutination.

7. The sera of native yacks and cattle contained about equal quantities of congenitins, resp. hetero-antibodies, whereas in immunised haynyks and Mongolian cattle the latter preponderated.

H. M. JETTMAR.

ETUDE EXPERIMENTALE DE L'ERGOSTEROL IRRADIE.

Extrait de *La Presse Médicale* (N° 11, du 5 Février 1930).

Une découverte de l'importance de celle de l'ergostérol irradié (Hess, Rosenheim et Windaus) ne pouvait laisser indifférents les pathologistes. Les remarquables résultats thérapeutiques obtenus dans les processus décalcifiants (rachitisme, ostéomalacie, pseudarthroses) et les états anémiques laissaient entrevoir la possibilité de résoudre expérimentalement des problèmes tels que la calcification des lésions tuberculeuses et encéphalopathiques, le mécanisme pathogénique de l'athérome et de l'artérite calcifiante, etc.... Avoir à sa disposition une vitamine permettant de déposer le calcium à volonté, non seulement là où il fait défaut, mais encore dans des organes déjà malades, ou à tendance calcifiante (vaisseaux), c'est posséder un moyen expérimental dont on ne saurait assez estimer la valeur.

Pour ces raisons, nous avons entrepris des essais avec l'ergostérol irradié dans le triple but suivant :

1° *Etudier avec précision sa toxicité pour les animaux de laboratoire;*

2° *Analyser le mécanisme de la calcification de certains organes (aorte, rein, tube digestif, foie) sous l'influence de doses massives de vitamine D;*

3° *Provoquer volontairement cette calcification au niveau de lésions dues à des bactéries (tuberculose), ou à des ultravirus (encéphalite chronique).*

I.—TOLERANCE ET TOXICITE.

Si les premiers expérimentateurs avaient cru pouvoir affirmer l'absence complète de toxicité de l'ergostérol irradié chez le rat, à des doses dix mille fois supérieures aux doses curatives, ce fait,—en lui-même surprenant—n'a pas été confirmé par les auteurs qui ont repris l'étude minutieuse de cette question.

Pfannenstiel, Kreitmann et Moli, Reyher et Walkoff, Hess, etc., ont montré que chez les animaux de laboratoire, des doses très élevées d'ergostérol irradié pouvaient entraîner le dépôt de sels calciques dans certains organes, voire même provoquer la mort. M. Mouzon a publié dans *La Presse Médicale* un article bien documenté sur cette question,¹ ce qui nous dispense d'y revenir à nouveau.

Comme les médicaments à base d'ergostérol irradié sont très à l'ordre du jour, il nous a paru du plus grand intérêt de rechercher dans quelle mesure les constatations faites sur les animaux de laboratoire pouvaient contribuer à fixer la posologie du nouveau remède, dont l'emploi s'est

¹ Mouzon.—*La Presse Médicale*, 1928, n° 97, p. 1546.

généralisé et dont la grande activité n'est mise en doute par personne. Jusqu'à quel point des états d'*hypervitaminose* (Kreitmann et Moll), ou d'*hypercalcémie* (Hess et Lewis) sont-ils à redouter avec les doses actuellement utilisées chez l'homme? Existe-t-il une accoutumance ou, au contraire, une sensibilisation des organes à la vitamine D?

Il est important, dès l'abord, de faire remarquer que l'ergostérol irradié n'est pas une entité chimiquement définie, mais un mélange renfermant, en quantités des plus variables, de l'ergostérine pure, n'ayant pas subi la transformation photochimique, de l'ergopinacose (Windaus), parfois du peroxyde d'ergostérol (qui nuit grandement à sa conservation), la vitamine D elle-même, dont la nature chimique nous est inconnue, enfin les divers produits de destruction partielle de cette vitamine. Cette variabilité dans la nature de la matière pourrait, dans une certaine mesure, expliquer les résultats contradictoires obtenus par les divers expérimentateurs. En ce qui nous concerne, afin de nous rapprocher le plus possible des conditions réalisées en clinique, nous nous sommes servis d'un produit préparé en France et connu sous le nom de *Stérogyl*.¹ Nous l'avons administré à nos animaux (souris, rats, lapins, jeunes chats, singes catharrinins, poules et poussins) à l'état de solution huileuse, contenant 10 milligr. de principe actif par centimètre cube.

1° SOURIS.—L'ergostérol irradié a été administré à nos souris mélangé à du pain² dont on alimentait les animaux tous les jours, de manière que l'absorption de la dose fixée par avance fût intégrale. 44 animaux ont servi à ces expériences. Ci-dessous un tableau résumant l'ensemble des résultats (tableau I):

¹ Voici les caractéristiques de la préparation du *Stérogyl*: Irradiation de courte durée d'une solution alcoolique saturée à froid, circulation continue du liquide dans un grand serpent de quartz de 15 mètres de long, dans l'axe duquel se trouve l'arc à mercure. 220 volts continu, modèle Hanau. Séparation de l'ergostérine non transformée par cristallisation fractionnée, redissolution de la partie incristallisable dans l'huile d'olives à la concentration de 1 pour 100. Toutes ces manipulations sont faites à l'abri de l'air, en atmosphère d'azote.

² Un petit lot d'animaux a reçu l'ergostérol irradié dissous dans du beurre de cacao, suivant la méthode de Simmonnet et Tanret (*La Presse Médicale*, 1929, n° 29, p. 468).

TABLEAU I.—*Per os. Souris.*

DOSE pro die.	DOSE journal. par kgr.	DOSE totale moyenne absorbée par animal.	NOMBRE des animaux	MORTALITE pour 100	SURVIE* moyenne des animaux	FREQUENCE du Ca
milligr.	milligr.	milligr.			jours	
0,5	33,3	11	4	0	..	0
1	83	30	7	28,5	22	1
3	250	48	12	83,3	11,4	2
5	400	54	21	100,0	10,5	10

* Il s'agit d'animaux ayant succombé à l'intoxication.

Ce tableau montre que la dose *maxima tolérée* d'ergostérol irradié administré *per os* oscille, chez la souris, entre 0 milligr. 5 et 1 milligr. *pro die*, soit entre 33 et 83 milligr. par kilogramme. La dose *presque constamment mortelle* (en 11 jours, 4) est aux environs de 3 milligr., *par jour*, soit 250 milligr. par kilogramme. Enfin, la dose *sûrement mortelle* est de 5 milligr., ce qui revient à 400 milligr. par kilogramme et *par jour*. Ce sont là évidemment, des doses considérables; leur effet nocif se traduit par une perte de poids, de l'amaigrissement, de l'inappétence, parfois de la diarrhée. *Mais le fait que la souris tolère, sans s'en ressentir, de 33 à 83 milligr. d'ergostérol irradié par kilogramme et PRO DIE* montre bien que certains organismes (il en est de même du singe, par conséquent aussi de l'homme; voir plus loin) peuvent absorber sans danger des quantités d'ERGOSTEROL IRRADIE infiniment supérieures à celles utilisées en thérapeutique¹.

2° LAPINS.—23 animaux ont été utilisés. La plupart d'entre eux (20) ont avalé le produit instillé goutte à goutte, d'autres l'ont reçu en injection intra-musculaire.

(a) *Voie buccale.*—Les résultats enregistrés sont résumés dans le tableau II.

TABLEAU II.—*Per os Lapins.*

DOSE quotidienne par kgr.	DOES totale moyenne par animal	NOMBRE des animaux	MORTALITE p. 100	SURVIE moyenne des animaux	FREQUENCE du Ca
milligr.	milligr.			jours	
1	117	3	0	..	2
2 à 4	172	3	0	..	2
5	238	2	100	26	2
10 à 15	254	4	100	12	2
20	310	8	100	9	4

¹ Nos essais sur le rat, quoique peu nombreux, confirment les précédents.

Il résulte de ce tableau que la dose maxima tolérée d'ergostérol irradié, administré par voie buccale, est, chez le lapin, d'environ 3 à 4 milligr. par kilogramme et par jour, alors que la dose mortelle est égale ou légèrement supérieure à 5 milligr. Les animaux qui reçoivent cette dernière dose quotidienne maigrissent (de 200 à 500 gr.), ont un mauvais aspect, présentent de la diarrhée et de l'inappétence; ils succombent vers le vingtième jour, alors que les sujets ayant absorbé 20 milligr. meurent déjà du neuvième au douzième jour (en moyenne). La sensibilité du lapin est donc supérieure à celle de la souris, si l'on tient compte de la dose mortelle calculée par kilogramme de poids vif. Néanmoins, le lapin, comme la souris, peuvent absorber impunément, pendant une longue période de temps, des quantités d'ergostérol irradié de beaucoup supérieures à celles utilisées en thérapeutique humaine (soit 0 milligr. 30 à 0 milligr. 35 par kilogramme chez l'homme).

(b) Voie intramusculaire.—Administré par voie intramusculaire le Stérogyl est nettement moins nocif que s'il est absorbé per os. Les données suivantes en font foi :

DOSE quotidienne	NOMBRE d'animaux	MORTALITE globale	SURVIE moyenne des animaux	FREQUENCE du Ca
mgr. p. 100			jours	
10	1	1	38	1
30	2	2	55	2

Il en résulte que des lapins ayant reçu des quantités considérables d'ergostérol irradié par voie intramusculaire (de 640 à 1.380 milligr.) ont survécu de 38 à 61 jours, tandis que des doses équivalentes, administrées per os, tuent en douze jours. La voie digestive se prête donc mieux à l'absorption du médicament que la voie intramusculaire. Quoique lente, cette absorption, après injection dans le muscle, n'en n'est pas moins réelle, ainsi qu'en témoigne la calcification rénale et aortique constatée chez certains de nos animaux traités de la sorte.

3° JEUNES CHATS.—Les jeunes chats sont réputés comme particulièrement sensibles à l'ergostérol irradié (Kreitmair et Moll). Nos essais confirment ce fait. Trois animaux ont absorbé l'ergostérol irradié à la dose journalière de 2 à 10 milligr. par kilogramme; ils ont succombé tous trois du neuvième au dix-huitième jour, après une perte de poids de 100 à 300 gr.

4° SINGES.—De toutes nos expériences, celles faites sur le singe nous paraissent les plus suggestives. Lorsqu'on se demande si, en administrant l'ergostérol irradié à des enfants rachitiques, on ne les expose pas à une intoxication lente, à une hypervitaminose plus nuisible que bienfaisante, seuls les essais sur le singe peuvent nous donner une réponse satisfaisante. En effet, il nous importe bien moins de savoir que la souris ou le lapin réagissent par une perte de poids, ou par une calcification hétérotopique des tissus, vis-à-vis de telle ou telle dose

d'ergostérol irradié. Leur sensibilité peut être (et elle l'est, en réalité) par trop accusée pour que l'on puisse conclure quant à la tolérance chez l'homme. Ce qui s'impose, au premier chef, c'est de connaître la susceptibilité des simiens espèce animale la plus anthropomorphe.

Expériences sur le singe.—Deux catarrhinins inférieurs, un *Cercopithecus callitrix* et un *Macacus rhesus*, ont reçu de l'ergostérol irradié par voie buccale; ci-dessous les résultats enregistrés (Tableau III).

TABLEAU III.—*Per os. Singes.*

No.	Espèce.	Poids.	Dose quoti- dienne par kilogr.	Dose totale	Variation de poids.	Sort de l'animal.	Observations.
28	<i>Cercop. callitrix.</i>	gr. 1.250	mgr. 10	mgr. 747	gr. < 200	Sacrifié le 46 ^e j.	Aucune lésion des organes.
36	<i>Macacus rhesus.</i>	750	20	450	Néant.	Sacrifié le 83 ^e j.	Très légère calcification du rein.

Ces essais prouvent que des singes, ayant reçu presque journellement, *per os*, des quantités d'ergostérol irradié de 30 à 60 fois supérieures à celles utilisées en thérapeutique humaine, ont parfaitement supporté le traitement; sacrifiés quarante-six et quatre-vingt-trois jours après, ils n'ont montré aucune altération des organes, hormis une très légère calcification à localisation rénale.

5° POULES.—Ajoutons que l'insensibilité de la poule, démontrée déjà par nos prédécesseurs (Kreitmair et Moll), est confirmée par nos expériences. Des poules ont reçu par voie buccale 10 et 20 milligr. d'ergostérol irradié par kilogramme (au total de 812 à 866 milligr.) sans nul trouble apparent, et il en fut de même des animaux injectés par voie intramusculaire. Les jeunes poussins paraissent plus réceptifs.

6° ACCOUTUMANCE ET BLOCAGE DU SYSTEME RETICULO-ENDOTHELIAL¹.—Il était utile de préciser si des souris ou des lapins ayant absorbé *per os* de nombreuses doses sous-toxiques d'ergostérol irradié ont acquis une accoutumance à l'égard de cette substance. Afin de résoudre ce problème, nous avons choisi des souris déjà traitées par des doses quotidiennes de 1 à 3 milligr., et nous leur avons administré, ainsi qu'à des témoins, la dose toxique de 5 milligr. *pro die*. Les résultats sont consignés dans le tableau IV.

¹ Cf. Les recherches de Rémond, Soula et Catquii. *Bull. de l'Acad. de Méd.*, 1928, t. C, p. 285.

TABLEAU IV.—*Accoutumance. Souris.*

No.	Dose quotidienne antérieure	Poids.	Dose d'essai.	Quan- tité totale	Perte de poids	Mort.
	milligr.	gr.	mgr.	mgr.		
43. .	1	17	5	50	7	10 ^e jour.
44. .	1	14	5	50	5	10 ^e jour.
46. .	1	11	5	50	2	10 ^e jour.
51. .	3	19	5	20	1	4 ^e jour.
53. .	3	11	5	20	2	5 ^e jour.

Il en résulte que l'ingestion de doses sous-toxiques d'ergostérol irradié ne crée, chez la souris, ni accoutumance, ni hypersensibilité; il en est de même chez le lapin.

Par ailleurs, nous avons étudié l'effet exercé par le blocage du système réticulo-endothélial, chez la souris, sur la sensibilité à l'égard de l'ergostérol irradié administré *per os*. Pour ce faire des souris ont été d'abord splénectomisées, puis bloquées au moyen d'une injection intrapéritonéale d'une solution de saccharate de fer à 20 pour 100. L'essai, fait sur trois animaux, a montré que ce blocage du système réticulo-endothélial n'influence pas la réceptivité d'une manière appréciable.

CONCLUSIONS.—Il est incontestable que l'ergostérol irradié, absorbé *per os*, exerce une action toxique sur des animaux de laboratoire, tels que la souris, le rat, le lapin, le jeune chat (la poule semble faire exception). Il serait étonnant qu'il en fût autrement. En général, tout principe doué de propriétés curatives est, à la fois, un toxique, si l'administre à des doses trop élevées. Ce qu'il importe de savoir, c'est si l'E. irradié est nuisible aux doses où il est utilisé en thérapeutique humaine. Or, nos expériences nous autorisent à répondre négativement. En effet, même si l'on s'adresse à des sujets éminemment sensibles (le lapin, par exemple), on constate que les doses parfaitement supportées quotidiennement, et pendant une longue période de temps, sont supérieures à celles que l'on fait ingérer à l'homme (par unité de poids). Encore plus, si l'on expérimente sur le singe. Les simiens, animaux le plus rapprochés de l'espèce humaine, tolèrent, sans nul trouble apparent, ni clinique, ni histopathologique, des quantités d'E. irradié dépassant très largement celles employées dans la cure du rachitisme. Sans méconnaître l'utilité d'une certaine prudence, toujours nécessaire en thérapeutique (Hess et ses collaborateurs), on peut continuer, sans risque de complications immédiates ou tardives, le traitement actuel du rachitisme, de l'ostéomalacie, des anémies ou des fractures par l'ergostérol irradié.

II.—CALCIFICATION HETEROTOPIQUE.

Ecartant la question de l'action calcifiante de l'ergostérol irradié sur les os rachitiques, que l'expérimentation et la clinique (Marfan¹) démontrent amplement, nous nous sommes attachés surtout à l'étude de la *calcification hétérotopique* de certains organes, en particulier du rein et de l'aorte, chez les animaux soumis au traitement par l'E. irradié. Nous avons utilisé les techniques de Kossa² et de Crétin³ permettant la mise en évidence, sur coupes, du Ca, dans ses rapports avec les éléments cellulaires, la partie chimique du problème étant réservée pour des publications ultérieures (relations entre la calcémie et la calcification hétérotopique). Résumons nos résultats suivant la dose et l'espèce animale employées.

1° SOURIS.—21 examens histologiques ont été pratiqués, dont deux pour la dose de 1 milligr., quatre pour la dose de 3 milligr., et quinze pour la dose de 5 milligr. *pro die*. Le calcium fut décelé chez 13 animaux (soit 62 pour 100), à savoir *une fois* pour la première de ces doses, *deux fois* pour la seconde et *dix fois* pour la troisième. La fréquence de la calcification paraît donc marcher de pair avec l'accroissement de la quantité d'ergostérol irradié administré *per os*. Il est important de constater que certains sujets succombent à l'intoxication ergostérolée aiguë, sans qu'il y ait, chez eux, incrustation calcique manifeste des tissus, ce qui démontre que la calcification n'est pas l'unique cause de la mort, encore moins un témoin fidèle de l'empoisonnement⁴.

Le Ca fut décelé 13 fois dans le rein et une seule fois dans l'intestin.

2° LAPINS.—Le nombre des examens a été de 16, dont six pour les doses de 1 à 4 milligr., un pour la dose de 5 milligr., deux pour les doses de 10 à 15 milligr., et sept pour la dose de 20 milligr. La calcification fut trouvée positive à six reprises (soit 37 pour 100), à savoir deux fois chez les animaux ayant reçu 5 et 15 milligr., et quatre fois chez des lapins ayant absorbé 20 milligr., par jour et par kilogramme. Ici aussi, la fréquence de l'incrustation calcique des organes augmente, avec la dose d'ergostérol administrée. En outre, il apparaît que le lapin, comme la souris, peut succomber à l'intoxication ergostérolée sans qu'il y ait déposition de calcium dans ses tissus. La calcification intéresse le rein, l'aorte, et plus rarement, l'estomac, l'intestin, le foie et le myocarde.

¹ Marfan.—*La Presse Médicale*, 1929, n° 46, p. 749.

² Kossa.—*Ziegl. Beiträge*, t. XXIX, 1901, p. 163.

³ Crétin.—*Recherches sur l'ossification*. Imprimerie de l'Institut commercial, Le Mans, 1925.

⁴ Peut-être les principes chimiques plus ou moins indéterminés qui accompagnent la vitamine D, dans l'ergostérol irradié, sont la cause de cet empoisonnement.

Ajoutons que, parmi les autres espèces animales utilisées, seuls le jeune chat et le rat ont montré de la calcification. Chez les singes, nul dépôt calcique dans les organes, excepté quelques traces dans le rein (un cas sur deux).

En résumé, la calcification hétérotopique, localisée le plus souvent dans le rein et l'aorte, est réelle, mais non absolument constante. Nulle chez les animaux ayant absorbé des doses sous-toxiques, mais fréquemment répétées, d'E. irrad., cette calcification, VARIABLE SUIVANT LES SUJETS, devient plus fréquente et plus intense, au fur et à mesure que l'on augmente la quantité de principe actif. Le fait qu'elle peut être totalement absente chez des lapins ou des souris morts par suite d'une intoxication aiguë, montre que celle-ci n'est pas forcément une conséquence de l'accumulation du Ca dans les tissus.

Particularités histologiques.

REIN.—Chez la souris, comme chez le lapin, l'incrustation calcique du rein intéresse aussi bien la corticalité que la papille rénale. Au début, le calcium apparaît dans le cytoplasma des épithéliums qui tapissent les tubes contournés, au contact immédiat du noyau, qu'il finit par masquer entièrement. Certaines cellules se calcifient en totalité; elles confluent et donnent lieu à des concrétions calcaires, véritables calculs qui obstruent certains canalicules (fig. 2). Lorsque la calcification est intense, il y a déposition de Ca dans les parois vasculaires, artérioles et veinules, à l'exception des glomérules (fig. 1). Au niveau de la papille, on observe des cylindres calciques à l'intérieur des tubes excréteurs (fig. 3), le tout pouvant s'accompagner de signes de néphrite épithéliale et de diapédèse leucocytaire intra-canaliculaire (écorce rénale). Il s'agit, dans l'ensemble, d'une précipitation du calcium à localisation intra-épithéliale et vasculaire, due à un trouble du métabolisme calcique.

AORTE.—La calcification de l'aorte, fréquente surtout chez le lapin, a pour siège la tunique moyenne, à proximité de l'intima (fig. 4). Sans qu'elle s'accompagne de signes histopathologiques d'athérosclérose (Marchand), ou d'artéropathie chronique déformante (Lubarsch), cette calcification se limite aux divers éléments constitutifs de la media. La lésion ressemble étonnamment à celle décrite chez l'homme par Mönckenberg¹ (vaisseaux périphériques). Elle consiste en une incrustation calcique des fibres élastiques, des cellules conjonctives et des éléments musculaires lisses de la tunique moyenne (fig. 7.) On ne décèle aucun signe inflammatoire ou dégénératif faisant point d'appel. Tout semble se réduire à une accumulation progressive du Ca dans le cytoplasma des fibroblastes, à la surface des fibres élastiques et dans la substance collagène fondamentale. Le calcium finit par masquer complètement les noyaux. L'importance des fibres élastiques et des cellules conjonctives,

¹ Mönckenberg.—*Münch. med. Woch.*, 1920, t. LXVII, p. 365.

en tant que lieu électif de la précipitation calcique, est, comme chez l'homme [Faber, Hueck¹], indiscutable. La calcification de la tunique moyenne de l'aorte provoque un épaissement de la paroi artérielle, dont la topographie et l'intensité sont variables (fig. 4). Ajoutons que ces altérations aortiques, analogues à celles constatées à la suite de l'intoxication adrénalinique (Josué), ou cholestérinique [Ignatovski²], sont bien dues aux troubles du métabolisme calcique déclenchés par l'ergostérol irradié; en effet, l'examen de sept aortes provenant de lapins témoins ne nous a fourni que des résultats négatifs³.

TUBE DIGESTIF.—La calcification de l'estomac intéresse, chez le lapin, la tunique musculaire et les vaisseaux de la sous-séreuse (fig. 5); celle de l'intestin a, pour siège, surtout la muqueuse. On voit sur la figure 6 que le calcium apparaît à l'intérieur et entre les tubes glandulaires, ainsi que dans la paroi de certains vaisseaux. Nous ne pensons pas qu'il s'agisse, ici, d'une précipitation du Ca par suite d'une action locale directe de l'ergostérol irradié, pour le motif que les concrétions calciques sont abondantes dans la profondeur de la muqueuse et non pas à sa surface. De plus, lorsqu'on injecte l'E. irr. huileux dans le muscle, le dépôt de Ca intramusculaire est presque insignifiant. Ces altérations s'accompagnent parfois des signes microscopiques d'entérite dégénérative et inflammatoire, principalement chez la souris.

POUMON.—Les plus belles lésions calcifiantes ont été constatées chez le chat (Cf. fig. 8). Le Ca se dépose sur les parois alvéolaires, dans les épithéliums qui tapissent certaines ramifications bronchiques et aussi dans la tunique moyenne des vaisseaux.

FOIE.—Chez un seul lapin il nous a été donné de déceler une calcification en foyer des cellules hépatiques à la périphérie des lobules, sans réaction inflammatoire concomitante.

Ajoutons que nous n'avons jamais observé la moindre trace de Ca dans le cerveau, la rate, le pancréas, les glandes lymphatiques, la moelle osseuse, la thyroïde, la vessie, à condition, toutefois, que ces organes soient exempts d'altérations dues à une infection spontanée quelconque.

III.—CALCIFICATION DES LÉSIONS PREEXISTANTES.

En général, chaque fois que l'animal est porteur de lésions tissulaires dues à des processus infectieux ou parasitaires antérieurs au traitement par l'ergostérol irradié, celui-ci, appliqué dans des conditions déterminées, provoque une accumulation du calcium au niveau de ces lésions. Il en a été ainsi des capsules surrénales chez le lapin (pseudo-tuber-

¹ Hueck.—*Münch. med. Woch.*, 1920, t. LXVII, p. 535.

² Cité d'après Mönckenberg (loc. cit.). Dans l'aortite cholestérinique, la dégénérescence lipodique de l'intima prédomine.

³ Nous reviendrons dans un travail ultérieur sur certains détails, auxquels, par manque de place, nous sommes obligés de renoncer.

culose, v. fig. 10), ou du *poumon* chez le lapin (parasitose helminthique). Mais on peut provoquer à volonté cette calcification, particulièrement dans la tuberculose et l'encéphalite. Pour ce qui a trait à la tuberculose (lapin), nos recherches, actuellement en cours, montrent que l'ergostérol irradié augmente dans des proportions considérables la tendance qu'offrent spontanément les tubercules pulmonaires, spléniques, ganglionnaires ou testiculaires à se calcifier. L'administration du produit, loin d'aggraver l'évolution de la *tuberculose expérimentale*, lui imprime un caractère plutôt bénin, ce qui semble contredire l'assertion de certains auteurs [Bamberger et Spranger¹] au sujet de la toxicité de l'ergostérol irradié chez les enfants tuberculeux.

Nous nous proposons de revenir ultérieurement sur cette question.

Pour l'instant, nous rappellerons nos constatations récentes concernant la *calcification des lésions nevraxiques produites chez le lapin par le virus herpéto-encéphalitique*. Il résulte de notre travail² que : 1° les altérations cérébrales de type chronique ont une certaine tendance spontanée à se calcifier; 2° le calcium apparaît d'abord dans le cytoplasma des cellules granulo-adipeuses microgliales et des neurones, par suite d'un trouble du métabolisme calcique intracellulaire (fig. 9, 12, 13, 14 et 15); 3° l'ergostérol irradié, administré par voie buccale, intensifie la calcification des foyers d'encéphalite chronique et paraît aider à la réparation cicatricielle de ces foyers.

¹ Bamberger et Spranger.—*Deutsche med. Woch.*, 6 Juillet 1928, n° 26, p. 1116.

² Levaditi et Li Yuan Po.—*C. R. Soc. de Biol.*, 1929, t. CI, p. 881.

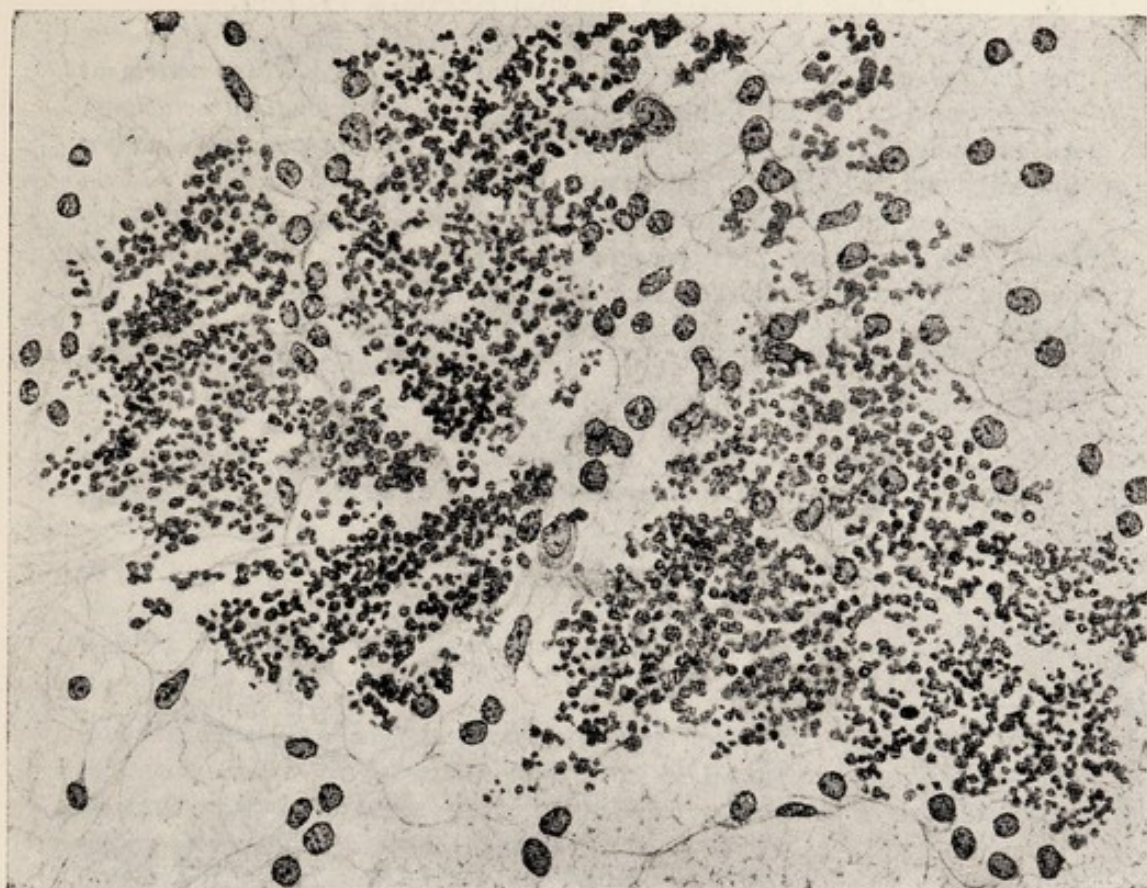


Fig. 14.—Coupe de cerveau. Lapin atteint d'encéphalite chronique (virus herpéto-encéphalitique C) traité par l'Ergostérol irradié. Dépôts calciques en plein foyer d'encéphalite (Ca en noir). Hémalun-éosine-orange. Gross. 600/1.

CONCLUSIONS.

L'ergostérol irradié, administré per os, est parfaitement supporté

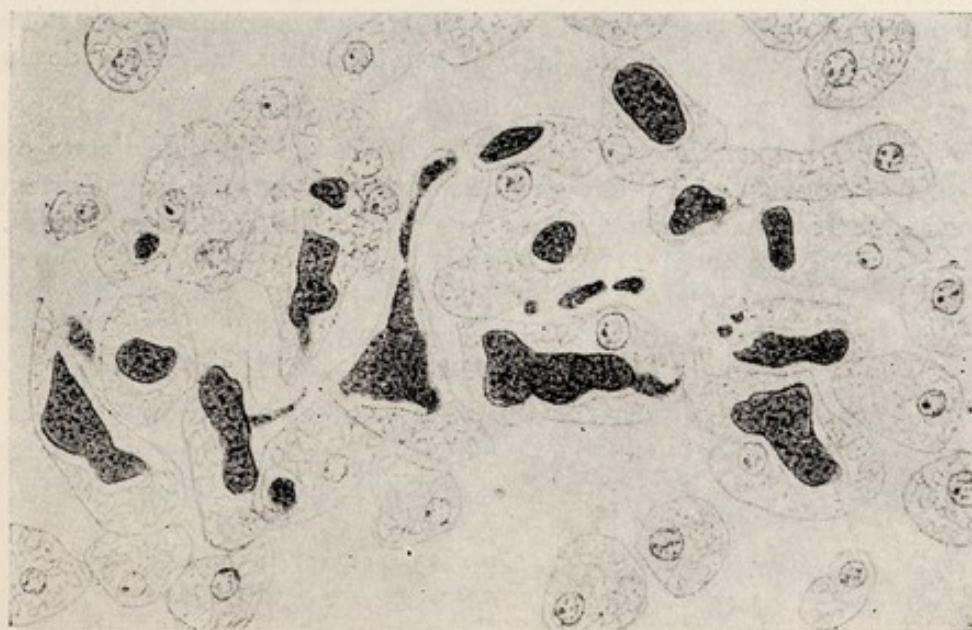


Fig. 15.—Coupe de cerveau. Lapin atteint d'encéphalite chronique (virus herpéto-encéphalitique C) traité par l'ergostérol irradié. Apparition du calcium dans les cellules microgliales. Hémalun-éosine-orange. Gross. 600/1.

par les animaux de laboratoire, y compris le singe, à des doses nettement supérieures à celles que l'on utilise en thérapeutique humaine (rachitisme, ostéomalacie, anémies, fractures, etc...). Les animaux peuvent absorber journellement, et pendant longtemps, l'ergostérol irradié, sans que l'on observe chez eux des troubles morbides, ni cliniques, ni histopathologiques. A des doses plus considérables, l'ergostérol irradié peut être nuisible, sa toxicité se traduisant par un amaigrissement progressif et des lésions organiques (rein), accompagnées ou non de *calcification tissulaire hétérotopique*. Celle-ci est due à un trouble du métabolisme calcique, ayant, pour siège, le cytoplasma de certains éléments cellulaires.

L'incrustation calcique hétérotopique n'est cependant pas une *conditio sine qua non* de l'intoxication ergostérolée.

La mort de l'animal peut survenir alors que dans aucun de ses organes on puisse déceler du Ca, tout au moins histologiquement.

L'absorption de petites doses répétées d'ergostérol irradié ne produit ni accoutumance, ni hypersensibilité.

L'étude des propriétés physiopathologiques de l'ergostérol irradié aide à préciser expérimentalement le mécanisme de certains processus morbides, tels les néphrites calcifiantes et les vascularites calcigènes de l'homme. Elle montre que la calcification d l'aorte peut intéresser exclusivement la tunique moyenne et débiter par une incrustation calcique primitive des fibroblastes, des élastoblastes (Mönckenberg) et des fibres lisses, en dehors de toute altération inflammatoire ou dégénérative préalable. Enfin, on peut, grâce à l'utilisation de l'ergostérol irradié, déclencher une précipitation du calcium au niveau de certaines lésions microbiennes ou parasitaires préexistantes (tuberculose et encéphalite chronique). L'inconstance de l'aortite calcifiante chez des animaux appartenant à la même espèce et soumis à un régime ergostérolé identique semble démontrer le rôle de la prédisposition dans la genèse de la calcification hétérotopique.

Reste à préciser si, à la longue, les dépôts calciques de l'aorte ou du rein sont susceptibles d'être résorbés, chez les animaux qui guérissent spontanément. Mais cette question fera l'objet de recherches futures.

Prof. C. LEVADITI and DR LI YUAN PO.

EXPERIMENTAL STUDY ON THE IRRADIATED
ERGOSTEROL.

BY C. LEVADITI AND LI YUAN PO.

Reprinted from *La Presse medicale*, No. 11. February 5th, 1930.

ENGLISH SUMMARY.

The irradiated ergosterol administered per os in considerably bigger doses than those used in the human therapy (rickets, osteomalacy, anaemia, fractures) is well received by the animals experimented upon (included the monkey). The animals are able to absorb the irradiated ergosterol every day for a long time without any morbid clinical or histopathological features. More considerable doses of irradiated ergosterol can become dangerous. Its poisonous effect manifests itself by a progressive atrophy and by organic lesions (kidney), with or without heterotopic calcification in the tissues. This calcification is due to a disturbance of the metabolism of calcium concerning the cytoplasm of special cellular elements.

However this heterotopic deposition of calcium is not a condition *sine qua non* of the intoxication caused by the ergosterol. The animal may die without showing any calcification in its organs (at least by means of histological investigation).

The repeated absorption of small doses of irradiated ergosterol does not produce any habit formation nor hypersensibility.

By the study of the physiopathological qualities of the irradiated ergosterol one can experimentally show the mechanism of some morbid processes as for instance the "nephrite calcifiante" and the calcification of the arteries of man. This study shows that the calcification of the aorta can involve only the tunica media and begins by a primary impregnation with lime of the fibroblasts, the elastoblasts (Moenckeberg) and the fibres without any preceeding inflammatory or degenerative alteration. By means of the irradiated ergosterol one can produce a deposition of calcium in some preexistent lesions due to microbes or parasites (tuberculosis and chronic encephalitis). The different intensity of the calcification of the aorta produced by the same treatment with irradiated ergosterol in animals of the same species seems to prove the importance of the predisposition for the origin of heterotopic calcification.

It remains to be seen whether the deposits of calcium in the aorta or the kidneys can be resolved in animals which recover spontaneously. Further investigations will be performed in order to solve this question.

LA CALCIFICATION DES LÉSIONS D'ENCEPHALITE CHRONIQUE SOUS L'INFLUENCE DE L'ERGOSTEROL IRRADIE (STEROGYL).

Extrait des *Comptes rendus des séances de la Société de biologie*
(Séance du 6 juillet 1929.—Tome CI, page 881).

La calcification des éléments cellulaires entrant dans la constitution de certaines lésions névrauxiques chroniques humaines, telles que foyers encéphalitiques, ramollissement, paralysie juvénile, syphilis cérébrale, a



Fig. 1.—Lapin 818 D. Virus Carnot. Encéphale. Zone élective. Lésions chroniques. Calcification sous l'influence de l'ergostérol irradié. Ca en noir. Gross. 50/1.

été parfaitement étudiée. Spilmeyer¹ lui consacre une description détaillée et signale l'incrustation calcique des cellules nerveuses, des éléments microgliaux et des parois vasculaires, ainsi que la présence de dépôts de calcium au milieu des foyers dégénératifs (*globus pallidus*, Weimann²). Suivant Hofmeister, le calcium ainsi précipité provient de la circulation sanguine et lymphatique, sa précipitation étant déterminée

¹ Spilmeyer. *Histopathologie des Nervensystems*. Berlin, 1922, p. 302.

² Weimann. Cité d'après Spilmeyer.

LA CALCIFICATION DES LÉSIONS D'ENCEPHALITE CHRONIQUE 61
SOUS L'INFLUENCE DE L'ERGOSTEROL IRRADIÉ (STEROXYL).

par des changements de l'état physique des colloïdes protecteurs. Schmincke³, à la suite de ses études sur l'encéphalite de Virchow, admet que la précipitation est en fonction de la quantité d'acide carbonique résultant de la respiration des tissus altérés; toute diminution de la teneur en CO² favoriserait cette précipitation. Les recherches d'Aschoff, von Girke, Nissl, tendent à prouver que le fer peut s'associer au calcium lors de la précipitation de ce dernier et que certains composés, se colorant en bleu foncé par la méthode de Nissl, représenteraient des fixateurs du calcium (Kalkfänger).

Il était à prévoir que certaines infections expérimentales dues à des virus neurotropes, réalisant des altérations névrauxiques chroniques, devaient,

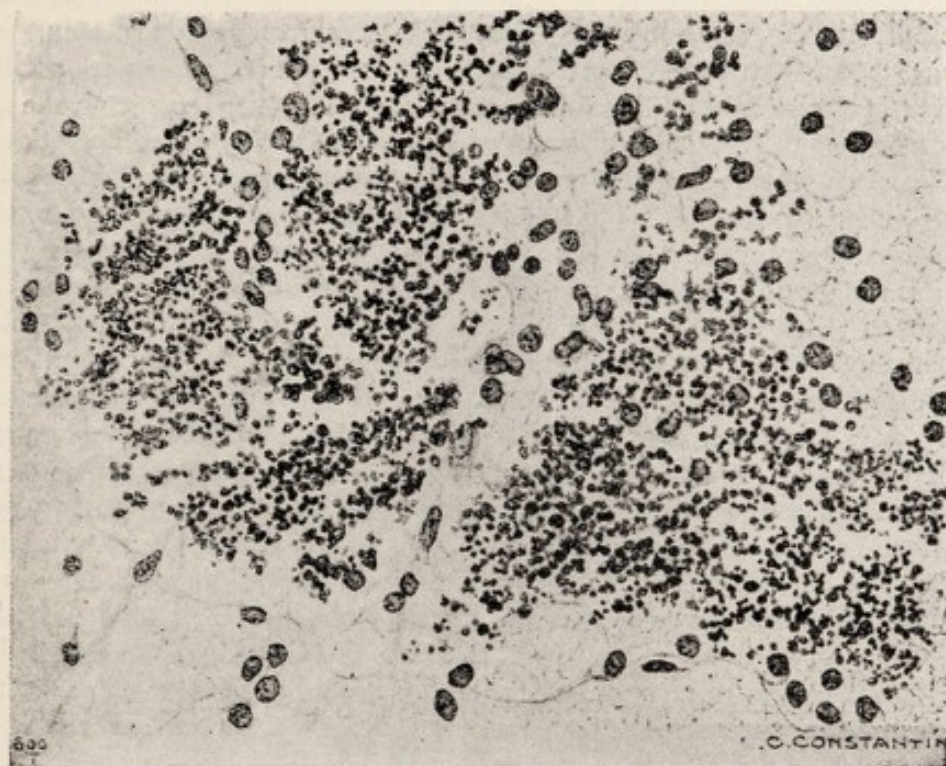


Fig. 2.—Lapin 818 D. Calcification des lésions cérébrales chroniques sous l'influence de l'ergostérol irradié. Ca en noir. Gross. 600/1.

à une phase déterminée de leur évolution, déclencher une précipitation du calcium au niveau de ces altérations. En fait, Da Fano et Perdreau⁴, dans un travail documenté sur la méningo-encéphalite herpétique chronique ou subaiguë du Lapin, décrivent la présence du calcium au niveau des lésions encéphaliques. Le calcium imprègne les cellules nerveuses de la *lamina pyramidalis*, du *stratum radiatum* et de la *lamina lacunaris* de la corne d'Ammon. Ces auteurs, dont le travail comporte

³ Schmincke. *Zeitschr. f. d. ges. Neurolog.*, 1920, t. 60.

⁴ Da Fano et Perdreau. *Journ. of. pathol. and bacteriol.*, 1927, t. 30, p. 67.

une parfaite description de l'encéphalite chronique du Lapin, emploient toutes les méthodes permettant d'identifier la matière calcique des concrétions découvertes par eux.

Nous avons étudié la question de la calcification des altérations névrauxiques produites par notre virus herpéto-encéphalitique C, chez des Lapins ayant survécu à la période aiguë de la maladie et jouissant d'une immunité acquise solide. Notre étude a été entreprise du point de vue : 1° de la topographie du calcium; 2°) de la fréquence du processus calcifiant; 3°) de l'influence que pourrait exercer l'ergostérol sur l'intensité de la calcification des lésions névrauxiques.

1°) *Topographie des concrétions calciques.*—L'un de nous, en collaboration avec Lépine et Schoen, a décrit dans une note récente⁵ les principaux caractères de l'encéphalite chronique du Lapin, en insistant tout particulièrement sur la formation de véritables cavités porencephaliques, dues à la fonte du tissu de soutien consécutive à la neuronophagie. A un moment donné de l'évolution de ces altérations, le calcium apparaît sous forme de concrétion parfaitement colorable par l'hématoxyline et les méthodes électives de Kossa et de Crétin. Ces concrétions naissent toujours dans le cytoplasma des cellules granulo-adipeuses d'origine microglie, dont l'abondance a été signalée par Da Fano et Perdreau et par Levaditi, Lépine et Schoen (*loc. cit.*). Des granulations calciques, de dimensions variables, incrustent le protoplasma vacuolaire de ces cellules. Par ailleurs, des pseudo-cellules géantes, à 8 ou 12 noyaux, provenant de la confluence des éléments granulo-adipeux ou de la multiplication amitotique de leurs noyaux, apparaissent à la périphérie des formations cavitaires. Or, le calcium imprègne certaines de ces cellules et en masque les formations nucléaires. Enfin, çà et là, on décèle des concrétions calciques extracellulaires, et aussi une imprégnation des neurones; ces derniers offrent alors l'apparence de cellules nerveuses colorées par la méthode de Golgi. En résumé, le calcium précipite au niveau des lésions d'encéphalite chronique, par suite d'un trouble du métabolisme intra-cellulaire, et apparaît d'abord dans le cytoplasma des éléments granulo-adipeux et des neurones altérés.

2°) *Fréquence du processus calcifiant.*—Nos examens ont porté sur 25 Lapins, tous inoculés par voie intracérébrale avec la souche herpéto-encéphalitique C et ayant survécu de 9 à 105 jours. Sauf un animal mort le 9^e jour, tous les autres Lapins étaient porteurs d'altérations d'encéphalite chronique siégeant dans la zone élective, ou au voisinage de la corne d'Ammon et du ventricule latéral. Parmi ces 25 Lapins, 10 montraient des traces de calcium au niveau de leurs altérations névrauxiques, 3 des quantités appréciables, quoique relativement faibles, alors que chez les 12 autres, le calcium était totalement absent, ce qui fournit un pourcentage de 51 p. 100 de résultats positifs. Nous n'avons révélé aucun rapport bien précis entre l'âge et l'intensité de la lésion cérébrale et l'abondance des concrétions calciques; ainsi le calcium était

⁵ Levaditi, Lépine et Schoen. *C. R. de la Soc. de biol.*, 1929, t. 101.

présent chez des Lapins sacrifiés la douzième ou le quatorzième jour, tandis qu'il manquait totalement chez d'autres animaux examinés du trente-cinquième ou cent cinquième jour.

3°) *Influence de l'ergostérol irradié (Stérogyl).*—Nous étudions depuis longtemps le mécanisme de l'action calcifiante du Stérogyl chez les animaux de laboratoire. Nos recherches, démontrant qu'aux doses thérapeutiques ce dérivé est parfaitement supporté par le Lapin, la Souris et les Singes catharriniens, et qu'à des doses toxiques, de beaucoup supérieures à celles utilisées en pratique, il détermine de l'athérome aortique, ainsi qu'une néphrose calcique, seront publiées ultérieurement. Ces expériences nous ont conduit à rechercher si l'ergostérol irradié, administré par voie digestive à des animaux porteurs de lésions chroniques, telles l'encéphalite à virus neurotrope, ou la tuberculose, était capable de déterminer une augmentation appréciable de la calcification de ces lésions. Plusieurs Lapins, inoculés longtemps auparavant (voie intracérébrale) avec la souche herpéto-encéphalitique C, ont reçu, *per os*, des doses variables de Stérogyl. Chez 3 de ces Lapins, examinés 33, 36 et 104 jours après l'inoculation, nous avons constaté effectivement une augmentation assez considérable du calcium dans les altérations névraxi-ques, se tradisant par l'apparition d'abondantes concrétions tant intra-qu'extra-cellulaires (fig. 1 et 2). Ces Lapins avaient reçu respectivement 160, 180 et 484 mgr. de Stérogyl pendant toute la durée de l'expérience. Voici, à titre documentaire, le protocole de nos expériences : *Lapin 998 E*, lésions chroniques intenses; méningite à mononucléaires et manchons périvasculaires monocytaires, surtout au niveau de la zone élective; formations cavitaires bilatérales; abondance de cellules granulo-adipeuses; dépôts de calcium dans certaines cellules microgliales de forme allongée, gros foyers entourés de monocytes, contenant d'innombrables concrétions calciques, rondes, ovalaires ou sous forme de baguette; les cavités touchent le ventricule latéral et la corne d'Ammon.

Conclusions.—1°) Les altérations névraxi-ques du type chronique provoquées par des virus neurotropes, tels le germe herpéto-encéphalitique, ont une certaine tendance à se calcifier.

2°) Le calcium apparaît d'abord dans le cytoplasme des cellules granulo-adipeuses microgliales et des neurones, par suite d'un trouble du métabolisme calcique intracellulaire.

3°) L'ergostérol irradié (Stérogyl), administré par voie buccale, intensifie la calcification des foyers d'encéphalite chronique et paraît aider à la réparation cicatricielle de ces altérations.

(Institut Pasteur et Fondation Matheson
pour l'étude de l'encéphalite.)

Prof. C. LEVADITI and DR. LI YUAN PO.

THE CALCIFICATION OF THE LESIONS OF CHRONIC
ENCEPHALITIS UNDER THE INFLUENCE OF THE
IRRADIATED ERGOSTEROL (STEROGYL).

BY C. LEVADITI AND LI YUAN PO.

Reprinted from Comptes rendus des seances de la societe de biologie.
Vol. CI, 1929, pag. 881.

ENGLISH SUMMARY.

(1) The chronic lesions of the central nervous system produced by a neurotropical virus (the herpatoencephalitic virus) show a special tendency to calcify.

(2) In the beginning the calcium appears in the cytoplasm of the fatty granular cells and the neurons in consequence of a disturbance of the intracellular metabolism of calcium.

(3) The irradiated ergosterol (Sterogyl) administered per os intensifies the calcification of the focus of the chronic encephalitis and seems to accelerate the scar reparation of these lesions.

ETUDE EXPERIMENTALE DE LA CALCIFICATION DES LÉSIONS TUBERCULEUSES SOUS L'INFLUENCE DE L'ERGOSTEROL IRRADIÉ.

EXTRAIT DU BULLETIN DE L'ACADEMIE DE
MEDECINE.

(Séance du 13 Mai 1930, Tome CIII, No. 19).

Dans une note présentée à la Société de Biologie (séance du 6 juillet 1929)¹ concernant l'action calcifiante exercée par l'ergostérol irradié dans l'encéphalite chronique du lapin, nous avons mentionné des expériences en cours se rapportant à la calcification des lésions tuberculeuses expérimentales au moyen de la vitamine D. Ultérieurement, dans un article publié dans *La Presse Médicale* (5 février 1930)², nous sommes revenus sur ce sujet, montrant que l'administration de l'ergostérol irradié *per os*, à des lapins infectés de tuberculose par voie intratesticulaire, détermine une calcification intense des lésions bacillaires. Le problème nous ayant paru plein d'intérêt, non seulement du point de vue théorique, attendu qu'il touche de près au mécanisme de la calcification spontanée des tubercules, mais encore du point de vue pratique, nous en avons poursuivi l'étude.

Il est de notion courante que les accidents tuberculeux pulmonaires, ou du moins certaines formes de ces accidents, offrent, lorsqu'ils sont en voie de guérison, une tendance marquée à la calcification spontanée. Cette calcification s'opère-t-elle parce que la lésion tend vers la cicatrisation, ou bien les tubercules guérissent-ils parce que l'organisme acquiert la faculté de les emprisonner dans une coque calcique capable d'entraver la pullulation du bacille de Koch³? Peut-on, en faisant ingérer aux animaux tuberculeux des doses non toxiques d'ergostérol irradié, augmenter dans des proportions considérables cette tendance à la calcification? Ce sont là les problèmes que nous nous sommes proposé de résoudre, et que nous désirons exposer dans la présente communication.

¹ Levaditi et Li Yuan Po. *C. R. de la Soc. de Biol.*, t. CI, 1929, p. 881.

² Levaditi et Li Yuan Po. *La Presse Médicale*, n° 11, 1930, p. 168.

³ Consulter, à ce sujet, le travail de Mayer et Wells (*Americ. Rev. of Tuberc.*, t. VIII, 1923, p. 318) (Cf. Kolle et Wassermann, t. V, p. 1201 (article de Klopstock)).

Nous avons montré antérieurement¹ que l'ergostérol irradié, administré par voie buccale, agit différemment suivant les doses de vitamine D ingérée. Chez l'homme, la grande majorité des cliniciens admettent qu'à des doses parfaitement tolérées, l'ergostérol irradié déclenche une accumulation de Ca dans les os rachitiques, d'où ses remarquables effets thérapeutiques. Nous en avons la preuve dans la récente enquête faite à ce sujet par l'*Hôpital* et publiée dans le numéro de mars 1930. Chez l'animal (lapin, souris, rat, chat), cette action calcifiante est fâcheusement dépassée, si l'on se sert de doses toxiques ou hypertoxiques d'ergostérol. On obtient alors ce que nous avons désigné sous le nom de *calcification hétérotopique*, à savoir une précipitation de Ca ailleurs que dans le système osseux : aorte, rein, poumon, estomac, intestin, etc. Nous avons étudié le mécanisme de cette calcification hétérotopique et montré que le Ca apparaît d'abord dans le cytoplasma, par suite d'un changement du métabolisme calcique intracellulaire. Il nous a été ainsi possible de préciser le mécanisme pathogénique des aortites, des vascularites et des néphrites calcifiantes, et d'aboutir à des conclusions semblables à celles déjà formulées par Pfannenstiel², Kreitmair et Moll³, Reyher et Walkoff⁴, et, tout récemment encore, par Hélène Herzenberg⁵ et par Demole et ses collaborateurs⁶.

Ayant constaté, au cours de nos recherches, que sous l'influence de l'ergostérol irradié le Ca se dépose non seulement dans certains points d'élection, tels les os, l'aorte, ou la musculature du tube digestif, mais encore dans des foyers inflammatoires chroniques de nature diverse (à la condition que ces foyers soient antérieurs à l'administration du médicament), nous avons songé à entreprendre des essais analogues dans la tuberculose. Voici notre technique :

I.—TECHNIQUE.

1° *Choix de la souche de bacille de Koch.*—Afin de réaliser chez l'animal une infection bacillaire d'allure chronique, permettant de suivre pendant assez longtemps l'évolution de la tuberculose et de provoquer des lésions ayant, par elles-mêmes, une certaine tendance vers la guérison, en un mot, désireux de nous placer dans des conditions expérimentales aussi proches que possible de ce que l'on constate dans certains formes de bacillose humaine, nous avons porté notre choix sur une souche de bacille tuberculeux humain, que nous avons inoculée au lapin. Cette souche, que nous avait confiée notre regretté ami L. Four-

¹ Levaditi et Li Yuan Po. *La Presse Médicale*, n° 11, 1930, p. 168.

² Pfannenstiel. *Munch. med. Woch.*, n° 26, 1928, p. 1113.

³ Kreitmair et Moll. *Munch. med. Woch.*, n° 15, 1928, p. 637.

⁴ Reyher et Walkoff. *Munch. med. Woch.*, no 25, 1928, p. 1071.

⁵ Hélène Herzenberg. *Beitr. für pathol. Anat.*, t. LXXXII, 1929, p. 27.

⁶ Demole et Fromherz. *Arch. für exper. Pathol. u. Pharmacol.*, t. CXLVI, 1929, p. 348.

nier, était entretenue depuis plusieurs années sur de la pomme de terre glycinée et cultivée depuis peu, dans notre Laboratoire, sur milieu de Dorset. La dose inoculée n'a pas dépassé 5 milligrammes (lapins de 2,500 à 3,000 grammes).

2° *Choix de la voie d'inoculation.*—Nous avons préféré pratiquer l'infection en inoculant l'émulsion de culture dans le testicule du lapin. De cette manière, il nous était possible d'apprécier *de visu* l'évolution de l'orchite bacillaire, avant et après le traitement par l'ergostérol irradié. De plus, ce mode d'inoculation détermine, chez le lapin, une tuberculose évoluant très lentement, en plusieurs mois, sans provoquer une perte de poids considérable, ce qui serait nuisible pour des animaux destinés à être soumis à un traitement par l'ergostérol irradié.

3° *Traitement.*—L'ergostérol, sous forme de solution huileuse à 10 milligrammes par centimètre cube¹, était administré exclusivement par voie buccale. Dans une première série d'expériences, l'ingestion du médicament eut lieu de quarante-deux à cent huit jours après l'inoculation du bacille tuberculeux dans le testicule, à un moment où l'orchite était en pleine évolution. Dans deux autres séries d'essais, le traitement fut effectué dès le début, soit de sept à treize jours après l'injection intratesticulaire.

4° *Appréciation des résultats.*—Hormis les rares animaux morts en cours d'expérience (dix-huit à vingt-neuf jours²), tous les autres furent sacrifiés à des intervalles variant de quarante-cinq à soixante-sept jours après le début du traitement. L'examen histo-pathologique des organes fut pratiqué d'après les méthodes habituelles. Les techniques utilisées pour la mise en évidence du calcium sur coupes (appréciations

¹ Nous avons utilisé la préparation connue sous le nom de *Sterogyl* et dont nous avons donné les constantes chimiques dans un travail antérieur (Cf. Levaditi et Li Yuan Po, *La Presse Médicale*, loc. cit.).

² Ces animaux sont morts, pour la plupart, d'infection secondaire.

qualitative et quantitative) furent, comme dans nos travaux antérieurs, celles de Kossa¹ et de Crétin².

5° Afin de juger les différences entre animaux traités et sujets non traités, nous avons eu soin de pratiquer simultanément une série d'*inoculations témoins* (lapins infectés au même moment, avec la même dose de bacille de Koch, mais non soumis à l'action calcigène de l'ergostérol irradié).

II.—ENSEMBLE DES RESULTATS.

Nos constatations sont résumées dans les tableaux I et II, insérés ci-dessous. Trois séries d'expériences ont été faites, comportant chacune un assez grand nombre de témoins. Ces tableaux contiennent des données concernant la dose d'ergostérol irradié administrée par kilogramme et par jour, la quantité totale de vitamine D ingérée pendant toute la durée de l'expérience, les variations de poids de l'animal, la date à laquelle le lapin est mort ou fut sacrifié, enfin les constatations faites, lors de la nécropsie, du point de vue des lésions tuberculeuses, de la présence des bacilles tuberculeux (coupes) et de la richesse de ces lésions en calcium (méthodes histochimiques).

RESUME DES RESULTATS.—*Première et deuxième séries* (tableau I).—Les animaux, au nombre de 8, ont reçu des doses d'ergostérol irradié variant de 3 milligrammes à 20 milligrammes par kilogramme *pro die*, soit de 286 à 1.260 milligrammes en tout. Ils sont morts (3), ou ont été sacrifiés (5), entre quarante et un et cent soixante-deux jours après l'infection, et entre dixhuit et soixante-sept jours après le début du traitement. En général, il y eut tantôt perte de poids (surtout chez les lapins ayant succombé à la suite d'infections secondaires ou traités avec des doses toxiques d'ergostérol), tantôt augmentation de poids (de 50 à 600 grammes). Les lésions les plus fréquentes intéressaient le testicule et le poumon, les premières caractérisées par des foyers tuberculeux plus ou moins développés (orchite bacillaire), les secondes ayant l'aspect de petits tubercules disséminés. Nous donnerons plus loin une description détaillée de ces lésions. Pour l'instant, insistons sur ce fait important, à savoir que chez 7 des animaux traités par l'ergos-

¹ Kossa, *Ziegl. Beitr.*, t. XXIX, 1901, p. 163.

² Crétin, *Recherches sur l'ossification*, Imprimerie de l'Institut commercial du Mans, 1925.

TABLEAU I (première et deuxième séries).—*Injection intrasterculaire de 5 milligrammes bacilles tuberculeux.*

NUMEROS DES LAPINS	ERGOSTEROL		POIDS		ANIMAL SACRIFIE OU MORT		TESTICULE			POUMON			FOIE			RATE			AORTE		
	Dose pro die par kilogramme	Dose totale	Augmentation	Perte	Jours après inoculation	Jours après traitement	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	
Témoins.	587g	..	150	..	68	..	++	+	0	++	+	0	0	0	0	0	0	0	0	0	
	588g	..	550	..	77	..	++	+	0	++	+	0	0	0	0	0	0	0	0	0	
	590g	..	850	..	83	..	++	+	0	++	+	0	0	0	0	0	0	0	0	0	
	592g	..	350	..	15	..	++	+	0	++	+	0	0	0	0	0	0	0	0	0	
2e série.	581g	5	50	..	41	29	++	+	+	++	+	+	0	0	0	0	0	0	0	0	
	583g	3	600	..	80	67	++	+	+	++	+	+	:	0	0	0	0	0	0	0	
	584g	10	486	50	53	26	++	+	+	++	+	+	+	0	0	0	0	0	0	0	
	585g	10	1.092	250	..	80	67	++	+	+	++	+	+	+	0	0	0	0	0	0	
1re série.	857D	10	0	gr.	162	53	++	+	+	++	+	+	+	0	0	0	0	0	0	0	
	858D	20	730	600	126	18	++	+	+	++	+	+	+	+	0	0	0	0	0	0	
	890E	10	782	100	87	45	++	+	+	++	+	+	+	+	0	0	0	0	0	0	
	894E	20	1.360	100	..	87	45	++	+	+	++	+	+	+	0	0	0	0	0	0	

TABLEAU II (troisième série).—Injection intratesticulaire de 5 milligrammes bacilles tuberculeux.

NUMERO DES LAPINS	ERGOSTEROL		POIDS		ANIMAL SACRIFIE OU MORT		TESTICULE			POUMON			FOIE			RATE			AORTE		
	Dose pro die	Dose totale	Augmentation	Perte	jours après l'inoculation	jours après traitement	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca	Lésion tuberculeuse	Bacille de Koch	Ca
Témoins.	988g	..	200	..	58	..	++	++	+	++	++	0	++	++	0	++	++	0	++	++	0
	991g	..	150	..	58	..	++	++	0	++	++	0	++	++	0	++	++	0	++	++	0
	992g	..	250	..	58	..	++	++	Trace.	++	++	0	++	++	0	++	++	0	++	++	0
	993g	..	80	..	59	..	++	++	0	++	++	0	++	++	0	++	++	0	++	++	0
	994g	..	..	..	59	..	++	++	0	++	++	0	++	++	0	++	++	0	++	++	0
	988g	..	..	..	59	..	++	++	0	++	++	0	++	++	0	++	++	0	++	++	0
3e série.	982g	mgr. 555	gr. 150	gr. 150	59	52	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0
	983g	5	..	50	59	52	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0
	984g	5	50	..	59	52	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0
	985g	5	..	..	58	51	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0
	986g	5	200	..	58	51	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0
	987g	10	..	100	58	51	++	++	++	++	++	0	++	++	0	++	++	0	++	++	0

térol irradié il y avait calcification intense des lésions tuberculeuses testiculaires, et qu'il en fut de même de 5 lapins, du point de vue des incrustations calciques des follicules tuberculeux pulmonaires. En outre, chaque fois que la glande hépatique offrait de petites lésions spécifiques, celles-ci étaient calcifiées.

Comparons ces données à celles recueillies chez les *animaux témoins*, non soumis au traitement ergostérolé. Si, du point de vue de la survie des lapins et des variations du poids, aucune différence n'apparaît, par contre, des écarts frappants ont été enregistrés quant à la calcification, des altérations tuberculeuses testiculaires. En effet, *bien que des deux côtés, chez les animaux traités comme chez les autres, l'orchite ait atteint le même degré de développement, la calcification des altérations bacillaires des testicules était nulle chez quatre des lapins témoins et à peine ébauchée chez un cinquième.*

Troisième série (tableau II).—Cette série comporte 6 lapins traités par des doses d'ergostérol variant de 5 à 10 milligrammes par kilogramme (en tout de 444 milligrammes à 1.170 milligrammes) et cinq animaux témoins. Les sujets ont été sacrifiés de cinquante-huit à cinquante-neuf jours après l'infection et de cinquante et un à cinquante-deux jours après le début du traitement. Dans leur ensemble, les résultats enregistrés sont identiques à ceux que nous venons d'exposer, soit un écart considérable entre la calcification des tubercules testiculaires chez les sujets traités et les témoins. Un seul, parmi ces derniers, montrait des traces de Ca dans le testicule, alors que tous les six lapins ayant ingéré la vitamine D offraient des altérations orchitiques fortement calcifiées.

Il en résulte que *l'ergostérol irradié, administré per os à des lapins tuberculisés par voie intratesticulaire, provoque une calcification intense de tubercules orchitiques et pulmonaires, exagérant ainsi au plus haut degré la tendance calcifiante spontanée de ces tubercules. Cette action de la vitamine D s'exerce à des doses sous-toxiques et peut se manifester en dehors de toute autre calcification hétérotopique.* En effet, si dans la première série d'essais (Cf. tableau I), certains lapins, ayant reçu des doses d'ergostérol variant de 10 à 20 milligrammes *pro die* et par kilogramme, montraient des lésions d'aortite et de néphrite calcifiantes, par contre, de telles lésions étaient absentes chez tous les animaux traités de la deuxième et la troisième série (V. tableau II) [ayant reçu des doses inférieures de vitamine D (5 milligrammes)], en dépit d'une calcification intense de leurs tubercules orchitiques.

S'il est hors de doute que l'ergostérol irradié calcifie intensément les lésions tuberculeuses expérimentales à évolution chronique, il nous est actuellement impossible d'affirmer quoi que ce soit de précis quant à l'action curative exercée par la vitamine D sur l'évolution de ces lésions. Ni les variations de poids, ni la survie des animaux, ni la dissémination de foyers bacillaires ne nous renseignent à ce sujet d'une manière entièrement satisfaisante. De nouvelles recherches sont donc nécessaires pour élucider ce problème, et nous nous proposons d'en relater

les résultats à bref délai. Mais d'ores et déjà on peut affirmer que l'action calcifiante de l'ergostérol irradié ne se manifeste que si les lésions bacillaires, quoique nécrotiques et caséifiantes, offrent une évolution lente, une certaine tendance vers la guérison spontanée. Cette action nous a semblé, en effet, nulle dans la bacillose expérimentale du cobaye (souche humaine). Malgré l'administration régulière de doses sous-toxiques de vitamine D, les lésions aiguës (ganglionnaire et splachnique) n'ont montré aucune calcification notable (épreuve comportant 4 cobayes traités et 3 témoins).

III.—MECANISME DE LA CALCIFICATION DES LESIONS TUBERCULEUSES SOUS L'INFLUENCE DE L'ERGOSTEROL IRRADIE.

L'étude microscopique de la calcification ergostérolique du testicule et du poumon tuberculeux nous a fourni de précieux renseignements concernant le mécanisme du processus calcifiant.

Lorsqu'on examine les lésions de l'orchite tuberculeuse chez les lapins témoins, on constate que les modifications tissulaires sont celles d'un processus bacillaire quelconque, à tendance nécrosante et caséifiante. De nombreux tubercules confluents envahissent tout le parenchyme testiculaire et l'épididyme. Au centre, ces tubercules sont nécrotiques et intensément caséifiés; à la périphérie, on décèle des lésions évolutives, constituées par cellules géantes en grand nombre, des éléments épithélioïdes et des monocytes (lymphocytes et cellules plasmiques). Telle est également la constitution histologique, d'ailleurs classique, des petits tubercules pulmonaires, hépatiques ou spléniques, avec cette différence qu'ici le processus nécrotique et caséifiant est de beaucoup moins marqué. *Sauf de rares exceptions, ces altérations bacillaires sont dépourvues de calcium*, du moins au moment où nos animaux sont morts, ou ont été sacrifiés. Ça et là on décèle, dans le testicule, quelques dépôts calciques, intéressant la zone de caséification.

Il en est tout autrement chez les animaux soumis au traitement par l'ergostérol irradié. Dans la grande majorité des cas, la calcification est ici des plus intenses, surtout lorsqu'il s'agit de tubercules orchitiques. Le calcium, mis en évidence sur coupes par des méthodes appropriées, envahit toute la lésion; il confère au testicule une consistance dure et une coloration élective des plus prononcées (rouge par la méthode de Crétin, noire par la technique de Kossa). Les dépôts calciques siègent, de préférence, dans la zone caséifiée du tubercule, où ils apparaissent sous la forme d'une masse compacte, résultant de la confluence de concrétions calciques d'aspect irrégulier. Vers la périphérie on observe des formations globuleuses de Ca isolées du tissu environnant.

Pour saisir le mécanisme de cette calcification des tubercules, il y a lieu d'examiner attentivement leur périphérie, là où le processus revêt un caractère nettement évolutif. On y découvre le phénomène de l'"incrustation calcique intracytoplasmique" décrit par nous lors de nos études sur la calcification ergostérolée hétérotopique. En effet, l'analyse

attentive de ces lésions incipientes les plus proches de la zone caséifiée centrale permet de déceler, dans le cytoplasme des gros monocytes, des cellules épithélioïdes et des cellules géantes, des dépôts de calcium ayant l'aspect de grains plus ou moins volumineux, plus ou moins confluents. Ces dépôts calciques sont fréquemment inclus dans des vacuoles protoplasmiques situées au centre de la cellule géante, précisément dans la région où se logent habituellement les bacilles tuberculeux. Ils sont séparés des noyaux par une zone protoplasmique dépourvue de Ca.

Comment interpréter la présence du calcium dans les éléments constitutifs des tubercules? La première idée qui s'offre à l'esprit est que le Ca, précipité en dehors des cellules, est phagocyté par elles, comme le serait n'importe quel corpuscule étranger se trouvant dans des conditions analogues. Cette hypothèse doit être rejetée pour les motifs suivants: les cellules calcifères sont situées assez loin des foyers nécrotiques et caséifiés, foyers que le Ca imprègne d'une manière massive. On ne trouve entre elles, près d'elles, aucune concrétion calcique libre, non phagocytée. Par ailleurs, le calcium occupe, dans la cellule-hôte, la zone cytoplasmique où siègent, habituellement, les bacilles tuberculeux, ce qui semble prouver que la calcification s'opère autour de ces bacilles et peut-être même sous leur influence. Enfin, nos recherches antérieures concernant la calcification ergostérolée hétérotopique démontrent que *cette calcification, quel que soit le système tissulaire intéressé, est, avant tout, le résultat d'un changement du métabolisme calcique intracellulaire*. Sans que nous puissions préciser le mécanisme intime du processus, tout tend à prouver que, par suite d'un tel changement, le calcium se dépose progressivement dans le protoplasma de certaines cellules, tels les élastoblastes de l'aorte et des vaisseaux, les épithéliums des tubes contournés du rein, les éléments mésoglyques du névraxe, etc.

Or, il en est de même dans la tuberculose. Sous l'influence calcigène de l'ergostérol irradié, le Ca précipite dans le protoplasma des gros monocytes, des cellules épithélioïdes et des éléments gigantomitotiques, pour y constituer des dépôts, petits d'abord, de plus en plus considérables par la suite. *Il est intéressant de constater que les cellules qui phagocytent les bacilles tuberculeux et qui tolèrent leur pullulation intracytoplasmique sont précisément celles qui, les premières, montrent ces changements du métabolisme calcique*. Y a-t-il quelque rapport entre cette calcification des éléments cellulaires bacillifères et l'incrustation calcique du cytoplasma? Nous le pensons fermement. On sait, en effet, depuis les recherches de Metchnikoff¹ sur la tuberculose de la Gerbille d'Algérie (*Meriones shawi*), que le bacille de Koch phagocyté par les cellules géantes de cette espèce animale (normalement assez réfractaire à la tuberculose) s'entoure de capsules, lesquelles paraissent bien être formées de couches superposées de calcium. Ce qui le démontre surtout, c'est le fait suivant:

¹ Metchnikoff. *Leçons sur la pathologie comparée de l'inflammation*, Masson, Paris 1892.

Ayant remarqué la fréquence de *formations globuleuses calciques* à la périphérie du testicule, indépendantes du foyer calcifié central, nous avons recherché, par des méthodes appropriées, ce que pouvaient contenir de telles formations. Nous avons décalcifié nos coupes par contact avec de l'acide sulfurique à 5 p. 100, puis nous les avons colorées par la méthode de Ziehl, associée à diverses colorations doubles. Il nous a été ainsi donné de constater que chacun de ces globes calciques est constitué par une coque de calcium, contenant un véritable magma de détritits cellulaires riches en noyaux fragmentés. Or, au sein même de ce magma entouré de Ca, on *décèle des bacilles tuberculeux, lesquels sont nettement déformés, plus longs que d'habitude, granuleux et mal colorés.*

Mais pouvons-nous parler d'un effet curatif réel? Nos essais sont par trop récents et incomplets pour que nous soyons autorisés à formuler quoi que ce soit de précis à ce sujet. Seul l'examen histologique des foyers tuberculeux calcifiés, démontrant le rôle protecteur de la coque calcique péri-bacillaire, semble plaider en faveur d'une telle action curative.

Il serait donc désirable que des essais thérapeutiques systématiques fussent entrepris, tant chez l'animal que chez l'homme tuberculeux, soit avec l'ergostérol irradié seul, soit avec la vitamine D, associée à un vaccin (le BCG de Calmette et Guérin, ou l'antigène méthylique de Nègre et Boquet), ou à des composés chimiques ayant donné quelques preuves d'activité curative [dérivés de l'or (Mohlgaard), du cadmium et du manganèse (Walbum)¹]. En attendant que de tels essais soient effectués, citons quelques travaux tendant à prouver que le traitement de la tuberculose par l'ergostérol irradié n'est pas sans exercer une influence nettement favorable sur l'évolution de la maladie: tels sont ceux de Malmström², de Villaret, Justin-Besançon et Fauvert³, de G. von Bergman⁴ et de H. Menschel⁵, entre autres. On trouvera dans l'article de M. Villaret et ses collaborateurs les résultats favorables obtenus grâce à l'emploi de l'huile cholestérinée irradiée dans le traitement des épanchements pleuraux succédant au pneumothorax artificiel et dans les pleurésies purulentes tuberculeuses. Les auteurs ont entrepris également le traitement général des tuberculeux par ingestion de lipoïdes irradiés et ont été favorablement impressionnés par les résultats obtenus. Ils concluent que "dans la tuberculose pulmonaire, ou celle des ganglions trachéo-bronchiques, l'actinothérapie indirecte paraît donc constituer un adjuvant excellent de la cure hygiéno-diététique". En général, des effets thérapeutiques encourageants ont été enregistrés dans des tuberculoses articulaires, osseuses, cutanées, (lupus) et pulmonaires. Ainsi,

¹ Walbum. *Zeitschr. f. Tuberkulose*, t. LI, fasc. 3, 1928, p. 209.

² Malmström. *Acta radiologica*, t. IV, fasc. 3, n° 19, 1925.

³ Villaret, Justin-Besançon et Fauvert. *La Presse Médicale*, n° 48, 1926, p. 753.

⁴ G. von Bergman. *Deut. med. Woch.*, t. LV, 1929, p. 1407.

⁵ H. Menschel. *Münch. med. Woch.*, t. LVII, 1930, p. 293.—Cf. également Villaret et Even, *La Science médicale pratique*, 1er décembre 1928.

d'après Menschel (*loc. cit.*), l'ergostérol irradié, administré à la dose de V gouttes de la solution à 1 p. 100¹, une ou deux fois par jour, à des malades atteints de tuberculose pulmonaire ouverte, exerce une influence régressive sur le processus exsudatif, lequel est atténué, voire même résorbé, les foyers guérissant par induration et formation de cicatrices. L'auteur enregistre l'augmentation du poids, la diminution ou la suppression de la fièvre, des sueurs nocturnes, des hémoptysies, etc...

En résumé, sous l'influence de l'action calcigène de l'ergostérol irradié, des changements du métabolisme calcique font que le Ca s'accumule et précipite d'abord dans les cellules bacillifères qui constituent le tubercule évolutif incipient. Ultérieurement, lorsque la lésion tuberculeuse évolue vers la caséification, le calcium, libéré par suite de la fonte des cellules, forme une véritable coque minérale autour des détritux cellulaires et des bacilles de Koch. Cette coque calcique isole ainsi les bacilles tuberculeux des tissus environnants et, sans doute, s'oppose-t-elle à la progression extensive de l'infection. A quel point cette protection est-elle efficace? Quelles sont la vitalité et la virulence des bacilles tuberculeux inclus dans les coques calciques? Ce sont là autant de problèmes non encore résolus et que nous nous proposons de soumettre à une étude approfondie.

Conclusions.—Nos recherches permettent de formuler les conclusions suivantes :

1° L'ergostérol irradié, administré per os à des animaux (lapins) porteurs de lésions tuberculeuses à évolution lente et offrant une certaine tendance vers la guérison spontanée, augmente dans des proportions considérables la calcification de ces lésions²;

2° La calcification des tubercules est le résultat d'un changement dans le métabolisme calcique ayant pour siège le cytoplasma des éléments cellulaires bacillifères entrant dans la constitution de ces tubercules évolutifs : monocytes, cellules épithélioïdes et cellules géantes;

3° Les dépôts calciques dans les foyers tuberculeux nécrosés et caséifiés résultent de la confluence de ces concrétions calciques intracellulaires. Il en résulte la formation de véritables coques minérales, enfermant un tissu nécrobiosé et des bacilles de Koch, généralement déformés et mal colorés;

4° Il est vraisemblable que la formation de telles coques calciques met une entrave à la propagation de l'infection bacillaire aux tissus environnants.

¹ L'ergostérol fut associé au Stovarsol chez les malades anémiques.

² Cette augmentation de la teneur en calcium peut être appréciée non seulement histologiquement, mais encore par l'analyse chimique. Dans un essai préliminaire, nous avons constaté la présence de 0 gr. 0051 de Ca dans le testicule tuberculeux calcifié sous l'influence du traitement ergostérolé.

Quelles sont les *conséquences pratiques* de nos recherches? Il est hors de doute que l'administration buccale de l'ergostérol irradié aux doses habituellement utilisées n'exerce aucune action nuisible sur les animaux tuberculeux. Ni les variations de poids, ni la durée de survie de nos lapins traités n'ont révélé une nocivité quelconque du traitement ergostérolé. Ainsi, nos expériences paraissent-elles en désaccord avec les constatations de Bamberger et Spranger¹ ayant trait à la toxicité de la vitamine D pour les enfants tuberculeux.

L'avenir décidera de la valeur de ces observations cliniques, mais d'ores et déjà on peut affirmer *qu'a priori* il n'y a pas de raisons valables pour en douter. En effet, la guérison de la tuberculose est une question de défense tissulaire et humorale, défense que les moyens thérapeutiques actuels augmentent jusqu'à la rendre réellement efficace. Tel est le mécanisme d'action de la climatothérapie, du pneumothorax artificiel, de la vaccino-ou de la chrysothérapie. Or, parmi les facteurs aidant à la cicatrisation des foyers bacillaires la calcification est un de ceux qui apparaissent au premier plan. Quoi d'étonnant alors, si, en augmentant dans des proportions considérables cette calcification, au moyen de l'ergostérol irradié, on puisse faciliter cette cicatrisation? L'hypothèse est donc plausible, mais seules l'expérimentation et la clinique seront capables d'en déterminer la valeur réelle.

¹ Bamberger et Spranger. *Deut. med. Woch.*, n° 26, 1928, p. 1116.

Prof. C. LEVADITI AND DR. LI YUAN PO.

EXPERIMENTAL STUDY UPON THE CALCIFICATION OF TUBERCULAR LESIONS UNDER THE INFLUENCE OF IRRADIATED ERGOSTEROL.

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BY C. LEVADITI AND LI YUAN PO.

ENGLISH SUMMARY.

The investigations allow the following conclusions to be made :

1. The irradiated ergosterol, given per os to animals (rabbits) which suffer from tubercular lesions with a slow development and showing a tendency to spontaneous healing, increases the calcification of these lesions to a considerable degree.

2. The calcification of the tubercles results from a change of the metabolism of calcium involving the cytoplasm of the cellular elements which enclose the bacilli and compose the evolving tubercle, namely mononuclear leucocytes, epitheloid cells and giant cells.

3. The deposits of calcium in the necrotic and caseous tubercular foci result from the confluence of these concretions in the single cells. From these arise real shells of calcium enclosing the necrobiotic tissue and tubercle-bacilli which are mostly deformed and badly stained.

4. Probably the development of these shells hinders the bacillary infection spreading to the surrounding tissues.

Practical conclusions : The administration of irradiated ergosterol per os does not damage the tuberculous individual. On the contrary it is probable that the calcification and also the cicatrization of the tubercular foci can be facilitated by the irradiated ergosterol.

LE TRAITEMENT BISMUTHIQUE DE LA SPIROCHETOSE SPONTANEE DES LAPINS EN GENERAL ET DU CASTORREX EN PARTICULIER.

La spirochétose spontanée provoquée chez le lapin, par le *Sp. cuniculi*, est signalée comme étant très fréquente dans certains élevages de *Castorrex*. Les altérations muqueuses et cutanées qui caractérisent cette maladie éminemment contagieuse inquiètent, à juste titre, les éleveurs. C'est la principale raison pour laquelle nous avons entrepris l'étude chimiothérapeutique de cette infection considérée surtout du point de vue pratique du problème. Nous nous sommes efforcés de trouver un médicament qui, administré en une seule injection par voie intramusculaire, puisse, non seulement guérir les lésions et faire disparaître rapidement les Spirochètes, mais encore conférer un état réfractaire durable.

Après de nombreux essais préliminaires, nous avons porté notre choix sur une préparation bismuthique liposoluble, à savoir le A—carboxéthyl—B—méthyl nonoate basique de bismuth. Ce dérivé soluble dans les lipoides a fait l'objet d'études expérimentales publiées par Levaditi, Sanchis-Bayarri et Schoen, dans les Annales de l'Institut Pasteur¹. Il fut utilisé en clinique (Syphilis à toutes ses périodes) par Fournier et Schwartz², avec des résultats des plus satisfaisants.

Nous avons entrepris deux séries d'expériences :

- 1.—*Effets curatifs du dérivé bismuthique dans la Spirochétose expérimentale.*
- 2.—*Action préventive à l'égard du Sp. cuniculi.*

I.—ACTION CURATIVE.

Des lapins porteurs de lésions préputiales et anales riches en spirochètes reçoivent, par voie intramusculaire, des quantités de dérivé liposoluble variant de 0.005 gr. à 0.04 gr. Bi. Voici les résultats de cette première série d'essais.

¹ C. Levaditi, V. Sanchis-Bayarri, R. Schoen et Y. Manin, Annales Pasteur, 1928, t. XLII, 148.

² L. Fournier, Guénot, Schwartz et Yovanovitch, Bull. Soc. de Derm. et Syphiligr., 1928, n° 7, p. 602.

TABLEAU I.

Lapins No.	Dose de Bi par Kg.	Disparition des Sp. et cicatrisation le.	Récidive le.	Temps d'obser- vation.
309 G	1 cc = 0.04g Bi.	3ème jour	80 ^e jour.	80 jours.
106 H	0,8 cc = 0.032 Bi.	1 ^{er} jour	Pas de récidence	34 jours.
79 G	0,7 cc = 0.028 Bi.	3ème jour	„	13 jours.
88 G	0,6 cc = 0.024 Bi.	7ème jour	„	66 jours.
947 E	0,5 cc = 0.020 Bi.	2ème jour	„	22 jours.
946 E	0,25 = 0.010 Bi.	8ème jour	42 ^e jour	42 jours.
945 E	0,125 = 0.005 Bi.	intermittente	4 ^e , 11 ^e , 18 ^e j.	18 jours.

Les résultats consignés dans ce tableau montrent l'efficacité curative de notre produit liposoluble, administré par voie intramusculaire, à des doses variant de 0.01 g. à 0.04 g. par kg. et en une seule injection. Les spirochètes ont disparu des lésions et celles-ci se sont cicatrisées du premier au troisième jour pour les doses comprises entre 0.028 g. et 0.04 g. par kg. et du deuxième au huitième jour avec les doses comprises entre 0.01 g. et 0.025 g. par kilo. Quoiqu'un certain nombre d'animaux, morts trop tôt par suite d'infection secondaire, n'aient pas pu être observés assez longtemps, on peut affirmer que les récurrences, si elles existent, ne sont pas précoces; en effet elles n'ont pas été constatées chez 4 lapins ayant survécu 13, 22, 36 et 66 jours. Toutefois une rechute a été observée après 80 jours chez un animal ayant reçu 0.04 g. Bi par kg. et le 42^e jour chez un autre lapin injecté avec 0.01 g. Bi par kg. Il est à remarquer que, chez aucun de nos sujets d'expériences, nous n'avons constaté la moindre manifestation morbide pouvant être attribuée à une intoxication par du bismuth; aucune perte de poids n'a été enregistrée.

On peut donc conclure de cette première série de recherches que faire disparaître le *Sp. cuniculi* des lésions de la Spirochétose spontanée et obtenir une guérison rapide de ces lésions, il suffira d'administrer aux animaux par voie intramusculaire 1 cc. de la solution huileuse de *A-carboxéthyl-B-méthylnonoate basique de bismuth*, par kg. soit en pratique, 2 cc. de notre produit liposoluble pour des animaux dont le poids varie de 2 à 3 kg. 5, sans tenir compte de la valeur exacte de ce poids.

Afin d'assurer la guérison totale et définitive de l'infection spirochétienne et d'éviter les récurrences, nous avons estimé opportun d'associer le Bi-liposoluble à un sel bismuthique insoluble. On sait que les dérivés insolubles du bismuth forment un dépôt qui se résorbe lentement et qui confère à l'organisme un état réfractaire prolongé (Fournier et Schwartz ¹,

¹ L. Fournier, Guénot, Schwartz et Yovanovitch, Bull. Soc. Dermatol et Syphiligraphie, 1928, n° 7, p. 602.

Levaditi, Sanchis-Bayarri, Schoen et Manin².) Notre préparation contient par c.c. 0.04 g. Bi sous forme liposoluble et 0.04 g. Bi sous forme d'oxycarbonate de bismuth. Un lapin porteur de lésions de spirochètose spontanée riche en spirochètes, reçoit le 16-12-29, 0.5 cc. de cette préparation, par kg. et par voie intramusculaire; voici le protocole d'expérience :

Date.	Poids.	Sp.	Lésions.
16-XII-29	2930	++++	très intense
17-XII	2930	0	sèche
18-XII	2800	0	très sèche
20-XII	2750	0	0
24-XII	2900	0	0
28-XII	2800	0	0
30-XII	2820	0	0
31-XII	2850	0	0
8-I-30	2950	0	0
10-II- (55 jours)	2700	0	0

Cette expérience montre qu'à la dose de 0.04 Bi par kg. le mélange Bi-liposoluble + oxycarbonate de Bi, administré par voie intramusculaire assure une stérilisation et une cicatrisation rapide des lésions sans récurrence ultérieure.

Toutefois, malgré cette action curative définitive du médicament en question, nous recommandons l'utilisation en pratique du bismuth liposoluble, lequel a l'avantage de se résorber plus vite et plus intégralement, ce qui permet d'éviter la formation de nodules intramusculaires et d'adhérences cutanées, inconvénients indésirables lorsqu'il s'agit d'un animal comme le Castorrex.

2.—TRAITEMENT PREVENTIF.

L'expérience a consisté à administrer à des lapins en une seule injection et toujours par la voie intramusculaire, soit 0.02 g. Bi liposoluble, soit 0.04 g. Bi du même produit, puis à infecter les animaux à une ou plusieurs reprises, par scarification du prépuce ou de la muqueuse vulvaire. Les résultats des inoculations permettaient de préciser la durée de l'état réfractaire antispirochétién réalisé par le Bi-liposoluble.

² C. Levaditi, V. Sanchis Bayarri, R. Schoen et Y. Manin, *Annales Pasteur*, 1928, t. XLII, p. 1489.

1ère Série : 0.02 g. Bi, par kg.

Lapins No.	1ère inoculation du virus le.	Résultat.	2ème inoculation du virus le.	Résultat.	3ème inoculation du virus le.	Résultat.
37 A	12 ^e jour	négatif ap. 39 jours.	—	—	—	—
38 A	12 ^e „	négatif ap. 41 jours.	—	—	—	—
41 A	25 ^e „	Positif ap. 56 jours.	—	—	—	—
42 A	25 ^e „	négatif ap. 61 jours.	—	—	—	—
39 A	19 ^e „	négatif.	35 ^e jour.	négatif	55 ^e jour	Positif ap. 22 jours

2ème série. 0.04 g. Bi, liposoluble par kilo.

Lapin.	1ère inocul. de virus, le.	Résultat.	2ème inocul. de virus le.	Résultat.	3ème inocul. de virus.	Résultat	4ème inocul. de virus.	Résultat
73 C	13 ^e jour	négatif	29 ^e jour	négatif	49 ^e jour	négatif	69 ^e jour	positif ap. 20 j.
74 C	24 ^e jour	négatif	52 ^e jour	négatif	69 ^e jour	négatif	—	—
77 C	29 ^e jour	négatif	50 ^e jour	Positif ap. 26 jours	—	—	—	—
78 C	34 ^e jour	négatif	79 ^e jour	Positif ap. 20 jours	—	—	—	—

Ces deux séries d'expériences montrent que lorsque la première inoculation du virus a été pratiquée du douzième au trente-quatrième jours, tous les lapins, à l'exception d'un seul (41 A) ont été mis à l'abri de la contamination expérimentale par des quantités considérables de *Sp. cuniculi*. Sur cinq lapins inoculés une seconde fois du 29^e au 79^e jour, après l'administration du bismuth, trois ont été protégés (29, 35, 52 jours), alors que deux ont contracté l'infection (50 et 79 jours) sur trois animaux infectés pour la troisième fois, le 49^e, le 55^e et le 69^e jours, deux n'ont pas contracté la maladie et l'autre a montré des lésions spirochéliennes le 22^e jour. Enfin, un dernier lapin, 73 C, inoculé pour la quatrième fois 69 jours après l'injection bismuthique, a contracté la spirochétose après une incubation de 20 jours.

Il en résulte que le bismuth liposoluble, administré en une seule injection intramusculaire, à des doses variant de 0.02 g. Bi à 0.04 g. Bi par kg., confère un état réfractaire antispirochétien qui, chez certains animaux, peut être marqué à tel point qu'ils résistent même à plusieurs inoculations successives d'un virus spirochétien éminemment actif. La durée de cet état réfractaire est parfois très prolongée, pouvant atteindre

dans certains cas 69 jours. Il est donc indiscutable que pratiquement parlant, l'utilisation du Bi-liposoluble offre l'avantage, non seulement de guérir, le plus souvent définitivement, l'infection produite par le *Sp. cuniculi* mais aussi celui de conférer aux animaux sains ou guéris de la maladie, un état réfractaire des plus solides et des plus durables. Tout en tenant compte de quelques échecs dûs à la sensibilité par trop accentuée de certains individus, l'application d'une telle méthode thérapeutique et prophylactique doit avoir comme conséquence la suppression de la spirochétose spontanée dans les élevages contaminés. Mais pour atteindre un tel but, nous conseillerions d'administrer le *A-carboxéthyl-B-méthylnonoate basique de bismuth liposoluble*, non seulement au sujets atteints par la maladie, mais aussi, à titre préventif, à tous les castorrex exposés à la contamination.

Nous tenons à remercier Mr. le Dr. Paul Monnier des conseils pratiques et de l'aide matérielle qu'il nous a apportés à l'occasion de ces recherches.

Prof. C. LEVADITI, DR. G. ROUSSEL AND DR. LI YUAN PO.

THE TREATMENT OF THE SPONTANEOUS SPIROCHETOSIS BY BISMUTH IN RABBITS IN GENERAL AND IN THE CASTORREX IN PARTICULAR.

BY C. LEVADITI, G. ROUSSEL AND LI YUAN PO.

Reprinted from Bulletin de l'academie veterinaire de France, Vol. III.
april 1930, pag. 183.

ENGLISH SUMMARY.

Cases of spirochetosis of rabbits—especially of Castorrex—produced by the spirocheta cuniculi (a very frequent disease with lesions of the skin and the mucous membranes) were treated by a single intramuscular injection of a liposoluble preparation of bismuth (basic A—carboxethyl—B—methylnonoate of bismuth). The spirochetæ disappear and the lesions cicatrise soon after the injection and a quantity of 0,04 gr. of bismuth per 1 kg. is recommended. Relapses occur very seldom.

A single intramuscular injection of the same preparation (0,02—0,04 gr. per 1 kg.) protects the rabbits against an infection of the disease for a considerably long time (in one case for 69 days) and seems to be of great advantage in contaminated breedings.

CYCLE EVOLUTIF DU *TREPONEMA PALLIDUM*, DU *SPIROCHAETA PERTENUIS* ET DU *SPIROCHAETA* *CUNICULI*.

Parmi les formes représentant le cycle évolutif du *Treponema pallidum*, décrites par l'un de nous en collaboration avec R. Schoen et Sanchis-Bayarri¹, celles appartenant aux groupes 3, 4 et 5 ont attiré à nouveau notre attention. Les voici, telles que nous les avons définies et figurées dans notre mémoire de 1928.

Groupe 3.—Spirochètes en boucles lâches ou incomplètement fermées.

Groupe 4.—Spirochètes en boucles serrées et complètement fermées.

Groupe 5.—Spirochètes en pelotes compactes.

Le parasite, sous l'influence de certaines conditions de milieu, s'enroule sur lui-même et forme une boucle; celle-ci se serre de plus en plus, se ferme complètement et donne lieu à des pelotes compactes. A partir de ce moment, il devient difficile de préciser la structure des

¹ Levaditi, Schoen et Sanchis-Bayarri, *Ann. de l'Inst. Pasteur*, 1928, t. 42 p. 475.



Fig. 1.—Lésion préputiale à *Spirochaeta cuniculi*. Méthode de Dieterle, Gross. 1.000/1.

masses globuleuses résultant de la fusion plus ou moins totale du Spirochète enroulé sur lui-même. On a l'impression que ces formations globuleuses se segmentent à leur tour, pour donner naissance, soit à des petits Spirochètes fragmentés, en forme de virgule ou de points d'interrogation, soit à des granulations irrégulières, rondes ou légèrement ovalaires (groupes 6 et 7 de notre classification). Finalement, on se trouve en présence de grains presque ultramicroscopiques, dont les dimensions, extrêmement restreintes, impliquent l'idée de leur filtrabilité possible.

Il nous a été donné d'établir que le stade évolutif représenté par les Spirochètes disposés en boucles lâches, serrées ou compactes, est déterminé par des conditions de milieu inhérentes au tissu même qui héberge les parasites. En effet, ces formes en boucles peuvent apparaître simultanément, dans une zone tissulaire bien délimitée, alors que dans d'autres zones voisines ou plus ou moins éloignées, le Spirochète ne revêt que l'aspect ondulé typique. Il se forme ainsi de véritables plages de Tréponèmes en voie d'accomplir le même stade de leur cycle évolutif. Le fait que les parasites en boucle, destinés à se transformer en granulations ultramicroscopiques, sont disposés par groupes, et non pas dispersés,

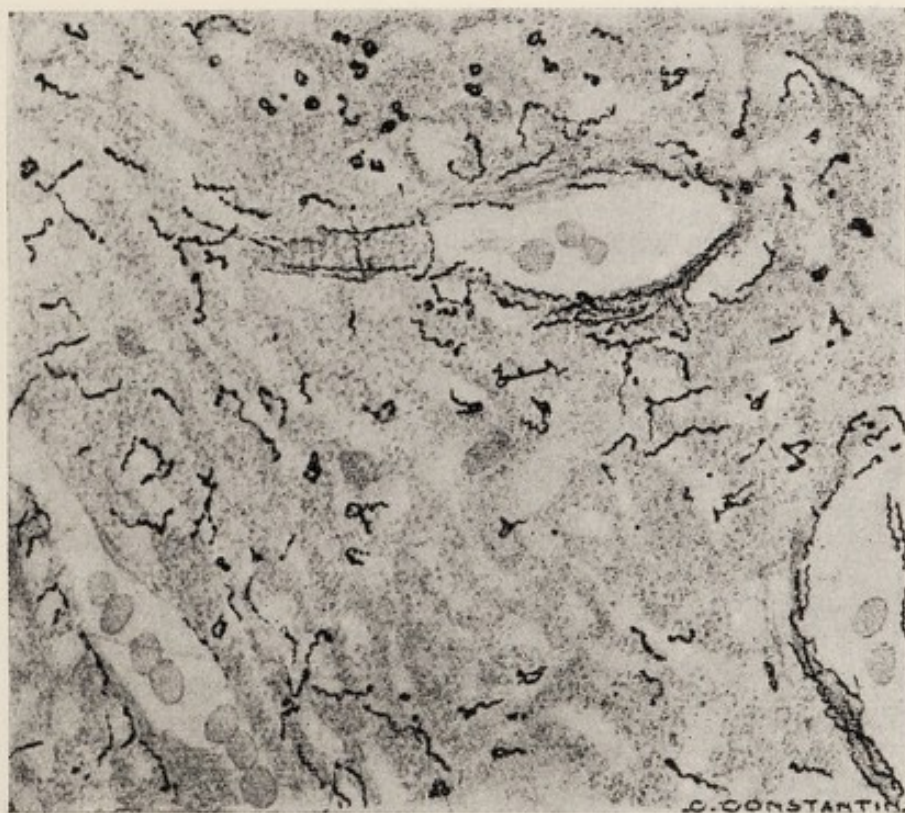


Fig. 2.—Chancre pianique du Lapin. Méthode de Dieterle. Gross. 1000/1.

montre, à notre avis, que la genèse de cette phase évolutive est déclenchée par des modifications des tissus où s'effectue la pullulation du germe. Il en résulte que cette disposition particulière des Spirochètes n'est pas fortuite, mais qu'elle représente, en réalité, un stade évolutif du virus syphilitique.

Les constatations qui précèdent ont été faites soit sur des syphilomes expérimentaux, soit sur des chancres pianiques, soit, enfin, sur des papules provoquées chez le Lapin par le *Spirochæta cuniculi*. Il s'agit de tissus fixés au formol, et dont les coupes à la paraffine ont été traitées par la méthode de Dieterle^{2*}. Ce nouveau procédé d'imprégnation argentique nous a donné d'excellents résultats. Les Spirochètes, parfaitement colorés en noir, se détachent nettement sur le fond gris-jaunâtre de la préparation.

Les deux premières figures ci-jointes (fig. 1 et 2) montrent la simultanéité de la phase évolutive en boucles lâches ou serrées du *Spirochæta cuniculi* et du *Spirochæta pertenuis*. Les boucles, de même que les pelotes et les granulations qui en résultent, ressemblent à s'y méprendre aux formes analogues constatées par l'un de nous, avec

^{2*} Dieterle. *Arch. of Neurol. and Psychiat.*, 1927. n° 18, p. 73.

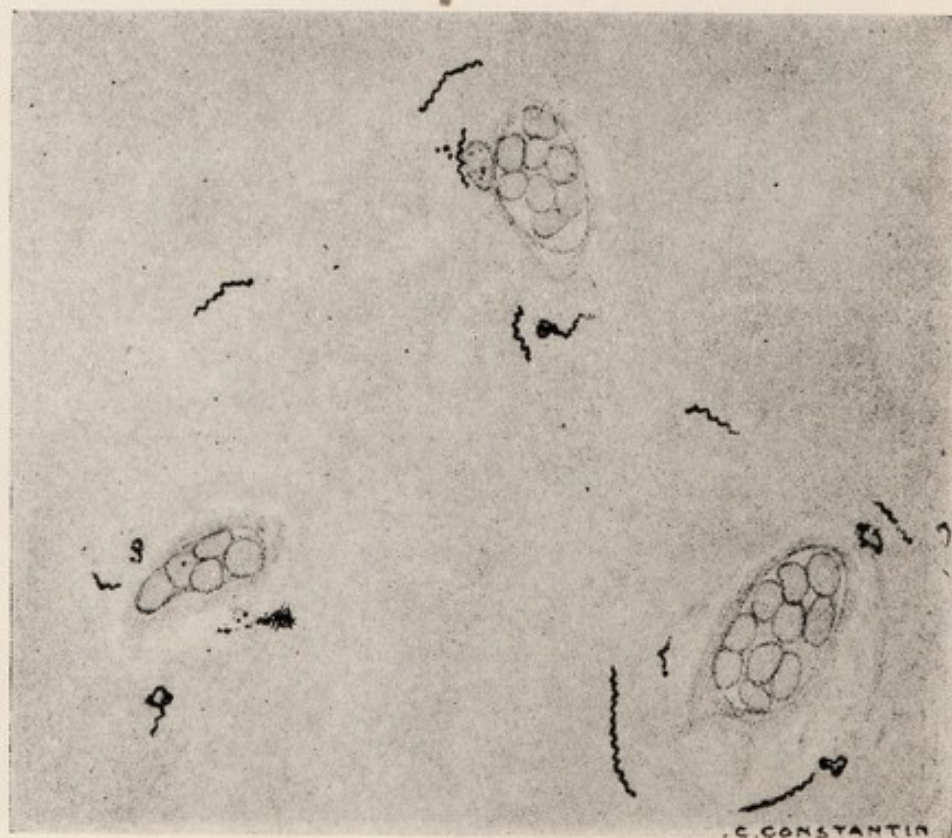


Fig. 3.—Encéphale de paralytique général. Méthode de Dieterle. Gross. 1000/1.

Schoen et Sanchis-Bayarri, dans les cellules géantes des greffons de ganglions syphilitiques inoculés au Lapin (Cf. fig. 2, 3, 9 et 10 de notre mémoire). Dans la figure 1 (*Sp. cuniculi*), presque tous les parasites sont aux stades évolutifs 3, 4, 5, 6 et 7 de notre classification. Dans la figure 2 (*Sp. pertenuis*) des Spirochètes en boucles côtoient des parasites parfaitement ondulés.

Paralyse générale.—Dans des travaux récents^{3*}, Levaditi, Anderson, Selbie et Schoen, étudiant les particularités des cerveaux d'animaux infectés avec le *Sp. duttoni*, ont soutenu que, dans la paralysie générale, la forme spirillaire du virus syphilitique n'est qu'une des phases du cycle évolutif du Spirochète pâle neurotrope. En effet, le virus récurrentiel, habituellement à l'état ultramicroscopique, peut, dans certaines conditions, achever dans le névraxe son cycle évolutif et aboutir à la forme spirillaire. Ces conclusions impliquent l'idée que le virus syphilitique peut, lui aussi, dans le cerveau des paralytiques généraux, réaliser son cycle évolutif et revêtir, par conséquent, tantôt la forme spirillaire, tantôt la forme en boucle, tantôt, enfin, la forme granulaire. Or, c'est ce que nous venons de constater sur des préparations de cerveaux de paralytiques généraux colorés d'après la technique de Dieterle. La figure 3 montre la présence de boucles spirochètiennes dans le parenchyme cérébral, à côté de Spirochètes ondulés et de parasites granulaires. Ces constatations confirment donc les conclusions des travaux cités ci-dessus.

Nous tenons à rappeler, à propos des données résumées dans la présente note, les faits observés en 1907 par Prowazek^{4*}, se rapportant à "certaines formes de repos ou de dépression" du *Tr. pallidum*. En examinant des frottis de chancre provenant de Singes syphilitisés, l'auteur observa non seulement l'état végétatif du Tréponème, représenté par des parasites spiralés typiques, mais aussi des stades de repos, caractérisés par des Spirochètes enroulés sur eux-mêmes. Prowazek considérait cet aspect du Spirochète comme une phase particulière du cycle évolutif du microbe et appelait les formes en question "formes de dépression". Il les rapprochait de celles que R. Herting avait décrites chez certains Protozoaires. Rappelons également qu'antérieurement (1904), Levaditi^{5*}, étudiant l'évolution du *Sp. gallinarum* dans l'œuf incubé de Poule, a décrit des formes parasitaires analogues.

Conclusions.—Le *Treponema pallidum*, le *Sp. pertenuis*, de même que le *Sp. cuniculi*, comportent un cycle évolutif dont l'une des phases est représentée par des parasites disposés en boucles et en pelotes plus ou moins serrées. Ce stade précède celui de la transformation en granules presque ultramicroscopiques. Différentes phases de ce cycle

^{3*} Levaditi, Anderson, Selbie et Schoen, *Bull. de l'Acad. de méd.*, 1929, t. 102, p. 705.

^{4*} Prowazek. *Arbeiten aus dem kaiserl. Gesundheitsamte*, 1907, t. 26 p. 29.

^{5*} Levaditi. *Ann. de l'Inst. Pasteur*, 1904, t. 48, p. 129.

évolutif peuvent être retrouvées non seulement dans des lésions cutanées et muqueuses, mais encore dans le cerveau des paralytiques généraux (*Tr. pallidum*).

(Institut Pasteur et Committee on research in syphilis.)

Prof. C. LEVADITI AND DR. LI YUAN PO.

CYCLE OF EVOLUTION OF TREPONEMA PALLIDUM, SPIROCHETA PERTENUIS AND SPIROCHETA CUNICULI.

BY C. LEVADITI AND LI YUAN PO.

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Vol CIV, pag. 736.

ENGLISH SUMMARY.

The treponema pallidum, the Spirocheta pertenuis and the Spirocheta cuniculi have a cycle of evolution. One of the phases shows parasites arranged in groups and clusters which are more or less compressed.

After this stage the parasites are transformed into granules being almost ultramicroscopical.

Different phases of this cycle of evolution can be found not only in the lesions of the skin and the mucous membranes but also in the brain of patients suffering from general paralysis (Treponema pallidum).

OPIUM PROBLEM REACHES ACUTE STAGE.

(Reprinted from Chinese Nation, Shanghai, January 18, 1931).

The opium (and narcotic) problem is rapidly reaching an acute stage throughout the world. Prior to 1907 it was fashionable to point to China as the one and only country, whose people were addicted to the habit, and legislation on narcotics, whenever made in British, Portuguese, French, Dutch, Japanese and other colonies, had in view this "favourite" pastime of the Chinese, who were charged to the utmost limit for their indulgence in a poison known universally to be most deleterious to both body and mind.

Since the World War, however, the more sombre western nations have realized that narcotic addiction has a habit of invading the most sacred precincts as a result of such diverse causes as mental affliction, bodily pain, prolonged enjoyment, sexual excitement, buddhistic repose, and physical exhaustion. To most of these, the modern craze for dancing, late nights and outward smartness have contributed not a little.

OPIUM.

Let us deal first with the opium question as it exists in China at the present moment. Before the remarkable ten-year agreement concluded between China and Great Britain for gradual and simultaneous abolition of the traffic within ten years, China had been known to produce at least 400,000 piculs (of 133 English pounds each) within her borders, half of which came from the two provinces of Szechuen and Shansi. This was apart from the thousands of chests (each containing 133 pounds) yearly imported from India for which a high excise duty was charged. Within three years after signature, China had on her side, thanks to the activities of the two brothers Viceroy Chao Erh-sen and Chao Erh-hsun, uprooted every opium poppy from the ground, and the farmers were told to plant wheat and cotton instead of opium. Any drug that found its way into the country consisted mainly of the highly expensive Indian variety and some smuggled stuff via Yunnan, Formosa, Tsingtau and the borders of Manchuria.

The Revolution of 1911 brought the Chinese freedom from alien Manchu rule, but it unfortunately also gave a great impetus to a recrudescence of poppy cultivation, which President Yuan Shih-kai and subsequent military lords encouraged as a quick and ready means of raising money for their countless troops. So, for almost twenty years now opium suppression has become almost a farce, and although public opinion is still dead against the habit the call for revenue has supplanted every consideration of humanity. Although the opium vice is taught in all schools and no more looked upon as a fashionable or social obliga-

tion as it used to be previous to 1900, the quantity now grown throughout the country cannot be less than 200,000 piculs, that is, half that produced before the Anglo-Chinese Agreement of 1907. Officially, the Central Government has never received any revenue from the extensive trade in opium, which under the protection of military chiefs has developed into one of the biggest scandals of the country. The income thus received, amounting to at least fifty to one hundred million taels annually, has been dissipated by selfish individuals with no benefit to the nation at all.

EIGHT SUGGESTIONS.

The question arises, "Is there no way out of this present impasse? Cannot some commonsense, practical way be found, which would meet the declared anti-opium policy of the nation and yet help to contribute to the central exchequer a substantial sum which at present goes into the private pockets of unscrupulous persons?" My humble suggestion, after years of heart-breaking experience, lies in the following plan, which I now offer for the consideration of those interested:

1. The Central authorities, through the Government Opium Suppression Bureau, should acknowledge the magnitude of the affair and invite practical business and scientific leaders to a conference so as to adopt a fundamental method of dealing with the danger.

2. Without delay, an accurate survey should be made of the areas of poppy cultivation throughout the various provinces, so that full data may be available for the guidance of the authorities.

3. Propose an interregnum of fifteen years for bringing the whole traffic to an end. During this period, strict control of its production throughout the Republic by the Central Government should be established, particular stress to be laid on the ports and cities whence the raw drug is exported.

4. Invite the experienced staff of the Maritime Customs to collect the necessary revenue, say, at the rate of Tls. 2,000 per picul, which should be entered as a separate opium excise account. By this means, immediate operation could be assured with little or no extra cost to the country.

5. Out of the gross revenue thus collected, at least ten per cent. should be ear-marked for the establishment and maintenance of opium refuges and general hospitals in various centres, where the addicts could be treated and whence anti-opium and health propaganda could be disseminated.

6. Hand-in-hand with the above, there should be firmly enforced the gradual diminution of poppy cultivation and opium smoking by one fifteenth every year, so that the provinces and people could adapt themselves to the progressive policy of the government.

7. It is not advisable to adopt too drastic or detailed a scheme at the beginning, such as, the licensing or photographing of opium habitues, for such means entail enormous expenses of administration and

numberless loopholes for misdeeds, apart from the unpopularity of the measure.

8. There is no need to be ashamed of this apparent inconsistency from previous declared anti-opium policies of the government, for a mistake corrected is better than an obstinate insistence upon unpractical methods. Besides, we have the glaring example of the powerful and well-organized United States of America, which in spite of its advantages has not been able to solve the problem of Prohibition among a population only one-fourth ours.

OPIUM DERIVATIVES AND OTHER ALKALOIDS.

Now, let us turn briefly to a discussion of the strictly narcotic problem (that is, cocaine and numerous derivatives of opium) which in many respects is of more outstanding importance for the world than the opium one. For, as I predicted in 1919, the morphine (and cocaine) menace has indeed affected many countries especially those which have gone ahead fastest, and like the influenza pandemic threatens to envelope all civilized nations.

Twenty years ago, the number of factories manufacturing morphine and other narcotics might be counted in two hands. At the present time, I have on my list over one hundred and forty firms openly dealing in these pernicious alkaloids. The latest and one of the largest producer in the field is Turkey, which in the last Report to the League of Nations announced that its annual export in drugs was 5,200 kilograms of morphine and 8,650 of heroin. This means that modern Turkey is producing half the world's requirements of morphine (12,000 kilograms and more than its total needs of heroin (8,650 kilos)! Truly an apt pupil of advanced Europe!

Thanks to the ever-increasing demand for narcotics in handy form among the ever-exciteable smart set (and which country does not possess them?) and the loose standards of commercial and professional morality since the World War, we hear of wide ramifications of dope smugglers extending from one end of the earth to the other. Huge seizures have been made in San Francisco, New York, Singapore, Rangoon, Shanghai, Tientsin, Hongkong, Marseilles, in fact every big port, showing how profitable the illegal trade is. Well-known actresses, film stars, apparently respectable merchants, mysterious millionaires, smooth-tongued dentists and physicians, etc. are among its victims, sometimes distributors. It is evident that the League workers are at a loss to know how to tackle this ever-growing menace. But the leading countries of Europe have only themselves to thank for this deplorable situation, because in the past they have played with the question as one affecting only "subject" or "backward" races, whom it was well to tax for their vices so that their own nationals might escape proper taxation. Instead of acting up to their convictions, they had wasted year after year since the Hague Convention of 1912, emphasizing unessentials and evading fundamental issues. That was why the representatives of America and China refused

to sign the Treaty of 1925 and left the Council Chamber at Geneva. If they are in earnest, the narcotic problem can be settled in a much easier and more equitable manner than that of Disarmament. My suggestion, and I am glad our official delegate Mr. Woo Kai-seng has introduced it at Geneva, is that a Central Narcotic Factory should be established at that capital of the League with official authority to manufacture alkaloids for the legitimate and medical needs of the world. Every other country should forthwith close down its factories. This quantity can be estimated on the basis of 450 milligrams for each inhabitant of a state with a developed medical organization as had been fixed by League experts. The Factory could act as official agent of the already established Central Board of Control for the distribution and sale of such narcotics. Only recognized alkaloids (and these in as few forms as possible) shall be distributed, always among accredited agents of each government. Finally, a research department for biochemical investigations upon habit-forming drugs should be established with a view to the amelioration and total abolition of such pernicious habits.

Two objections have been lodged against this plan of a League-controlled factory. One is the question of vested interests in the countries hitherto manufacturing narcotics, but surely this applies to much bigger problems, such as, armaments, navy reduction, etc. Anyhow, the narcotic business is comparatively a new one, and could be easily liquidated by arrangement with the government concerned. The second objection lies in the matter of national security in time of war, where each country must have its own supply of narcotics for medical needs. But here again, the issue is not pressing, for more important and more urgent supplies like gasoline, oil, food, etc. have prior claims. Anyhow, the League of Nations being a sort of super-government, it will be to the interest of quarrelsome and narcotic-minded nations to think twice before they endanger the prospects of peace. Some readers may consider my plan revolutionary, but these are days of initiative, and those responsible for the world's happiness should try to consider any reasonable plan submitted for its attainment.

WU LIEN-TEH,

*(China's Government Delegate to the Hague
International Opium Conference 1910-11).*

ANCIENT CHINESE CONTRIBUTIONS TO SURGERY.

(Read at the First Pan-Pacific Surgical Conference, Honolulu, 1929).

The history of Surgery in ancient China is an extremely interesting one. It is significant that here, as in Europe, a surprising degree of skilfulness was reached by individual practitioners, but that, in the same way as formerly in the west, their achievements mostly passed away with their demise. To draw a complete picture of surgical events in China during the 4,000—5,000 years of her existence would require hours, hence I will confine myself in this paper to a review of certain outstanding features connected with the subject.

ANATOMY AND PHYSIOLOGY.

First let me deal with *Anatomy and Physiology*—the two mainstays of chirurgery needed even in those anicent times. It is stated that the Emperor Huang-ti 黃帝 (B. C. 2766-2666) ordered three physicians (whose names are given) to study the blood vessels, which were believed to convey to the viscera the vital heat from the heart. While this advanced knowledge so long ago might perhaps be questioned, there is no doubt that Pien-Ch'iao 扁鵲 (full name Ch'in Yueh 秦越人), who lived in the state of Chao 周 in the 6th century B. C., dissected the human body and was evidently more or less familiar with the circulatory system. A treatise on the Pulse was likewise ascribed to him. One quite authentic book on the Pulse, written by Wang Su-ho 王叔和 (who flourished in the Tsin dynasty third century B. C.), was translated in 1741 by du Halde, the famous Jesuit; this alludes definitely to the movement of the blood within the vessels.

In the *Nei Ching* 內經 (Canon of medicine) with later editions by Wu K'un 吳昆 of the Ming Dynasty 明 (1328-1644) in 24 volumes, appears the following significant paragraph:

All the blood is under the jurisdiction of the heart.....
The twelve blood vessels are deeply hidden between the muscles and cannot be seen. Only those on the outer ankles are visible because there is nothing to cover them in these places. All other blood vessels that are on the surface of the body are "loh" vessels (veins).....The harmful effects of wind and rain enter the system first through the skin. It is then conveyed to the "sun" vessels (capillaries). When these are full it goes to the "loh" vessels and these in turn empty into the big "chin" vessels (arteries).....The blood current flows continuously in a circle and never stops.

ACUPUNCTURE.

Acupuncture, which is still being widely practised by old style Chinese physicians for both surgical and medical complaints, has been handed down from time immemorial. Its inception was ascribed to Emperor Huang-ti (B. C. 2766-2666). The physician Pien-Ch'iao, already mentioned above, was highly efficient in the technic. The *Su-wen Ling-shu*, 素問靈樞, a medical encyclopedia published in the 3-4th century B. C., devoted an important chapter to acupuncture, while in the Sung dynasty 宋 (A.D. 960-1280) the first book dealing entirely with the subject was published. Acupuncture was at this time raised to an exact science and one Emperor ordered life-size copper figures of the human body to be made for the instruction of practitioners. These figures (some removed by the foreign troops during two successive invasions of Peking, but one still remaining in the Temple of Imperial Physicians at the northern capital) contain each 367 points where needles may be inserted for the relief of various complaints.

The *actual cautery* has also been in use for over 2,000 years, and at least nine instruments are described and figured.

VENESECTION.

Venesection was also frequently practised in past times, at first with a sharp stone to open the blood vessel, and later on by means of a piece of broken china. The main object was to let off the excessive heat principle, so as to maintain a proper balance between the mystic cosmogony of the *yin* 陰 (radical moisture or negative principle) and the *yang* 陽 (vital heat motion or positive principle). From this plan it is clear that blood-letting was known to the Chinese a long time ago as a means of preventing the bad consequences of an excess of heat, and it is now generally used in China for horses and other animals. Leeching and cupping were also widely adopted.

ANESTHETICS AND OPERATIONS.

It is established beyond doubt that from an early date, Chinese medical practitioners had been familiar with different methods for producing anesthesia. This was accomplished:—

- (a) by the use of certain fungi,
- (b) by the root of *aconite* (evidently for local uses),
- (c) by a *soporific incense* called the soul confuser. By the last method, the incense fumes along with the accompanying rituals sent the patients to a deep sleep and when the operations were over they were roused by charms and a douch of cold water.
- (d) *Datura stramonium* (or the Man-to-lo 曼陀羅 of the Buddhist classics) called by the Chinese *feng-chieh* or *shan-chieh* 鳳芥 山芥 because of the shape of the leaves, was imported from India. When taken by the mouth, unconscious laughter is set up and the person

acts as if intoxicated. The drug is usually taken in the form of infusion.

- (e) *Belladonna* 颠茄 is a drug sometimes used for producing general anesthesia, mainly in midwifery or gynecology cases. But it has also been administered by criminals to render prospective victims unconscious.
- (f) *Opium* known to the ancients as *Ying-hsu* 罂粟 was used occasionally and not to the same extent as nowadays for alleviating pain, while *alcohol* was taken internally, both to 'forget things' and 'produce a happy mood.'
- (g) *Cannabis indica*. This narcotic, probably another importation from India, has played a conspicuous part in the annals of Chinese surgery. Known in China as *Ta-ma* (大麻 great hemp) or *Han-ma* (旱麻) a word much similar to the English word hemp or German Hanf, it is also extensively used by the Mahomedans of Central Asia under the name of *bang*. "Ma-po 麻勃 (the flower) will cure every sort of bad vapour; it is an antidote against forgetfulness, confers prophetic powers, and will give a knowledge of what is about to happen in four quarters of the globe," so said the old books! "If too much be eaten, devils may be seen; in fact it is taken by those who indulge in spiritualism." "It is also recommended as a cure for scorpion bites and it stops the advance of age," the book continued. But nowadays this famous drug has been replaced by the more seductive opium and its numerous derivatives like morphine, heroin, allonal and what not, the smuggling trade in which has become one of the scandals of the age.

Cannabis indica was probably the principal ingredient contained in the anesthetic mixture *Ma-fu-shan* (麻沸散) used by *Hua-to*, the most famous surgeon in Chinese history. *Ma-fu-shan* in literal translation means aromatic narcotic power.

Surgeon *Hua-to* (華佗) lived about 115-205 A.D. and was one of the prominent figures of the Three Kingdom Period (A.D. 190-220). Of his childhood we know little. As he grew up, he became fond of travelling, chatting and reading. Although well acquainted with the classics and used to the grandest style of living, *Hua-to* was humble and always eager to learn. One day, while in search of knowledge, he was resting by a mountain cave, when he heard two hermits speaking. One said "Here is *Hua-to*, we can give him our secret". But the other replied: "That youth is greedy and merciless, should we trust him?". On hearing this, *Hua-to* jumped into the cave and implored them to accept him as their pupil. The senior hermit responded, "We are willing to part with the secret, only it may give you trouble. However, if you promise not to discriminate between superior and inferior, rich and poor, noble and commoner, if you refuse bribery and are not afraid of hardship, and if you bestow kindness on old as well as young, then you may overcome all trouble." After he had

sworn to carry out this injunction, comparable to the Hippocratic oath, Hua-to was handed a book and warned not to show it to others. From this book he gathered valuable information for his future medical guidance. The youth developed in time into a great doctor and performed many wonderful operations. Simplicity was his guiding principle in practice. He utilised only a few drugs, but these were the best and purest as he often collected and tested them himself. In the process of acupuncture he adopted only a few sites. When neither medicine nor acupuncture succeeded, he resorted to operation. His operating procedure has been thus described:—

"If the sick man is suffering from some internal complaint, and medicines produce no satisfactory result, then Hua-to will administer a dose of *Ma-fu-shan*, under the influence of which the patient becomes as it were intoxicated with wine. He now takes a sharp knife and opens the abdomen, proceeding to wash the patient's viscera with medicinal liquids, but without causing him the slightest pain. The washing finished, he sews up the wound with medicated thread, and puts over it a plaster, and by the end of a month or twenty days the place is healed up."

From the above description, it may be concluded that this ancient surgeon was aware of the value of antisepsis about 1500 years before Semmelweiss and Lister were born.

One classical operation performed by Hua-to may be described: In one of his many fights during the period of the Three Kingdoms (190-220 A.D.) General Kuan-yu 關羽 received at Hsiang-Yang (Hupeh) an arrow wound in the elbow. In spite of assiduous care and numerous changes of plasters, the lesion would not heal. As a last resort, Hua-to, who happened to pass the city where the General lived, was called in to treat the distinguished patient. The famous surgeon examined the wound and evidently found necrosis of the bone for he suggested scraping of the diseased tissues. The General assented. Hua-to wished to give him his usual anesthetic mixture to prevent pain. The general said he could bear it if a friend would sit opposite and play chess with him while the operation was going on. Hua-to completed his preparations. The sinus was enlarged by a scalpel and the necrotic mass cleared away. An apprentice knelt down in front with a tray to collect the flowing discharges. The operation was quickly performed, and the wound healed up in good time. Hua-to's reputation spread to other provinces as a result. General Kuan-yu was the model warrior of history, for he was generous as well as fearless, and numberless temples have been dedicated during the past centuries to his memory as the 'god of war'.

Now comes the anti-climax to our surgeon's career. There lived as contemporary of the above General Kuan-yu a capable but unscrupulous leader, Tsao-tsao (曹操) by name, who rose step by step from a captain of infantry to King of Wei (one of three kingdoms of that time). As he grew older and his responsibilities increased, Tsao-tsao

began to experience repeated headache and dizziness, which acupuncture could not always relieve. He sent for Surgeon Hua-to from the rival state of Wu which had just then been defeated by him militarily. Hua-to examined the great man all over and apparently diagnosed a cerebral tumour for he proposed to perform the operation of trephining, which would require the opening of the skull. Tsao-tsao, always of a suspicious disposition, thought this was an attempt on the part of his enemies to kill him. Instead of appreciating Hua-to's disinterested medical advice, Tsao regarded him as an agent of the enemy state and forthwith threw him into prison. There the unfortunate surgeon lingered for years and when he found all hope of liberty lost bequeathed the treatise on surgery he had written to the prison warder, saying, 'This book can save Man's life'. The latter accepted the book and on returning home informed his wife what an opportunity he now had for becoming a famous surgeon. But his spouse was either too ignorant or too contented with her little world to appreciate the gift, for she said, 'If such deep knowledge as Hua-to possesses only lands him in prison, I prefer to remain a jailer's wife.' Thereupon, when the husband went out, she collected the valuable manuscript and set fire to it. The jailer returned just in time to save the remnants from extinction, and these are all that have been left to posterity.

Tsao-tsao did not himself survive long, for his headache increased and his health worsened until death finally overtook him. Could the operation upon the brain which Hua-to advised have saved his life? Alas, no postmortems were performed.

Another great Chinese surgeon was Ch'en Hui (陳會) living in the 6th century. Like Hua-to he performed laparotomy and successfully removed diseased organs.

CASTRATION.

Our survey would not be complete without some reference to the operation of castration. Mentioned in the annals of Chinese history as early as 1100 B.C., it was originally adopted as a mode of punishment for certain grave offences. Later on, however, the operation came in vogue as a means of procuring suitable servants for the imperial palaces and for the eight hereditary princes who alone besides the members of the emperor's family had the right to keep eunuchs. The operation of castration was performed in Peking in a special establishment maintained outside one of the palace gates. The applicants were usually from Hochienfu—a city one hundred miles south of Tientsin. The operators were known as 'Knifers', and they contrived to keep the trade in their own families. For one operation including after-treatment they received the equivalent of £1.16.0. The technique is thus described:—

"When about to be operated on, the patient is placed in a semi-supine position on a broad bench. One man squatting behind him grasps his waist, and one man is told off to look after each

leg. Bandages are fastened tightly round the hypogastric and inguinal regions, the penis and the scrotum are three times bathed in a hot decoction of pepper pods, and the patient, if an adult, is solemnly asked, whether he repents or will ever repent his decision. If he appears doubtful he is unbound and dismissed, but if his courage has held out, as it usually does, all the parts are swiftly swept away by one stroke of a sickle-shaped knife; a pewter-plug is inserted into the urethra, and the wound is covered with paper soaked in cold water and is firmly bandaged. The patient, supported by two men, is then walked about the room for two or three hours, after which he is permitted to lie down. For three days he gets nothing to drink nor is the plug removed from the urethra. At the end of this period the dressings are changed, and the accumulated urine is allowed to escape. The parts generally heal in about one hundred days..... About two per cent. of all cases prove fatal, some by hemorrhage, some by extravasation, and some doubtless by irritative fever..... For a long time there is incontinence of urine.....

Besides man the Chinese have always boldly castrated animals. From early times they have discovered the dependence of conception upon the presence of testicles and ovaries, and acting upon this knowledge they have castrated boars and cocks, and sprayed sows with the simplest instruments and remarkable skill and success. To this day such operations may be seen at any village throughout the vast country.

Special Operations like *hare-lip* were often performed by first creating a granulating surface with an escharotic and then bringing together the granulating edges by side pressure.

Entropion was also attended to by clamping a portion of the eyelid between two bamboo sticks, so as to cause a fold of skin to slough away, a contraction of the lid with eversion of the cilia being the result.

Simple operations were likewise done, but it is not necessary to deal with them here.

OBSTETRICS.

Turning now to the domain of *obstetrics* we must *a priori* expect less outstanding achievements. For the strict code of moral laws handed down from olden times forbade the attendance of male practitioners upon laboring women, this important branch of medicine being left in the hands of ignorant midwives. Even such a great surgeon as Hua-to did not deviate from this rigid rule. We read that his advice was sought for pregnant women but—after diagnosing their case by palpation of the pulse—he left vaginal examination and treatment in the hands of the midwives. The mortality resulting from such a state of affairs was naturally high. One of the ten Buddhist hells, the "bloody lake", was said to be the abode of unfortunate victims of this hard custom. Beneath its surface all women who die within a month after parturition

are supposed to be incontinently plunged. Large sums were paid to the priests to free the victims through their prayers. Short of actual release or during the tedious process of accomplishing it, pauses in the torment can be obtained by purchasing the privilege of affixing a few hairs cut from the dead woman's head to the inside of a certain bell set aside for that purpose. Every time the bell is struck during the progress of the temple ceremonies the women whose hair is attached to it rise for a moment above the lake and are allowed to catch a breath of air..... As soon as the vibration ceases they are again plunged below the surface.....

Only a few bright episodes stand out against this gloomy background. Thus we know that Cesarian section was performed in the year 285 A.D. upon the wife of a Tartar prince who served at the time as a page at the Chinese court. It is said that the patient was pregnant for 12 months when she was cut open and a living child was delivered.

Mention should be made also of a Chinese treatise on midwifery translated by the pioneer-missionary Dr. Lockhart, which reminds one strongly of the earliest English authors, like Reynalde, Culpepper, etc. This treatise, "drawn up for the benefit of women", claims to make

"reference to the powers of nature rather than to prescriptions. All strange and wonderful prescriptions are to be avoided; and further, if we can succeed in preserving the patient without the use of even the simplest remedies, so much the better."

Though naturally not free from erroneous theories, this treatise abounds in sound advice. A proper regime of pregnancy is preached, stress being laid upon the advantage of exercise and the danger of too rich a diet. Though repeated warnings are given against precocious interference, active steps are recommended under certain conditions. Thus, in cases of "transverse or unnatural presentation" it is recommended to put the woman to bed and administer some inhalation (hsun 薰) or

a large dose of the decoction called ch'i wei 七味 (seven carminative medicines); then the hands and feet of the fetus are to be taken hold of and properly adjusted, and after a night's rest she will certainly be delivered.

Again,

if the membranes do not come away immediately, take a hempen thread, and having tied it to the navel cord, double the latter so as to make a loop, then tie it again with the thread, and fasten a small weight to it; then separate the child by cutting the cord, and in three or four days the whole will shrink, become dry and pass away. This plan has often been adopted with success; it is only necessary to inform the woman what has been done so that she may be quiet and not alarm herself. The midwives must not be allowed to pull away the membranes; many have lost their lives from this, therefore be very careful.

PHYSICAL THERAPY.

Like other branches of surgery, the art of physical therapy also possesses an ancient history in China. It is traced to Ch'ih Sung-tzu 赤松子 (also styled Kuang Ch'eng-tzu 廣成子), a legendary personage who had attained the age of 12 centuries when the Yellow Emperor (Huang-ti) sought instructions from him in the art of prolonging life. The philosopher Lao-tzu (老子), latter half of 6th century B.C., and his disciples Lieh-tzu (列子) are next named. About two centuries later (middle of 4th cent. B.C.) we find Chuang-tzu (莊子) speaking disparagingly of a school of philosophers who, by merely swallowing air and through muscular exercises, aimed to avert death. Later on, chuan-shu (拳術) as the exercise is called was also regarded by the regular practitioners as charlatanism, life-prolonging elixirs being preferred. But it was revived by the Buddhist school of medicine as recently as the 13th century.

This system of treatment, as codified afterwards, consisted of breathing exercises, friction by hand (to be administered by a girl if the disorder is due to the defect of the male or positive principle *Yang*, by a boy if the negative principle *Yin* is at fault), massage with the aid of special pestles or a bag filled with pebbles and finally twelve kinds of gymnastic exercises to be continued for an indefinite period. Illustrations are supplied in the treatise to explain the method.

I have come to the end of my paper. You will have seen how fascinating these back pages of Chinese medical history are, and yet until the last 50 years or so little advantage was taken to develop the knowledge which was handed down by the great teachers of the medical art. One of the reasons of this lack of progress may be attributed to the secret way in which medical truths were passed from one generation to another within the same family. Retrogression instead of improvement was thus unavoidable.

Doctors of present-day China have wisely refrained from this selfish attitude of the past and have decided to cooperate with their confreres of Europe and America in scientific research and modern practice so that the world in general might benefit by their united activities.

DR. WU LIEN TEH,

Director and C. M. O.

EARLY DAYS OF WESTERN MEDICINE IN CHINA.

*(Being a Lecture delivered before the Royal Asiatic Society,
Shanghai Branch, Dec. 4th, 1930.)*

Chinese Medicine has a long glorious history of its own, extending back to the days of Emperor Shen Nung (B. C. 2737-2705), patron deity of agriculture and medical science in this country, but the purpose of my address to-day is not to delve into that rather mysterious and complicated subject but merely to trace as far as possible the early connection of ancient Cathay with western (or modern) methods of treating sickness. In order to do this, we must ascertain the occasions when East and West first met in China and see if any exchange of medical ideas took place at such meetings.

So far as we know, it was during the reign of Wu Ti (B. C. 140-87), greatest of the Han sovereigns, when the Chinese Empire first extended its domains westward, that the earliest Euro-Asiatic contact took place, and this with the Romans largely through Turkestan to Ctesiphon on the Tigris, to Palmyra, the Persian Gulf and Gulf of Suez, thence to Alexandria and Rome. Horace, Virgil, Ptolemy, Pliny the Elder and other writers have left their records behind on behalf of the west while Szu-ma Ch'ien (B. C. 145-74), the great historian of the Han Dynasty, was mainly responsible for our knowledge of Chinese chronological history up to B. C. 104.

Buddhism was officially introduced into China about A. D. 67 at the time of the later Hans, though a golden image of Buddha was supposed to have been brought back from Turkestan about B. C. 123. Anyhow, it was the Eastern Han Emperor Ming Ti (A. D. 58-76) who openly encouraged the new cult, which, originating in India, has had a profound influence upon Chinese culture and perhaps medical and scientific thought. The T'ang Dynasty came and went, medicinal springs where the beautiful Yang Kuei-fei drank and bathed were described in the old capital of Chang-an, the exciting game of polo was imported from Persia, and ideas of alchemy were exchanged with Arabia, but little or no authentic information is available as to the practice of western medicine having been introduced by foreign visitors or returned travellers.

The first European physicians working in China were probably scattered among the learned foreigners on the staff of the Mongol conquerors. In fact, it is stated that Aisie (perhaps Isaiah) one of these *fuh-lins* (or Frank) was courtphysician and astrologer to Kublai Khan and established a charitable hospital named Broad Charity in Peking in A. D. 1272. However, information handed down in regard to him is so vague that he appears almost as a legendary figure. There is

also reason to believe that some medical activity was displayed by the Nestorian Christians, whose first churches were built in Honan as far back as A. D. 635¹. Later we read of the Nestorian *Mar Sergius* or *Sargis*, a physician from Samarkand, who in 1277 or 1278 was appointed governor of Chinkiang and built monasteries in and near this city, where probably medical aid was given to the poor.

China was visited in the latter part of the thirteenth century by Roman Catholic missionaries, and in 1307 the Franciscan, John of Montecorvino, reached Cambulac (Peking) and was appointed Archbishop by Pope Clement V.

The closing of the overland route to China led to a break in missionary endeavours to reach the country, until the sea route became better known. Francis Xavier attempted to reach China, but died in 1552 on an island off the coast of Kwangtung. From that date, however, China has been visited by a constant stream of Roman Catholic missionaries, particularly Jesuits. Their scientific knowledge soon won them the favour and esteem of the Chinese. Two of their number became Presidents of the Board of Mathematics (controlling the observatories and calendar affairs) in Peking.

Western practitioners had probably been working in the Portuguese Colony of Macao since its foundation. We know definitely that in A. D. 1569 the Misericordia Hospital (*Santa Caza da Misericordia*) was founded by Bishop D. Belchior Carneiro². Here medical aid was confined to Europeans only, as the relations between Chinese and foreigners in those days were not in the nature of friendly intercourse. About the same time, however, a start was made in providing medical relief by the Jesuit Fathers. Among the converts of the great Missionary Matteo Ricci (1552-1610) was the minister Hsu Kuangchi (Ko Lau) who received baptism under the name of Paul. His youngest daughter, called *Candida* in missionary annals, showed the same religious piety as her father.³ Her history was quite remarkable. Married at sixteen years she became a widow at thirty. Thereafter she devoted her whole life to religious works, specially in the provinces of Kiangsi, Hu-Kuang and Szechwen, whither she followed her son Basilius, Intendant General of the Posts and Navigation. Among the charities instituted by her in those parts was a foundling hospital and orphanage. As Du Halde says, "the number of these children was so great that, notwithstanding all the care taken, upwards of two hundred died every year."

Soon afterwards the ranks of the Jesuit Fathers in China were joined by a great scholar and physician, Father Jean Terrenz (*or Terrentius*), called Schreck before he took holy orders. Born in A. D. 1576 at Constance in Switzerland, he became widely known and appreciated

¹ A. C. Moule (*Christians in China before 1550*) 1930.

² J. C. Thomson, *Chin. Recorder*, Vol. XIX.

³ Du Halde, *General History of China*, etc., London 1791.

⁴ Pfister, *Notices, Biogr. and Bibliogr. sur les membres de la Soc. de Jesus en Chine*.

as physician, philosopher and mathematician. Skilful and successful cures at home endeared him to royalty and princes, who conferred upon him exceptional favours⁴. Yet at the age of 35 he renounced all splendours and joined the Jesuit Order. Being attached to the Overseas Missions he embarked from Lisbon together with another Father in April, 1618. Arrived in the East he undertook long journeys in India, Malacca, Sumatra, Cochin-china and China, everywhere collecting samples of minerals, plants and animals as well as undertaking climatological and ethnological studies. Being an excellent painter he supplemented his collections with creations of his brush, with the intention of embodying all in a bulky volume called "Plinius Indicus". Besides his manifold activities he found time to practice medicine and to convert patients cured by his skill.

Arriving in Macao in 1621 this brilliant man was incredible to relate—first sent to Hangchow to work as an ordinary missionary, and was summoned to Peking only when his services were required for revising the calendar. He concentrated all his energies upon this task which was not only of the greatest importance for the Chinese Government but at the same time provided the *raison d'être* for the presence of Jesuits in China. Whilst still in the preparatory work he died A. D. 1630. His *magnum opus* "Plinius Indicus" was unfinished at the time of his death and never published. Among less important works which appeared during his life time, one on structure of the human body published in the Chinese language deserves attention. Though later critics have, with some reason, dealt harshly with this small treatise (being poor both in text and illustrations) the historical importance of this first attempt to bring western medical knowledge to Chinese scholars should not be underrated.

Mention may be made in passing of Father Michael Boym (1612-1659) who in his turn tried to bring some knowledge of Chinese medical lore to the west by writing the *Clavis medica ad Chinarum Doctrinam de Pulsibus*. This comprised (a) four books by Wang-Chu-ho on the pulse, (b) a treatise on the aspect of the tongue in different diseases and (c) an exposition on simple drugs, prepared by the missionaries according to the directions of Chinese authors. The whole manuscript together with a few other fragments was sent in 1658 by Father Couplet to Batavia to be dispatched thence to Europe. But due to disagreement between the Jesuits and the Dutch Company the author's name was suppressed and the book was published in 1682 by Andreas Cleyer, *Protomedicus* to the Company, under the title of "Specimen Medicinae Sinicae". Even some learned compilers of our times consider this as the authentic edition, although a book bearing the name of the right author and under its original title was published in 1686.

Still more interesting than the achievement of Boym were those of other Jesuit Fathers who, though not properly qualified medically, had an opportunity to prove to the court at Peking the superior qualities of certain western medicines. The famous Emperor K'ang Hsi (1655-

1723) was attacked in 1692 by a malignant fever which was relieved by Fathers Gerbillon and Pereyra administering some medicinal lozenges prepared for Louis XIV of France. Later when recurring symptoms of Tertian ague appeared and defied the skill of the imperial physicians, proclamations were issued that anyone knowing of a remedy against this ailment should at once impart it to the Court where a special Commission would test it. The missionaries possessed a pound of cinchona bark which had been received by Father de Fonteney from India. They offered this and three patients confined in the Palace for experimental treatment were speedily cured by its action. Encouraged by this the emperor partook of the remedy with the same spectacular result.

Soon after his recovery, K'ang Hsi rode fearlessly from the palace into the city with a great following, and permitted the people, who as a rule were driven away when ever the emperor appeared in town, to remain in the streets, an event which had never happened before. Among those accompanying His Majesty were the four Fathers, Gerbillon, Bouvet, Fonteney and Visdelon: they were allowed to stand while even the highest officials went down on their knees and touched the ground with their foreheads. In a loud voice, the emperor turning towards the missionaries said: "You Europeans have always served me with zeal and affection, and I have not the least thing for which to reproach you. Many Chinese mistrust you, but I, who have carefully watched your movements, am so convinced of your honesty and probity that I openly and publicly say: "You shall be believed and trusted!" K'ang Hsi then proceeded to tell the people how ill he had been and how the foreign guests had restored him to health again. A huge and commodious house within the First Court of the Palace was presented to the Jesuits.

We have noted that Terrentius had already compiled a book on human anatomy in Chinese. A more elaborate attempt in this direction was made by Father Dominique Parrenin (1669-1741) who translated "*L'anatomie de l'homme suivant la circulation du sang, et les nouvelles decouvertes par Dienis*," into the Manchu (Mandarin) dialect. To the eight volumes of this translation the author added a ninth dealing with Chemistry, Toxicology and Pharmacology. After five years' labour this task was finished and he submitted the work to the aged Emperor. Perhaps through intrigues of the court physicians, it was never printed. At least two handwritten copies of this work are extant.⁵

It stands to reason that the charitable acts instituted by Candida were continued and enlarged by successive missionaries, specially the homes for foundlings in whose souls rather than their bodily welfare the Church was interested. It is certain that about A. D. 1700 an organisation of lay Christians existed which provided among other things for the care of the sick. Besides, we know of quite a number of qualified medical men in the ranks of the Order who performed signal

⁵ One in Dudgeon Library, one in Russian Legation, Peking.

services for the indigent ones. Mention must first be made of Brother Bernard Rhodes (1645-1715), who arrived in China in 1699. Being able to benefit several patients who had been treated in vain by the native practitioners he soon won general confidence and opened a kind of dispensary for the poor in his house. Even the Court officials were impressed by this foreign doctor who contrary to the native practitioners "talked little, promised little, yet performed much." The emperor himself was twice relieved by Brother Rhodes, once for palpitation of the heart, the second time for a boil on the upper lip. The treatment of the latter ailment necessitated the removal of a few hairs from the scanty beard of the emperor—a delicate operation which was entrusted to one of his eunuchs. Great was the ire of the emperor when he detected that *four* of the precious hairs had been clipped whereas *three* would have been sufficient! ⁶ It would seem that Brother Rhodes gradually became regular medical attendant to the emperor whom he accompanied on his travels. To reward the Order for these services the emperor handed over gold ingots, then worth 200,000 francs.

Later Brother Joseph da Costa (1679-1747) worked from A. D. 1715 onwards in Peking where he kept a regular dispensary maintained by the gifts of paying patients. The work was continued by Brother Etienne Rousset (1689-1758), from 1719. He accompanied the emperor Kang Hsi during his last journeys as physician and apothecary. Brother Rousset was generally known under the name of the Charitable Physician, and large crowds attended his dispensary. Another much loved physician was Brother Emmanuel de Mattos (1725-1764) who arrived in Peking in 1751. He was an able surgeon and, though urged by his superiors to become a full priest, he preferred to remain a brother so as to have more time to care for the sick poor. Through constant overwork he contracted lung tuberculosis and died in 1764. The last of this series of physicians was Brother Louis Bazin (1712-1774) who spent the remaining six years of his life in Peking after a romantic career in Persia and India.

Reviewing these early medical activities of the Jesuits, it must be stated that though full of early promise they left but few permanent traces. The reasons are not far to seek. It would seem that the Superiors of the Order did not realise the great importance which medical work might play in propagating the faith or, because they possessed a strong foothold in Peking through their mathematical and astronomical skill, they paid insufficient heed to medical matters. Terrentius, for instance, with his splendid medical training, was first sent to Hangchow and only called back to the capital for consultation upon the calendar. Brother de Mattos was urged to become a full priest, and thus curtail his usefulness as a surgeon. Nevertheless, it is possible that the Jesuit Order would have continued to send out medical men to China if their whole work had not been cut short by the dissolution of the Society of Jesus in 1773. More than a quarter of century elapsed before a fresh

⁶ Dudgeon, Chinese Recorder, Vol. III.

attempt to introduce European methods into China was made by the British doctors in Canton and Macao. Before discussing this epoch in Chinese medicine it may be well first to cast a glance upon the medical activities of the Russian Ecclesiastical Mission in Peking.

Most of the regular missions dispatched from Russia possessed a medical man on their staff. The first was Pulart, a graduate of the Moscow Academy, who arrived with the Archimandrite Hilarion in 1716. In the same year there arrived also in Peking a *British* surgeon engaged by the Russians. The story is that the Emperor Kang-Hsi wrote to the Tobolsk Governor to recommend him a good physician and also some *serviceable physic for pleasure* (apparently vitalizer or aphrodisiac). A British surgeon of the St. Petersburg Hospital, called Thomas Garwin in the Russian records (his real name was probably Harwin), was selected. Together with some engineers sent by the Czar, this English doctor reached Peking in November 1716. All that we can find of his medical activity there is that he was once permitted to feel the pulse of the emperor. By the spring of 1717 he had already left the capital. Dr. John Bell of Antermoney (sic), the author of the curious work, "Travels from St. Petersburg in Russia to Diverse Parts of Asia" (Glasgow, 1763) also came to Peking with a Russian embassy. He arrived in November 1720, and left again in the following March. The Russian doctors seemed to have confined their attention to their own countrymen, the descendants of the valiant defenders of the fortress Albazin on the Amur River who were brought to Peking by Chinese soldiers in 1688.

Allusion has been made already to the early existence of a European hospital in Macao. The Portuguese doctors who started it were gradually joined by Dutch physicians and later on by British medical officers. The first mention of a Dutch doctor is found in the year 1735, while in the chronicles of A. D. 1779 a Mr. Abraham Leslie, junior surgeon to the British factory, is mentioned. He was presumably an able man for he was recommended for promotion to the post of senior surgeon, but certainly he was smart in business as well, lending his savings at high interest to the Chinese merchants. On one occasion when one of his debtors got bankrupt, the doctor forcibly seized his house, disobeying the orders of his superiors to return to the factory. He proceeded similarly on a second occasion, though, as the chronicler drily remarks "he had certainly received more than the original principal." Leslie made himself so obnoxious that he was finally arrested by the Council in 1781. In 1783 he visited India where he was bold enough to complain personally to the Governor-General who, however, refused to support his claim.

Since Leslie's time one or two doctors had been permanently employed by the East India Company at Canton and Macao (between which two places the staff alternated, Macao being chosen for the off-seasons). Allusion can rarely be found of any medical aid given by them or their Dutch colleagues to the Chinese. In fact, the only

occasion they treated such patients seems to have been when Chinese were wounded by Europeans. This is easy to understand since the Chinese laws of that period held anyone responsible for the death of a person to be guilty of murder and liable to execution. The foreigners therefore took a vital interest in the recovery of any Chinese who had been wounded by one of them. Apart from these comparatively rare occasions, the foreign doctors like the rest of their compatriots seem to have lived and worked quite separately from the Chinese. The desire to introduce Jenner's method of vaccination for smallpox into China finally bridged this chasm. The earliest attempts in this direction date back to June, 1803, when a dispatch was received from the Governor-General in Council of the East India Company in which he intimated his wish to see this method, which had come into general use in the British possessions in India, applied in China as well. The Governor-General therefore advised the Committee to consult the principal mandarins. Meanwhile, a supply of vaccine, sent by the Bombay Governor, was actually received in October 1803. With the aid of the hong merchants it was tried upon a number of healthy Chinese children but without success, "the virus having from the length of passage, been deprived of its virtue." Fortunately another method of obtaining an active virus was effected. To describe this event we had best quote the words of Dr. Alexander Pearson, surgeon to the British factory, who unlike his Portuguese colleagues made the method available to rich and poor alike and was principally, if not solely, responsible for its gaining firm root among the Chinese population. In a report of 1816, Dr. Pearson wrote :

"In the spring of 1805.....the vaccine was brought by Mr. Hewit, a Portuguese subject and a merchant of Macao, in his vessel, upon live subjects from Manila—His Catholic Majesty having had it conveyed by suitable means and under the care of professional men across the South American continent to his settlement in the Philippine Islands. I observe that one of them (D. F. X. Balmis) states himself to have introduced the practice in this country; but before his arrival in China it had been quite extensively conducted by the Portuguese Practitioners at Macao, as well as by myself among the inhabitants there and the Chinese, and the accompanying tract, drawn up by me, had been translated by Sir G. Staunton into Chinese and published several months previous to his arrival. As I deemed the inoculation on any subjects connected with the foreign society, or with the Settlement of Macao, nugatory towards an establishment of the practice in China, it was from the beginning conducted, first at some expense, by inoculations at stated periods among the natives, and of them necessarily the poorest classes, who dwelt crowded together in boats or otherwise.....".

The beginning was naturally difficult but, Pearson continues, "the method soon sprang into favour among the Chinese, who though very

conservative in their feelings, when once convinced of the benefit of any new method, take it up very readily, and great numbers were brought to be operated on during the period of the raging of small-pox in the course of the winter and spring months of 1805-1806."

Pearson now needed more help than the casual attention given him by his compatriots in the factory, and from 1806 onwards he employed Chinese assistants, recruited from the employees of the factory. The most prominent of these was Yao Hochun, called A. Hequa by the foreigners and nicknamed Dr. Longhead on account of the extra-ordinary length of his head. It is said of him that in the 30 years of his activity he vaccinated one million of people. Moreover, he taught the art to his son and thus became the founder of a family of distinguished vaccinators.

Sir Edward Jenner in England soon learnt of the success attained in China. In a little tract called "Results of Vaccination", is a letter from one John Barrow, who transmits to Jenner a copy of Sir George Staunton's treaties and informs him of the results achieved, adding that "thus the English at length as well as the other Europeans have established their claim (which though last is not least) on the gratitude of the Chinese." The great discoverer of vaccination (Jenner) was evidently much impressed because according to an entry in Farington's diary he remarked to the latter that the Chinese seemed much readier to resort to vaccination than the English people nearer home.

However, things in China did not progress as well as during the panicky days of 1805-06, when thousands were vaccinated at a time, the Chinese assistants of Dr. Pearson working both locally under his immediate supervision and in the country districts. However, as soon as small-pox ceased to be epidemic, "the evil and the remedy against it were equally forgotten." The preservation of the virus in those days, when only vaccination from human being to human being was practised, necessitated regular vaccination the whole year round, but this was not always possible in China. Twice it was necessary to reintroduce virus from the Philippines, and twice it was found alive in the rural areas though dead in Canton. Gradually, however, all difficulties were overcome. The principal hong merchants established a fund for the gratuitous vaccination of the poor at all times and a small present was given to parents bringing their children. By this means it was possible to perform vaccination every ninth day throughout the year. Gradually the art also spread to the adjacent provinces and several attempts (at first futile) were made to introduce it into the capital of Peking. Finally this became successful in 1828 through the good services of the prefect Tseng who had formerly served in the South. (Among the descendants of the Albazines in Peking vaccination was practised from 1820 by the doctors attached to the Russian Mission who had introduced it to Kiachta on the Russian-Chinese frontier as early as 1805).

By the time Pearson left China in 1832 his great work had already been firmly implanted.

In his final report Pearson highly commended Chinese vaccinators, particularly A. Hequa, whom he called "a man remarkably qualified for the business, by his accuracy of judgment, method and perseverance." In the 1843 report of the Medical Missionary Society was published this eulogy, "the name of Alexander Pearson will ever be associated with those who have proved benefactors to mankind." Sir Andrew J. Ljungstedt, the President of the Swedish Factory and author of the book "Macao and China," said in 1834, "Dr. Pearson will ever live in the memories of the foreign residents in China, as an attentive and sympathising friend, as well as skilful physician."

A description of the steady penetration of vaccination into the rest of China is interesting but space does not allow even a brief sketch. Therefore I will now turn to the second stage on the road of modern Medicine in China, namely, the foundation, in the year 1820, of a dispensary for Chinese at Canton by John Livingstone, surgeon to the East India Company and the Rev. Robert Morrison, D. D. We possess but little information about the former, "the first person who systematically brought medical aid within reach of the Chinese". It would seem that he had been in China since 1808⁷, although Morse, the chronicler of the British Company, mentions him for the first time in 1812, when serving as Assistant Surgeon under Pearson—with an "annual share" of £1,000. In the lists for 1815 Livingstone figures already as surgeon though still drawing the same salary up to 1825. Soon afterwards he apparently returned to England on long leave, for in 1827 Thomas R. Colledge figures as Assistant Surgeon under Dr. Pearson. In 1829 Livingstone is reported to have died at sea while returning to China. The life history of Rev. Robert Morrison is better known. Born in Northumberland as the son of a religious family he offered his services in 1805 to the London Missionary Society (founded in 1795). In the next year he took up a short course of medical study for missionaries at St. Barts, London. At the same time he began the study of the Chinese language through the manuscripts at the British Museum, in which arduous labour he was helped by a Cantonese student, Yong Samtuk.

Morrison left for China in 1807. Because of the petty hostility of the East India Company to Protestant missions and missionaries he had to travel via America, which country he reached after having been 109 days at sea. He then took passage via Cape Horn and arrived at Canton on September 7, 1807 where with the aid of two Roman Catholic Chinese he energetically pursued his language studies. In 1809 he joined the East India Company, drawing £500. as interpreter, and the same sum as instructor in the Chinese language. Dr. Pearson

⁷ J. C. Thomson, Chinese Recorder, Vol. XVIII.

was one of his pupils in 1812. For printing and circulating his translation of the Bible by stealth he was dismissed by the Company in 1815. In the next year he joined the Amherst Embassy as an interpreter and thus travelled to Peking. In 1823 he went to England, returning again to China in 1826, and died in 1834 at Canton.

As can be gathered from a valuable article "Historical Landmarks of Macao" by Thomson⁸ Livingstone's idea in founding the dispensary was not only to give aid to the poor sick but to find out whether the Chinese Pharmacopoea "might not supply something in addition to the means now possessed of lessening human suffering in the west." He therefore invited the co-operation of Dr. Morrison on account of the latter's great command of the language. A Chinese medical library consisting of upwards of 800 volumes was installed with a complete assortment of Chinese medicines. A respectable Chinese physician, Dr. Lee, was engaged; occasionally a herbalist attended to explain the properties of the various articles supplied by him. Livingstone and Morrison spent one to two hours every morning at the Institution to supervise and assist Dr. Lee, who seems to have been in actual charge. Some help was evidently also given by Dr. Pearson, for he wrote in 1821 :

"I have also been able to give pretty constant attendance and have had an opportunity of observing the details of Chinese practice, in from about 10-15 cases daily."

Strange to say he spoke only of Morrison as the founder and regular consultant of the dispensary and did not mention his regular assistant Livingstone.

The success of the dispensary was evidently assured from the very beginning, as shown by a statement of Livingstone himself republished in the above-mentioned article by Thomson⁹.

"Already much good has been done, much suffering has been relieved (hundreds were treated), and upwards of 300 patients have made very grateful acknowledgment for renovated health Besides our commercial intercourse, which is not always helpful to friendly sentiments between man and man, we have hitherto had little or no opportunity of establishing with them those friendly reciprocations of beneficent acts which must ever constitute the firmest bonds of social intercourse. Such attempts as this seem calculated to produce speedily the best results. I am certain we have in the short time in which the institution has existed, fully proved that we are both able and willing to do them much good; and that both they and we have much useful information to impart to each other."

⁸ Chin. Recorder 1887.

⁹ This had appeared before in 1821 in the *Indo-Chinese Gleaner*.

I have not been able to establish definitely how long this institution was maintained. As has been said, Morrison left China on furlough in 1823, while Livingstone went away after 1825, destined never to return again to the field of his benevolent activities.

Their places remained empty for but a short time. In 1827 Dr. Thomas Richardson Colledge (known as the Chinaman's Friend), an old Rugby boy and Assistant Surgeon to the East India Company, began medical work for the Chinese at Macao. A very sympathetic account of Colledge was published in 1834 by Sir A. Ljungstedt under the anonymous name of "A Philanthropist." Here praise is bestowed upon the East India Company whose liberal policy "allowed to their medical servants salaries so ample, that they were satisfied, and went about doing good" and a fitting tribute is paid to the doctors themselves who

"were not the formal practitioners of their profession; they entered into the chambers of the sick, carrying healing and balm to the mind as well as body; they were patient hearers of the often-told and long details of enervated, distressed and melancholy minds. . . ."

Sir A. Ljungstedt quotes copiously from the medical pioneer's own records, some of which are here given. In a statement written at Macao in 1832 Colledge says :

"In the year 1827, I determined to devote a large proportion of my time, and such medical skill as education and much attention to the duties of my profession had made my own, to the cure of so many poor Chinese sufferers of Macao and its vicinity as came in my way. My intention was to receive patients labouring under every species of sickness, but principally those afflicted with diseases of the eyes. . . ."

"During that year my own funds supplied the necessary outlay. . . . In 1828 many friends who had witnessed the success of my exertions in the preceding year, and had become aware of the expenses I had incurred, came forward to aid in the support of a more regular infirmary. . . ."

"Thus the hospital grew up upon my hands; confidence was established amongst a people who had been accustomed to consider foreigners as barbarians, incapable of virtuous, almost of human feelings; and the number of my inmates was regulated only by the limits of my accommodations. Two small houses have been rented at Macao, capable of receiving about forty patients.

"The more opulent and respectable classes of Chinese have in the last three years added their names to the list of subscribers; and have, by giving the hospital the sanction of their support, much enlarged the circle of its usefulness. The E. I. Company has written of it in terms of approbation, and when applied to, has liberally supplied it with medicines."

He concludes that :

"Independently of the practical benefits conferred on suffering humanity, it is most desirable that the enlightened nation to which I belong should be known in this country as possessing other characteristics than those attaching to us solely as merchants and adventurers. As charitably anxious to relieve the distress of our fellow-creatures, we may be remembered when the record of our other connections with China has passed away."

Many Chinese testimonials, some still extant, praise Colledge's good deeds, but perhaps the most fitting tribute to him was a painting by George Chinnery, an exiled Irish artist residing at Macao. This shows an elderly Chinese woman blind with cataract led by her son to Colledge for aid. The operation was successful; in fact, the patient was on the point of returning home when the painting was made.

Besides his clinic at Macao, Colledge assisted by Dr. Bradford, an American physician hailing from Philadelphia, opened in 1828 a free dispensary at Canton, where big crowds of sufferers were relieved. The work was later carried on by Bradford and Cox, Assistant Surgeon to the Company, and it appears that the institution existed until its closure preceding the first Anglo-Chinese war (1840).

The Ophthalmic Hospital at Macao shut its doors in 1832, when—owing to the departure of Dr. Pearson—Colledge found no more time to attend to it. During the five years of its existence, some 6,000 patients had been treated. Remarkable as this achievement is, it forms but a portion of the benefits conferred by Colledge. For, though he himself modestly deprecated it, his example as well as his reports and papers were instrumental in directing the attention of the missionary circles in America and Europe to the splendid opportunities for medical missionaries in China and led to the early dispatch of the first and greatest of them, the Rev. Dr. Peter Parker.

This great man, of whom it was truly said that "he opened the gates of China with a lancet when western cannon could not heave a single bar"¹⁰ was born in Massachusetts in the year 1804 and graduated at Yale both in theology and medicine. Appointed by the American Board of Commissioners for Foreign Missions he left New York in 1833 on board the *Morrison* and arrived at Canton on October 26, 1834. Soon afterwards (December) he left for Singapore to study the Chinese language. There he opened a dispensary for Chinese where more than one thousand patients were treated from January to August 1835.

Returning to Canton he opened on November 4 of the same year a hospital and dispensary in Factory No. 7, Fung-taihong, San-taulan Street, a site quite near the foreign factories. It was fortunate for the young institution that this building belonged to Howqua (his real name

¹⁰ Rev. Dr. Beadle, quoted by Thomson, Chin. Rec., Vol. XIX.

was probably Wu Tunyuen), the richest of the hong merchants and the only one who had with westerners other than strictly business relations. For he waived aside the rent which had been settled at \$500.00 per annum.

In Parker's first quarterly report, he mentioned that the building had on the second floor a large room, where 200 patients could be comfortably seated and prescribed for; in addition the house afforded shelter to at least forty in-patients. Though it was planned to admit cases of all kinds if they were "of peculiar interest and praise", it was resolved that a single class of patients would probably furnish more than enough work. Eye diseases were chosen, because they were most common and the native practitioners were usually helpless against them.

To characterise the exceptional success of Parker's undertaking from the very beginning, a record left by himself may be quoted:—

"..... It was after long effort that a place was found for a hospital, and when at length a suitable building was reated and previous notice had been given, on the first day no patients ventured to come, on the second day a solitary female afflicted with glaucoma came, the third day half a dozen, and soon they came in crowds. It is difficult to convey to a person who has not visited the scenes of the hospital a just idea of them. He needs to be present on a day for receiving new patients, and behold respectable women and children assembling at the doors the previous evening and sitting all night in the street, that they might be in time to obtain an early ticket for admission. He needs behold in the morning the long line of sedans, extending far in every direction; see the officers with their attendants, observe the dense mass in the room below, stand by during the examination and giving out tickets to the hall above, where they are prescribed for, urgent cases being admitted at once, while others are directed to come again at a specified time.....Great numbers of patients are thus relieved every day, exhibiting more and more the confidence placed in the physician.

The idea to run the institution as an ophthalmic hospital, which—as we have seen—was never quite strictly adhered to, was soon given up altogether, general cases and especially surgery being taken up in addition. Kerr summarises in his *History of the Canton Hospital*

"The surgical operations called forth the wonder of all, and well they might, for the excision of tumours, the operation for cataract, the removal of stone from the bladder, were methods of relieving suffering which had never been heard of; and indeed the astounding fact became known that surgical instruments and operations were unknown throughout the empire."

This statement undoubtedly is exaggerated but there is no doubt that new and hitherto unheard-of surgical methods were first tried in this real cradle of western medicine in China. Mention may be made of the first lithotomy operation in 1844 (stones of the bladder are

uncommonly frequent in Canton), the first ether anaesthesia in 1847 and the first chloroform narcosis a year afterwards. That bold operations could be confidently undertaken even before these methods to relieve pain were introduced, was possible because of the courage and apparent lack of nerves of the Chinese patients, repeatedly commented upon by pioneers of those days. Another favourable factor was that wound infections, which made the contemporaneous surgical wards in Europe such haunts of horror, were practically unknown in the Canton Hospital.

The foreign merchants residing in Canton not only took great interest in Parker's work by contributing liberally to its modest needs (the expense for the first quarter was \$454.84) but also visited the hospital, and some actually assisted Dr. Parker in his operations. Notable among the latter was Mr. W. Jardine, who—though he had given up his original profession of ship surgeon to the East India Company—was ever ready to lend to Parker all the assistance he could. In spite of this and the ready help from his colleagues Parker soon felt the need of native assistance. In 1857 he began with a class of three promising youths to whom he gave in addition to practical training theoretical instruction—apparently in the English language. The best of these students was Kwan Ato, a nephew of the famous painter Lamqua (pupil of Chinnery). This man soon became most proficient in surgery so that many operations, even serious ones, were entrusted to his skilful hands. He continued to serve in the Canton Hospital under Drs. Parker and Kerr except during the wartime of 1856-58 when he enlisted as surgeon to the Imperial forces sent from Kwangtung to fight the rebels in Fukien. Here he narrowly escaped death when the rebels surrounded a city in which he had opened a military hospital. For these services and as the first western-trained surgeon to the Chinese military forces he was rewarded by a crystal button with the title of mandarin of the fifth rank. On restoration of peace he returned to the Canton Hospital as Dr. Kerr's senior assistant, and from 1866 taught Practical and Chinese Medicine at the newly opened medical school. The remaining period of his life was spent in lucrative private practice. Kwan Ato died in 1874 and after him came a succession of Kwans as doctors.

But we must return to the year 1836, when Drs. Colledge and Parker together with the Missionary Elijah C. Bridgeman (founder of the Chinese Repository) made a joint appeal for the foundation of a Medical Missionary Society in China. This, the first Medical Missionary organisation in the world, was actually inaugurated at a meeting held under Mr. Jardine's chairmanship in the rooms of the Canton General Chamber of Commerce on February 21, 1838. Dr. Colledge (though absent) was elected President, Dr. Parker, W. Jardine, C. T. Lay and E. C. Bridgeman Vice-Presidents, Dr. Alexander Anderson, the successor of Colledge as surgeon to the British Factory, Recording Secretary, while among the members we

find not only the names of physicians but of many business men, some very prominent in after years. The only Chinese member for years was Howqua, ever a generous helper of Parker's work. The lofty program of the society provided for medical missionary work in China on as large a scale as possible adding that "while the Society's agents, who will be looked for from Missionary Boards in Christian lands, will ply their art they will educate young Chinese in it and reflex benefits will accrue to medical science from discoveries in China." The first general convention of the young Society was held in 1843.

The earliest practical step taken by the Society was to send Dr. Parker during the time in which the Canton hospital underwent extensive repairs, to Macao to carry on hospital work in a house purchased by them (July-October, 1838). Parker then returned to Canton to continue the work until June 1840, when the disturbed state of affairs in China stopped it.

The fateful year of 1839, when the troubles leading to the first Anglo-Chinese war became threatening, saw the arrival of two more medical missionaries destined to play most important parts in the introduction of western medicine.

The first of these was Dr. William Lockhart who was commissioned by the London Missionary Society and arrived in January, 1839. The Macao Hospital, left vacant since Parker's return to Canton, was placed under his care, but in September he was compelled to leave on account of the measures taken by the Chinese Government against Britishers. He retired temporarily to Batavia, studying the Chinese language under the Rev. Medhurst and practising medicine amongst natives and immigrant Chinese alike.

The second new missionary was also an Englishman, Benjamin Hobson, born in Northamptonshire in 1816 and a graduate of University College, London. Arriving in China in September 1840, he jointly with Dr. W. B. Diver took charge of the Macao Hospital, while Dr. Lockhart, who had reopened the institution a few months earlier, left for Chusan. The occupation of this island by the British seemed to offer suitable opportunities for medical missionary work. His hopes were realised, for by February 1841, when the withdrawal of the troops made a longer residence impracticable, over 3,500 patients had been treated, including many non-surgical cases. In addition, he attended the members of the Chinese Coolie Corps from the Canton district which had been formed to serve as a service detachment to the British army.

Lockhart returned to Macao, where he remained until the end of the war. After the treaty of Nanking in 1842 he proceeded to Hongkong in the hope of being sent immediately to Chusan, but was retained till summer 1843. He supervised the building of the Medical Missionary Society's Hospital in that new British colony. This was placed under Hobson's care, the Macao hospital having

been disposed off. In July 1843, Lockhart resumed work in Chusan, achieving the same success as before. It became clear, however, that the port of Shanghai, just opened to the foreigners, would afford much ampler facilities. Thus, after he had paid two visits to this city towards the end of 1843, he closed the Chusan establishment in January 1844, and the following February started the Society's operations at Shanghai. However, before considering these post-war activities we must see how Parker fared during the war.

During the hostilities of 1839 the Canton hospital was removed from the factory to Dr. Parker's own residence and then to the Canton dispensary, evacuated by the British doctors. Finally, on June 7, 1840, it was again closed by reason of the blockade of Canton by the British; on the closing day there was still an attendance of some 200.

Parker, with the approval of the Society, left early in July, not so much to recuperate his health as to preach the cause of medical work to England and America. His hope was to raise a permanent fund for maintenance and enlargement of the Society's operations, as well as the education of Chinese pupils. He took with him a collection of paintings of the more remarkable cases, showing both the condition of each malady and the appearance of the patient after cure, donated by his admiring friend, the painter Lamqua; these he afterwards presented to Guy's Hospital Museum. Suffice it to say that Parker's presentation of the cause met everywhere with encouraging success and even led to such permanent results as the founding of the great Edinburgh Medical Missionary Society.

The war ended, Dr. Parker, who had married in America a niece of the statesman Webster, again reached China and with his bride took up residence at Canton on November 5, 1842. This was in direct opposition to the old regulation "that neither women, guns, spears, nor arms of any kind can be brought to the Factories." Mrs. Parker was the first foreign lady to reside at Canton, living as a "lone woman without a single female companion for many months." Curious reference is made to her in a memorial presented to the throne by the Imperial Commissioner Koying, hereafter a patient of Parker:

Another point, it is the wont of the foreigners to make much of their women. Whenever their visitor is a person of distinction, the wife is sure to come out to receive him. In the case of the American Parker and the Frenchman Langrene (? Lagrene), for instance, both of these have brought their foreign wives with them, and when your slave has gone to their barbarian residences on business, these foreign women have suddenly appeared and saluted him. Your slave was confounded and ill at ease, while they, on the contrary, were greatly delighted at the honor done them. The truth is, as this shows, that it is not possible to regulate the customs of

the Western States by the ceremonial of China, and to break out in rebuke, while it would do nothing towards their enlightenment, might chance to give rise to suspicion and ill-feeling.

Dr. Parker reopened the hospital on November 21 in the former premises. Old Howqua, the landlord, demurred at first, remembering the trouble he had when an inquest was held upon a beggar who had died in the hospital. He soon gave in, however, and when asked about the rent he refused any, saying:—"My own heart likes this business too; if any repairs are necessary, just call on my compradore and he will see that they are attended to."

This grand old man died of enteritis on September 4, 1843.

The success of the Canton Hospital became greater than ever, sometimes about one thousand persons being present on a receiving day. Yet the great changes engendered by the war were bound to reflect themselves upon the Medical Missionary Society, which owed its existence to the foreign community resident formerly at Canton but now removed largely to Hongkong. The crisis came in the year 1845 when the Hongkong members demanded that meetings be held at their place and questioned the administration of a sum of \$5,000.00 collected by Parker mainly in America. The committee demanded control of this sum, whereas Parker wanted to use it at his own discretion, a claim which was afterwards endorsed by the American donors. The result was that two committees and societies functioned, each claiming to be the original society and each having for its President, Dr. Colledge, who lived in England. Attempts to reconcile the parties failed and the two societies continued to exist side by side until, as far as I could establish, the Hongkong Society quietly passed away. Colledge remained President of the Medical Society for 40 years, that is, until his death in 1879 at the age of 82.

It will be well to refer here to the further history of Parker. Having acted with Dr. Bridgman as joint secretary in the negotiations of the U.S. Treaty with China at Macao on July 3, 1844, and as interpreter at the exchange of treaties at Pun T'ong, Canton (Dec. 31, 1845) Parker was appointed U.S. Charge d'Affaires. In 1847 he severed his connection with the American Board of Missions, but continued his medical services until 1855 at the hospital and amongst the foreign community, so far as his diplomatic duties permitted. Naturally, more and more of the medical work devolved upon his able Chinese assistants. In the spring of 1855 Parker returned to the U.S., the charge of the hospital having been transferred to Dr. John Kerr who had arrived in 1854. Appointed U.S. Minister Plenipotentiary he once more visited China but left the country for good in 1857 and took up his residence at Washington. When Dr. Colledge died in 1879, Parker became his successor as President of the Medical Missionary Society, showing great interest in its welfare until his death on January 10, 1888, at the advanced age of 84 years.

We may return now to the discussion of the activities after the war. One favourable point of the treaties, concluded in the years 1842-1844 between China on one hand and the United States and France on the other, was the insertion of the so-called Toleration Clauses which allowed foreigners the right to build hospitals and schools as well as places of worship in the treaty ports. Thus we find that in this period not only the work in Canton was safely continued but that medical missionaries gained a firm footing in other cities formerly not accessible to them.

Mention may first be made of the old port of Amoy where trade with Spain and the Philippines had been carried on for several years. Here the work was started in 1842 by Dr. William Henry Cumming who opened a dispensary at Ku-lang-su, a small island adjoining the port. He was soon joined by Dr. J. C. Hepburn. Both had to retire after a few years' work on account of ill-health. Their successors did not fare better, while Dr. Ino. Carnegie, who took over the hospital in 1859, soon severed the connection with his mission to join a local firm of medical practitioners. There being no new medical missionary available, he agreed, however, to carry on the hospital work—a voluntary service which was continued by his successors. This was very fortunate, because it enabled Dr. (later Sir) Patrick Manson who arrived in Amoy in 1871, to take charge of the hospital and start his epoch-making discoveries in tropical medicine.

The year after the opening of Amoy, work was started in Ningpo by Dr. Lockhart who during a visit in summer 1845 treated about two hundred patients. In fact, it appears that he was doubtful for some time whether to make this place or Shanghai his future permanent residence. As we have seen, he finally decided upon Shanghai, while the post at Ningpo was filled towards the end of 1843 by Dr. D. J. Macgowan (American Baptist Mission) who, being generously supported by the foreign community of Bengal, was able to open a small hospital in 1845. Two interesting features of medical relief were started here: (a) treatment of opium addicts (b) lectures on anatomy before the practitioners and students of the city with the aid of models from Paris, some plates and one skeleton. Considerable interest was evinced by the class, one of which became Dr. Macgowan's valued assistant.

We have seen already how Dr. Lockhart commenced regular work in Shanghai in February, 1844. This was first carried on in a Chinese house, situated apparently in a southern suburb of the city and rented by the Hongkong Medical Missionary Society. The institution was a great success from the start:—

“As soon as the hospital was opened”, writes Lockhart, “and its purpose became known, crowds of people came daily to the house, urgently, often boisterously, requesting to be attended to. The applicants were not only residents in Shanghai, but many came from Su-chau (Soochow), Sung-kiang and other cities in the vicinity, and also from the island of Tsung-ming.”

In 1846 it became necessary to provide ampler and better accommodation for the *Chinese Hospital*, as the establishment was then called. No footing could be found within the city itself, so a piece of ground situated more than a mile outside the north gate had to be chosen. Here a building with a large hall for out-patients and commodious wards was erected, the total cost together with land being \$3,200.00. The property was vested in the hands of some British residents at Shanghai, conditionally that it be always used for the purpose of a hospital. About the same time, in accordance with a wish of the subscribers to the Medical Missionary Society, a local committee was formed consisting of Messrs. Dallas, Shaw, Beale and Dr. Lockhart.

The improved accommodation added much to the usefulness of the hospital. The best proof that it enjoyed the confidence of the people is:

"That during the various attacks on Shanghai city in the uncertain times of the Triad, Taiping and other rebellions, both sides agreed, though Dr. Lockhart's hospital was very inconveniently situated for the hostile forces in their attacks on the city, to steer as clear of it as they could and particularly to avoid damaging it with their artillery; and both sides found the hospital ready to accommodate, to its fullest capacity, their wounded and their sick."¹¹

Like most of the medical missionaries in those early days Lockhart did his best to train assistants, one of whom, called Chun-fu, showed unusual ability. Dr. Lockhart went on furlough in 1857, his place being taken temporarily by Dr. Hobson, who after a year had to go home too on account of ill-health. The medical work was then carried on by Chun-fu with the occasional assistance of local practitioners until in 1860 Dr. James Henderson arrived on behalf of the London Missionary Society to assume charge.

The next port we have to deal with is Foochow, opened to foreign commerce in 1844. It was not till six years later that the first medical missionary, the Rev. Wm. Welton, arrived (1850). Though many sufferers applied for relief, his work was at first hampered by the hostility of the literati who resented the fact that Welton had obtained a portion of a temple near their schools. The dispute was finally settled by Dr. Welton removing to another temple nearby. Here he continued his activity until 1856 when his health became so debilitated that he was obliged to seek rest first at Shanghai, then in England. He did not recover, and died in 1858. The regular medical work at Foochow came to a standstill until 1870 when Dr. and Mrs. Osgood arrived.

Reference has been made already to the construction of a hospital at Hongkong by Dr. Lockhart and its opening by Dr. Hobson (June

¹¹ Brayton Barff, *North China Herald* 1926.

1, 1843). Like the other early institutions this soon prospered; the number of patients for the first two years was over 7,000, so that in 1845 extensions became necessary. Hobson from the first paid particular attention to the training of pupils. In his 1845 report he bestowed special praise upon one of them, Ahsam by name, whom he considered capable of running a hospital like himself. Hobson adds :—

“I am very anxious to see a medical school established in the immediate vicinity of this hospital in Hongkong. And from the facilities such a desirable and useful institution as this would give to China, I trust no efforts will be spared to carry this project into effect.”

The failing health of Mrs. Hobson made it necessary for the doctor to accompany her home in autumn 1845, but she died during the voyage. Dr. Hobson returned in 1847. During his absence the hospital had been kept open, first by Dr. Alfred Tucker,* surgeon to the Naval Hospital Ship and the Colonial Surgeon Dr. Francis Dill; then after the untimely demise of these two merited physicians by Dr. A. Balfour.

Soon after Hobson had resumed his labours in 1847 it was intimated to him by the Directors of the London Missionary Society that he should go to Canton where no English Missionary had been stationed since the death of Dr. Morrison in 1834. Complying with this wish he succeeded in April, 1848, to obtain a house in the western suburb of Canton, at Kum-li-fau. The hospital established there became so popular that in 1854 it had to be moved to more spacious premises. Hobson was fortunate in having a most skilful helper in Ho Kingmun who performed all smaller operations and fulfilled the duties of a resident surgeon.

In 1854 and 1855, when fighting between the Imperialists and the members of the Triad Society took place, the institution was busy in caring for the wounded. The strain of this work proved too much for Dr. Hobson and he left for Shanghai in December 1854. Ho Kingmun, however, ably carried on with the assistance of Dr. Walter Dickson. He was afterwards rewarded by the government with a white crystal button, corresponding to the sixth rank. During the fight native physicians were employed by the government to care for the sick and wounded outside the hospital. Those with the militia were paid *according to the number of cures they effected*. Naturally they preferred to send all serious surgical cases to the hospital which cared in 1855 for nearly 30,000 patients, 10,000 of these being new ones.

* It was largely due to Dr. Tucker's efforts that in 1845 a "China Medical and Chirurgical Society" was organised, of which institution he was the first president.

Successful as Hobson's hospital practice was, its importance is surpassed by another undertaking which he had started at Kum-li-fau. This was the compiling of *Chinese textbooks on medical subjects*, being translations of well-known English textbooks. The first was an *Anatomy and Physiology*, followed by a volume dealing with the principles of *Physics*. Next came a work on the *Principles and Practice of Surgery*, another on *Midwifery and Diseases of Children* and finally a treatise on the *Practice of Medicine and Materia Medica* together with an English-Chinese Medical Vocabulary. The engravings illustrating the books (many from original drawings made by Hobson's friend and voluntary helper Dr. Dickson) were executed by Chinese artists in Canton.

The success of the publications was from the first assured. The greatest compliment to the author lay perhaps in the fact that they were several times republished by the Chinese, the *Anatomy and Physiology* at the instance of the father of the Viceroy of Canton. Publications of the whole series were made in Japan as well. Hobson's books remained for many years the standard works in Chinese, and their influence not only upon the Chinese in touch with western medical men but upon the scholars in general cannot be overstated.

We come now to another crisis in the intercourse of China with the foreign powers, leading to the war waged with interruptions between the years 1856 and 1860 and resulting in the conclusion of treaties which reaffirmed among other things the right of foreigners to build or open hospitals and similar institutions in the treaty ports. This specific clause as well as the security afforded to foreigners by the various treaties gave a mighty impetus to their medical work. Before dwelling upon this, we must contemplate how far the war interfered with the organisations already existing. The military operations being mostly restricted to Canton and its environs, the work at other medical posts appears to have been carried on without much disturbance. In Canton, however, it was completely interrupted. The premises of the Missionary Hospital there which had served all purposes since the early days and had continued rent free by Howqua's heirs, were destroyed by fire on December 14, 1856, when the foreign factories were burned by the Chinese. The dispensary, where most of the medicines were kept, had received the same fate in October.

Hobson's hospital did not fare any better. It being situated in the vicinity of some large batteries in the western suburbs, the British Consul insisted upon evacuation in October, 1856. Scarcely anything was removed, as hopes for an early adjustment of difficulties were entertained. For some time the Chinese in the neighbourhood voluntarily stood watch over the premises and their contents. But their protection had to be gradually withdrawn and soon only the bare walls remained. Dr. Hobson himself removed to Shanghai in February 1857, where he carried through the press his work on *Surgery*. Towards the end of the same year, when Dr. Lockhart was compelled by

domestic circumstances to return for a while to England, Hobson was in charge of the Shanghai Hospital for Chinese until a year later his own health necessitated a furlough.

The interruption of the work was not of long duration. Dr. Kerr reopened the Medical Missionary Society Hospital in 1858 in a Chinese building in Chang-sha street in the southern suburbs where it remained until removed in 1866 to its present site. The Kum-li-fau institution was also reopened in 1858 under Dr. Wong Fun, the first Chinese to have graduated in medicine abroad. Dr. Wong Fun (Wong Cheuk-hing) was a native of Heong-san district in Kwangtung and was first a pupil in the school of the Morrison Education Society under Samuel R. Brown. Together with two other Chinese students (Yung Wing and Wong Shing) he accompanied his teacher to America and took a degree in literature. He then proceeded to Edinburgh where—supported by the benevolence of some foreign merchants at Hongkong he studied medicine from 1848-1853. He passed with honors, taking several prizes and, after graduation as the fifth of his class, he took up post-graduate work in pathology and anatomy. When a student he was already under the influence of the Edinburgh Medical Missionary Society. As a graduate he offered his services to the London Missionary Society and was sent to China. Arriving in 1857 he first opened a dispensary in Hongkong but next year removed to Canton. He was superintendent of the Kum-li-fau hospital for about two years only, resigning on account of a dispute over the fraudulent and commercial conduct of some converts. He returned to Canton where he soon became prosperous in private practice and was eventually appointed Customs Medical Officer. He contributed many valuable articles to the Customs Medical Reports and took, from 1866 onwards, a prominent part in the school work of the Missionary Society hospital, which he was in charge of during Dr. Kerr's furlough in 1867. Having amassed a large fortune Wong Fun died on October 12, 1878.

Wong Fun's place in the Kum-li-fau Hospital was successively occupied by Drs. Happer, Carmichael and Dods until the establishment was amalgamated with the Medical Missionary Society Hospital and thus came under Dr. Kerr's control (1865).

During and soon after the war some interesting medical activities connected with military operations were carried on. We have mentioned already the signal services rendered during the Triad and other rebellions by Lockhart's Shanghai hospital. Worthy tasks of a similar nature were undertaken by the Catholics as well. Their mission had already established a hospital in 1848 at Tong-kia-tou, Shanghai, to take care of the refugees driven from Kiang-nan Province through famine after a disastrous flood. This establishment was probably of a temporary nature. Medical work was certainly taken up again in the same place during the occupation of Shanghai by the "Small Swords" (1853-1855). Like the Protestant Missionary Hospital the church and residence of Tong-kia-tou lay between the two combating parties.

Father Lemaitre not only remained at his dangerous post but cared for the wounded soldiers in a small building which ordinarily served as a Customs house (October, 1853). Brother Saguez, a trained layman, was sent from Zi-ka-wei to help him, but more skilled help became necessary. Such was obtained from the commander of the French man-of-war "Cassini" who gave permission for his surgeons Fallier and Hubac to work in the hospital. This was heartily responded to by Fallier especially. Among the patients cared for was a future Viceroy of Nanking who ever remained grateful to the Catholic missions. Aid was given to civilians as well as military; in fact, a report of May, 1854, says that equal numbers of both were cared for. When the siege was over, the work probably came to a standstill for about 10 years, after which Brother Bernard resuscitated it with much success, caring for thousands of patients until his death in 1867.

During the war the French General Montauban organised a military hospital next to the St. Joseph's Church of Yang-king-pang, Shanghai, which was kept open as long as there were French detachments in the city but had evidently ceased to exist before 1864. It does not seem that medical aid was given to civilians on any large scale on this occasion.

During the occupation of Tientsin in 1860, the British established a small hospital there for the treatment of the wounded and sick of their Chinese Coolie Detachment, the doors of which were open also to the general public. Though this was a temporary undertaking only, it is of historical importance insofar as Li Hungchang obtained here his first insight into the benefits of western medicine. He never forgot the lesson and in 1881 personally opened a hospital in Tientsin, known as the Viceroy's Hospital, and remained its generous patron.

An interesting episode of a military nature is the organisation of the medical work in Gordon's 'Ever-Victorious Army', a well-trained Chinese detachment under foreign officers, engaged in suppressing the Taiping revolution during the years 1862-64.

The medical service of the detachment was in the hands of Dr. A. Moffitt, up to that time assistant-surgeon of H. M. 67th Regiment, assisted by two other medical officers. A stationary hospital and a field detachment were organised—the former at Sungkiang first and later at Quinsan. The attendants were supervised by a young Chinese scholar who soon became most expert, especially as a compounder of medicines. The field establishment was organised on the lines still used in the British army medical service nowadays. Usually two large covered boats served as its base, and from here the wounded were brought to Quinsan in Chinese gun-boats. Partly on account of the well-organised work and partly because the firearms of the Taipings were not of a very destructive nature, the results obtained were excellent. Colonel Gordon testified: ¹².

¹² Andrew Wilson (The Ever Victorious Army), London 1868.

"That the confidence felt by all ranks of his forces in the surgical skill of the principal medical officer was of signal service in nerving their minds for any enterprise, however hazardous."

In the 'Lancet' (Aug. 11, 1866) it was stated that :

'It is impossible to over-estimate the good done by Dr. Moffitt, not only to the force in which he served with so much distinction, but to the reputation of his profession and country.'

One of the important consequences of the second Anglo-Chinese war from a medical viewpoint was that western medical work in Peking, interrupted for almost a century after the last Jesuit Fathers had gone, could be taken up again. The pioneer here, as previously in Shanghai, was Dr. Wm. Lockhart, now a F.R.C.S., who arrived in the capital as Senior Physician to the British Legation on September 13, 1861. He saw a few patients at first while staying as a guest of Mr. Bruce, the British Minister. As soon as he managed to settle down (October 23) in some premises adjacent to, and rented from the British Legation, such crowds came that the total number had reached 22,144 by the end of 1862. He continued to work until 1864 when, relieved by Dr. J. Dudgeon, he took up private practice at Blackheath in England. He died in 1896, long survived by his widow. In 1865, when the Legation wanted the premises for their own needs, the hospital was removed to a Buddhist temple on the Great East Street, now known as Hatamen Street. This Hospital is now named after Lockhart and is the nucleus of the present Peking Union Medical College.

New hospital accomodation in Shanghai had been provided some years previously. The site and plant outside the North Gate were sold in 1861 and a new building erected on Shantung Road. Thus the "Chinese Hospital" founded by Lockhart in 1844 became from now onwards to be known under the name of the *Shantung Road Hospital*.

Soon afterwards new hospital premises were also procured for the foreigners at Shanghai who had hitherto been cared for in the *Shanghai Hospital*, from 1861-1864 under Dr. Henry W. Boone. The accomodation becoming insufficient, shares were sold for the establishment of a new hospital, some French priests, among them Father Lemaitre, (died 1863) taking a prominent part in the organisation. A big building was rented from the banker Yang Taki, situated on the French Bund at the corner of Rue Colbert. The establishment was opened on January 1, 1864, the nursing being placed in the hands of the French Sisters of St. Vincent de Paul. It was first known under the name of the *French Hospital*, its present designation of the *General Hospital* coming into common use only when it was removed in 1877 to its present site north of the Soochow Creek.

In 1866 another important undertaking was started. With a capital fund of M\$84.00 (!) and in a house the rent of which was M\$5.00 per month, a dispensary was opened by the Reverend (after-

wards Archdeacon) Thomson and Rev. H. N. Woo, the medical service being undertaken by Dr. J. Macgowan. Soon many patients attended and an appeal was made in the newspapers for additional funds which resulted in the prompt subscription of Tls. 700.00. With this, 13 houses were purchased at a cost of ten taels each and on the land thus acquired a small hospital was built, known at first—on account of its location—as the *Hongkew Hospital*. Several physicians including Dr. Jamieson, volunteered their free services. In 1880 the institution moved to its present site donated by Li Chiuping and assumed the name of St. Luke's. In 1881 the Gutzlaff Hospital, which had existed in a back street for about 20 years, was amalgamated with it.

As after the first, so after the second war, advantage was taken of the opening of new treaty ports. Thus Dr. William Gauld began to work at Swatow in 1863, Dr. F. Porter Smith in 1864 at Hankow, while in 1864 Dr. James Maxwell reached Formosa after a voyage in a sailing vessel lasting nearly six months and opened a hospital at Takow. This was so greatly appreciated that

“Go wherever you will (not excluding some savage districts)
“Ma I-seng” is spontaneously spoken of and kindly inquired
after. . . .”¹³

Dr. Maxwell removed in 1866 to Taiwanfu, his place at Takow being filled by Dr. (afterwards Sir) Patrick Manson, newly appointed Customs Medical Officer to the Port.

Here I may conveniently end my narrative. While it has been possible in the foregoing pages to furnish an outline of the main events connected with the early introduction of western medicine into China, a summary of what may be gathered between the lines of the contemporary records is now called for.

The hospitals of those days formed just a rough shelter for in-patients, who were expected to provide their own food, clothing and often bedding. No trained nurses were available, the care of the sick being usually left in the hands of relatives and friends, though pioneers like Peter Parker did not hesitate to sit for nights at the bedside of some patients upon whom they had performed serious operations. Greatly to their credit, the doctors amidst their manifold duties found time to teach their assistants. But, as in the case of physicians in medieval Europe, their pupils were more like apprentices than proper medical students. It was rarely possible for the overworked clinicians to interest themselves in scientific or public health matters. Even if they did, there was at that time no medium in China for recording their observations except in the hospital records, which had to be written to attract lay subscribers at home rather than medical readers.

¹³ Myers, Customs Medical Reports 1881-82.

With the year 1860 came the dawn of a new era. The organisation of a properly-paid Customs Medical Service by Mr. (later Sir) Robert Hart from the year 1863 resulted in the publication of a series of valuable Customs Medical Reports, to which the best practitioners of the time contributed. This and the establishment of a regular medical school attached to Canton Hospital (1866) are the harbingers of the third great chapter of modern medicine in China.

WU LIEN TEH.

THE HISTORY OF CERTAIN INFECTIOUS DISEASES IN CHINA.

(Being a lecture delivered in the Harbin Medical Society on April 5, 1930).

1. Plague.

It is well to begin this survey of the history of some infectious diseases in China with a discussion of plague, because there is no doubt that outbreaks of this occurred in China since long ago. This is not surprising if we consider the nearness of this country to the Central Asiatic endemic focus—the original or at least one of the original homes of plague. It is definitely known that the famous Black Death of the 14th century spread from this Central Asiatic area not only westwards into Europe but also eastwards into China. In fact some contemporaneous European writers are inclined to place the origin of this worst of all known pandemics in China, among the vast population of which the disease raged in a much more spectacular way than in the sparsely settled regions of its real origin.

While such and other considerations—which cannot be discussed here—prove the early existence of plague in China, it is impossible to give an accurate survey of its early inroads into this country. The old chronicles and encyclopedias abound of references to 'pestilences' but rarely sufficient details are supplied to differentiate the diseases thus collectively named. It is true that some reconstruction work can be done by considering (a) the time at which said outbreaks occurred which coincides in some instances with well established plague epidemics in other countries; (b) the localisation of the outbreaks in question part of which occurred in provinces now known to suffer frequently or even constantly of plague epidemics. Such studies confirm the perpetual recurrence of the disease in Mongolia and the adjacent tarabagan-infested regions for instance and suggest that Shansi province—in part of which plague is now endemic—suffered frequently in historical times as well. However, as far as the South and South-West of China is concerned, we reach firm ground only about the middle of the 19th century. Probably earlier in the course of this century plague was doing little harm in these parts, since almost everywhere a lull before the storm of the present pandemic is noticeable.

The history of the onset of this present plague pandemic is closely connected with the history of the disease in China. In fact some authors placed its origin in the Chinese province of Yunnan which was wrongly considered as an endemic plague area.

Yunnan province suffered from a number of 'pestilences' in the past, the first of these known to us occurring in A.D. 1165. Dr.

Michoud, who wrote in 1894 an excellent paper on the plague in Yunnan (Customs Medical Reports No. 48, p. 41), was led to believe that the Jesuit Fathers, sent in 1617 by the Emperor K'ang Hsi to survey the province, met with a disease, the symptoms of which were rather similar to those of bubonic plague. In a book of Hang Liang-Kih (1736-1809) reference is made to a strange disease affecting first the rats and then man. One victim of this 'queer rat epidemic' was the poet Shi Tau-Nan, a contemporary of Hang-Liang-Kih, who died of the distemper a few days after he had written his master-piece, a poem entitled 'Death of Rats'.

We may take it therefore that plague was occasionally manifest in Yunnan province before the 19th century. Evidently, however, it was not endemic there. Michoud says in this connection that

too many proofs of past prosperity abound in Yunnan, incompatible with the conditions of misery necessary to the development of such an infectious germ as that of the yang-tzu-ping (local name for bubonic plague), and therefore contradictory of any belief in the early existence and permanency of an epidemic the consequences of which are fatal to the welfare and fortune of a country.

He thinks that the question how the disease started is shrouded in mystery. However, though the problem is a difficult one, it may be elucidated to a certain degree. From the contributions of Rocher (who travelled extensively in the province on behalf of the Chinese Maritime Customs) and of Baber (who visited with Grosvenor's Mission Western Yunnan) as well as from other sources two main facts can be established:

(a) That plague raged in the central and eastern part of Yunnan province only after the Mohammedan rebellion had broken out, i.e., from about 1860 onwards;

(b) That before that time it had existed in the western part of the province without prevailing epidemically. Here as well as in the East the human outbreaks were preceded by rat epizootics.

Different opinions are held as to how the western-most part of Yunnan province was invaded in its turn and it would lead us too far to discuss these different theories, pointing to Burmah, Thibet or farther westwards. Suffice it to say that there is no doubt that the plague in Yunnan--and thus the present pandemic--is ultimately traceable to the Central Asiatic endemic area.

Once plague had been distributed by means of the Mohammedan rebellion over the whole of Yunnan it continued not only to reappear there in every season but showed also an ominous tendency to spread beyond the provincial borders to the East. Beginning from 1867 already we find outbreaks at Pakhoi in Kwantung province, one of the southern-most ports of China, about 1,000 miles distant from the capital of Yunnan province. How Pakhoi was invaded so early, is one of the most puzzling problems in the history of the plague. Some trade was carried on between Yunnan and this port, but it took about 48 stages to travel from

one to another; moreover the goods exported sea-wards were mainly tin and opium and therefore unsuitable for the harbouring of rats or fleas. Further, though we know that later on plague was present in different towns of Kwang-Si province *en route* from Yunnan to the sea-coast, we do not know of such early invasions in the 'sixties. Perhaps one has to accept after all Simpson's hypothesis that Pakhoi was originally infected by troops returning thither from Yunnanfu. For this assumption speaks the fact that Yunnanfu (the capital of Yunnan) witnessed a terrible plague outbreak in 1866.

The next event of paramount importance we have to deal with is the invasion in 1894 first of *Canton* and nearly two months later also of *Hongkong*. From the statements made above it is obvious that plague might have reached these two ports either by land from the west or by sea from Pakhoi in the south. It is generally believed that the former route is the more probable one, specially in view of the fact that Hongkong, nearer to, and in direct communication with, Pakhoi was visited later than Canton. The epidemic at Canton lasted from about March until the end of July and claimed perhaps up to 100,000 victims. The outbreak at Hongkong abated in spite of a vigorous anti-plague campaign also not before the end of July but claimed less than 3,000 victims. As it is known to you it was there that the plague bacillus was detected by Yersin and Kitasato.

It would lead us too far to discuss the further history of plague in Southern China in full detail. When casting a rapid glance upon the present situation we find that Yunnan province is for decades already entirely free from the disease—thus it is shown once more that it is not endemic there. Canton and Hongkong suffered for a long time from annually recurring and often considerable visitations but are nowadays free or almost free. The disease continues to exist in some secondarily invaded areas, notably in Fukien province, but its ravages tend here also to become milder, specially since gradually stringent measures including vaccination are introduced.

Before concluding the chapter on plague we must return to the North of China. Here three foci are active at present:

(a) One situated in Transbaikalia and Mongolia and comprising a small portion of Western Manchuria (Heilungkiang province). Here the virus is kept alive in the tarabagan (Siberian marmot) leading—in Transbaikalia and Mongolia—to almost annual outbreaks. As you all know it was from here that the great 1910-11 and 1920-21 pneumonic plague epidemics started.

(b) One in the Tungliao area of Fengtien Province (South Manchuria). Here the disease is present from 1924 at least. The immediate source of the outbreaks are rat epizootics, the notorious *Xenopsylla cheopis* playing an intermediate role. How the infection reached this area is still *sub judice*; probably it will prove traceable to the adjacent Mongolian territory and wild rodents.

(c) One in Shansi province in certain north-western districts of which almost annual outbreaks have been noted since about 1915. It seems that here also rats are involved; detailed information is still lacking, however. Here also infection appears to have come originally from the west. A big pneumonic outbreak, taking place in those parts in 1917-1918 and claiming about 16,000 victims, did not start from the endemic areas in Shansi proper but further in the north-west in Inner Mongolia.

2. Cholera.

The evidence as to the early existence of cholera in China is not so satisfactory as that proving the ancient history of plague in the country. Some authors are firmly convinced that cholera existed here since long ago. Dudgeon, for instance, maintains that it was described in the year 2,500 B.C. by the very name which it bears now (Hwo-luan) and gives a long list of authors who were presumed to have dealt with this disease. He notes, however, that none of the sources accessible to him allude to the epidemic character of the outbreaks. No wonder therefore that other writers like Macgowan and Wong-fun (the first Chinese doctor who graduated abroad and later served as Customs Medical Officer in Canton) are sceptical as to the early occurrence of true Asiatic cholera, pointing out that this disease might have been mixed up with others prevailing in summer. A similar statement is made by Su-tze-mi, an old-fashioned practitioner describing the 1821 epidemic witnessed by him at Kiahsing (on the border of Chekiang and Kiangsu Provinces). He designates true cholera as 'contracting the tendons of the leg disease' and claims that this was, in contrast to the 'sudden vomiting and purging disease', something new. It must be said, however, that some of the ancient writings, including the earliest description extant, expressly mention muscular cramps. Some evidence also exists regarding cholera invasions of China in the seventeenth (Cleyer, Rogers) and in the 18th centuries (Gentil). Thus taking all in all, one is perhaps justified in saying that cholera was not entirely absent from ancient China though not so frequent as later on. When it appeared with great virulence early in the 19th. century, here as elsewhere, the erroneous impression that it was an entirely new disease might have been taken (Rogers).

The modern history of cholera in China begins with the year 1817, when the epidemic rampant in India invaded South-Western China by the land route. In 1820 the disease reached Canton *via* Burmah (whither it had been carried by British troops from India), Wenchow and Ningpo. In the latter city especially its ravages seem to have been terrible. The following year (1821) appears to have been the first real 'cholera year' in China, the disease not only re-appearing at Ningpo but breaking out in several localities including Peking and Shantung province in the North. Up to the year 1881 such 'cholera years' were witnessed at irregular intervals. Then for about a decade the disease was very active. From 1891 onwards up to our times there were certain years when it displayed great spreading power without regularity or periodicity. It might be maintained that—as far as China

as a whole is concerned—the data available are not complete enough to vouchsafe final conclusions. However, recently reliable figures have been collected for Shanghai which I show you in graphic form. You will see that here also no regularity is perceptible. The two years within the period contemplated, in which we had the disease in Harbin, coincide with peaks in Shanghai. On the other hand in certain years, like 1925 and 1927, when cholera was not particularly active in Shanghai, it caused much havoc in other parts of China. In general it must be stated that many problems of the epidemiology of cholera in China are still shrouded in mystery and it is to be hoped that the great attention which is now paid to this disease by the Health Ministry and local authorities will help to elucidate these questions.

3. *Smallpox.*

The question as to when smallpox was introduced into China was the object of much controversy. Moore, in his 'History of Smallpox' traces the disease to China (1000 B.C.). Dudgeon, when dealing with this problem in 1871, thinks that Moore

was probably indebted for his information, directly or indirectly, to the Jesuit writer Cibot (1727-1780) who asserts that in a medical work in the Imperial Medical College it was stated to have been known for 3,000 years.

He (Dudgeon) doubts the authenticity of this source and—after a scrutiny of the evidence—comes to the conclusion that

smallpox broke out in China much about the same time as in Europe. It originated in China probably towards the latter part of the T'ang dynasty (A.D. 620-907).

In a later remark on the subject he somewhat antedates the appearance of smallpox in China, which according to a new source found by him took place about A. D. 317 during the reign of the first emperor of the Eastern Chin dynasty. Dudgeon quotes at the same time from a Korean medical work according to which smallpox became known about the end of the Chou and beginning of the Chin dynasty, in other words, about the year 249 B. C. He adds that 'this position is quite untenable.'

Although statements regarding the early and even original existence of smallpox in China are to be found in quite modern publications (see e.g. Paschen in Kolle-Wassermann's Handbook, 3rd edition) the majority of writers possessing firsthand information are agreed that the disease was introduced into China during or after the first century of our calendar. It is usually stated that this event took place during the reign of Kien Wu while he was at war with the barbarians. A large portion of his soldiers including the famous hero Ma Wun succumbed to the new infection. According to this theory the disease would have entered China from the West—an aspect lending support to the assumption that

the original home of the disease was in Central Asia not far from the Caspian Sea (Dudgeon).

The first authentic description is found according to Dr. K. C. Wong (one of the foremost living authorities on old Chinese medical history) in the 'Handbook of Prescriptions for Emergencies' written by the alchemist Kohung (Tsin Dynasty, A. D. 265-313). Here smallpox is dealt with under the name of 'periodic disease' (tien hang) as follows:—

Recently there are persons suffering from epidemic sores which attack the head, face and trunk. In a short time they spread all over the body. The sores have the appearance of hot boils containing some white matter. While some of these pustules are drying up a fresh crop appears. Patients who recover are disfigured with purplish scars which do not fade until after a year. This is due to bad poisonous air. The people say that it was introduced in the reign of Kien Wu when that king was fighting the Huns at Nang Yang. The name of 'Hun pox' was given to it.

A later name said to be given to the disease when it was re-introduced from the South and considered as something new was that of the 'disease with bean-shaped pustules' (Thomson) while the present name is that of 'Heavenly Flowers'.

The early history of smallpox in China is also of great interest for the reason that here for centuries before Jenner's discovery of modern vaccination inoculation against smallpox was practised, infectious material from mild cases being passed to healthy individuals. Different stories are told as to how this time-honoured method was introduced into China—all, however, concurring that this event took place between A.D. 1000-1100. One of the versions adopted by Dr. Wong in his most recent publication (1929) is that about the year 1022 the Prime Minister Wang Tan, several of whose sons suffered severely from smallpox, heard that inoculation was practised by a Szechwanese living at the Ngo mountain. He caused one of his sons to be inoculated and—this proving successful—the method soon gained popularity. Dr. Wong adds that it is highly suggestive that this practice came via the trade routes from India where it is known to have been used at an early date. We may add that Jenner's modern method of vaccination was introduced a short time after its discovery into China by Dr. Pearson, surgeon to the East India Company in Canton and Macao. (1805).

4. *Scarlet Fever.*

The history of scarlet fever in China is fundamentally different from that of the epidemics dealt with above. For—cautious as one has to be—the view has to be accepted that here we have to deal with a recent importation into China.

The only comparatively early allusion to scarlet fever in China we came across during the course of our researches refers to the year 1821 when according to a report on smallpox vaccination in Kwantung province an outbreak of scarlet fever was ascribed to the new prophylactic thought to 'retain the poison in the system, to appear at a future time in still worse shapes'. We have been unable to find any corroboration for this report. On the other hand it must be kept in mind that even much later on measles, diphtheria and scarlet fever were often confounded. Dudgeon for instance, referring to the subject in 1875 says that scarlet fever (which he considers as a rare disease in China)

is frequently mixed up with measles; in fact nearly all diseases of the rash and pimple variety are generally designated by a combination of the two words *chen-tze* and *sha-tze*. The former is the word for measles (rubeola) and the latter that applied correctly to scarlatina.

It must be said therefore that the above mentioned 1821 outbreak seems doubtful indeed.

Invaluable material on this as on other epidemiological questions is contained in the Customs Medical Reports inaugurated through the wisdom of Inspector General Sir Robert Hart in 1871. In the year 1873 issue Drs. Carmichael and Myers (Chefoo) describe a scarlet fever case in a foreign child which they consider as 'the first recorded instance within our knowledge of the disease in China'. They add—

Although China is alleged to have an immunity from scarlatina, this is probably merely an inference from the fact that it has not hitherto been observed. But such negative evidence scarcely justifies us in assuming its non-existence, especially when we consider the few opportunities enjoyed by foreign physicians for a careful study of the disease amongst the native population.

However, it may be reasonably asked why in the early days cases of other infectious diseases including cholera were met with among the foreigners while the few instances of such a notoriously infectious disease as scarlet fever were considered as worthy of special record and were sometimes taken for the first ones ever encountered. And, following the trend of this disease through the subsequent reports one notices how it gradually becomes more frequent until true epidemics are met with.

The viewpoint that scarlet fever was unknown in China until about the year 1870 is expressed by Dr. Stanley (former Health Officer of Shanghai) who published in 1917 a careful study on this subject. If we turn our attention to neighbouring countries we find in a study upon the disease in *Korea*, published by C. Hara in the Japanese Journal of Bacteriology in 1917, that its history there is short, being limited to 20-30 years. Further, its name (Yang Tawk or Foreign Poison) is suggestive of foreign introduction (probably from Japan or China). With

regard to *Japan*, it was stated by Dr. Stuart Eldridge in 1878 that scarlet fever, 'if not entirely unknown among the natives is at least exceedingly rare.' In both countries we see how gradually this favourable situation changes in much the same way as in China.

We may take it therefore that scarlet fever is really a rather new disease in China although it was *possibly* present a little earlier than is usually assumed. At least Dudgeon maintains in a somewhat involved statement published in 1871 to have met with the disease during the 1866 diphtheria epidemic at Peking and adds in the following paragraph that

there were raging as endemics, measles, scarlet fever and small-pox during part of the time.....

Yet, as already mentioned, the same author testified in 1875 to the rarity of the disease in Peking and pointed to possible sources of diagnostic errors. In fact the statement made by him in 1871 that

many cases of scarlatina were supposed to be diphtheric when the eruption was absent.....

leaves one in doubt.

The present scarlet fever situation in China has been studied in 1924 by members of our Service who came to the conclusions that scarlatina is practically absent or very mild in South China, not unduly severe in Shanghai and Central Provinces but severe in the North, that further this disease, while comparatively more frequent among the foreigners in China, is decidedly more virulent among the Chinese.

5. *Syphilis.*

The question of the origin of syphilis is one of the most fascinating problems of medical history. Two diametrically opposite theories exist. According to one school, whose exponent is Proksch, this malady was present in the Old World since time immemorial. The other theory, advocated in our times by Bloch and V. Notthaft, maintains that syphilis was unknown here up to the time of discovery of America from which continent it was imported into the Old World. The adherents of the first mentioned school base their claims upon certain findings upon excavated bones supposed to be ancient and showing syphilitic changes as well as upon the interpretation of certain passages in ancient writings. The 'Americanists' retort that

- (a) the remains in question are either not so old as supposed or do not show unmistakable signs of syphilis;
- (b) the scanty references in the old writings might refer to other diseases rather than syphilis.

In one way they have certainly the best of the argument: Even if the whole Old World evidence is accepted at face value, the malady

was either rare before the discovery of America or was at least not well described. The former assumption is rather unlikely. And it is difficult to see why the old writers who furnish excellent descriptions of other diseases including skin affections, should have failed just in the case of syphilis.

It is obvious that the Old Chinese and Japanese medical literature is apt to play a decisive role in this controversy. For should we find any reliable reference to the existence of syphilis in the East before the 15th or 16th century, the Old World origin of this disease would be automatically proved. A solution of this important problem has been attempted by several workers, outstanding among whom is Dr. Kaizo Dohi, Professor for Dermatology in Tokyo.

This scholar points out that in the *Su-wen* (a medical book ascribed to the Emperor Huangti but actually compiled towards the end of the Chou dynasty 1130-250 B. C.) some references are made to genital ulcers and a disease 'Lee' in the course of which the nose is destroyed. The last mentioned malady was, however, in all probability identical with leprosy. As to the ulcers, their syphilitic nature is negatived by the fact that the excellently written work contains no reference whatsoever to the characteristic symptoms of secondary lues. The same may be noted in regard to later classical contributions. The *Pin-yuan-Hou-lun* (Etiology and Symptomatology of Diseases—A.D. 605-609) for instance contains no reliable reference to syphilis but abounds of fine descriptions of lepra and other skin diseases. In the *Tsin-chin-fang* (Thousand Gold Remedies) written by Sun-shi-miao (A.D. 682) a painful 'ulcer of jealousy' is described which is obviously identical with soft chancre.

The genuinely old Japanese books also do not mention syphilis. The often quoted *Daido-ruiju-ho* (Systematic Collection of Prescriptions from the Daido Period) does so, but the passages in question are obviously later interpolations.

It may be concluded therefore that in the old Far Eastern medical literature as well as in the Indian and European ones definite clues for the existence of syphilis are absent. The first reliable reference in the Far East is contained in the *Tsuk-i-shut*, i.e. New Series of Medical Opinions (A.D. 1545) where it is said in the chapter on Sarsaparilla:

During the last years of the Hung-chih period (1488-1505) a malignant skin disease raged among the people which started in Canton. This malady was up to then unknown to the inhabitants of Central China and they named it 'Canton Exanthema' (Kuan-tung-chuang) or, from its aspect, 'Peach-blossom-like Exanthema' (Yeung-mui-chuang).

It is added that the disease is treated with calomel preparations and sarsaparilla. Similar statements are contained in the *Pentsao-kung-mu*, a voluminous *materia medica* published in 1588, while the *Shih-shan-i-an* (Collection of Clinical Experiences—A.D. 1520-1533) brings the clinical

histories of syphilitic cases. You can see therefore that—in striking contrast to former centuries—syphilis looms now largely in the medical literature. And from the whole evidence it can be gathered that syphilis was imported into China between the years 1498-1505, most probably soon after 1500, i.e. about 15 years before Portuguese ships arrived there. Therefore it is impossible that the foreigners were *directly* instrumental in bringing this unwelcome gift. Their fleet under Vasco da Gama brought the malady to India (where it became known under the name of *phiranga* or Frankish disease) and it was introduced into Canton by Chinese sailors who had come in contact with the foreigners in the South (Malay Peninsula). Japan was reached in a similar manner from China on one hand, from the Liu-kiu Islands on the other, as proved by the two early names of syphilis in that country.

It must be said therefore that the Far Eastern evidence lends weighty support to the assumption that syphilis originated in America.

R. POLLITZER,

Bacteriologist of the Service.

THE PREVENTION OF INFECTIOUS DISEASES IN CHINA.

(Presented at the XIXth Biennial Conference of the China Medical Association, Shanghai, February, 1929, and reprinted from the China Medical Journal, 1929, p. 343).

The National Government of China has shown much incentive in establishing a Ministry of Health at Nanking. In this respect we are ahead of Japan where all health matters are still managed by a Department of the Home Office. But precept is one thing and practice another. In order that the modern health policy of China may attain the maximum of success at a minimum cost of time and money the experience of other countries as well as our own past efforts should be borne in mind.

Public health activities are not new in China. As far back as the Chow Dynasty 246 B.C. (2,300 years ago) the state had established medical schools, licensed practitioners, instituted a regular state medical and health service which supervised, among other things, the growing of trees and the cleaning of drains, while family physicians were responsible for keeping the members in health besides treating them when sick. Even such an up-to-date practice as isolating infectious cases from the general community was known.

When the late President Yuan-Shih Kai was Viceroy of Chihli Province (1903-07) he established sanitary bureaux in the principal cities with modern qualified physicians in charge. Unfortunately there were no health specialists in those days and public health usually meant cleaning of the streets and removal of garbage. Waterworks were not built and other health activities as we understand them nowadays were nonexistent. Even modern trained doctors often waste unnecessary time and energy upon the purchase and use of carbolic acid as a means of fighting epidemics. The result was that nearly twenty years passed without any awakening in the sanitary conscience of the people.

Passing to the present period we find coming forth gradually to assume the direction of health work some John Hopkins graduates of the School of Public Health whose keenness in trying to bring up ancient conservative China to the same level as rich young America is proverbial. The question is how far this hoary land can attain the requirements of our ever-changing Sister Republic on the other side of the Pacific. In other words in order to lighten our task and to commit as few mistakes as possible, the essentials should be distinguished from nonessentials, fundamentals from non-fundamentals.

In my humble opinion the acid test of proper health work in China lies not so much in the intricate and detailed tasks as performed in the United States, whose people are more advanced than ours in general and

scientific knowledge, as in the successful control of those maladies which have practically been stamped out in forward countries. I refer particularly to those infectious diseases which have no business to exist in a progressive land. In fact I hold with many others, that, until we have succeeded in eradicating such infections as small-pox, plague, cholera and leprosy from our midst, we should not rest satisfied, however well governed the country may appear in other directions. Our authorities should forthwith enact laws for the notification of infectious diseases and begin with Small-pox, Plague and Cholera. Later on, others can be added.

Roughly speaking, the infectious diseases of China may be classed under four headings, namely :

A. *Strictly Preventable* : The Big Three (Small-pox, Plague and Cholera), Tuberculosis and Malaria.

B. *Immunisable* : Typhoid, Dysentery, Rabies, Diphtheria, Scarlet Fever,

C. *Curable* : Syphilis, Gonorrhea, Leprosy, and

D. *Semi-controllable* : Influenza, Meningitis.

Of course I am aware that the above classification is arbitrary and not wholly accurate, but my principal object is to emphasize the main points.

A. The League of Nations Health Bureau at Singapore requires all Eastern countries to send weekly reports on the incidence of small-pox, plague and cholera (the Big Three). Almost every territory except China has been able to fulfil this task because of established government health organisations. In our case, partly because of the vast area involved and partly due to incomplete communications and medical organisation, our contribution to such epidemiological knowledge has mainly taken the form of general reports on the occurrence of certain communicable diseases in various provinces as initiated by Dr. Huang-Tze-Fang and of detailed reports of epidemics like plague and cholera whenever these occurred. Small pox being endemic throughout the land occupies quite an insignificant position !

Now that a responsible Health Ministry has been established it is hoped that our Government will cooperate more fully with the rest of the world in exchanging information not only with the Eastern Bureau of Singapore but also the Health Section of the League of Nations at Geneva and the Office International d'Hygiene Publique at Paris.

The experience of the world has shown how easily *Small-pox* can be stamped out in a community by systematic mass vaccination with calf vaccine. Note the encouraging results in Germany and Japan where a pock-marked person is a *rara avis*. The excellent preparations of the National Epidemic Prevention Bureau in Peiping are well known to most of us but are quite insufficient for the needs of the whole country.

I would therefore suggest that vaccine establishments be maintained at such centers as Hankow, Shanghai, Canton, Foochow, Chengtu and Harbin. The outlay is comparatively small and a considerable income regularly flows in thanks to the general confidence of the people in this particular form of immunisation. *Plague* is mainly confined to the provinces of Kwangtung, Fukien, Shansi and Mongolia where endemic centers may be said to exist. At the Delhi meeting of the Advisory Council of the Eastern Health Bureau (1828) it was decided to request the cooperation of all Eastern health authorities to undertake a survey of rodents and their fleas in their respective territories. We have established a receiving station at Harbin for such purposes and should be glad to supply all information necessary. Our Chinese must learn to appreciate the advantages of rat-proof construction of houses as well as the benefits conferred by anti-plague vaccination in the exposed areas. Since the preparation of anti-plague vaccine is a particularly dangerous one I would suggest that this work be carried out at two places only—Harbin (where our Institute has for years prepared the stuff) and Canton (which can serve all the needs of South China).

N.B.—The anti-plague vaccine as manufactured by us at Harbin is obtained by growing a fresh local strain of *B. pestis* on agar kept in flat bottles for 48 hours, at 30°C. then washing with carbolised physiological salt solution, killing by heating to 62 degrees for 1-2 hours, standardisation by centrifugal methods, proper dilution so that one c.c. dose contains 6 mg. of killed bacteria. Fuller details of our method will appear in the special plague supplement of the National Medical Journal, April 1929. It will be seen that the Harbin method is much simpler than the Haffkine one which requires at least six weeks for *B. pestis* to grow on bouillon. We find our vaccine quite effective for all purposes.

Cholera is even more wide-spread in China than plague and needs closer attention from the authorities. It is endemic in the Yangtse region with the great cosmopolitan port of Shanghai as a main distributing center. But because it is a purely human infection it should be much easier to eradicate than plague. Preventive measures consist of a clean water supply (preferably by the establishment of modern waterworks), proper disposal of excreta and systematic vaccination with anti-cholera vaccine in threatened areas. Our Harbin Institute has in the past manufactured vast quantities of this vaccine by simple methods.

N.B.—Suitable strains of *V. cholerae* are grown in flat bottles containing agar, then washed with sterile physiological salt solution, next standardised by Wright's method (by comparing the number of bacilli with that of erythrocytes in a mixture of equal quantities of finger blood and bacterial emulsion), killed at 56-60°C. for one hour and diluted with 0.5% phenol so that each c.c. dose contains 1,000 million bacilli. In future we hope to replace this tedious method of standardisation with the simpler centrifugal one.

Here again our central authorities can encourage the dissemination of knowledge of this all important infection among the masses as well as providing suitable centers for the preparation of the vaccine. I would recommend that besides Harbin and Peking, Shanghai and Canton should be chosen to deal with this matter.

The preventability of Tuberculosis of all kinds has been shown in practically all lands which have marched with the medical knowledge of the times. The decrease of mortality in U.S.A. and Great Britain has been very striking. Only Japan and China still claim T. B. as their chief killing disease. But to be sure of success, the various members of the family from infants upwards must practise such simple precautions as suitable food, sufficient sunlight and healthy living quarters. Medicines are quite secondary factors.

B. Only a few words need be said regarding this group of infections. The late World War of 1914-18 has shown how easily controlled such a feared war-disease as typhoid fever could be if two simple maxims are followed, namely,

- a. Systematic vaccination of all soldiers with anti-typhoid vaccine,
- b. Advance inspection of water supplies for camp use, etc.

Further, immunisation against paratyphoid and dysentery can simultaneously be administered with anti-typhoid vaccine.

With regard to diphtheria we have seen how this much-dreaded disease of children is rapidly disappearing from Europe and America by the systematic application of the Schick Test (for ascertaining the susceptibility of the individual) and inoculation with toxin-antitoxin (T-A-T). Thanks to the researches of Drs. George and Gladys Dicks upon Scarlet Fever this dangerous malady of children and adolescents will also be much ameliorated by the application of (a) the Dick test and (b) immunisation with diluted toxin.

In China diphtheria and scarlet fever are mainly confined to northern regions where the latter often takes on most virulent forms causing a large number of fatalities among adults as well as persons of tender age. By simply following what has been accomplished in the west our medical profession can both enhance their reputation and save numerous lives.

Although deaths from Rabies are seldom reported, there is reason to believe that they occur quite frequently in most parts of China, particularly where dogs are loose and uncared for. And yet, how easy it is to prevent the malady if taken early in hand with almost 100 per cent success. The use of Semple's carbolised dead virus makes treatment accessible to both man and animals.

C. The venereal group is widely disseminated in China, but up to now little or nothing has been done towards its control. In a paper read two years ago in Peking, I proposed that existing hospitals including Mission ones should undertake the teaching of preventive measures and early treatment of V. D. whenever required.

The large number of out-patients, male and female, who daily attend both public dispensaries and private consulting rooms in China for the after-effects of a venereal bout is notorious. And yet quite a number of my audience in 1926 shook their heads as if my proposals were too advanced, and might tend to increase sexual immorality. However, the last few years have shown how even such ingrained things as venereal infections, especially syphilis, are rapidly disappearing from Europe and America. In fact during my recent sojourn in Europe (1927) the doctors of the skin and venereal departments complained of the scarcity of primary sores for the teaching of their students. This success has often been achieved without forcible or open registration of patients, but by more educational propaganda and the provision of suitable stations for early and late treatment. In China our leading newspapers still derive a great bulk of their income from quacks and other unscrupulous vendors of patent medicines dealing in this human frailty.

Leprosy is most prevalent in the provinces south of the Yangtsekiang. It is no exaggeration to say that Chinese lepers number between one and one-and-half million, but institutions for their reception and treatment are still few and far between. Up to recently this work of rescue has been supervised by mission bodies in Kwangtung, Fukien, Chekiang and Hupeh, but lately the Chinese Mission for Lepers has been formed with head quarters at Shanghai. But such a vast task as the control of leprosy should be fully supported by public funds and not by private subscriptions. For then the work of segregation, treatment and suitable occupation for the afflicted could be undertaken with efficiency and continuity.

D. The last group deals mainly with that most virile enemy of man, Influenza, whose machinations even the most up-to-date scientific resources of America and Great Britain have not been able to defeat. We all remember the wide-spread pandemic of 1918 with its heavy toll of deaths from pneumonia. Now another though less killing pandemic wave is apparently spreading over the American continent and many parts of Europe. So far as one can see this infection must have been conveyed *en masse* by crowds of carriers as distinguished from plague and cholera where such human carriers are few and far between. Strange to say insular China escaped lightly in 1918, while this year there is still little evidence of its invasion.

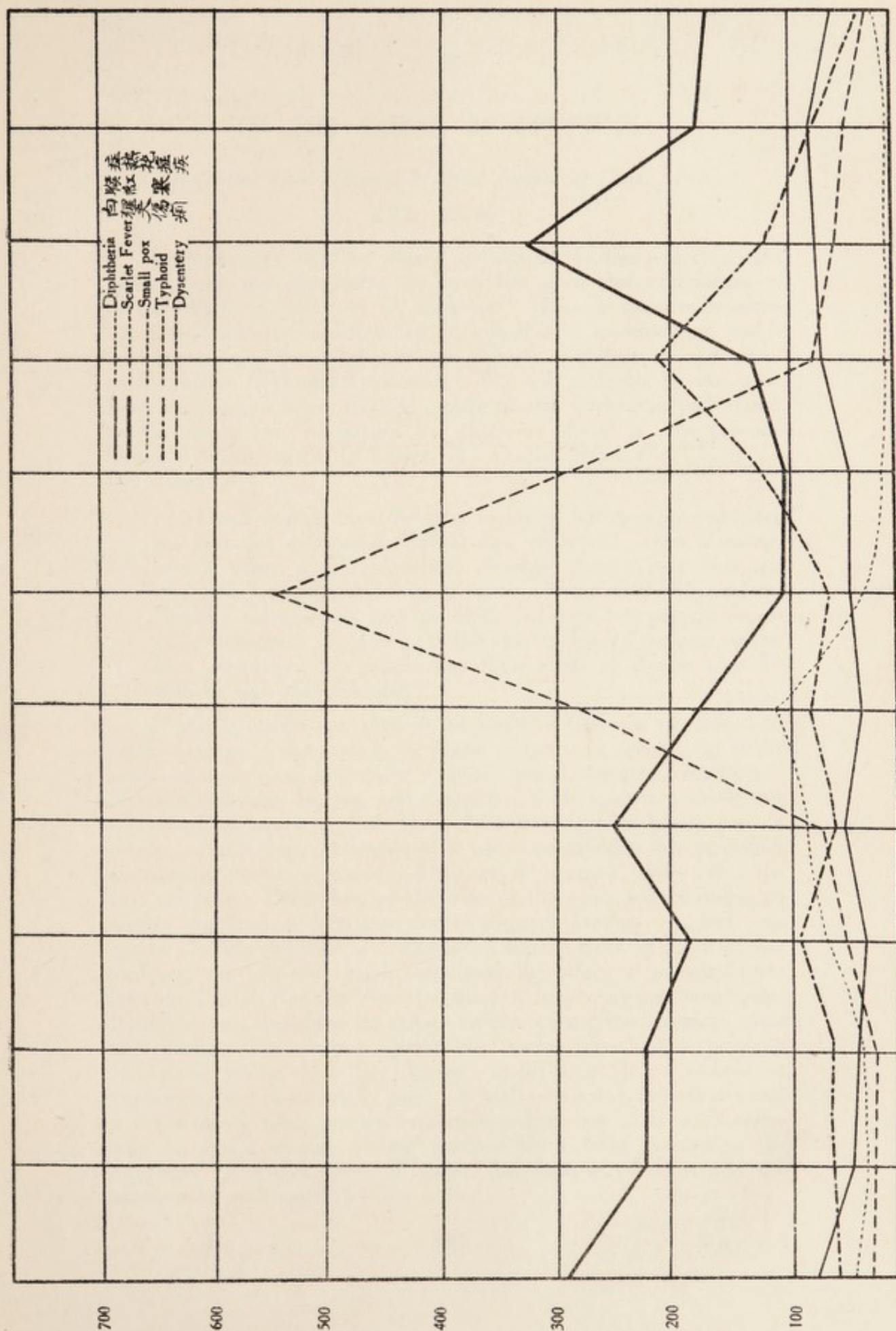
Conclusions. In this short review of health needs in this country *vis a vis* Prevention of Infectious Diseases, I have attempted to suggest a skeleton plan whereby our active Nationalist Government may improve upon the *laissez faire* methods of the past. It is said that this is an age of democracy and that the world should be made safe for democracy. The great War Prime Minister of England Mr. Lloyd George, once declared that they (the English people) could not expect to have an A 1 country with a C 3 population. Well, in regard to China, it is extra-

ordinary how she has managed to exist for thousands of years under almost C 3 health conditions. Perhaps in the past the struggle for existence was not so keen as at the present day, and her inhabitants by frugal living had succeeded in tiding over numerous crises in the form of famines, plagues and internecine wars. But how much better it would have been for all if they had had a better understanding of the innumerable benefits conferred by medical discoveries. But this day can only dawn if our educated and thinking classes will give up once for all the prevalent idea of ancient Chinese medicine being in many respects superior to western medicine. How can it be? For over two thousand years our system has remained stationary, and it is well known that anything that stagnates dies in the end. Medicine is no exception, and if in ordinary life we have to give up the wheel-barrow for the motor-car, surely the welfare of our body needs the best that science can offer.

Hence I would plead with fellow practitioners in China to devote some attention to the preventive aspects of medicine and not confine their attention to the curative side, however profitable this may be. Above all, those in charge of public institutions should utilise all the best resources in men and material at hand. In post-war Europe there is a controversy as to the usefulness or permanence of dictatorships. While we are still fresh in this respect, it may be worth while to choose between *autocratic democracy* and *democratic autocracy* in the governance of our medical policy.

WU LIEN-TEH.

GRAPH OF SOME EPIDEMIC DISEASES IN HARBIN RAILWAY AREA, 1926-1929.



ON THE CAUSES OF EPIDEMICS.

(Reprinted from *National Medical Journal of China*, 1930,
XVI, 395-401.)

Little apology need be offered for introducing the subject of this paper, seeing that speculation has been rife since time immemorial as to the reason for visitations of epidemics. Though intensive research has been undertaken in unravelling the mysteries of epidemiology, and it must be conceded that much has been revealed, yet there are apparently no answers to fundamental questions. We will elaborate on this point later, but suffice it to say that the present popular knowledge with regard to this subject may be gauged by what was offered in *The Literary Digest*,¹ where, under the caption of "Disease From The Clouds" it was stated :—

Death raining from the skies as fire or brimstone or pestilence has been for centuries a familiar idea of fiction. Now it seems, says a writer in *The American Weekly* (New York), that this may be a sober scientific fact, at least when the death is for plants. Possibly animals, too, may die thus, and even men are not necessarily immune. A young British bacteriologist, trapping germs from aeroplanes, has proved that these seeds of disease exist by millions high above the earth.

If this is really true, then in the midst of life, we are indeed in death. Again, if the average intelligent person were asked what is the cause of epidemics, he would probably say "insanitary conditions." As an afterthought he may add "microbes". It is even possible that some medical men may think along these lines without having time to ponder. Nor is this to be wondered at when one considers how epidemics are taken as matters of course. They are, so to speak, always with us, like the poor. Depending on the time of the year, and according to season, one form of infectious disease succeeds another. In fact, one speaks of these diseases as "seasonal", and in order to illustrate this tendency, the following graph taken from the infectious disease figures from the Harbin Railway Area for the past four years has been made. It will be seen that there are certain months when certain diseases attain high peaks. For instance, diphtheria reaches the highest point in November, scarlet fever in October, smallpox in June, typhoid in September, and dysentery in July. It has to be noted that there is not a single month when we are entirely free from any of these diseases, only in certain seasons we are troubled by a large increase in the incidence. It is understood, of course, that these curves show only the averages for each month for four years.

Before entering into the description of ancient and modern efforts in the study of the causes of epidemics, it must be stated here that nothing original will be offered in this paper which can only be considered as a digest of some contributions and theories towards the solution of this puzzling but highly interesting problem.

The earliest and most universal theory was that epidemics and especially pandemics were the exhibitions of righteous anger by an offended deity. This *deistic theory* may also be said to be the most persistent.

C. A. Gill² states that the medical philosophers of ancient Greece postulated that three factors were involved in the causation of epidemics, two of which—the *crasis* or temperament and habits of life (including diet and occupation)—were peculiar to the individual, whilst the third—the atmospheric status or *katastasis*—was an extra-corporeal factor affecting the community. It was along these lines of thought that the *miasmatic theory* was evolved, a theory which held the field for nearly 2000 years.

Hippocrates developed this theory, but he included a divine element into it. Since his time many modifications were made, notably "the epidemic constitutions" of Sydenham. The exact definition is lacking³. It can only be stated that it was a vague something over and above the more obvious causes of disease, the presence of which was necessary to bring about the epidemic.

With the advent of Pasteur, and the researches of Koch in bacteriology, the *germ theory* was evolved. Medical opinion became seized with the view that the discovery of the specific cause of disease had *ipso facto* provided the key to the solution of the problem of epidemic causation. Each epidemic disease was rightly regarded as distinctive, and had to be considered separately in an epidemiological sense. It was also tempting to account for the genesis of epidemics by some qualitative change in the specific parasite. Others have advanced the view that epidemic explosions are dependent upon the association of an ultra-visible virus with the germs hitherto regarded as the specific cause.

Then certain authorities espoused the *biological theory* of epidemicity. Their hypothesis is that epidemics may be the result of "a loss of equilibrium between the degree of immunity and the amount of infection."⁴ W. W. C. Topley,⁵ working on entirely new lines, contributed valuable knowledge towards the solution of epidemiological problems by experimental methods. He kept large numbers of mice in herds infected them with mouse typhoid and other diseases and observed the effects for long periods of time. In this way, the direct action and reaction between the causative parasite and the host could be watched without the interference of extraneous influences. By infecting the mice with pasteurellosis, observations were made on the effect of adding normal animals to an infected population. It had previously been shown that if an epidemic is started in a mouse community it spreads through it and then dies away, leaving a certain number of survivors, and that if at this

stage a number of normal animals are added to the community the epidemic blazes up again and involves not only the fresh mice but also the survivors of the first outbreak. If fresh animals are added at various intervals of a few days, the epidemic could be kept up for years. The presumption is that in the decline of an epidemic some sort of balance is reached between the parasites and the hosts such that the parasites can do no further harm unless they can get into some fresh non-immune individuals who are introduced by immigration or by birth. S. F. Dudley,⁶ as the result of an investigation on a diphtheria epidemic, concluded that all the peculiarities exhibited by epidemics may ultimately become explicable in terms of "a constantly changing relation between man and his parasites, and the effort of both to adapt themselves to each other and to attain a balance." The same authority in an exhaustive paper⁷ on "Human adaptation to the Parasitic Environment" came to the conclusion that "to describe adequately the phenomena of herd pathology, parasitic adaptation to the human environment is no less important than its antithesis, human adaptation to the parasitic environment."

Other authorities, while fully aware of these aspects, tend to emphasize the extraneous influences such as meteorological conditions which may have an effect on the causative parasites or their secondary hosts. For instance, Sir Leonard Rogers⁸ claims that climate has a great effect on the incidence of small-pox, plague and cholera, and, as the result of his observations and studies in India he was able to forecast these epidemics. The incidence of smallpox was high in certain states, such as the Punjab and the United Provinces, but very low in Bengal; he showed that it varied directly with the absolute humidity, and not with the temperature. A low absolute humidity was always followed by an epidemic. Plague epidemics were found to depend on the saturation deficiency, computed from the absolute humidity and the temperature; when this was low plague was low in the following year. In the case of cholera, if the absolute humidity was low the disease died out in the cold weather, and widespread cholera was impossible. The various outbreaks followed the rise in absolute humidity.

In order to link up the chain of circumstances which culminate in the flare up of an epidemic, C. A. Gill⁹ has elaborated the *quantum theory*. He propounds the hypothesis that in the genesis of an epidemic four factors are involved—namely, (1) a reservoir of infection, (2) a parasite, (3) an immunity factor, and (4) a transmission factor. The four factors named include almost all theories that have ever been propounded, and their co-operation will, as it were, explain every epidemic, but only in the sense that a soporific effect explains the properties of opium. He seems to consider the transmission factor the most important and perhaps the most inconstant. By concentrating on three diseases which show widely different modes of spread, namely malaria, influenza and plague, he endeavoured to put his theory to the test. In an exhaustive study on the problem of malaria in India, he states that "relatively high atmospheric humidity (of the order of 60 per cent. or over), in

association with relatively high temperature (of the order of 25°C), favour the transmission of infection, not only by their influence on the bionomics of the insect carrier, but also by their effect upon the specific parasite during its extracorporeal phase." By taking the humidity factor, the spleen rate factor, the economic factor, and the "epidemic potential" factor, he was able to make accurate forecasts of the malarial epidemics for many districts in the Punjab. In connection with influenza, he remarks "the most noteworthy feature of the present hypothesis is the predominant role assigned to meteorological conditions, or rather atmospheric states, in the natural history of epidemic influenza." With regard to plague, he stated "it is held that the climatal elements of temperature and humidity, by reason of their influence upon the transmission of infection, are capable of causing a great and sudden increase of the infection quantum and corresponding oscillation of the immunity quantum, and that an epidemic is the result of a sudden and great increase of the infection quantum, at a time when the immunity quantum is absolutely and relatively low. The climatal elements are, however, not merely concerned in determining violent fluctuations of the infection quantum and the immunity quantum; indeed, the facts elucidated during the course of this study suggest that the great seasonal fluctuations of the climate also play a significant part in the epidemiology of plague by reason of their influence upon the mammalian host, the insect-carrier, and the specific parasite."

Having reviewed briefly the various theories, we are now in a better position to consider what after all is the real cause of epidemics. It is true that since the discovery of the "carrier" of many infectious diseases, we are able to explain how a group of persons may be infected by contact without having to resort to mystical references or high mathematical calculations. We can now conceive how a cook who is a typhoid carrier can infect those persons who partake of his cooking. We can also understand how a cholera infected water-supply to a town will cause an epidemic of this disease among the population. But there are still many great epidemiological questions about which we really know little or nothing. What happens when an epidemic slowly emerges, gathers increasing momentum, culminates, and then falls down to die away back to the level it starts from? What are the respective shares of the microbic virulence and host resistance in this cycle whose regularity and definite characterisation gave it a personality before parasites were thought of? Is the decline of an epidemic due to the falling off of virulence or to the exhaustion of material susceptible under conditions of invasion? Are the hosts which survive at the end alive because they are by nature more than ordinarily resistant, or have they escaped by chance? Coming to more concrete points, why did bubonic plague cease to be endemic in England since 1666? And as for answers to the riddle of pandemic manifestations, we are still more at sea. Why did pandemic plague sweep over Europe, resulting in the "black death"? We know almost nothing about epidemic influenza, and have not a notion why

there was a dreadful pestilence in 1918. Is the answer to be sought by going back to nature? Might it not be nature's cruel method of adjustment by killing in order to keep down the population of the earth? Following this line of thought, the sequence of events, as given by Elton,¹⁰ is most instructive.

Every eleven years solar activity is at a maximum and causes the average temperature of the earth to go up 0.6 degree. The extra heat, in turn, produces an increase in the annular rings of the giant pines of California. More plant life means more food for many animals, including the varying hare of North America, which, as a result, increases its fertility from 5 to 6, to 8 to 10, young per litter. The resulting increase in numbers now places the hare beyond the control of its natural enemies or checks, the fox and lynx. These animals, since they are slower breeders than their prey, cannot multiply fast enough to eat up all the surplus hares. Once out of control the hares multiply more and more rapidly until the increase is terminated by an epidemic of disease which wipes out all but a few of the more resistant animals, and another eleven year cycle commences.

Thus a cosmic cause, the sun, acts, through the weather and food-supply, on the environment of an animal and allows it to multiply far beyond the control of its normal biological checks. An increase in infection pressure or some other alteration in the host-parasite relationship, which is thus produced, in turn stimulates a usually harmless commensal to escape the control of its host, and become a malignant pathogen. The result is an extensive epidemic which restores the balance of numbers, of both host and parasite, to where they were eleven year previously.

It seems reasonable, therefore, to assume that epidemics have a biological basis, and that they are the evidence of the unscrutable course of nature. If this view is acceptable, then it is no wonder that the fundamental cause of epidemics is unknown, and is likely to be unknown.

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IS TUBERCULOSIS CURABLE?

Remarks on some recently visited European clinics for tuberculosis, with a few case reports.

It has been the writer's privilege to have worked for over 2 years under F. Cevey of Sanatorium Sylvana, and Galli-Valerio, professor of bacteriology and hygiene of Lausanne University, under Schubert and Fleischner of Neumann's tuberculous clinic at Wilheminen Spital Vienna, and Gautier of Hospital Cochin in Paris, and en passant to have visited other chest hospitals elsewhere.

Tuberculosis as we all know is one of the most prevalent causes of death among young people, being responsible for more than half the deaths occurring between the ages of 15 and 40¹. Saville estimates the death-rate in London alone in 1910 was 114 per 100,000: while the total number of deaths from all causes registered in our office at Newchwang (Yinkou) for the month of September 1930 totalled 64, out of which 29 died of pulmonary tuberculosis, thus T. B. alone accounted for 45% or about $\frac{1}{2}$ of the deaths. Further the age incidence shows 16 died between the ages of 14 to 40, and 13 between 40 to 80. When we consider for every death from T. B., there are 9 active living cases², the economic loss must have been enormous.

In 1882 when Koch demonstrated the tubercle bacillus, there was a pious hope that man could stamp out this disease within a reasonable period, but it has, up to the present time, proved to be a herculean task. In spite of all elaborate theories, without our knowing how or why, in the majority of cases Koch's bacillus succeeds in stealthily invading the organism and continues to defy all means of destruction. If we cannot prevent it entirely, the next best thing left for us to do, is to cure it.

BELFAST.

At the railway station at Belfast, on stepping upon the platform the first curious thing that met our glimpse was a notice forbidding spitting on the floor, an act which makes the offender liable to a fine of £2. It would have been more like a Utopian dream if such a public health measure exists in this country.

Dr. Clarke kindly showed me round the Forster Green Hospital with its different huts built in the form of chalets connected with the main block. Here the open air and artificial pneumothorax methods are much practised, although Sanocrysin is employed in exudative cases.

VIENNA.

Vienna, the city of the blue Danube, is justly famed as the world's centre for medicine, as it offers here opportunity for medical

study that is unparalleled. It has been for centuries the home of such medical intellectual giants like Jaeger, Skoda etc. These founders of the Vienna school of medicine are now followed by men in whose keeping the best traditions of the past are held sacred. It is no wonder then that here, yearly medical men, both young and old, flock to review their knowledge and to learn the new methods.

At Wilheminen Spital the writer became attached to Prof. Neumann's clinic. The buildings are of the simplest construction consisting of wooden blocks, laid out in parallel rows with intervening wide spaces so as to admit of plenty of fresh air. The routine treatment consists of artificial pneumothorax, although tuberculin is also employed. This collapse therapy is employed in all cases whether early or late. At first we usually give two refills every week, later to space out at longer interval. Patients are screened every week.

Phrenectomy is seldom employed, except for cavity situated at the base of the lung. As the majority of cavity formation are found at the summit of the lung, so its use is seldom called into question. Thoracoplasty operation is avoided as much as possible as few can withstand the severe shock. Fleichner, the radiologist, always stresses the importance of sending up early cases for treatment as soon as Assman's focus is detected. With a little practice of the X-ray one can readily detect it in a patient by screening. This is an infiltrated area, the result of an exudative process, in an early phase of the disease, before breaking down to cavity formation.

For the year ending 1928, we have altogether done more than 2,000 cases of artificial pneumothorax without a single case of fatal accident, although 2 cases fainted immediately after the operation, but recovered on receiving the usual treatment. Thus one observes at Vienna first reliance is placed on artificial pneumothorax, and second on tuberculin therapy.

SWITZERLAND.

Leysen.

Leysen, 4000 ft. a.s.l., is a small picturesque village up the mountains. We are told that cured T.B. patients and their families form the majority of the inhabitants. Here the invigorating cold dry air, the absence of dust, the beautiful environs collectively form an ideal situation for a sanatorium. Dotted here and there on the sides of the mountains are many palatial sanatoriums which are more like hotels than hospitals.

Rollier's sunlight clinic for surgical tuberculosis is located here.

The chief physician of the Sanatorium Cantonal showed me round. He told me that the gold preparations gave him no satisfactory result, and his routine still consists of the open air treatment combined with artificial or even with oleo-thorax.

Lausanne.

The Sanatorium Sylvana is located at a small village with an elevation of only 1800 feet a.s.l., about 3 miles away from Lausanne. Thus we see as far as altitude is concerned, it has no pretention of a claim. It is a huge solid block of 5 stories, rectangular in shape, with the rooms laid out on all sides, the centre space is utilised for corridors, toilet-rooms, electric lift etc. One end of the patient's room opens into the centre of the building, (corridor), and the other portion opens out into the verandah where there is placed a long chair for the patient to lie out in the open air. The Solarium is situated at the top story. Here are fitted out all the paraphernalia of artificial sunlight producing apparatuses. Here natural sun-light is present in great abundance too. As Dr. Cevey does not believe much in sunlight treatment even for surgical tuberculosis this Solarium is allowed to go to ruin.

Here, Dr. F. Cevey, the chief physician, besides being tuberculous health officer of the city and private docent of tuberculosis of the university, has toiled upwards for more than 25 years to search out the various possible means that science can hold out to him, to restore back to health his tubercular patient—that had for years been a burden to himself and to others, disturbed by the pain and the incessant cough and the necessity to expectorate by day and by night, and in the silent watches of the night, never forgetting the pitiless disease that was slowly dragging him into the valley of the Shadow of Death. This doctor, a burly figure, towering over 6 feet, with a big long moustache, and long kept hair, though abrupt in manners at times is really a kind hearted soul. His name is treasured in grateful reverence by many of his patients to whom he has given their lives. Modest and unassuming this great savant commends a high reputation among phthisiologists of Europe. When Forlanini of Pisa, who invented artificial pneumothorax in 1892, published his results of treatment by this method in 1906, Cevey was the first physician from Europe to have visited him and to have introduced this method into his clinic.

ROUTINE TREATMENT AT SANATORIUM SYLVANA.

On admittance the patient is examined, screened and X-rayed and is put to bed. He is trained to take and record his own temperature every 2 hours by the axillary route kept for 10 minutes. Sputum is examined for T.B. and the amount in c.c. is measured daily. His weight is taken every week.

It is highly important for him to observe "la cure", which consists of having as much rest as possible, either lying on the chair outside or keep to his bed after breakfast up to 4 o'clock in the evening. After this hour he is allowed to receive visitors. The more advanced in treatment are obliged to go out promenading in the countryside consisting of 1—3 hours of walking exercise, except on the day of reaction when he must keep to his bed.

Food. Ordinary food is served except that a cup of milk is supplemented for at tea-time. No cod-liver oil is prescribed.

Hygienic measures are encouraged as much as possible in so far as adjuvants to specific treatment. Direct exposure of the bare chest to direct sun-light is forbidden, as this often produces a congestion in the already congested focus of disease, which readily brings on an attack of haemoptysis. If sunshine and sunlight alone can cure tuberculosis we would not have found the greater incidence and more rapid course in the tropics as compared to the temperate zone.

Drug as a routine is never prescribed, even the ordinary opiate cough mixture.

SPECIFIC TREATMENT.

a, Tuberculin.

b, Artificial Pneumothorax.

Tuberculin therapy, the routine line of treatment here, is considered by Cevey the anchor-sheet in his fight against tuberculosis. Artificial pneumothorax is supplemented whenever there is an indication for its use. Even in pyrexial cases we are able to start this treatment, unless the temperature is excessively high when we consider a preliminary collapse operation necessary to control the toxæmia. Sometimes we combine the two together, but often after a few months, we drop out the pneumothorax, as its prolonged use will often cause intra-pneumonal adhesion and later on the lung will fail to expand even if the intra-pleural pressure is released. It is with gratefulness, for his persevering efforts and the magnificent results obtained, that we salute here, the discovery of Forlanini, thanks to which, some patients before absolutely doomed, are now able to recover their health.

Sometimes though rarely when pneumothorax induction fails, is the aid of thoracoplasty operation called in. During the writer's association here of more than a year, he has witnessed very few cases that require this formidable operation. One case, he remembers, was performed by Prof. Roux, of Roux's incision for appendisectomy fame; though the operation was successful, the poor patient died a few hours later from shock.

Under control of temperature and weight, we start treatment with fractions of milligramme doses given twice a week, later on, spacing on to longer interval as bigger doses are reached. We do not believe in lingering with small doses but we try to push on to big doses without the provocation of violent reaction as fast as possible. We usually terminate treatment when he is able to withstand a maximum dose of 2 grammes of pure tuberculine without giving rise to any general reaction. Co-incidentally with this we usually find a corresponding improvement of all clinical symptoms, and the sputum, formally voluminous and T.B. positive, will usually become negligible in quantity and what is more remarkable to find it change into T.B. negative.

Tuberculin given with proper technique and precautions is without danger. It should be given by those who have had practical training in it. The writer himself has personally administered more than 3000

injections and has seen over 40,000 injections being given by others, without causing a single case of danger.

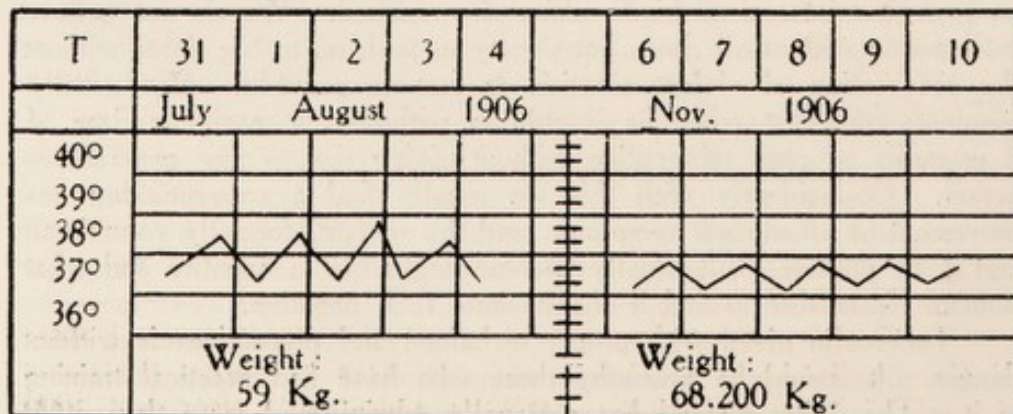
At the end of the treatment, the subject is re-examined and a second x-ray picture taken. The average period of treatment lasts about a year.

Lung cases form the majority among the patients of this clinic. They are found in all stages of the disease from the very early to the most advanced. While most of them are Swiss and French, there is a sprinkle of other European nationalities. Dr. Kuss of Paris, (inventor of Kuss's art. pneumothorax apparatus) whom the writer has met once, often refers his cases from Paris to Dr. Cevey for treatment.

The writer has followed the course of many patients from the start to the end of their treatment. During his ramblings in the city, he has casually made the acquaintance of 2 old patients of Cevey, who have completed the treatment, one, now a clerk, 5 years ago; and who told the writer that his own family doctor had given up hope before he came under Cevey's treatment; while another an old Swiss farmer who had completed the treatment some 10 years ago. Both to-day are leading active lives. Running over the old records of the patients of this clinic, which are too numerous to cite, I come across a unique case, which I reproduce below verbatim, except the French version is rendered into English. This case has also been published³.

DR. CEVEY'S CASE.

Lieutenant G. F. 34 years, licentiate of the Italian army, for tuberculosis of the left lung, with haemoptysis and fever, consulted me in summer 1906. He followed a combined treatment with serum and tuberculin, the fever fell rapidly, cough and expectoration ceased equally, the patient received a total of about 37 grammes of tuberculin, increased by 10 Kilos, and was cured completely. He was examined successively by 3 military medical commissions, who unanimously declared him cured, he was reinstated into active service and had since taken part in several campaigns, continued to be well, now 10 years.



THREE CASE REPORTS OF WRITER'S OWN
PATIENTS.

The writer has before him the history sheets of 40 cases treated in the East with tuberculin, in which 2 were supplemented with artificial pneumothorax. But owing to his change of residence elsewhere he was unable to complete their course of treatment. However he quotes below 3 cases which were among the most advanced in these series.

CASE I.

Dr. L., physician, was referred to me by a colleague for treatment on September 1929. History of pleurisy with effusion 3 years ago, occasional haemoptysis since then, loss of weight and energy, occasional cough. Examination, including x-ray showed upper third of left lung affection, sputum microscopically negative to T.B., but on inoculation into guinea-pig produced death from T. B., 5 weeks later. Temp. 37, 2 C., weight 8 stones 2 lbs.

Treatment with tuberculin was commenced. At latter part of Jan. 1930 he was immunised to 1 Grm tuberculin. His weight now was 8 st. 12 lbs. thus gaining 10 lbs. felt well, having no recurrent haemoptysis, T. normal.

CASE 2.

Mr. S. L. M. aged 25, came to consult me on June 1929.

History, complained of loss of weight and energy, night-sweat, incessant cough and expectoration. Employed formerly as a clerk in a foreign firm, treated for 3 months previously by his company's doctor (European) with no improvement and was discharged from service as an invalid.

Exam. showed a small focus at apex of right lung. Sputum amount spitted daily was 30 c.c. and only on repeated exam. was T. B. found. Temp. 37.5 C. weight 127 lbs. Tuberculin was immediately commenced.

Three months later, sputum became T. B. negative, expectoration and cough stopped entirely. Weight was increased by 6 lbs. Temp. became normal. Patient then returned to his previous doctor for a physical examination, who, with much surprise, pronounced him well. He was re-instated into the company's service. Although at work he still followed the treatment for 2 months longer.

CASE 3.

Mr. C. T. S. an office clerk, aged 34 came to me on September 1929. Complained of pain in the back, easily tired, evening temperature, night-sweat, loss of weight and cough. History of having haemoptysis and cough a few years back.

Exam. showed upper portion of left lung affection. Sputum T. B. positive, weight 108 lbs. temp. 37,5 C. Tuberculin was commenced. On Jan. 1930, 5 months later, he was able to receive 1,5 grm dosage. His temp. became normal, weight was increased by 7 lbs. cough night-sweat, expectoration all ceased and he felt well.

Principles of Tuberculin Treatment.

The formula $D = \frac{V}{R}$ (Disease = $\frac{\text{Virulence}}{\text{Resistance}}$) was used by

Prof. Galli-Valerio ⁴ to show the relation between the virulence of the microbe and the resistance of the infected organism. It is a prime necessity in prophylaxis as well as in treatment to suppress whenever possible, the numerator Virulence. On the other hand, the possibility remains of amplifying to such a degree the denominator Resistance, that the fraction ceases to have any further practicable value, the arrest or failure of the disease thus manifesting itself.

Failing to exercise any direct efficient action against the virulence, attempts should be made to intensify the resistance to the maximum.

Our aim in tuberculin treatment is to evolve the highest degree of relative immunity by the use of massive doses of antigen. Those who use small doses can never create a high titre of immunity, and small doses given according to Wright's method may exhaust the body cells without producing that excess of anti-bodies on which immunity depends.

What better method in experimental pathology than immunisation in its diverse forms, allows us to develop the defence so as not only to increase it tenfold, but even to make the organism sustain without injury doses of bacterial poisons a thousand times the fatal dose.

Tuberculin is a specific protein in that the slightest dilution gives rise to reaction in a tuberculous subject, which is not the case with milk.

THE VALUE OF TUBERCULIN THERAPY.

Insufficient practical experience does not justify the writer from expressing an opinion. But he feels it justifiable to quote the matured opinion of Cevey, who after an experience of over 25 years of tuberculin therapy, says, "without tuberculin it is not worth while in occupying oneself with treating tuberculosis. I have often repeated, it is not for the pleasure of setting up a record that I have arrived at this dose. Formerly, I have also tried treatment with feeble doses, if they have given me temporary amelioration, the result has never persisted." Continuing, he remarks, "Ce n'est que peu a peu, tremblant, je dois le dire, de ce qui, m'apparaissait alors d'une grande audace, que je me suis affranchi des idées recus pour ne me laisser guider que par les faits."

RESULTS OF TUBERCULIN THERAPY OBTAINED BY CEVEY.

The writer will now quote below Dr. Cevey's reports⁵ and opinion, in which is contained the reply to the question forming the title of this article.

"At the International Congress against Tuberculosis at Rome in 1912, we have presented a detailed report, in which we studied 182 cases treated with Koch's tuberculin from 1909-II.

25% of our patients belonged to 1st stage.

53.7% of our patients belonged to 2nd stage.

21.3% of our patients belonged to 3rd stage.

Summing up the results of all the cases treated, including those who received a few injections and were too quickly satisfied, and so discontinued the injections too soon, the proportion of the cured and the very much ameliorated, verified again at the end of a period of 3 years was as follows:—

Cured	68.5%
Ameliorated	12.5%

Thus without costly removal to the mountains, 81% of our patients have benefited from the immunisation, a result all the more remarkable in that it is not dependent upon the usual annual reports of the sanatoria, but that it was confirmed after an interval of three years.

To-day, the infection can be conquered, the patient cured, and we have been able to authorise young girls, formerly treated by us, to get married, to suckle their infants; during a number of years they and their families continue to be in good health. In citing some examples of old patients treated more than 10, 12, and even 15 years ago, to-day still enjoying perfect health, we believe we have the right, gentlemen, to affirm 'qu'on peut réellement guerir les tuberculeux' (that one can really cure the consumptives.)

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A REPORT ON THE BUBONIC PLAGUE EPIDEMIC IN THE TUNGLIAO AREA, 1929.

GENERAL REMARKS.

There seems to be sufficient evidence to justify the contention that bubonic plague is endemic in the Tungliao area. This area is exceedingly extensive, and may be regarded as the contiguous territories between Inner Mongolia on the one hand and South Manchuria on the other. The land here is very fertile and is attracting many immigrants from the south. How this territory is infected may be explained by the introduction of infected rats and rat-fleas from Mongolia. It may be permissible to assume that infected rats travel from place to place, and thus invade new districts, or that the rat-fleas are carried by human travellers either on their persons or in their luggage. The rats and fleas may also be conveyed by cargo in transshipment. By these means we may account for the successive infection of localities often situated quite far apart. What part the wild rodents play in the spread of plague is still unknown, because no naturally infected animals have been discovered. But the rat and their fleas as well as human fleas have been successfully convicted.

The invasion may be said to be of recent origin, for during the past five years suspiciously sudden deaths had occurred in villages at short distances north of Tungliao. They were always reported in the autumn from villages away from the railway, so that no facilities were afforded for a scientific diagnosis. In 1927, some Japanese doctors came across a probable Pneumonic case, and on examination post mortem they saw numerous bi-polar stained bacilli from lung smears. It was not until September, 1928, when the railway town of Chienchiatien was severely infected that an opportunity was given to the staff of the Plague Prevention Service to establish the cause of the deaths as bubonic plague by bacteriological tests. This particular outbreak caused some 600 deaths, and involved several railway towns, such as Tungliao, Chienchiatien, Pamiencheng, Sanlin, etc.

As might be expected, plague again made its appearance in the autumn of 1929. This time, the first known spot to be infected was Ouli, a railway station and village on the Tungliao—Chengchiatung section. A limited outbreak of 7 cases soon came to an end towards the latter part of July, but during August and September, some 22 localities were successively infected, resulting in more than 400 cases. These localities in question were in fact villages situated at short distances from the railway, somewhat isolated and in sparsely populated districts. They were to be found all along the Tungliao-Chengchiatung section and the Taonan-Chengchiatung section. Usually only a few deaths occurred in each village, which henceforth became clear.

A REPORT ON THE BUBONIC PLAGUE EPIDEMIC IN THE 157 TUNGLIAO AREA, 1929.

In a few instances, however, recurrence of infection took place, either in new houses or in recently infected homes.

It is impossible to say how many Mongols and how many Chinese were involved, but it would be safe to state that more Chinese cases were recorded than Mongols who were often hostile to investigation. One significant point may be mentioned and that is the first case of bubonic plague occurred in a Mongolian boy. His death occurred on the 11th July. The last case was reported on the 20th October in the Nungan District. How the epidemic came to an end may be due to the decline of the flea rate as the cold weather approached. Up to that time the railway towns were still free from infection. Also no tendency for a change from the bubonic to the pneumonic type was noticed. Before tabulating the list of infected villages, it must be made clear that in the prosecution of rural antiplague work, quite different methods have to be adopted from those suitable for railway towns. The poor means of communication, the unsettled condition of the country and the greater hostility of the population have all to be taken into consideration.

LIST OF INFECTED LOCALITIES.

Locality.	No. of cases.	Dates of	
		First cases	Last cases.
1. Ouli	12	11/7	— 26/9
2. Wuchiatze	27	22/7	— 22/8
3. Kaitung District	30	6/8	— 10/10
4. Small Sanchiatze	11	9/8	— 25/8
5. Haupetala	?		
6. East Payintala	13	17/8	— 31/8
7. Oupingtai	23		
8. Sanchiatze	11	21/8	— 27/8
9. Nungan District	103	24/8	— 20/10
10. Sichiagantulica	27	25/8	— 21/9
11. West Payintala	15	26/8	— 28/8
12. Wumungton	9	31/8	— 5/9
13. Nimutai	45	3/9	— 16/10
14. Sipeiyintze	?		
15. Ankwon Hsien	8	15/9	— 3/10
16. Chiangyu District	17	16/9	— 24/9
17. Wutaowan	?		
18. Taotehyintze	50	September	
19. Hulahuwupao	3	20th September	
20. West Nimutai	8	21st September	
21. Sanlin District	6	23/9	— 29/9
22. North Peiyintala	10	25th September	

SHORT ACCOUNTS OF EVENTS IN EACH LOCALITY.

1. *Ouli*. This was the first place known to be infected. It is a station and small village, 15 miles west of the Chengchiatung Junction of the Ssutao Railway. There were 19 families with a population of about 75 persons. Five of the families were Mongols, and the rest Chinese. The first case was that of a Mongol boy, aet. 15 who died on July 11, 1929, with involvement of cervical buboes. His death was followed by that of his cousin, aet. 24, who lived in the same house and succumbed on July 16, presumably of septicaemic plague. The third son of the family, aet. 9, was also attacked with cervical and axillary buboes. The diagnosis of plague was bacteriologically confirmed in this case which resulted in recovery. The remaining three members of the Mongol family escaped infection.

Four other cases occurred in 3 neighbouring families, namely 2 men, 1 woman and 1 child, all Chinese.

Man	aet. 30	Axillary & inguinal buboes.	Recovered.
Man	„ 50	Suspect septicaemic.	Recovered.
Woman	„ 40	Axillary bubo.	Died.
Her grand-daughter	„ 4	Cervical & inguinal buboes.	Died.

The first man, the woman and her granddaughter ran away to some neighbouring villages, but were traced and brought back by the police. The Mongol family also ran away to a nearby Mongolian village with the third son who was then still ill, but they were brought back.

After the 20th July, no fresh cases were discovered. On 26th September, however, 5 cases were reported from a nearby village.

How *Ouli* became infected with plague remains a matter of surmise. Though rats abound in the insanitary houses, no dead ones were noted, thus a regular epizootic may be ruled out of court. Nor can any definite blame be attached to the local wild rodents, though the station-master, a man well acquainted with the Mongols and knowing their fondness of wild rodents as food, maintains that the first victim might have caught sisels or jumping hares while cow-herding in the fields. Moreover, no other clue exists for the presence a wild rodent infection so near to the railway line. Coming to the question of the introduction of the disease by human agency, we have to state that the first affected family denied incursion or excursion to and from the Mongolian villages. There is no doubt however, they had good friends there with whom they took refuge when running away from *Ouli*. In all probability, therefore, the disease was imported by human agency—infection being conveyed through rat-fleas or human fleas—from the endemic area evidently existing farther inland.

2. *Wuchiatze*. Early in August reports reached our medical officers regarding the appearance of plague in this place, an isolated village, 16 miles north of Tungliao, and inhabited by ten families, (population about 40). When our doctor visited the locality, he learnt that 9 deaths occurred between 22nd—26th July. Since all victims were already buried, and no close relatives were left, no adequate clinical history could be obtained. On August 8, ten more deaths were reported. On visiting the place again, our medical officer found three patients suffering from bubonic plague. Five more cases were reported between 21st—22nd August.

This village is noteworthy for the reason that more than half of the population succumbed to infection. Further, it was alleged that as early as the beginning of July, a young girl had already died of plague. Also the population confessed to the occurrence of death among rats, though few were seen by us. We did come across three dead rats, one of which was brought by a cat, and another by a dog to the house. But all were too decomposed to be investigated bacteriologically. Fleas were found to be abundant in the huts. Rat holes were plentiful, but as noted, few rats were to be found. Investigation of fleas on healthy human beings showed the presence of about half human (*Pulex Irritans*) and half rat fleas (*X. Cheopis*). Only human fleas were found on several dogs, no dog fleas (*Ctenocephalus Canis*) were seen.

3. *Kaitung District*. In chronological order, the next spot to be infected was a collection of 5 villages situated 4 or 5 miles towards the east of Kaitung on the Chengchiatung-Taonan section. The first of these villages was invaded on the 6th August, but it was not till the 20th September that we learnt of the outbreak when only one village (Yikoshu) was found to harbour three cases. After the instigation of antiplague measures, only one case was encountered on the 10th October.
4. *Small Sanchiatze*. This is a small village, situated about 17 miles north of Tungliao. The population consisted of about 50 persons, half Mongols and half Chinese. Altogether 11 cases of plague were reported between 9th and 25th August.
5. *Haupetala*. Our medical officer was informed of suspicious deaths in this Mongolian village, about 3 miles south-west of Ouli. On account of the hostile attitude of the inhabitants who resisted investigation by the showing of arms, it was not possible to verify this report.
6. *East Payintala*. A small village with a population of 150, situated about 10 miles north of Chien Chiatien. Three cases were reported to have occurred between the 17th—26th August. Ten more cases were reported on the 31st August after which the village remained clear.

7. *Oupingtai*. This is a Mongolian village, 23 miles north of Chien-chiatien. Twenty-three cases were said to have occurred there in August. Owing to the distance and the swollen Liao river, it was not possible at first to ascertain the exact number.
8. *Sanchiatze*. A village with a population of about 200, situated $17\frac{1}{2}$ miles north of Tungliao. This is a closely built village. Ten cases were found between 21st—24th August. All remained quiet until the 27th when one more case appeared.
9. *Nungan District*. This locality is quite far from Tungliao. In fact it is situated in the south-west of Kirin Province, about 40 miles north of Changchun. On August 20, we received a wire from the Kirin Governor asking us to send assistance to Nungan because the resident magistrate reported over 100 deaths in two neighbouring Mongolian villages, both in the Chienchi district. When our medical officer arrived, he found that two villages, Yan Shu Lin and Shuan Lung San were particularly affected. The first cases were discovered on about the 24th August. These villages were very close to the Kirin Fengtien border, and also not far from Mongolian territory. They were in fact quite far, about 30 miles, from Nungan itself. But the magistrate was a keen man and had experience of plague prevention work last year. With our co-operation, he established an Antiplague Bureau which did good work throughout the two months of stress. He also ordered 10,000 doses of antiplague vaccine from our laboratory for whole-sale inoculation of the population. Altogether 103 cases were recorded, and the last one was reported on the 20th October.
10. *Sichiagantulica*. A Mongol village, about 20 miles north of Chien-chiatien. Eight cases were reported between 25th-27th, August. Nineteen more cases occurred between the 10th-21st, September. After that, no further cases appeared. Our medical officer made more than one trip to this place.
11. *West Payintala*. This village is situated about 11 miles west of Tungliao. Fifteen cases were reported between 26th-28th August.
12. *Wumungton*. This is a small village about $\frac{1}{2}$ mile east of Yamen-Tai station on the Chengchiatung—Taonan section. Nine cases occurred between 31st August—5th September. Owing to its proximity to the railway, train traffic was stopped to and from Yamen Tai station for a short period.
13. *Nimutai*. This place caused much anxiety, because it is close to Chienchiatien station, and because of the frequent recurrence of cases. The village is small, and situated about 5 miles north of Chienchiatien. The centre of infection was in a distillery which employed about 100 men. In the controller's compound where grain was stored, rats were seen to be wandering about, failing to find their holes. Many dead rats were also seen. This was confirmed by our staff. As a result of the epidemic among the employees of

the distillery, only about 30 men were left on the premises, some having succumbed and others escaped. The survivors finally closed the doors against the antiplague doctors, and would only speak to them from the walls. Antiplague work was carried on, however, in some workmen's houses at the back of the distillery where cases recurred time and again. This was because survivors used to return to the homes, only to succumb, thus starting another small group of cases. It must be stated that this happened even after sulphur fumigation of the infected houses had been carried out.

The series of recurrences may be put down in tabular form:—

Series.	No. of cases.	Date.
1	3	Between 3/9 —10/9
2	22	„ 4/9 —20/9
3	16	„ 28/9 — 7/10
4	4	„ 11/10—16/10
	45	

Because of Nimutai's proximity to the station Chienchiatien, railway traffic was stopped to and from the station. Sanitary inspectors were on duty in the trains running between Tungliao and Ssupingai. It was partly due to this inconvenience imposed on the local population that our staff had to go through an unpleasant experience on the night of the 8th October in Chienchiatien. It appeared that half a dozen armed men in plain clothes tried to force their way into the Antiplague Bureau at midnight. Failing in this, they fired their rifles into the rooms through the windows. Luckily by telephoning to the station nearby, our staff were saved by the timely help of the railway guards. We are very thankful to say that no personal injury or loss of life was inflicted upon us.

14. *Sipeiyintze*. This is a small village, about 8 miles south-west of Chienchiatien. The actual number of cases was not ascertained.
15. *Ankwon Hsien*. This place is about 70 miles south-east of Taonan. Altogether eight cases occurred between the 15th September and 3rd October.
16. *Chiangyu District*. Chiangyu is a town situated about 25 miles south-west of Kaitung station. Plague visited this place last year. On receiving news of the appearance of plague on the 16th September, a medical officer was sent there, and he found that 12 deaths occurred in a village, Chingmaochang, about 2½ miles east of Chiangyu during the previous weeks. At the time of investigation, there was only one suspect under observation. On the 24th September, in another nearby village, four deaths were reported. The magistrate in Chiangyu was a very keen man and gave all facilities to our staff.

17. *Wutaowan*. A village situated about 3 miles north-east of Chien-chiatien. The exact number of cases was not ascertained.
18. *Taotchyintze*. A village situated about 5 miles west of Tungliao. Fifty cases were reported from here during September.
19. *Hulahauwupao*. A village between Nimutai and West Nimutai. Three cases were reported on the 20th September.
20. *West Nimutai*. This is very near to Nimutai. Eight cases were reported on the 21st September.
21. *Sanlin District*. Sanlin is a station on the Chengchiatun-Taonan section. Plague visited this district last year. Between 23rd and 29th September, six cases were reported from two villages situated about 3 miles from the station.
22. *North Peiyintala*. This is also close to Nimutai. Ten cases were reported on the 25th September.

STATISTICAL TABLES.

(a) Sex Incidence.

		1929.		1928.	
		<i>Ssutao Railway.</i>		<i>Nungan District.</i>	
		<i>Number.</i>	<i>Per cent.</i>	<i>Number.</i>	<i>Per cent.</i>
Male	.....	136	56.43	57	55.34
Female	....	105	43.57	46	44.66
		241	100.00	103	100.00

(b) Age Incidence.

		1929.		1928.	
		<i>Ssutao Railway.</i>		<i>Nungan District.</i>	
<i>Age.</i>		<i>Number.</i>	<i>Per cent.</i>	<i>Number.</i>	<i>Per cent.</i>
0-10	.....	24	0.83	9	8.74
11-20	.....	47	19.50	21	20.39
21-30	.....	43	17.84	22	21.36
31-40	.....	45	18.67	10	9.71
41-50	.....	30	12.45	14	13.59
51-60	.....	20	8.30	10	9.71
61-70	.....	10	4.15	14	13.59
70-above	...	2	0.83	3	2.91
Unknown	...	20	8.30	0	0.00
		241	100.00	103	100.00

(c) *Mortality.* (Ssutao Railway).

	<i>Number.</i>	<i>Per cent.</i>
Deaths	213	88.38
Recoveries	9	3.73
Unknown	19	7.89
	<hr/> 241	<hr/> 100.00

(d) *Situation of Buboes.*

	<i>Ssutao Railway 1929.</i>		<i>Tungliao 1928.</i>
	<i>Number.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Cervical	19	7.88	7.9
Axillary	32	13.28	15.9
Inguinal and Femoral	47	19.50	52.7
Cubital	5	2.08	1.0
No buboes	47	19.50	
Unknown	91	37.76	
	<hr/> 241	<hr/> 100.00	

According to the table of sex incidence, there is not much difference between the males and females both in the Nungan District and the villages along the two branches of the Ssutao Railway, the proportion being in the neighbourhood of 55-56 to 44-43 per cent. Last year's figures in the Tungliao area showed a greater disproportion, being 72 to 27 per cent. This discrepancy may be explained by the suggestive fact that this year only small villages were affected. Now these villages were inhabited by farmers who had families, and this state of affairs undoubtedly tended to reduce the preponderance of males commonly to be found in larger communities. In other words, the affected localities contained almost as many females as males. This was probably not the case last year when relatively large railway towns were infected.

The age incidence correlates pretty well with that of last year. There is also a lower incidence among the children than should be expected from their numbers. Similar experience has been encountered in India. A suggestive diminution in the incidence of plague is noted among the aged, though in the Nungan District the percentage among those between 60-70 years of age was 13.59.

With regard to the mortality rate, we have to state that the severity of the disease is more apparent than real. There is no doubt that many recovering cases were missed, including a number of slight cases (*pestis minor*), because information could only be obtained concerning serious or fatal cases. Last year the mortality was also high (14 recorded

recoveries among some 600 deaths) for the same reasons. But apart from this, there seemed to be a real high mortality explainable perhaps by the invasion of a new territory by a relatively new disease which met with little or no immunity among the population. This brings us to the consideration of the type of disease which may be stated to be very severe in general. Those patients who were seen by our medical officers were often seriously ill, and conformed to the classical description of plague infection. It may not be worth while to give details of the clinical pictures of the various types of the disease, as we cannot add to those already published in last year's report on the Tungliao epidemic. Suffice it to say that in correlation with last year's figures, the inguinal and femoral groups of buboes were mostly involved, the axillary ones came next and the cervical came third. There is however, a number of patients who showed no buboes whatever, amounting to quite a high percentage of 19.5. These must be regarded as mainly septicaemic cases. We have, therefore, a presumptive evidence of the large number of septicaemic patients, a contention which is in support of the alleged severity of the disease. No pneumonic cases were found among the records.

ANTIPLAGUE MEASURES ADOPTED.

The North Manchurian Plague Prevention Service located in Harbin was in charge of the whole campaign. Close co-operation with the Mukden and local authorities, as well as the Ssutao Railway was fortunately obtained from the first. The Service supplied many doctors, equipment, and vaccine (made in the Service laboratory), while the railway also detailed medical personnel for plague duty. Our Antiplague Bureau in Chienchiatien was made the headquarters for activities. From here excursions were made to the surrounding villages on horseback. We also had at our disposal a railway car which was drawn to points of the railway nearest to the infected localities. When the affected villages were too far from Chienchiatien, our medical officers made journeys by rail and motor car to be stationed temporarily on the spot. Enumeration may be made of the measures they endeavoured to enforce:—

- A. The sick and the contacts have to be isolated in their own homes, a watch being kept by the police to prevent intercourse with the neighbours.
- B. The houses are disinfected with sulphur or are burnt under certain circumstances.
- C. Supervision of burial of the dead.
- D. Wholesale inoculation with antiplague vaccine is practised among the villagers.
- E. Attempts were made to educate the population by the distribution of pamphlets and posters and by lectures, so as to teach them some knowledge of plague. Special attention was paid to the riddance of rats and fleas.

A REPORT ON THE BUBONIC PLAGUE EPIDEMIC IN THE 165
TUNGLIAO AREA, 1929.

- F. Communication between the villages and the railway line is discouraged; a close watch is kept in railway towns.
- G. Traffic to be stopped at railway stations when nearby villages are infected.

It may be observed that these measures are mainly for the protection of the masses, and are therefore directed against the tendency of the spread of infection. Under the circumstances we had to work, and taking into consideration the type and nature of the disease we had to contend with, not much curative or therapeutic steps could be undertaken. With future improved conditions, hopeful results may be obtainable with intensive serotherapy. For the same reasons only a certain amount of scientific investigations could be performed by our staff. These are published elsewhere.

J. W. H. CHUN,

Senior Medical Officer.

A REPORT OF PLAGUE WORK IN THE TUNGLIAO DISTRICT, 1929.

On the 4th September I was instructed by the Acting Director Dr. Chun to proceed to Chinchiatien and to take charge of the anti-plague campaign in the infected areas nearby. I left Harbin on the same evening with two assistants, Tsui Ko Ching and Lee Shu Chi. We arrived at Ssupingkai on the morning of the 5th. On arrival I at once called on Mr. Tang, the chief traffic inspector, for information. He was at this time absent and therefore we immediately booked tickets for Chinchiatien. The railway line being busy with the transportation of soldiers to Manchouli, our train was 3 hours late and reached Chinchiatien at 11 P.M. of the same evening. We stayed in the laboratory of our branch office. Upon arrival we were informed that there were many deaths and that fresh cases had occurred a week ago in the localities Peiyintala, Nemutai, and some other small villages. The localities affected, as far as we could establish were mostly far away from the railway area and inhabited by small numbers of families only. The late hour made it impossible to start any work.

Next morning (6th) news was received to the effect that Peiyiantala, a place 80 li north of Tungliao, Wuchiatze, 60 li, and Nemutai, 20 li from Chinchiatien, were at the same time severely affected. Besides these, other unknown areas were said to be involved, and the situation seemed very unfavourable. I therefore at once proceeded to Tungliao by the morning train to interview the local authorities, Magistrate Lao and Chief of Police Chang, both up-to-date and active young men, the former was previously clerk of the Harbin customs and a returned law student from America, the latter had been in Tungliao for three years and was acquainted with me since last year. Both gentlemen were quite enthusiastic about antiplague work and willing to give all facilities to us. I had a long talk with them and proposed some measures such as restriction of the traffic across the small river north of Tungliao and Chinchiatien in order to stop the people coming from the infected Mongolian areas in the North, and drafted 5 regulations for the supervision of the passengers.

The principal points of these are given below:—

1. Nobody is allowed to cross the river during the epidemic, except those who obtain special certificates and pass a medical examination within 24 hours.
2. The time allowed for crossing is only from 9 a.m. to 3 p.m.
3. Any one coming over must avoid communication with others, must not enter any public places and must give details of his address, date of return, etc.

MAP OF PLAGUE REGION, SOUTH MANCHURIA, 1929.

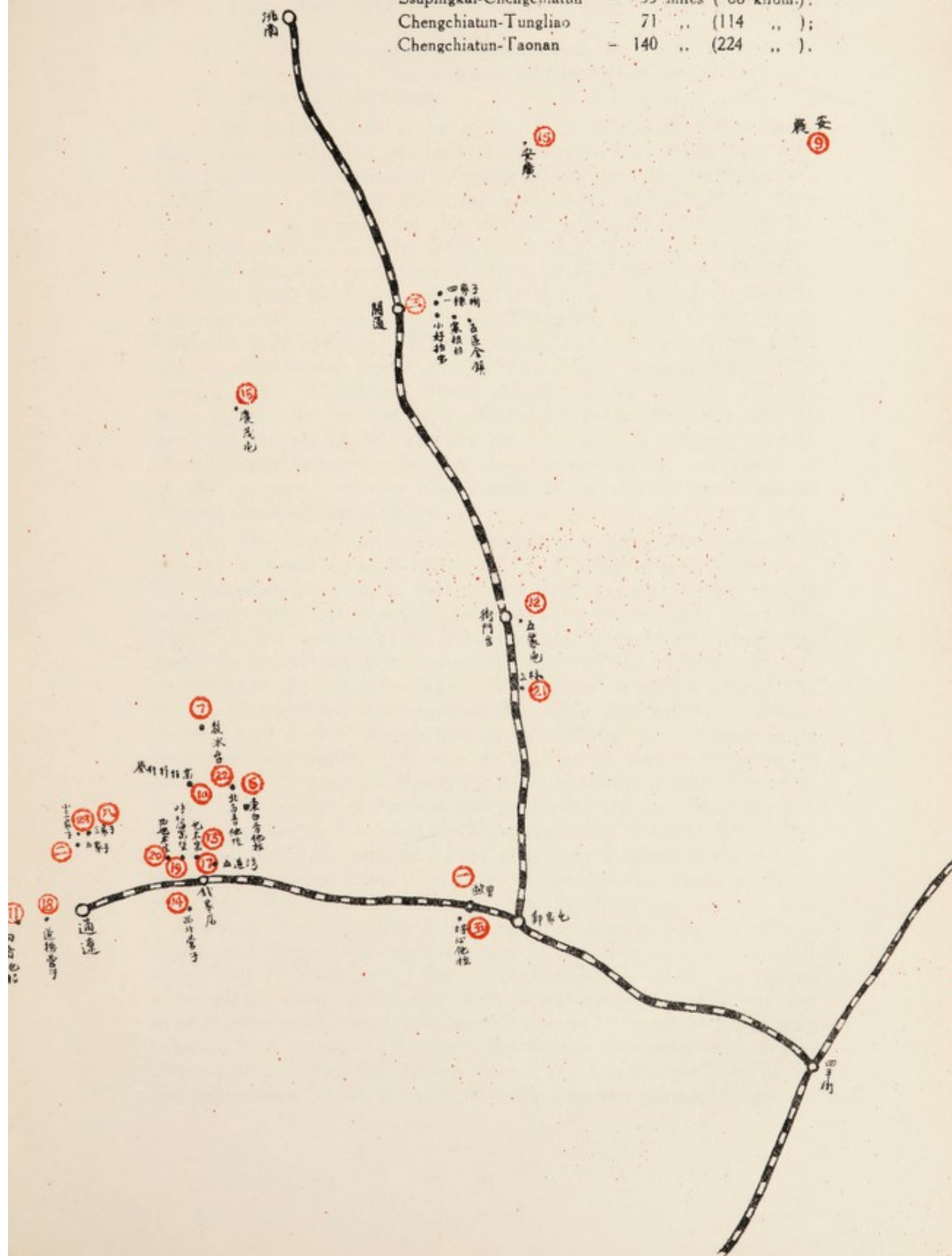
圖地之疫鼠生發所地屬各遼通

Distances :

Ssupingkai-Chengchiatun — 55 miles (88 kilom.) :

Chengchiatun-Tungliao — 71 .. (114 ..) ;

Chengchiatun-Taonan — 140 .. (224 ..) .



4. Any one coming over is not allowed to bring goods and belongings which may prove dangerous for the spread of the disease.
5. Coming over without permission means purposely infringing the Police rules. Therefore such persons will be sent to the Police office for punishment.

I left assistant Lee to be stationed in the branch police station near the river in order to give medical examination from 9 a.m. to 3 p.m. Four policemen were detailed to watch closely any one coming towards Tungliao city. I stayed there the whole day making enquiries from medical and lay men in the city and giving inoculations to more than 50 railway men in Tungliao station. Dr. Liu Tso Hsin proceeded to Nemutai to perform work there and assistant Shui started for Peiyintala (on horse back) for inspection. During this time I found the staff insufficient to do the anti-plague work; I therefore, wired to the Central Office for more assistants. When I returned to Chinchiatien I also found that we must have a proper office, besides proper accomodation for our working staff. Therefore I wrote officially to the chief of Railway bureau asking for the loan of a sleeping car to facilitate our work on one hand and accomodate our staff on the other. I proposed to print official plague bulletins every two days, concerning the work done by us and the actual situation, the circular to be sent to more than 60 different important organizations.

On the second morning we received a sleeping car containing a kitchen, 3 berths, a small office with fixed desk, electric lamps, etc. We immediately moved to the car and started to prepare our working program. After our removal, we were informed that at a place Wu Mon Tun, 2 li east of station Yamentai, plague appeared. I therefore asked the station master to connect our car with the morning train and to proceed to the infected village. When we were passing Chenchiatun station, I interviewed the magistrate Mr. Chin who was an up-to-date young man. I told him of the plague outbreak at Yamentai which was under his control. He was so kind as to spare me two active policemen. We arrived at the station in the afternoon of 8th. Fortunately the chief railway doctor was waiting for our arrival. Thus we proceeded together to the infected village and spent 5 hours there. We learnt that during the preceding week there were 7 deaths in the village, the symptoms being buboes, red eyes, unconsciousness, headache, fever, and death after 2—4 days' illness. The last fatal case was the wife of a certain Hwangkui who 3 days ago was diagnosed by the railway doctor as a suspect with right inguinal bubo. The village was small with about 70 inhabitants. On going through the village we noticed a true plague case, an old man with typical symptoms. He was said to be a professional wizard, who treated diseases by means of hypnotizing talismans and charms. He caught the disease by contact with a few plague patients during the last few days. We wired to the chief of the Railway bureau for the stoppage of traffic from the affected station and

other neighbouring stations, namely Yamentai, Chinsan and Talin. Assistant Lee and two policemen were stationed at Yamentai station in order to undertake daily inspection of the inhabitants, disinfection of infected houses, and also give anti-plague inoculation, etc. For 6 full days no fresh cases were discovered and therefore the railway traffic was resumed on the 6th day after the last case had been seen. Mr. Lee was sent to some other villages but 2 policemen were still left there for daily inspection.

Assistant Shui was sent at this time to Sanchiatze, a village 50 li from Tungliao with 50 families and 230 populations. This place had been visited by Dr. Liu and was said to have no fresh cases since 2nd of September. Shui also inspected the village Wuchiatze with 17 families and found only 3 remaining families with 16 people. Since the 3rd August no fresh cases had been seen here. The total number of deaths in both villages was 43. Some mud houses were burned down and about half of the population received inoculation with anti-plague vaccine. Another epidemic area, Peiyintala of the 2nd police section, 90 li from Tungliao had 28 deaths, the last death occurring on 2nd September. Another place (also called Peiyintala) which belongs to the 6th police section, 30 li from Chinchiatien and 70 li from Tungliao, was found with 13 deaths, the last case was on 30th August.

The newly infected place called Nemutai was one of the most severely infected areas for this year. This place was said to have been the starting point of the epidemic of Chinchiatien last year and was only a small village, 18 li north of station Chinchiatien. We usually took one and an half hours to reach there on horseback from the latter station. Since the 9th of September one death occurred daily. The symptoms were giddiness, fever, headache and buboes. Smear was taken from one of the dead bodies and *B. Pestis* were seen in great numbers. More than one hundred dead rats with symptoms suspicious of plague infection were found inside and near the infected beverage factory called Tehsingyuan, where most likely the first case of this epidemic appeared. The factory was a very big one with more than two hundred workmen and was the property of the well known Feng Yung University, Mukden. After many deaths had occurred among the workers, the manager of the factory escaped to Tungliao; the people left were very ignorant and always against the medical officers. They tried to hide the dead at night and bury the victims in the early morning. Some were said to have escaped to their own homes, carrying the infection with them. The door of the factory was closed all the time and it was very difficult to enter for inspection even under the protection of the police. We therefore wrote officially to Feng Yung in order to obtain instructions from their head in Mukden. We asked them to send their own medical man for anti-plague work for the factory as they did last year. But no notice seemed to have been taken since the Feng Yung students were at that time sent to North Manchuria for anti-Soviet work. The only thing was to try our best to stamp out the plague in the surrounding houses instead of in the originally infected factory.

A REPORT OF PLAGUE WORK IN THE TUNGLIAO DISTRICT, 169
1929.

On the 15th September a despatch was received from the Civil Governor in Mukden instructing us to proceed to the infected districts Peiyintala of Tungliao, Szechiatze of Kaitung, Chingmuchang of Chiang-yu. On receipt of this dispatch we immediately sent one assistant to each infected village to be stationed there for duty. After their arrival, the report from Kaitung was that within the district there are 5 infected areas namely 1). Szechiatze, 25 li east from the station, 2). Shio Yi Ko Su, 17 li east from the station, 3). Shiohoulapo, 22 li east from the station, 4). Hsiachingchao, 50 li east from the station. The total number of deaths was about 40. Another report was received from Chianyu, stating that a place called Chingmuchang, 15 li east with 24 families and 189 population was infected. The total number of deaths was 16 only and no fresh case was seen by our staff. Owing to the proximity of the infected villages in Kaitung to the station, the plague situation seemed dangerous. For this reason, I personally proceeded with the railway doctors to the infected villages. We found there had been no fresh cases for more than one week; the total deaths up to the present were about 30. We left word to the local authorities and assistant Shui, asking them to report by long distance telephone in case any signs of plague became known.

The 18th of September was a great holiday, being the Mid-autumn festival. According to the Chinese custom every shop has to close for 2 days and everybody has to follow the old custom of staying at home even in daytime. We therefore embraced the opportunity to make a thorough inspection of the severely infected villages such as Nemutai and its surroundings in order to find out the true situation. For the people of this place were absolutely ignorant of plague prevention work and against the anti-plague workers. The inspection showed that, if one individual got attacked, the whole family, or at least half of it became affected, while those who ran away from their homes died by the wayside. When we came for inspection, they never answered truthfully and no doubt every one tried to work against our methods. Thus, several families were annihilated. There were left only 9 families with 45 persons (including 12 Mongolians); a great number of deaths were not yet reported; 5 corpses were seen by us. Besides we also found the infection to have extended to the village called West-Nemutai about 2 li from East-Nemutai; here we found 6 deaths and two suspect patients. The native people were mostly Mongolians. The sanitary conditions were worse than anywhere. After this thorough inspection, attention was focussed mainly on this area, several members of the railway hospital staff and of our service were detailed to work day and night. The natives were said to be every minute ready to kill the anti-plague workers.

On 24th September a military surgeon called upon me with an official letter stating that at a village called Peiyinkosheo, 15 li from Taotehyintze a serious plague occurred involving more than 10 families with more than 50 deaths. Some cases were diagnosed as plague by

the military surgeon and he came to ask me for help. I therefore, gave him 400 doses of vaccine and 200 c.c. of serum and some anti-plague posters etc. Besides I told him to report regularly the situation to our head office in Harbin instead of reporting to the Civil Government in order to save time. That was all what we could do for them at the time.

On inquiry, we heard that the magistrate of Tungliao decided to remove 500 refugees from the famine district to Chinchiatien. I therefore interviewed him personally and urged him not to send any refugees before the situation became better. He then stopped the removal and temporarily kept 2000 refugees in Tungliao, waiting for information from us.

A recurrence of infection took place in East Chakantulica, 35 li from Chinchiatien station, the total deaths up to date is 20 with 5 suspect cases. This place was infected 4 times in this year besides having been severely infected last year. The other small villages in Kaitung and Ouli were also noted to have been repeatedly invaded by plague this year. So far as our experience went, it seemed that reinfection with plague in these areas occurred through the continual moving of people from one community to another. For this reason we tried in every way to enlist the co-operation of the local authorities in limiting the communication and controlling the chief of each village. This method proved successful.

The Director of the Ssutao Railway bureau, Mr. Chow, who was absent from Ssipingkai for a long time, resumed his duty. I called upon him in the evening of the same day to consult with him about some questions concerning anti-plague work. Mr. Chow was a Japanese returned student and up-to-date young gentleman and keen on our work. He had deposited twenty thousand dollars for anti-plague work along the whole line. Besides, he had spared a quite big building for our office and living quarters for medical officers. I stayed in the special office for one night and accompanied him by special train to inspect every station along the whole line. I therefore started next morning from Ssupingkai with Mr. Chow and some members of his staff to proceed along the whole line and stop at station after station up to Tungliao, thence returned and worked up the Taonan line. Besides I had a long talk with him during the trip. He said he knew our director quite well and wished to have an opportunity to meet him for making arrangements for permanent anti-plague measures. He also said that our present office at Chinchiatien was absolutely unfit for proper work, and seemed quite willing to spare part of the old station building in Tungliao for our branch office. In any case, Mr. Chow believed in the efficacy of modern anti-plague methods and constantly impressed upon his sub-ordinates the necessity of heeding the advice of the plague workers, as he seemed to realise the yearly calamity of the epidemic which affected the railway business very much. The S.M.R. bureau also selected two representative doctors to make investigations along the

A REPORT OF PLAGUE WORK IN THE TUNGLIAO DISTRICT, 171
1929.

line. We had a long talk on anti-plague work. Both the Japanese doctors showed an unusual desire to render every assistance in their power, to help the railway doctors to secure anti-plague serum and other materials, etc.

On the 15th of September, when I was walking along a street in Tungliao I happened to see one dead body covered with bamboo matting in a corner of the road. Upon inquiry by the local police, no one knew anything about the history of this case. I therefore returned to my car for slides, coats, etc. in order to investigate the dead body. After everything was ready and when after four hours I reached the place again, the corpse was already removed and deeply buried by some one. Next morning Dr. Cheng Pei Chun, an experienced local practitioner, informed me that he had the day before attended the above case which apparently came from Sanchiatze in a precarious condition with typical plague symptoms. Because Dr. Cheng was at that time unable to render him any immediate medical assistance, he died on the roadside. Dr. Cheng also said that about a month ago he had seen 3 more similar cases, all of them having slowly walked their way over some 20 li across plains and river in a southerly direction until they reached Tungliao city. It was said that some more had died or been infected. The following 3 cases were reported by Dr. Cheng:

<i>Name.</i>	<i>Sex.</i>	<i>Age.</i>	<i>Date.</i>	<i>Symptoms.</i>	<i>Duration.</i>	<i>Result.</i>
Lien Mu	M.	30	16/8	Axillary buboes.	4 days	Died
Su	F.	20	23/8	Right inguinal bubo.	9 days	Recovered
Wong	M.	9	27/8	Right inguinal bubo.	56 days	Died

According to Dr. Cheng, Tungliao was also one of the infected areas in this year's epidemic. It is surprising that though the disease was repeatedly imported in this place, it did not spread. The areas infected by plague during the past 6 years are shown in the appended map. The areas are bordering on Inner Mongolia. In all probability the infection originates from Mongolia, and invades every autumn these places.

C. S. LIN,
Senior Resident Medical Officer.

A REPORT ON THE BUBONIC PLAGUE OUTBREAK IN SOUTH MANCHURIA 1930.

Though we feared that plague might make its appearance in the summer, yet as time went on and no news was received, we hoped that we might escape its visitation this year. But we were rudely disappointed when reports of plague reached us at the beginning of September. In response to the Governor's orders, Assistant Medical Officer Wang Yi Chen was sent to Ssupingkai to investigate. On arrival he found that the infection was in a village, Fupingchuan (富平村) 1 mile distant from Kaitung station on the Taonan Chengchiatun Section. He proceeded there with the Ssu-tao Railway doctors and found the corpse of a man named Chengshing (程姓), aged 65, with swollen cervical buboes. Smears were made from the juice of the buboes and *B. Pestis* were seen in large numbers. Having established the diagnosis, measures were taken to prevent the spread of the infection. The contacts were isolated in their own homes and closely watched. The villagers were subjected to a daily examination. No railway tickets were sold at Kaitung station nor at the near-by stations for a period of five days. A medical examination of the railway passengers was held at the junction, Chengchiatun, and later at Paimiencheng also. Anybody with suspicious signs was isolated in railway box-cars for observation. The Chinese Eastern Railways established observation points in Tsitsikar, Changchun, Yaomen and Harbin. In fact, all the railways took measures to limit the spread of the plague. The Ssu-tao railway, being the most concerned, adopted most efficient means, including the inoculation of their staff with anti-plague vaccine. The Manchurian Plague Prevention Service undertook to look after the villages away from the railway and provided both medical personnel, equipment and vaccine. In co-operation with the local authorities, we disinfected houses, distributed antiplague pamphlets and inoculated the isolated contacts. In this way we were at the forefront of the scene and were in actual contact with plague-infected persons, striving to prevent the infection from travelling from the villages to the railway towns.

It was ascertained that round about Kaitung station, 13 villages were involved. The first village was Tungchiawaopao about 7 miles away. The first date was July 29. The last village was Fupingchuen and the last case occurred on September 29. Altogether 69 cases of death were recorded. A table of the affected villages is as follows:—

A REPORT ON THE BUBONIC PLAGUE OUTBREAK IN SOUTH 173
MANCHURIA 1930.

<i>Name of village.</i>	<i>Distant from Kaitung.</i>	<i>Date of Infection.</i>	<i>No. of Death.</i>
Tungchiawaopao	8 miles	27/7— 1/8	5
	21 „	31/7— 2/8	2
Paimensanchion	22 „	12/8	1
Harlagantu	7 „	3/8— 4/8	7
Erlungsan	9 „	27/8—31/8	11
Siharlagantu		27/8—28/8	4
Wangchiawuopao	8 „	28/8	3
Paochuanzan	16 „	28/8—31/8	3
Hositaigan	14 „	27/8—29/8	14
Fupingchuan	1 „	26/8—29/9	7
Sichiatzu	8 „	2/9	1
Chansanpuo	8 „	17/9—21/9	4
Haichingpulika	17 „	21/9—27/9	2
			69

As other localities were infected, more personnel was required, so Dr. Shih Chi-liang and two dressers Ma and Li were sent down to help in the work. Along this section of the railway Taipingchuan station was threatened by the appearance of plague in a Mongolian village, Hsinanli, situated 10 miles southwestwards where 26 deaths took place in August and September.

Near Taonan station, on September 12 plague occurred in Su-chuantun village in the Tuchuan District, 20 miles westwards. In 10 days 8 persons had died. The Taonan-Tsitsikar Railway doctors in cooperation with our doctors took precautions at Taonan station.

Turning to the western section of the Ssutao Railway, we find that in Payintala near Tungliao several plague deaths were reported to have occurred towards the end of August. Some of the soldiers stationed there were also infected. A case was reported in a village just outside Tungliao city on September 12. When Assistant Doctor Wang Yi Chen heard of the outbreak in Payintala and went there, he found that no fresh cases occurred.

Somewhat disquieting news were received from Talin station on October 14 to the effect that plague had broken out in the town. On investigation, it was found that a man, Chang Hsi Cheng, aged 29, died of plague.

He worked in a fur shop in which plague deaths had occurred. Altogether 10 deaths had taken place in seven days in two neighbouring fur shops. Strict precautions were taken immediately and no further cases were reported. At about the same time, at Chengchiatun junction, a man Wang Yu Shan, aged 20, was found to have died from plague. This man came from Kailu west of Tungliao, stayed with some friends

in an iron foundry, and died three days later. Fortunately after disinfecting the premises and isolating the contacts, no further cases occurred.

Apart from the Ssu-tao railway area, plague broke out in another district, namely Nungan. This district was also involved last year. The first focus was located in Inner Mongolia in the Kuerlossu Principality in July. Some workmen returning from this place to their homes in Kungchiatun village, 20 miles north of Nungan but within the district became ill, and spread the infection which caused some 61 deaths. From this village, the infection travelled to eight other villages, with a mortality of 154 deaths. The epidemic began on July 17 and ended on October 6.

Fortunately the Nungan magistrate had great experience and ability and was able to organise an antiplague bureau to deal with the situation. We cooperated most happily with him by sending personnel, vaccine and antiplague pamphlets. The proximity of this infected area to Harbin and the ease of communication both by railway and river made it particularly menacing. But thanks to the vigilance of the respective authorities, the epidemic was successively localised.

The following is a table of the names of places known to be infected both in the Ssutao Railway and Nungan areas :—

<i>Name of village.</i>	<i>Nearest locality.</i>	<i>Date.</i>	<i>No. of deaths.</i>
13 villages	Kaitung station	29/7 —27/9	69
9 villages	Nungan	17/7 — 8/10	154
Hsinanli	Taipingchuan	16/8 —10/9	26
1 village	Tungliac	12/9	1
Suchuantun	Taonan	1/9 —10/9	8
	Talin	7/10—14/10	11
	Chengchiatun	16/10	1
			<hr/> 270 <hr/>

As in former years, the evidence tends to show that this bubonic plague started in the summer in several villages simultaneously, in a locality which now borders on Inner Mongolia, but formerly was actually Mongolian territory, and is still largely inhabited by Mongols. Whether the infection in each place was introduced from Inner Mongolia is impossible to say, though naturally there is much intercourse across the border. In the case of Nungan, plague was reported to have been brought by some workmen on their return journey from Mongolia.

The area involved is very extensive, bounded by Tuchuan, about 20 miles west of Taonan; by Nungan, about 160 miles eastwards from Taonan and by Tungliac South-westwards. Report of the appearance of plague as far westwards as Kailu was received though not investigated, owing to the difficulty of communication.

A REPORT ON THE BUBONIC PLAGUE OUTBREAK IN SOUTH 175 MANCHURIA 1930.

The features of the epidemic were that mainly small villages at short distances away from the railway lines were involved, that the type was chiefly bubonic and that the majority of cases were not observed by doctors but only became known after the outbreaks had spontaneously subsided. The mortality seemed to be high, but the exact percentage could not be ascertained.

With the proposed scheme of the construction of a network of railways in the infected areas and the planning of through trains between Peiping and Tsitsikar through Tahanan and Tungliao, the means of communication with the rest of Manchuria is proportionately facilitated, thus increasing the danger of the spread of plague. Both the Manchuria Plague Prevention Service and the Ssutao Railway authorities are fully aware of this menace and are planning to take measures to counteract it. Part of these measures includes the establishment of an anti-plague bureau and quarantine camp at Chengchiatur junction which is a strategic point in the management of a plague epidemic along the Ssutao railway lines.

Tables of the sexes of the plague victims and of the age incidence in different decades of life are appended :—

SSUTAO RAILWAY AREA.

Sex incidence.

Male	69
Female	28
	<hr/>
	97

Age incidence in different decades.

0-10	11
10-20	17
20-30	19
30-40	23
40-50	14
50-60	7
60-70	6
	<hr/>
	97

NUNGAN.

Sex incidence.

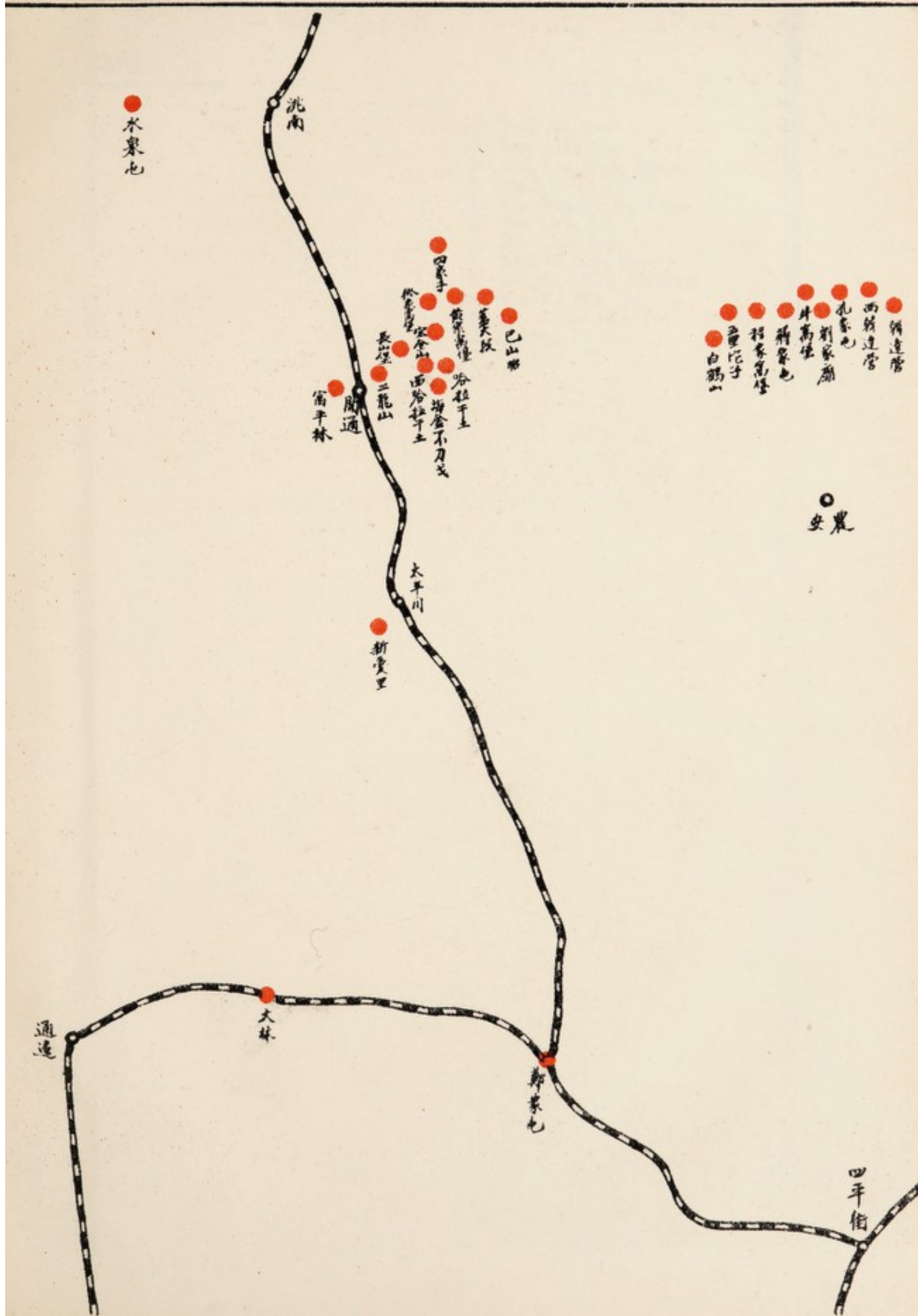
Male	91
Female	63
	<hr/>
	154

Age incidence in different decades.

0-10	.....	13
10-20	.....	22
20-30	.....	22
30-40	.....	24
40-50	.....	34
50-60	.....	26
60-70	.....	11
70-80	.....	1
80-90	.....	1
		<hr/>
		154
		<hr/>

J. W. H. CHUN,
Senior Medical Officer, Harbin.

民國十九年四洮路之開通及農安縣發生鼠疫地圖



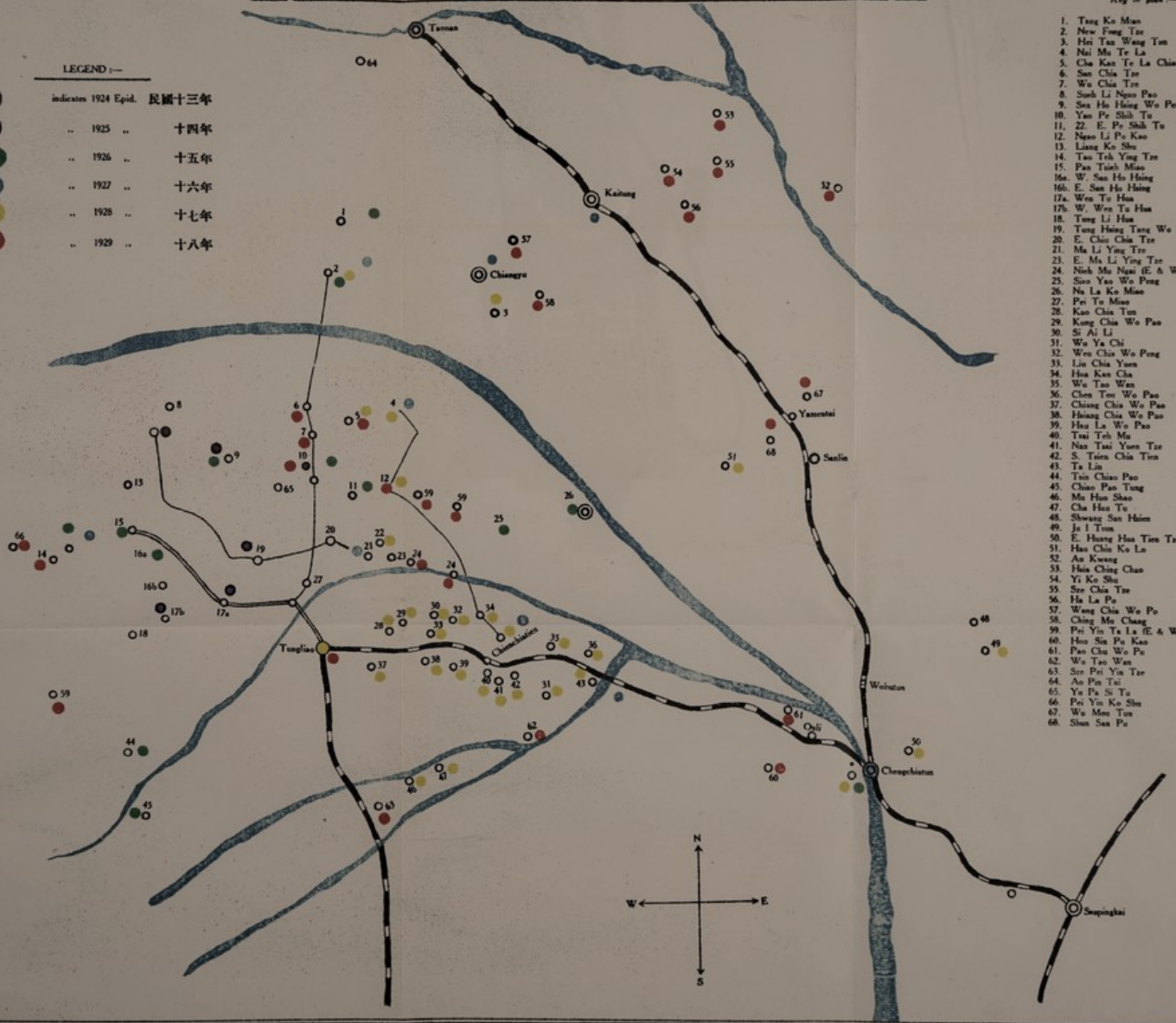
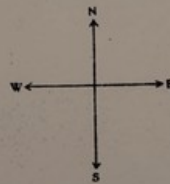
前六年四港鐵路沿線鼠疫傳染地圖
PLAN OF PLAGUE INFECTED LOCALITIES IN SSU-TAO RAILWAY AREA FOR THE LAST 6 YEARS

LEGEND 1—

indicates 1924 Epid. 民國十三年
 .. 1925 .. 十四年
 .. 1926 .. 十五年
 .. 1927 .. 十六年
 .. 1928 .. 十七年
 .. 1929 .. 十八年

Key to plan:—

1. Tang Ko Mao
2. New Feng Tai
3. Hsi Tai Wang Tin
4. Nai Ma Te La
5. Cha Kan Te La Chiao
6. San Chia Tze
7. Wu Chia Tze
8. Suoh Li Ngao Pao
9. Ssu Ho Hsing Wo Peng
10. Yao Pe Shih Tu
11. 22. E. Pe Shih Tu
12. Ngao Li Po Kao
13. Liang Ko Shu
14. Tso Teh Yang Tze
15. Pan Tsiuh Miao
- 16a. W. San Ho Hsing
- 16b. E. San Ho Hsing
- 17a. W. Tu Hsu
- 17b. W. W. Tu Hsu
18. Tung Li Hsu
19. Tung Hsing Tang Wo Pao
20. E. Chia Chia Tze
21. Ma Li Yang Tze
23. E. Ma Li Yang Tze
24. Nih Ma Ngai (E & W)
25. Ssu Yao Wo Peng
26. Na La Ko Miao
27. Pei Tu Miao
28. Kao Chia Tun
29. Kung Chia Wo Pao
30. Si Ai Li
31. Wu Ya Chi
32. Wuu Chia Wo Peng
33. Liu Chia Yuen
34. Hua Kao Cha
35. Wu Tao Wan
36. Chen Tze Wo Pao
37. Chiang Chia Wo Pao
38. Hsiang Chia Wo Pao
39. Hsu La Wo Pao
40. Tsi Teh Ma
41. Nao Tze Yuen Tze
42. S. Tien Chia Tze
43. Ts Lin
44. Tzu Chao Pao
45. Chiao Pao Tung
46. Ma Hsu Shao
47. Cha Hsu Tu
48. Shwang San Hsiu
49. Jo I Tze
50. E. Huang Hua Tze Tze
51. Hsu Chia Ko Lo
52. Au Kwang
53. Hsu Ching Chan
54. Yi Ko Shu
55. Sze Chia Tze
56. Ha La Pa
57. Wang Chia Wo Po
58. Ching Ma Chang
59. Pei Yin Ts La (E & W)
60. Hsu Su Po Kao
61. Pao Chu Wo Po
62. Wu Tao Wan
63. Sze Pei Yin Tze
64. Au Pei Tai
65. Yu Pa Si Tu
66. Pei Yin Ko Shu
67. Wu Men Tun
68. Shun San Pa



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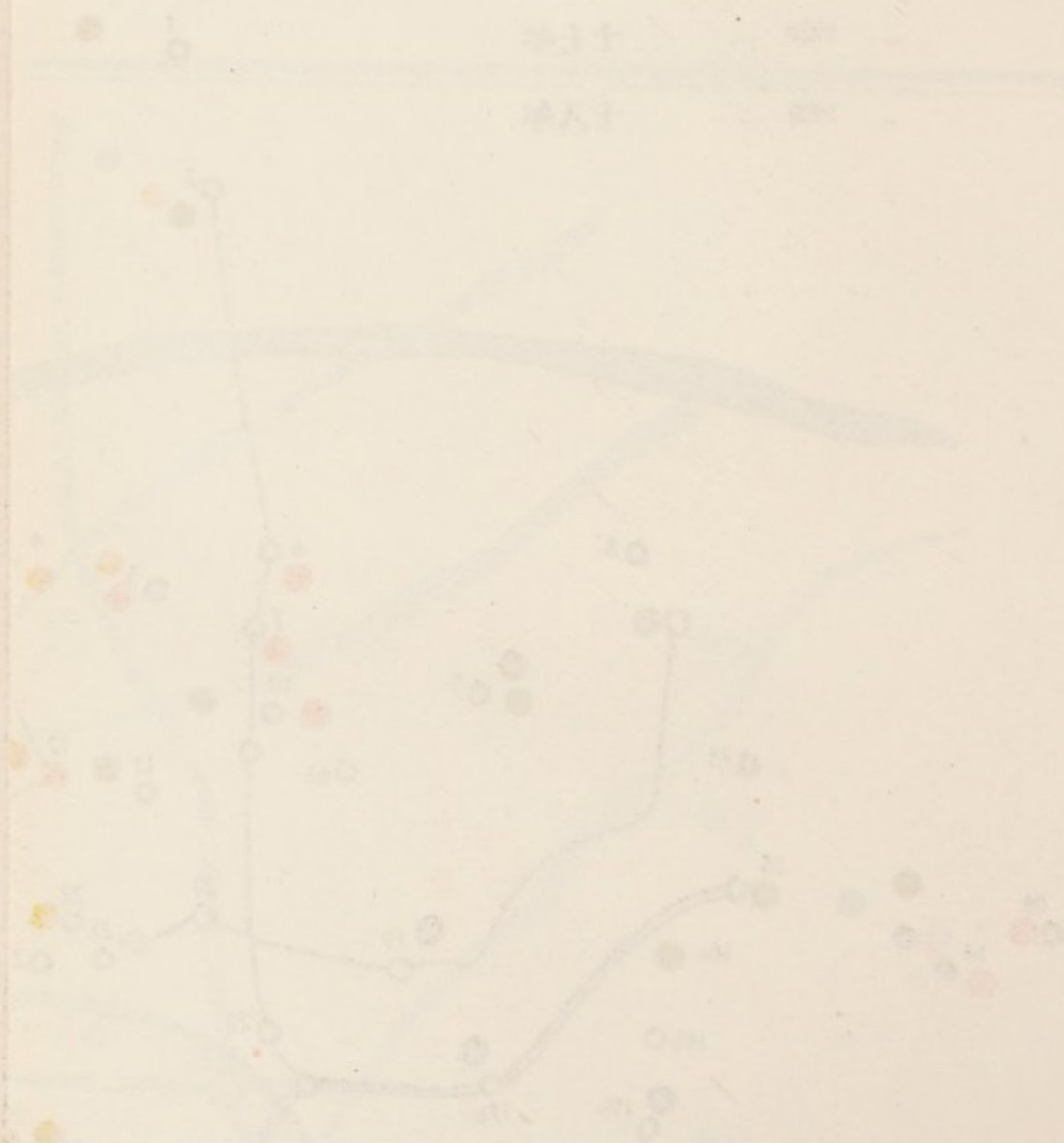
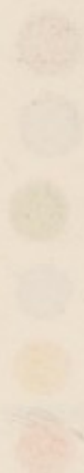
BRITISH MEDICAL ASSOCIATION

BRITISH MEDICAL ASSOCIATION

BRITISH MEDICAL ASSOCIATION

BRITISH MEDICAL ASSOCIATION

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A Typical Farmstead in Plague-Affected Village (Wuchiatzu).

五家子發生鼠疫之村莊



A Near View of a Rat Hole in a Mud Wall.

泥牆上近視之鼠洞



Three Rat-Holes in the Outer Wall of a Mud House in Chienchiatien.

錢家店泥房之鼠洞





Interviewing Mongolian Villagers in Whose House Plague Cases
Occurred Near Sanchiatzu.

附近三家子發生鼠疫之蒙人住戶



An old Woman imploring our Doctor for Anti plague Inoculation of her Son.

婦人求本處醫官爲其子注射疫苗



A Plague Patient Showing the Staggering Gait.

染疫者之蹣跚



A Small Plague Patient with Still Healthy Father and Brother in Front of Their House Door Near Wuchiatzu.

附近五家子住戶圈中爲父子兄弟三人站門口者已染鼠疫



OBSERVATIONS ON SOME EUROPEAN CLINICS.

*Reprinted from National Medical Journal of China, 1930,
XVI, 289-296.*

It has been the author's privilege to visit recently the cities of Berlin, Vienna, Paris and London. With regard to London, it would be truer to say that it was a case of revisit. In each place endeavours were made to see something of the most important hospitals, special attention being paid to the surgical features of the institutions.

Having inside knowledge of English hospitals, it may be worth while to draw general comparisons between them and those of the Continent. The Continental hospitals, especially those of Paris and Vienna, are older, not so well-equipped, and not so uniform. That is to say that for instance while there are highly organized and luxurious hospitals in Berlin, yet there are old and somewhat dilapidated ones in Paris. The general impression is, that with the exception of a few modern ones, the European hospitals are by no means new; a few are very old, some are even furnished with wooden stairs and floors. They have, however, the good feature which goes with old hospitals, namely the pavilion plan, with spaces between where patients can enjoy the air. Old and even dingy-looking at times, visible signs of progress are often to be seen in the shape of new wings being wedged in between ancient buildings. Particular attention seems to be paid to the operating room sections or lecture theatres. These are most often spacious, well-lighted, well ventilated, and well-equipped.

The continental surgeons are naturally keen and able men. They operate neatly and quickly with what one may say military precision. The incisions are free, decisive and clean, each movement is purposeful, and with long practice together with the perfect cooperation of well trained assistants, they bring the successive operative steps to a rapid close. In this respect their *éclat* appears to be in direct contrast with the more deliberate and seemingly more careful manoeuvres of the English surgeons. Some surgeons devote their whole time, and perhaps their whole lives to the work in the institutions. Professor Breitner, first assistant to Professor Eiselsberg in Vienna, lives on the hospital premises. He does not seem to have any outside interests but apparently is in his white duck trousers and overalls all the time. In this connection, German and Austrian surgeons wear white trousers, overalls, and canvas shoes, and are not afraid of catching cold when they walk from block to block in their rounds, or when they walk from the heated operating room back to the office. It was in the month of December when this observation was made.

With regard to the patients, they are very intelligent and obedient. They realize the importance of coming to consult the doctor at an early stage of the disease, thus avoiding many disasters such as late inoperable carcinomata etc. They are clean in appearance in the majority of cases. They answer questions quickly and are able to give an intelligent account of their ills. The relationship between the doctor and patient is friendly. The doctor would often speak a cheery word and the patient would reply with a smiling remark.

The patient understands that anything the doctor suggests or commands him to do is meant for his good, and accordingly he obeys without protests, being willing to submit to any position, or reexamination. I cannot say that there is any undue exposure of the patients which is often alleged, for they are all decently covered when they are brought to the operation premises, though there is less fussy arrangement of screens in the wards.

The nurses in the famous Allgemeines Krankenhaus are Sisters of Mercy. This can be seen at once from their style of dress. They are very devoted to their work, and very respectful to the chief when he is doing the rounds. The watch word seems to be that he must be treated like a prince. At the Charité Hospital in Berlin, a nurse was observed helping most skillfully at an appendisectomy operation. She had a pair of tiny scissors and used it dexterously for cutting sutures or what not without interfering with the work of her other fingers.

BERLIN.

A visit was paid to the Stadt Krankenhaus Am Urban. There the writer saw Professor E. Gohrband operate on four cases, unilateral thyroidectomy for goitre, ventral hernia, cholecystectomy for gall stones, and appendisectomy. The custom is to do operations in the morning, afterwards a round is made in the wards. I was allowed to stand by the side of the patient so that I had a very good view of all that was going on. Anaesthetic was given by an interne in a room adjoining the theatre. In suitable cases, Pernoxton (Riedel) was injected intravenously,—1 cc for 25 lbs. body weight,—fifteen minutes before the operation with the object of helping the general anaesthetic which is closed ether. None of the operating personnel wear mask or cap. Rubber gloves are worn, but when dealing with slippery intestines, sterile cotton gloves are drawn over the rubber ones. After washing of the hands, alcohol is used for rinsing purposes. The wound area is swabbed with alcohol and then tincture iodine. Artificial light is always used in the form of several concentrating lamps. The anaesthetist is screened off from the operation field by a white cloth screen, a very good idea. Another useful device is a small instrument table which is clamped on to the operation table over the body of the patient, so that the usual bad habit of putting instruments on the body of the patient is avoided. The incisions are free and decisive, thus ensuring adequate exposure. The skin edges are protected with gauze pads which are clamped with

clips, and the pads are then folded over them to cover them up out of the way. Catgut and linen thread, not silk thread, for economy's sake presumably, are used for deep sutures and ligatures. Silver wire was used for suturing the ventral hernia. The floor of the theatre is often awash with water, explaining in part the use of high rubber goloshes. The Professor is a youngish man of about 40 years of age. Quick and purposeful in his different operative procedures, he nevertheless took pains to demonstrate any important points as they occurred. The type of cases operated upon here as well as in Vienna apparently are illustrative, to a certain extent, of the dietetic errors of the inhabitants. The universal fondness for beer might perhaps also be taken into consideration.

European peoples eat too much meat, and do not include sufficient cellulose in their diet. Asiatic peoples who eat very little meat, but subsist mainly on a vegetable diet are relatively free from gall stones and appendicitis. Their food is not so rich. Often they have not the means to overeat with the result that they are lean and not worried overmuch with adipose tissue which is one of the factors for inducing ventral hernia.

Thus in Europe, many cases of gall stones and ventral hernia, mostly in fat female subjects, are admitted in the wards. Appendicitis and gastric ulcer are also common. Goitre cases seem to occupy many beds. With regard to this last condition. I was surprised to see a young woman sitting up in a chair by the stove on the evening of the same day on which thyroidectomy was performed. That this is allowed is shown by the cheery reply she gave to the enquiry of the professor as he was making the evening round.

One of the most famous hospitals in the German capital is the Charité, on approaching which brings one near the monument of the great Virchow, the father of cellular pathology. The Charité covers an extensive area and consists of a large number of pavilions which house the different specialities. The paths and entrances to the buildings are appropriately adorned with statues and busts of great German medical men—Von Graefe, surrounded by a grateful group to whom he gave back the gift of sight; von Leyden; Traube; König; Langenbeck, the father of German surgery; Robert Koch; and Emil Fischer. Only the most unfeeling can ramble among these monuments to such a galaxy of celebrities without feeling thrilled.

The Director, Sauerbeck, was kind enough to have me shown through the hospital. I watched him lecture to a class of University students, male and female, numbering 150 in all, in a modern and beautifully planned theatre. The subject of the lecture was on a fresh specimen of disorganised kidney (renal stone) which was removed from a patient that morning. He spoke impressively and without notes, evidently *ex tempore*. Professor Frey of the surgical unit wore white drill trousers and long white coat like all the male staff, looking very neat and business-like. An exploratory laparotomy for inoperable retro-peritoneal carcinoma was seen. Here local anaesthesia with novocaine

was successfully employed. Injections were given at first in the skin and then deeply, infiltrating a large area. The surgeons wear low rubber goloshes, and rubber aprons under their white overalls. They use a kind of hood covering the head and mouth. The principal operating room is very large and roomy; there are three operating tables in it so that 3 operations can be performed at the same time. The floor is made of light blue cement, and the walls are also blue in colour. Artificial light (Zeiss), concentrating in effect is used all the time. A very fine set of sterilising apparatus separates this large operating theatre from a smaller one where septic operations are performed.

One good feature in German clinics is the existence of small wards for two or three beds each where those recently operated upon are kept for a few days for careful observation. They are also used for cases that are smelly or noisy in order to avoid causing inconvenience to the patients in the general wards.

VIENNA.

Of the many hospitals in Vienna, perhaps the first of the old world medical centres, none is so old or famous as the Allgemeines Krankenhaus, which, with its 6000 beds, is the largest institution of its kind. The whole forms an extensive enclosure, flanked and intersected by buildings of old, sombre, two-storey structures, enclosing spacious courts. To a surgeon, names of great men, Skoda, Semmelweis, Billroth, Schauta, and Wertheim involuntarily bring hallowed memory. In spite of the apparent age of the Allgemeines, judged by its physical exterior, all means of diagnosis and treatment (some of which had their inception within its very walls) are brought to bear upon the management of any disease.

In dealing with such a very large number of patients the different branches of medicine are divided into different clinics, which are numbered and named after the respective chiefs. Thus the first surgical clinic is headed by von Eiselsberg, the first medical clinic by Wenkebach etc.

The city of Vienna is fortunate in having the best and purest water supply in the world, or so it is claimed. Certain it is that some surgeons have the greatest confidence in it, using it in making solutions for vaginal and vesical irrigations without further sterilization. This makes one sigh for such a boon in bacteria-free water for one's own ward, dispensary and perhaps some operating room procedures.

Though most of the buildings are old, some blocks such as the X-ray unit, the continuous bath treatment rooms, the operating rooms and lecture rooms etc. are relatively modern. In going round the wards with Professor Breitner, assistant to Eiselsberg of brain surgery speciality, one sees that the wards are mostly commodious, well-ventilated with high ceilings, each containing about 18 beds. The wards are lit with gas light, though an electric light connected with a long wire and pulley working along the whole length of the room can be moved near to any

part of the ward for a closer examination of a patient. There is still a window with pieces of small roundish thick glass glazed with thick strips of lead in the ward. This is evidently preserved for the sake of its ancient and quaint appearance. There is even such a window in the big operating room. The walls of the wards are all white-washed, and present a very clean appearance. Each patient has a biggish black board placed high above the head. On the board is written the diagnosis and date of operation if any, so that the visiting doctor can see at a glance these important data.

I saw forcible movement of the elbow joint in a patient who was operated upon some months ago for an old dislocation. This was done with the object of freeing adhesions, and under anaesthesia. The surgeon did not fear the possible setting up of a latent infection.

Adjoining the big operating room there was a dark room, and in here a professor was doing an intranasal hypophyseal resection under local anaesthesia. This was a very trying ordeal for the patient, because it took a long time, and there was a certain amount of bleeding. But the patient behaved most exemplarily, and hardly moved or complained, once more demonstrating the fortitude and obedience of the Vienna patients.

Across the road and nearly opposite to the right side of the Allgemeines stands the Peham's Hospital for gynecology and maternity. This is a very nicely built and modern three story structure, erected just before the World war. All the latest ideas are incorporated, such as rounded corners, tiled and wide corridors, oil painted wards etc. The patients are well looked after. The whole place is steam heated, clean, and not crowded at all. After a normal parturition, the patient is allowed to go home on the eighth day. The operating room is built with aseptic principles and is in a very clean condition. Great stress, perhaps too much stress, is laid on hand washing, for the surgeon must scrub his hands for ten minutes by the hour-glass.

Near by is the famous Von Pirquet Klinik, also a well built modern hospital. On the roof is the open-air sanatorium where the patients are mostly children suffering from surgical tuberculosis. They lie in beds in the open, but protected from the wind from one side and sometimes from four sides. Some phthisical patients of the adolescent age are housed in the wards where they are treated with rest and good nourishment, and in suitable cases with artificial pneumothorax. Sometimes a little codeine is given to allay the cough. Lower in the building are housed the infectious diseases, such as measles and scarlet fever etc. Professor von Pirquet is a great believer in the use of glass partitions as an effectual preventive against the spread of infection.

He does not believe in aerial infection apparently, for he has a glass cage like cubicle open at the top, and containing a case of infectious disease, in the middle of a ward of other infectious cases. The scarlet fever ward is most interesting. Along the centre of the ward, there is a corridor lined with glass, and it is here the parents and friends of the

patients may walk along and see the patients. The latter are in separate glass cubicles with doors which open into a separate corridor running right round the periphery of the ward. Nurses can go to and fro along this corridor in order to observe the inmates of the little cubicles. Of course without good nursing this isolation with glass partitions cannot be a success.

Inside the great compound of the Allgemeines, there is a block for the continuous water-bath treatment which is worth mentioning. In a cement floored room (there are several of these opening into a long corridor) three or four huge oblong tubs are placed and into each an iron bed with coarse wire netting for mattress is let in, but suspended by four wires at the corners so that the beds can be raised or lowered into the tubful of water. A blanket is placed over the bed and the patient is made to lie on it, and then lowered into the water. There are no chemicals put in the water which is just plain warm water kept at the body temperature all the time. The water is changed completely once daily. The patient lies naked in the water, with only his head above it. He can read or sleep quite comfortably, and is said to be quite happy and contented once he is used to it. The doctor in charge informed me that a young boy with a tuberculous sinus was put in the water off and on for one year until the sinus was healed, and during that period he gained in stature. All sorts of conditions are benefited by the water-bath treatment, namely, bed sores, mania ulcers, inflammatory affections of the skin, burns etc. The wonderful part of it is that the urine and faeces are allowed to be voided in the water without altering the changing period which is once daily and yet wounds are alleged to heal quickly under this method of treatment. Here again good nursing is essential.

The morbid anatomy department is under the able directorship of Professor Maresch. This part of the hospital is old, and yet a model lecture theatre is under construction. Looking in the post mortem room, eight or nine corpses were seen to be laid out for examination. The law decrees that every patient who dies in the general ward must be examined post mortem. The result is that the ultimate study of diseases is compulsory and great advantage is taken of this opportunity to the enhancement of Vienna medicine. Since there are so many patients in the hospital, hardly a day passes without the performance of half a dozen post mortem examinations. If it should happen that none is performed for a day, this is celebrated by the hoisting of a flag, an event which, it is said, occurs about once a year.

Before leaving the Allgemeines with its mellow traditions and world-wide fame, one must dwell on the achievement of Semmelweiss, a gynecologist and obstetrician, who may be said to have practised anti-septic principles before Lister. Passing through the wards in which he laboured, one cannot help visualizing Semmelweiss as he puzzled over the problem of puerperal fever. How he racked his brains to discover the cause. When he found the solution, he gathered all his

data and tried to convince his confrères and the world that in order to save lives, all they had to do was to wash the hands in a solution of chloride of lime before assisting in a delivery. Instead of approval he met only with their sneers and contempt which caused his mental unbalance and death. What a great sacrifice in order to make truth to shine.

Beyond the wards is a small room, 3 by 5 metres, which Semmelweiss occupied during his residence at the hospital. The room is also noteworthy for the fact that in it was performed the first successful caesarian section in German-speaking countries. It was performed on a bed, for the operating table had not then been invented.

The clinic has a small museum where the most interesting exhibits are the powdered meal with which Semmelweiss cleaned his hands and the two compartment vessel, 10" by 5", for the chloride of lime solution. There are also the small iron basin and the pitcher used by him. The most interesting part of the museum, which should have convinced anyone of the truth of Semmelweiss' claims, was the graphic chart of the mortality from puerperal infection before and after the introduction of his methods. The figures were low at the beginning, before work was carried out on cadavers by students; then they became suddenly high, when autopsy work was undertaken by students; then again they were low after antisepsis as taught by Semmelweiss was practised, only to become high again when he was ridiculed and his teachings were abandoned. Finally, after enough lives had been sacrificed to convince the hardest unbeliever and his doctrine was again practised, the figures again showed decrease.

A visit was paid to the near-by town of Baden, one hour by tram from the heart of Vienna. Here among beautiful scenery and surroundings, many hydrotherapy establishments are to be found. The most famous is the Gutfenbrunn Sanatorium which is situated among spacious grounds and trees. It is like a fine hotel where about one hundred people can be accommodated. The natural sulphur spring is diverted to flow to the bathing department. There are facilities for mud-baths, and physical exercise on different machines, all under the direction of four doctors. People who want a rest cure or recuperation may find good service here, as well as those who want to reduce their obesity, besides those whom hydrotherapy would benefit.

PARIS

I had the opportunity of visiting a very ancient hospital, the St. Louis. The wards are far too crowded, and stuffy. They have high ceilings, supported by wooden beams. The stairs and floors are made of wood. The surroundings and the buildings give an old world impression. Nevertheless, there is a very wonderful pathological museum, with many life-like models of different diseases made of wax, an art in which the French excel. The physiological chemistry laboratory is comparatively new, and I was able to observe a class of students in

attendance. In connection with medical students, I am told that they have to go from one hospital to another in order to follow the lectures by different professors. In other words, they have to run all over the place, and cannot get the convenience and concentration of some English medical schools.

The Cochin hospital was also visited. This is where the late professor Widai carried out his tests for the diagnosis of typhoid fever. The hospital is not so old as the St. Louis, but is also by no means up to date.

Paris has 20 or 30 hospitals. As in those in Vienna, there is an air of simplicity and economy about them. Those of us who are used to the elaborate appearance and ceremonious atmosphere of some operating rooms will be astounded, perhaps agreeably, to find how simple the arrangement and the procedures are there. Often the operating room is deserted and the tables quite bare minutes before operations are scheduled to take place. This is because the tables are rarely covered with towels; the instruments are brought in and arranged in trays which are kept dry.

There is a commendable effort in most European clinics to limit the number of assistants in the operating room. This is particularly so in Paris where one assistant is usually employed.

The sterilization of instruments is done mostly by hot air, a method which keeps them in good condition for many years.

The washing of hands in Paris is not nearly so meticulous as in Germany. They do not wash for so long nor so far up the forearm. After washing, the fingers are dipped in alcohol and iodine solution.

The long-handled Reverdin needles are very popular in Paris for introducing ligatures and sutures, and in experienced hands certainly work quicker than the ordinary needles. The Michel clips are extensively used for skin sutures. They can be applied very quickly with the combined clip feeder and forceps.

Postgraduate and specialists' courses are given in many hospitals. Paris is the rendezvous of medical South America, just as Germany is much sought by the Japanese, and Vienna by the doctors of the United States.

No medical man can afford to miss a visit to the Pasteur Institute. The laboratories are inspiring enough, but the tomb of Pasteur is the most impressive, leaving one with feelings of veneration and admiration.

It is a simple yet elegant and eloquent testimony of the worth and value of the great man. The plain black but majestic sarcophagus lies at the bottom of a pit, the walls of which are adorned with mosaic pictures of his scientific activities. On each side of the sarcophagus is engraved a list of his original researches which have benefited the whole world. That Pasteur should rest in a place of research and learning is very appropriate for this humble but indefatigable scientist.

A visit was made to the radium institute, dedicated to Madame Curie. Particular attention was paid to the building endowed by Rothschild, where patients are examined and received for suitable treatment by radium or deep X-ray therapy.

LONDON.

It was with deep emotion that I revisited my old hospital, namely St. Thomas', after a lapse of some sixteen years. Some of the staff have gone, while others who were junior before have now become seniors. I was glad to recognise some of the faces, and make their acquaintance once again. Of the lay staff, Hopkins, the hospital bedel, who has been in the service for some twenty years is still active, though his *pes planus* is no better. Our old friend and omniscient Mead, who was the caretaker of the museum besides other activities, is alas not to be seen, for he has retired some years ago.

The arrangements and routine of the hospital do not seem to have changed much. Several new departments have been added, however, namely those for venereal diseases, tuberculosis, electro-therapy, the electro-cardiograph, biochemistry laboratory, etc.

The new dean was kind enough to give me permission to take advantage of the hospital practice in all departments. A serious attempt was made to do some work in the biochemical laboratory on kidney and liver efficiency tests as well as estimation of sugar content in the blood, only to find that there is no encouragement for postgraduate or specialist courses, for fear of upsetting the routine teaching. In order to pick up the latest developments of the art of healing, some time was devoted to the newer departments. I had the opportunity of watching Mr. Nitch operate on several cases. My old chief, Mr. Battle of the Battle's incision fame for appendicitis has retired. The operating routine does not seem to have changed much. I noticed, however, that the ligature and suture materials have taken on colours, for whereas formerly, the silk and salmon gut were all white, now the former is of a bright red and the latter a beautiful blue colour. Another innovation is the use of strips of corrugated rubber for drainage instead of rubber tubing.

Try as one might, it seemed a little awkward to acquire knowledge in company with medical students who are much younger than oneself. It was then decided to join the postgraduate course in the West London Hospital, Hammersmith. Here one can take up work whenever one desires, and for as many weeks as one can. The course is continuous, and systematic teaching, both by lectures and clinical demonstration, is carried out in all departments according to a time table. Doctors of all nationalities and of both sexes are to be found there attending the classes which are not too large, so that one has the opportunity of examining the patients. Besides this form of teaching, special classes are held for administering anaesthetics, and operations on cadavers. Most afternoons are devoted to the operating rooms which

are very modern. The student must put on a white overall and hood-mask; entrance to the gallery is from a separate door. The anaesthetic of choice is usually ether, not by the open method, but by blowing air or oxygen through it into the face mask of the patient. The surgeon, who usually wears a morning coat or black suit in the wards, now wears what appears to be a pair of pyjamas beneath his white overall. All the modern conceptions of asepsis seem to be strictly carried out. The instruments are laid on sterile towels on tables, and are covered over until required. The head nurse appears to be exceedingly efficient and well trained. I remember especially an amputation of the breast for carcinoma which was beautifully carried out, dissection of the axilla being cleanly and thoroughly performed. In delicate movements, the side-strokes of the knife were delightful to behold. Mr. Arnour treated a case of carcinoma of the oesophagus by introducing radium needles (radon) into the growth with special forceps through an oesophagoscope tube, and afterwards passed a tube through the strictured area to prevent swelling and occlusion of the oesophagus. There seems to be a great deal of the exhibition of radium needles which are quite effective and not at all expensive.

The X-ray department must be overworked, for many cases are referred there for diagnosis or for treatment.

Special attention was paid to the treatment of fractures. Here one need only emphasize the importance of extension. In fractures near the upper end of the femur, the best results are said to be obtained by extension and abduction. In order to obtain true abduction, both legs must be abducted, so that a spread-eagle position is maintained.

Of course varicose veins are treated by the injection method, the solution being quinine and urethane. The formula is as follows:—

Quinine hyd	4,0
Urethane	2,0
Aq Dist	30,0

Two c.c. are injected the first day in order to test susceptibility and four to six c.c. are injected on the third day, repeated if necessary.

In connection with my visit to the School for Tropical Medicine in Ensleigh Gardens where students may receive training and where many cases of tropical diseases are treated, I may mention the continuous irrigation method of treating dysentery. The patient is first put in a warm bath, and a two-way rectal irrigator is inserted in the anus. Connected with this irrigator by a long tube is a thermos-like cylinder containing a warm solution of quinine or some other medicament. In this way the rectum and parts of the colon may be slowly washed with the solution. Leading away from the irrigator is another tube which flows into the drain. This method is said to be most effective and comforting to the patient. The treatment lasts some twenty minutes and may be repeated two or three times daily.

GENERAL REMARKS.

Travel may be said to have a broadening and stimulating influence. It enables one to pick out what is the best in others, and make use of their methods, always conforming them to local requirements of course. As we compare our backwardness with the progress of other peoples we will learn that in medicine at least, our weakness lies in failure to utilize our clinical material to its fulness. Think of the problems that are still awaiting solution, to mention some prevalent and mysterious diseases such as cirrhosis and splenomegaly alone. Like Columbus' egg, when we are shown something which we might have easily found out ourselves, how often do we sigh and wish we too could have thought of it before?

After observing how many eminent men have achieved world wide fame and recognition as the last authority on some particular disease, even when they have to work under difficulties and perhaps by no means up-to-date conditions, it behoves us to work hard and to study hard, trying to improve all the time. For how many of us have made researches into local problems, however humble our position may be, in a thorough manner so that we become the last court of appeal in any given subject?

In other words, foreign travel should inspire a man to be not only progressive and *au fait* with the latest ideas. It should not make him put blind faith in authority, born of admiration for the ability and industry which made authority possible, rather he should return with feelings of self-reproach on account of his failure to grasp all the opportunities that have been his and to utilize all the resources that have been placed within his easy reach. If this is the case, then his journeying will not have been in vain.

DR. J. W. H. CHUN,

Senior Medical Officer.

A REPORT ON MY TRIP TO ATTEND THE MICROBIOLOGICAL CONFERENCE IN PARIS.

As I informed you already, I am back in Harbin since September 7 and going ahead with some experiments on plague.

As you know, I left Harbin for Vienna on June 29th. During my journey from Manchouli to Tshita I met Dr. Kukushkine, the head of the Transbaikalian Plague Organisation who joined me at the 26th post.

He told me that the reports given by some Harbin News papers about some catastrophical migration of rodents along the Argunj river on the Russian border were entirely wrong.

The Plague Organisation in Transbaikalia has been enlarged in the last few years. There is a permanent laboratory now in Borsja, an observation station at Kailastui, and a permanent field organisation is working from the early spring to the late autumn in the Daurian steppes. The head quarter is again located in Tshita.

They have some new ideas; one of them is to destroy the Tarbagan population in the Daurian territory by importing a kind of rabbits being especially adopted to the life in the steppes, hoping that finally rabbits will multiply to such a high degree that the conditions of life for the tarbagans become impossible. Of course, I objected that this would be a rather responsible and probably fateful disturbance of the normal balance of nature, and remembered to him the present sorrows of Australia.

Dr. Kukushkine has returned recently from Moscow and Saratow where he worked in Nikanoroff's institute.

In Warszawa I had to stay 22 hours as the train for Vienna leaves just two hours before the arrival of the eastern train from Stolpze. I made advantage of this unexpected delay by visiting Prof. Hirszfeld at the Hygienic Institute. We had a long talk together mostly about blood grouping. I heard from him the sad news that Dr. A. L. Wasiliewsky, my former chief at Tshita died some years ago of *ulcus ventriculi*. I suppose you remember him. He has been in Harbin and worked in the Polish Red Cross in the years 1920-1921. Dr. Hirszfeld himself was unable to join the Congress on account of the illness of his wife. He sends his best compliment to you.

At Vienna I had a rather busy time; I spent a considerable part of the day in the well equipped library of the Viennese Medical Association, to go through medical literature being not obtainable to us in the Far East. I found indeed some new important papers and had partly to change my manuscript. Much of my time I spent in the Museum of Natural History where I got the final determination of

some of our wild rodents having been used for the grahamella-bartonella-experiments. I worked also in the factory of Reicherts' optical works where I took photos of some preparations for our bartonella-grahamella-lectures. The lantern slides of them have been demonstrated during the lecture in Paris, and have been regarded there as first class ones. I sent you already some copies of the negatives. At Hochstetters in the institute of normal anatomy I studied the famous paraffin method for museum specimens. Animals, especially frogs, reptiles, and so on, thus prepared are really surprising. They look like the work of a genius sculptor the natural colours being excellently preserved. This method is in great fashion now, and also the director of the Wellcome Museum of Medical Science, Dr. Daukes, has been recently in Vienna to learn the details of the technic locally. The preservation of mammals is somewhat more difficult, and some more experience is necessary, but it is undoubtedly worth trying this method for our small wild rodents. During my stay in Europe where I visited the museums and collections of 7 big capitals I never have seen a really satisfactorily preserved small rodent. Especially the mouth, nostrils, and eye regions are always severely changed by shrinking. The new paraffin method however preserves them especially well.

At Vienna I also met Docent E. Lauda, the well known bartonella specialist. I gave him our manuscript, and he was surprised by the abundance of the different species of rodents investigated by us. On account of our new results he made numerous corrections and completions in the second proof of his article for the new issue of the *Handbuch der pathogenen Mikroorganismen*; unfortunately it was too late as the printer refused already to make so many changes. Doc. Lauda has been very interested in our work, and showed me also much of his own material. He is working now on parabiosis in partly splenectomized rodents.

The Congress in Paris was indeed imposing. One can say freely that more than one half of all living microbiologists of importance have been present. Most of the members came from France and Germany. It is a great pity that the prominent Russian microbiologists as Slatogoroff, Barykine, Nikanoroff and others had no possibility to join this congress although some of them had been elected referees in chief for some sections.

The themes of the congress were divided into four sections. All the four meetings were held at the same time. This was undoubtedly a disadvantage as it was impossible, therefore to join all the lectures.

Our two lectures had a numerous auditorium. Thanks to a rather inconvenient arrangement I had to read both of them almost at the same time and missed therefore some valuable reports about blood grouping. Concerning the lecture about grahamellosis and bartonellosis special attention was paid to our new findings about the life cycle of the grahamellae and their cultivation. As to the blood grouping among the Manchurian domestic animals, Professor Bernstein remarked that

these investigations are of special importance as the local races of the investigated animals are comparatively pure and unmixed and it is necessary to finish these investigations now before crossing with other races of cattle, sheep or pigs respectively takes place. After the lectures and the discussions I had a long talk with the colleagues, and Prof. Mayer and Landsteiner offered me their help in publishing further material about these interesting subjects. I have been invited by Prof. Mesnil into his laboratory where I showed the whole collection of preparations I brought with me, and presented some of them to the laboratory. Especially our preparations of the grahamellosis among hamsters have been wanted by everyone as nobody has ever seen before such a high degree of infection of the blood by the grahamella microorganisms.

Among the most important facts stated in this congress the following may be mentioned:

D'Herelle emphasised that his bacteriophage shows all the features of a living being. The symbiosis of the bacteria with the bacteriophage can be considered as a chronic disease of the bacteria. This symbiosis produces sometimes mutation among the microorganisms. (Analogical facts can be observed also among different plants where symbiosis takes place). Under this point of view the present classification of the bacteria has to be revised.

Bordet spoke against this theory; he considers the bacteriophage not as a living organism but as a by-product in the metabolism of bacteria.

As to the problem of the aetiology of scarlet fever some authors considered it as not solved until now. The Dickreaction has to be regarded as irregular, inconstant, and unreliable. It cannot be considered as a specific antiscarlatinal reaction. The therapy with antistreptococcal serum has no influence on the severe toxic cases while convalescent serum has. The cause of scarlet fever is probably an ultravirus which is partly absorbed by the streptococcus and therefore is present in its filtrate.

Though Slatogoroff was absent his lecture was presented in printed form to the members of the congress. His opinion about the aetiology of the scarlet fever is of great interest. He emphasises that in the filtrate of scarlet fever patients there can be demonstrated an active virus. This virus can change into a visible stadium in the form of minute diplococci, similar to the microorganisms studied already years ago by Caronia, Sindoni and other Italian authors. By means of injections of mucus from scarlet fever patients immunisation against scarlet fever can be produced. Among other authors Friedemann pleaded for the streptococcal aetiology of scarlet fever while Teissier spoke against it.

Calmette's lecture held in the Grand Amphitheatre of the Institute Pasteur has been very crowded. His statements are in brief as follows. The immunity against the tuberculous bacilli exists only as long as the

organism is invaded by living Tb. bacilli. Only living bacilla are therefore able to immunize. The immunizing vaccine can be therefore prepared exclusively by a weakened race of the Tb. bacilli being no more able to produce any Tb. lesions. The B.C.G.-vaccine has these features. Their effectiveness has been stated in different countries all over the world. It is available for application (1) per os (sucklings in the first weeks of life), and (2) subcutaneously in individuals not yet reacting on Tb.-lesions. Great reduction of the infant mortality can be performed by this vaccine. In France more than 4 Millions of children were immunized. The immunity is active till the fifth year of life. The author emphasised that by this method the Tb. infant mortality could be "stamped out."

The section of blood grouping stated that the A.—group has to be divided into A1 and A2, and the study of these two subgroups promotes our knowledge in anthropology. As to the study of blood groups in domestic animals (our lecture) it has been emphasised that these studies are of great importance especially in countries where the races of domestic animals are still comparatively pure. (Central Asia).

As far as the bartonella-grahamella section is concerned, Martin Mayer spoke about the importance of the study of those microorganisms not only from the standpoint of human medicine (Oroya fever and Verruga peruviana), but also from the pure scientific standpoint. The role of the spleen in connection with the reticulo-endothelial system can be learned best by studying these microorganisms. As I informed you already our lecture has been heard with great attention, especially the notes about our positive results in cultivation of different grahamella strains through numerous passages on serum-blood agar media.

The section on Febris undulans has been of great interest as well. Bang's lecture stated that in Denmark there were counted in the last year more than 500 cases of febris undulans among men. Bang spoke about the relations of *Micrococcus melitensis* with *Brucella abortus*, and stated an infection of human beings with Br. abortus by goats' milk never has been observed until now. Almost in all specimens of "mixed milk" examined the presence of Bac. abortus could be stated. Luckily these bacilli are not able to multiply outside of the living organism, and for invasion and producing the disease, there is necessary a considerable amount of these microorganisms. Examinations of the veterinarian students and physicians have shown that while students of the first terms had almost exclusively negative reactions, the least terms showed already a considerable percentage of positive agglutination and complement fixation test of the brucella abortus. Still more striking was the examination of veterinarian doctors. Among 65 doctors who treated the sick cows 61 showed positive results! Only a small percentage of them had clinical symptoms; in most of them the disease passed in hidden form producing however a high degree of immunity (high agglutination titre!). The chemical changes of the milk from sick cows are considerable, and all cows having once given an abortion are regarded as suspi-

cious, as the microorganisms are able to live for a long period of time in the lymph glands of the uterus. The bull on the other hand does not play any role in the distribution of the disease which has to be regarded as a rule an "infection per os". I think that it would be of great interest to investigate also in Harbin or somewhere else in the Far East (1) the milk from different places on the presence of the *brucella abortus* and (2) the blood of veterinarian employees in order to find out whether also here such a high percentage of this personal shows immunity as in the northern European countries.

As soon as the congress was over I left Paris for London where I visited the excellently equipped Institute of Tropical Medicine. Mr. Parkinson showed me the whole building, the beautiful new lecture rooms and the recently installed museum. The latter—although at the present moment only in its early beginnings—is already now an object of great interest. Mr. Parkinson kindly wrote me also a recommendation to the director of the Burrough Wellcome Museum. The rest of the day I spent there. It was a great pity that my time was so limited as only by means of numerous visits it would have been possible to go through all the exhibits in detail. This museum is admirable not only on account of the rich material being exhibited but mostly on account of the standard technic of the art of exhibition. Especially striking are the numerous photomicrographs in colours substituting some thousands of microscopes. The director of the museum, S. H. Daues has been recently in Vienna in order to learn the new paraffin method of Hochstetter. He told me that he would be very much obliged if I could interest you in the question of plague specimens for this museum. They are not easy for them to obtain and would be of great teaching value. (They have only one not very nice specimen of pneumonic plague in their museum.)

The next day I visited the British Museum and the Museum of Natural History. The third day of my stay in England I went to Tring where I spent a very nice time at Jordans, the director of the famous Rothschild museum. I spent the whole day there in studying the famous entomological collection of siphonaptera containing more than a thousand different species of fleas. Dr. Jordan presented to me a complete set of the valuable journal "Ectoparasites" containing many important papers on fleas. We had a long talk about siphonaptera together. The last days of my stay in London I spent in sightseeing of different museums; among others I visited repeatedly the Museum of Natural History where I became acquainted with some zoologists. Unfortunately most of them were on leave. Everyone I met has been very interested in our work and asked me for animals and parasites from Manchuria. My limited time and the rather expensive life in London forced me to leave England for Hamburg already on the fifth day of my stay.

At Hamburg where I stayed almost a fortnight I worked in the Tropical Institute—mostly in Prof. Mayer's laboratory. M. Mayer showed greatest interest in our work and has been in every respect very kind to me. I met there numerous microbiologists, although the season

A REPORT ON MY TRIP TO ATTEND THE MICROBIOLOGICAL 193
CONFERENCE IN PARIS.

was not at all favourable and most of the medical staff has been on leave. I visited repeatedly the quarantine stations and the disinfector of the harbour and of the city as well. The "Hafenarzt" Prof. Sannemann enabled me in being present during the disinfection of some Ocean Steamers by hydrocyanic acid (Cyclon B') and sulphacose, and I learned a good deal in handling these disinfectants.

Thanks to the new construction of the ships and buildings (almost the whole quarter of "Old Hamburg" has been rebuilt in the last few years) rats are not common in Hamburg. Ships entering European Harbours are all deratised exclusively when they arrive from plague infected regions. Thanks to the modern regulations of disinfection, ships harbour as a rule, if ever, only a very small number of rats. Thus ships on which after disinfection more than 50 rat-carasses are found, are considered as contaminated to an uncommonly high degree. As a rule, on modern ships, not a single rat corpse is found after disinfection.

In 1929 there have been investigated 475 "plague suspicious" ships by the Hamburg Hygienisches Staatsinstitut, and only one proved to be positive: Out of the 8632 investigated rats from those ships 13 gave positive results. In the year 1930 until July not a single plague positive ship has as yet entered the harbour of Hamburg. I visited also the Hygienic Institute of Hamburg, where I met Prof. Neumann who asked me for stuffed tarbagans and provided me with different pamphlets and literature.

My stay in Berlin has been a very short one. I visited there the "Robert Koch" Institute for Infectious diseases where I met among others Prof. Otto who asked me much about the plague situation in the Far East. In the zoological museum I met Prof. Enderlein, while unfortunately Prof. Martini had left Berlin for Italy some days before my arrival. After inspecting the famous hospital "Charite," I left Berlin for Jena where I visited the optical works of Zeiss. I saw there the production of microscopes from the beginning, the grinding of lenses for oil immersion and so on, all what is on a little smaller scale well known to me through the kindness of Dr. Reichert whose optical factory I have visited repeatedly.

The up-to-date microscopes are all binocular, and many new inventions are made to improve these stereoscopic instruments. It seems that the monocular microscopes will be soon regarded as "old fashioned".

From Jena I went to Dresden where I spent a few days to see the famous hygienic exhibition. I brought from there many valuable catalogues, books, pamphlets, and so on.

It is really impossible to give a survey of this exhibition in brief. All I can say is that it was indeed marvellous. It is to be pitied that our institution did not participate in exhibiting plague material. But this can be still remedied as the exhibition is to be repeated in summer 1931.

Soon after sightseeing Dresden I left Europe for Harbin.

(Signed) H. M. JETTMAR,
(Serologist of the Service).

SUMMARY OF THE HARBIN HOSPITAL REPORTS FROM SEPTEMBER 1928 TO AUGUST 1930.

It is proposed to go through the list of patients who were treated during the period under review with additional remarks on any characterizing features.

The class of people one has to deal with is mostly poor and ignorant, lacking in ideas of hygiene. They are, however, very patient and uncomplaining under suffering, and when they recover they are most grateful. In many respects, they are ideal patients in that they are not nervous or apprehensive. When giving them anaesthesia, one does not have to practise Crile's anoci-association dodges, for they simply "go under" quietly and easily. Their constitution seems remarkably good and recovery powers exceptional. Most of them are of the Northern stock and usually have good physique. One is happy to state that most of them are lean and muscular, a condition which delights both the diagnostician and the surgeon who do not have to wade thro' layers of fat before they can get at the interior. This is because the home diet of the patients is generally poor of course. From this point of view one can account for the great prevalence of tuberculosis in all forms, especially when the crowded living conditions are taken into consideration.

Among the factors which may exert an influence over the incidence of diseases, mention may be made of their meteorological and geographical conditions. The extremely cold and dry climate in winter and the relatively high altitude of North Manchuria seem to have direct or indirect influences. An endeavour will be made to elucidate some of these points.

INJURIES.

More patients are admitted under this category than any other. Wounds from accidents or stabs head the list, while gun-shot wounds come a close second. Most of the patients receive their wounds from robbers or by accident. Many of them have to travel some distance to reach the hospital and are seen some time after the event. This is the reason why so few come with wounds of the trunk which are serious and often quickly fatal.

A fair number of fractures are seen, mostly of the tibia. These injuries are usually from crushes by carts or heavy objects.

DISEASES OF THE GENITO-URINARY SYSTEM.

Bubo heads the list, showing the prevalent tendency of the venereal diseases. Other forms like syphilis and gonorrhoea do not usually require hospital treatment and are therefore seen mostly as out-patients.

SUMMARY OF THE HARBIN HOSPITAL REPORTS FROM 195
SEPTEMBER 1928 TO AUGUST 1930.

Nephritis is not very frequently met with, though scarlet fever is often with us.

DISEASES OF THE ALIMENTARY CANAL.

Fistula in ano is very frequent. This is probably due to the coarse food and habitual constipation, resulting in the injury of the mucous membrane of the rectum.

Dyspepsia is also seen, caused by the large meals taken by the people who eat only twice daily.

T. B. peritonitis cases were admitted six times.

Only one case of appendicitis was admitted and cured.

CIRCULATORY AND RESPIRATORY SYSTEM.

Tuberculosis in the form of phthisis and adenitis are encountered, the former mostly for diagnosis or for haemoptysis. Some are sent in when they are in extremis, so as to avoid dying in their own homes. It is not often that we get early and suitable cases for a thorough treatment. The winter is so severe, and the treatment of phthisis is so long that patients would prefer to go south to their homes for rest and recuperation.

We have largely given up the operative treatment of T.B. adenitis of the neck, unless they are small and very few. There are much better methods such as the injection of iodoform emulsions and use of X rays.

Though there are many heart diseases, their etiology is obscure. The impression is that there are many cases of the involvement of the musculature of the heart.

TUMOURS.

Papilloma, mostly in the form of large venereal warts are often admitted. Carcinoma only three times and sarcoma three times. Ovarian cyst cases were admitted five times.

DISEASES OF THE NERVOUS SYSTEM.

Neurasthenia heads the list.

Spastic paraplegia is quite often seen. Both tabes dorsalis and general paralysis are seen only once each. It seems as if late syphilitic manifestations are rare.

DISEASES OF BONES, MUSCLES AND JOINTS.

T. B. bone and joint affections are exceedingly common. They are seen more often than in the south. The cases are usually old-standing and require amputation of the limb.

Chronic rheumatism is often due to syphilis and is benefitted by appropriate treatment.

FEVERS.

Typhoid is always with us. During the autumn of 1930, there was quite an epidemic in the town. It was difficult to ascertain the source, because the fly season was already over and the water supply of the town is from individual artesian wells. Of course the question of carriers cannot be eliminated.

Some relapsing fever cases were also admitted, there being an epidemic in the spring of 1930. Neosalvarsan injections proved very successive and dramatic.

VARIOUS.

Patients who come for help in order to rid themselves of the opium habit are usually fractious and intractable to the necessary restrictions. After lengthy and difficult treatment, it is notable that they not infrequently relapse to their old habit again after their return home.

During the period under review the exceedingly rare disease of leukaemia was seen once.

The fact that common excreta are not used for manure explains the comparative infrequency of intestinal parasites. We ascertained that some 25% of the stools contain the ova of parasites. Of these 19% are those of the ascaris. Other parasites are rare.

CITATION OF CASES.

Ovarian Cyst. Mrs. Miao, aged 34, multipara, complained of gradual swelling of the abdomen for the last three years. She was thin, but not emaciated. The abdomen was enormously distended, and there were engorged superficial veins to be seen. Some solid mass could be felt in the left upper quadrant. There was much fluid, and on tapping 2½ buckets of dark viscid fluid were removed. At operation, a large ovarian cyst was found. It was, however, firmly adherent to the abdominal wall in large areas. Unfortunately the adhesions could not be removed, so the abdomen had to be closed again. The wound healed by first intention. The fluid began to accumulate again.

Imperforate Anus. A baby, by name Wu, 7 months old. The occlusion was not complete, for there was a small opening in the anterior part of the perineum which permitted the passage of liquid faeces, and there was a dimple at the proper place for the anus. At operation, the dimple was incised, and the mucous membrane of the rectum was identified and pulled down. This was sutured to the skin all round the opening with the result that a good anus was reconstructed.

Strangulated Hernia Seen After 14 Days. Chao, a man of 24 years, was admitted with a history of 14 days' irreducible inguinal hernia. This hernia was on the right side, and was in the beginning reducible. He had it for 5 years. The condition of the patient was fair. There was not much distension of the abdomen. The pulse was not bad. But there was an area of inflamed skin in the region of the

SUMMARY OF THE HARBIN HOSPITAL REPORTS FROM 197
SEPTEMBER 1928 TO AUGUST 1930.

inguinal ring which was very painful. At operation, the inflamed tissue was found to contain faeces. It was then found that there was a perforation of the intestine at the neck of the ring and the faeces were trying to point at this place. The hernia was adherent to the sac and could not be separated or reduced. A resection of the intestine could not be done, so a tube was put in the perforation and the wound partly closed. The next day the patient was relieved by the passage of faeces at the perforation point, but on the third day he was worse. Symptoms of toxæmia set in. The temperature fell very low and the pulse increased in frequency. In spite of glucose and saline injections and heart stimulants, he did not rally, but passed away on the fourth day.

Strangulated Hernia Seen after 10 Days. Yang, a man of 28 years, complained of a left inguinal reducible hernia of several years' standing. At operation, the contents of the sac consisted of some degenerated omentum adherent to coils of small intestine which was not gangrenous. It was possible to separate the omentum from the intestine, and return the latter to the abdominal cavity. The degenerated omentum was ligatured and removed. A radical cure was performed after the method of Bassini, and the patient afterwards did fairly well. Both faeces and flatus were passed daily either naturally or by enema. The patient insisted on returning home on the 4th day. His stitches were removed on the 7th day at home, and the wound was then healing by first intention. He made a good recovery.

Banti's Disease. A man, named Chao, aged 39, complained of the swelling of the abdomen for three years. On examination, he did not appear to be emaciated, but fairly well nourished. There was some anaemia. No history of haemorrhages anywhere. All organs were found to be healthy. The spleen was much enlarged, being palpable down to the umbilicus, and notched. The liver could not be felt. No distended veins were seen on the abdomen. Urine and stools were normal. The blood showed ordinary secondary anaemia. With the exhibition of Fowler's solution and the daily injection of sodium cacodylate for 14 days, the spleen was found to be smaller. When the patient felt better at this stage, he left the hospital. The temperature was not raised at any time of his stay.

Ovarian Cyst. Mrs. Hoa, aged 33, suffered from swelling of the abdomen for two years. She was tapped twice, once by us four months ago and ovarian fluid was obtained. At operation, after tapping the day before, the cyst was found to adhere extensively to the upper abdominal wall. These adhesions were separated, and the pedicle of the cyst clamped and tied. The stump was sutured first and then buried by Lambert sutures. She made a good recovery, though cough and accumulation of phlegm for the first two days after operation caused anxiety. The wound healed by first intention.

Leukaemia. Mrs. Kwan, aged 34, complained of the swelling of the abdomen for one year. On examination, the spleen was found to extend to the pelvis. The blood showed typical picture of leukaemia. There was also some petechiae of the mucous membrane of the lips. Arsenic injections were started, but she did not stay long enough to receive any benefit. Leukaemia may be said to be very rare in this hospital.

Dermoid Cyst Of Ovary. Mrs. Chang, multipara, aged 25, had a history of three years' gradual swelling of the lower abdomen. The swelling was found to be a tumour occupying the lower abdomen, firm, freely moveable, and seemed to be connected with the uterus. At operation, the tumour was removed from the left appendage. On examination of the right ovary, it was also cystic. This was also removed. On section, the tumour was found to contain hair and sebaceous matter. The tumour had a diameter of about 8 inches and weighed about 5 lbs. The patient made an uneventful recovery.

Intestinal Obstruction. A young man, Jen, aged 26, was admitted with the history of pains in the abdomen for 10 days. There was vomiting of stomach contents and water for four days, but no faecal matter. Small amount of faeces were said to have been obtained by enema in another hospital. Past history seemed to show some irregularity of the bowels such as diarrhoea. Nothing else of importance. On examination, the patient was fairly well nourished and did not seem to be desperately ill, though he was suffering from pain and could keep very little in his stomach. Enema did not bring any result. The abdomen was tender and distended, but not hard. No mass could be felt. At operation, distended coils of intestine were seen and when traced to the region of the caecum, fibrous bands were encountered. On separating them from the intestines it was found that there was a narrowing of the intestine besides adhesion at the site of the narrow part. On seeking the cause, it was found that the mesenteric glands were all enlarged. Therefore, this was a case of tuberculous ulcer causing the obstruction. A resection of the intestine was made and an end-to-end anastomosis was performed. The patient recovered well, and for three days he passed a large number of stools. But on the fourth day he showed signs of peritonitis, perhaps from the giving way of the anastomosis, and he died suddenly.

Intestinal Obstruction. A man, Ko, aged 34, was admitted for severe pains and stoppage of the bowels for four days. There was a history of diarrhoea at first for three days. On examination, he was found to be suffering from great pain with perspiration. The abdomen was rigid and tender: No mass could be felt but there was some fluid found in the flanks and in the pelvis. At operation under ether, the abdomen was found to be filled with offensive yellow pus. The hand could feel there was adhesion in the right iliac fossa. It was thought that the appendix was at fault, and as the patient's condition



Photograph of Mrs. Miao, with her large Ovarian Cyst.

苗氏(卵腺袋瘤症)摄影圖



BRITISH MEDICAL ASSOCIATION

SUMMARY OF THE HARBIN HOSPITAL REPORTS FROM 199
SEPTEMBER 1928 TO AUGUST 1930.

was bad, it was decided to drain the peritoneal cavity without further operation or interference. The abdomen was closed. On the next day faeces and flatus passed through the drainage tube, tending to the formation of a faecal fistula. It was thought that if the condition permitted, it might be possible to do a second operation to ascertain the true condition of the abdomen and to close the fistula. But unfortunately the patient died after four days.

J. W. H. CHUN,
Senior Medical Officer A.

A BRIEF ACCOUNT OF THE QUARANTINE HOSPITAL, NEWCHWANG.

INTRODUCTION.

Since the establishment of the Newchwang Quarantine Hospital in 1919, annual reports have been issued and included in the Reports of the North Manchurian Plague Prevention Service Vol. II to VI, this little booklet merely serves as a general review of its activities. This review not only records its past history but also traces the gradual progress achieved within recent years. This booklet is published both in the Chinese and English languages so that its information may be available to our foreign readers as well. It is hoped that this booklet will serve to broadcast to the world the objects and activities of this Hospital.

GENERAL DESCRIPTION OF NEWCHWANG.

Newchwang was made a treaty port in 1864. It is situated about 16 miles from the mouth of the river Liao. Up to 1889 this river with its various tributaries served as a means of cheap transportation. During that year a serious flood occurred, the villages at Tangkiawopu 45 miles away cut a channel at Lengkiakow to let flood waters escape westward into the marshy ground: which is supposed to drain again into the sea. This new channel during rainy and flood seasons soon cut itself a direct route to the sea, thus affording an alternate route to the interior. It is about 30 miles west of Yinkow or Newchwang.

In 1907 the various public bodies built a dam across this defluent channel under the direction of a foreign engineer, Mr. W. E. Hughes. During 1911 just when the works were on the point of completion the enraged country people wrecked them. In 1909 a surtax were levied on goods passing through to raise funds to deepen the bar, and to improve the harbour and the river.

Prior to 1907 Newchwang was the only outlet to the whole Manchurian trade but since 1907 Dairen and Antung came into the field of competition: Dairen is opened all the year round, whereas Newchwang is ice-bound four months every year besides being handicapped by the presence of a troublesome bar at the mouth of the river, so that ocean-going steamers are not accessible. The natural harbour limits can contain sixty steamers. In 1904, 56 steamers, totalling 56,240 tons were accommodated at one time. With an increase of wharf facilities this number can still be augmented.

RAILWAYS: The Chinese Government Railway runs on the north side of the city, detailing two trains per day, whereas the South Manchurian Railway (Japan) runs on this south side having several trains per day. The former connects with the Peiping-Mukden Line, while the latter with the Dairen-Changchun.

SCHOOL: Three middle schools for girls: four for boys: twelve primary schools for boys and eight for boys and girls.

Nationality.	1925.	1926.	1927.	1928.	1929.
Chinese	93,106	99,871	103,603	103,027	104,011
Europeans	132	126	125	99	92
Japanese	3,458	3,586	3,276	3,645	3,004

POLICE: There are about 500 policemen in the city, and 500 soldiers under the command of a colonel.

IMPORTS AND EXPORTS.

		<i>Imports by native junks.</i>		<i>Exports by native junks.</i>	
		H.S.		H.S.	
1919		28,114,578		41,941,642	
1920		30,032,808		51,812,040	
1921		33,380,251		55,821,701	
1922		30,195,760		61,715,016	
1923		35,073,287		57,295,715	
1924		40,056,244		34,827,199	
1925		59,273,732		50,256,165	
1926		43,775,725		45,149,959	
1927		40,640,156		41,252,137	
1928		44,886,756		56,191,324	
		<i>Imports by steam-vessels.</i>		<i>Exports by steam-vessels.</i>	
Date.		From Foreign	Chinese Ports	To Foreign	Chinese Ports
1919	H.S.	6,086,955	17,387,883	H.S. 10,471,315	7,754,134
1920		7,105,140	25,188,803	3,218,290	10,776,254
1921		7,882,212	28,724,875	7,281,223	12,683,063
1922		9,849,376	25,163,064	3,996,576	19,656,026
1923		11,920,059	33,444,155	3,926,366	22,467,143
1924		11,910,533	26,282,653	2,947,179	14,387,841
1925		18,294,373	34,995,884	4,669,507	21,945,962
1926		11,998,891	39,869,949	4,685,973	22,281,633
1927		12,149,147	30,723,931	4,966,588	23,614,621
1928		17,608,527	26,390,349	7,794,379	23,937,872

MARITIME CUSTOMS Vessels entered and cleared.

Date.	Ocean Steamers.		Sailing vessels (foreign type)	
	No.	Tonnage.	No.	Tonnage.
1919	960	830,466	10	1,280
1920	914	727,532		
1921	954	850,286	4	1,903
1922	1085	995,850		
1923	1114	1,107,090		
1924	1004	1,005,330		
1925	1448	1,323,289		
1926	1373	1,340,611		
1927	1336	1,268,238		
1928	1724	1,568,304		

INLAND WATERS. Vessels entered and cleared.

<i>Date.</i>	<i>British.</i>		<i>French.</i>		<i>Italian.</i>		<i>Norwegian.</i>	
	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.	No.	Tonnage.
1919	60	16,860						
1920	64	17,984						
1921	34	16,012						
1924			40	9,040	80	10,720		
1925			1	226			1	875
1926	5	6,266					1	656
1928			14	3,164			1	875

INLAND WATER. Vessels entered and cleared.

<i>Date.</i>	<i>Chinese.</i>		<i>Japanese.</i>	
	No.	Tonnage.	No.	Tonnage.
1919	176	63,796	210	63,086
1920	124	57,817	212	73,550
1921	134	47,578	120	43,214
1922	188	60,224	168	71,058
1923	264	121,526	110	48,840
1924	208	102,766	54	18,894
1925	203	103,028	235	113,230
1926	233	112,565	166	71,944
1927	360	182,501	56	21,189
1928	372	191,658	49	17,859

CHINESE PASSENGERS.

<i>Date.</i>	<i>Arrivals.</i>	<i>Departure.</i>
1919	126,809	47,811
1920	162,488	41,415
1921	131,820	50,101
1922	156,552	63,438
1923	136,388	57,318
1924	115,429	52,118
1925	147,840	53,638
1926	177,122	64,197
1927	217,107	62,371
1928	249,385	99,846

TEMPERATURES. For 1929.

<i>Maximum.</i>			<i>Minimum.</i>		
May	5-	93 F.	Oct.	30-	'0'
June	8-	93	Nov.	25--	10
July	4	93	Dec.	19-	2
Aug.	9	93	Jan.	7	9
Sept.	1	91	Feb.	1	5

THE DETENTION CAMPS. They were completed during September, 1924, consisting of the following :

- (a) Three long rectangular 150 feet by 24 feet buildings, each with attendant's room, baggage rooms, and patients' rooms which contains two paralld rows of hygienic dust, flea, rat and fly proof sleeping 'Kangs' consisting of wooden boards resting on ferroconcrete supports. Each can accommodate 100 contacts. Each block is separated by barbed wire supported on concreted posts. Each has a separate fire proof and rat proof and fly proof latrine built of concrete slabs with cement foundation.
- (b) A Female block of 80 feet by 24 feet, with attendant's room, a baggage room, and a patient's room consisting of two parallel rows of hygienic 'Kangs' which is capable of holding about 100 contacts.
- (c) An 'L' shaped block consisting of 13 rooms with 'fire' kangas for private families. The servant quarters and the general kitchen are in this block. Capacity is for about 100 contacts.

THE EXAMINATION BLOCK. It was completed during July, 1927, consisting of a large waiting room, men's examination and women's examination rooms, men's shower-bath and women's shower-bath rooms, men's and women's dressing rooms, a doctor's consultation room and a boiler room. All these are on the ground floor.

The first storey consisting of a living, bed, dining, bath room, and a kitchen for an assistant doctor's quarters.

Besides the above named buildings there are one gatehouse on the north and one on the south entrance. All the buildings are wired throughout with electricity. The main block or the hospital proper is heated with steam heating system. The rest of the other buildings with individual iron stoves.

STAFFS AND THEIR DUTIES.

There shall be the following staffs consisting of higher staff Director and Chief Medical Officer, Co-Director and Treasurer, Port Health Officer, Resident Medical Officer, Nurse, Medical Assistants, and lower staff (3 Attendants, 2 Coolies, 1 seamstress, and one Cook). The Director & C.M.O. who shall have supervision of all the affairs of the Hospital. The Co-Director and Treasurer shall assist in the supervision of the Hospital affairs but not to interfere with the technical direction of the Hospital. He takes responsibility for the safe-keeping of the funds allotted for the maintenance of the Hospital. The Port Health Officer shall examine steamers coming from the infected ports. The Resident Medical Officer shall direct the general affairs under the orders of the Director and C.M.O. The two Assistants shall undertake technical

duties and hospital routine under the order of the Director and C.M.O. The Nurse shall have charge of nursing work and regular examination of local prostitutes. The appointment of R.M.O. and assistants are made by the Director & C.M.O. and that of the lower staff is made by the R.M.O. and reported to the Director & C.M.O. for approval.

STATISTIC OF PATIENTS TREATED.

The following statistics are since the opening of the hospital on July 10th, 1920 to June 30th, 1929.

(a)	Outpatients treated	Inpatients treated				Total
	1920-1	3225	Medical 21	Surgical 22		43
	1921-2	3367	.. 10	.. —		10
	1922-3	2919	.. 44	.. 21		65
	1923-4	4412	.. 10	.. 18		28
	1924-5	4343	.. 10	.. 43		53
	1925-6	5812	.. 18	.. 44		62
	1926-7	6034	.. 60	.. 35		95
	1927-8	7960	.. 38	.. 32		70
	1928-9	11254	.. 40	.. 61		101

(b) Infectious Diseases treated during the same period

Name	1920-1	1922-3	1923-4	1926-7	1927-8	1928-9
Cholera	—	36	—	35	01	—
Erysipelas	—	—	—	03	03	02
Diphtheria	01	—	—	—	09	—
Scarlet Fever	02	—	—	01	—	02
Measles	—	—	—	01	01	02
Smallpox	01	—	—	—	01	01
Typhoid Fever ...	02	—	01	—	—	—
Parotitis	—	—	—	29	05	09
Meningitis	—	—	—	—	—	02

CHOLERA IN NEWCHWANG.

Since the opening of the Quarantine Hospital on July 10, 1920, we have cared for about 133 cholera cases. The incidence of cholera is as follows :

From July 1, 1922 to June 30, 1923—	36 cases with 10 deaths.
.. .. 1, 1926 30, 1927—	87 cases with 27 deaths.
.. .. 1, 1927 30, 1928—	1 case with no deaths.
.. .. 1, 1929 .. Dec. 31, 1929—	9 cases with 1 deaths.
TOTAL	133 cases with 38 deaths.

About the 87 cases we had during 1926, 22 of them died on admission with no treatment; they were brought in too late, and 5 died within 24 hours after admission, totalling 27 deaths in all. Treatment with hypertonic saline solution of the following formula was given intravenously, averaging 2 pounds each dose at intervals of 6 to 8 hours apart.

A BRIEF ACCOUNT OF THE QUARANTINE HOSPITAL, 205
NEWCHWANG.

Sodium chloride	120 grs. or	7.104 gms.
Potass chloride	6 grs. or	.388 gms.
Calcium chloride	4 grs. or	.259 gms.
Aqua	1 pint	500.000 c.c.

The majority were given three injections of 2 pounds each. During the 1926 cholera epidemic we instituted mass vaccination with cholera vaccine each person receiving 1 c.c. containing about 200 millions of the killed cholera bacilli hypodermically. We started with our own hospital staff, the police, the schools, the brothels, restaurants, bath house and hotels or inns. A total of 12,220 males and 4,625 females were vaccinated in the above mentioned places. Besides these we vaccinated about 20,488 male and 1,058 female passengers. We also inspected about 8,251 officers and crew from 141 steamers, and 413 officers and crew from 208 junks. During the year 1929, there were 8 cholera cases with 1 death from July to October. This case was said to have come from a Tientsin steamer the day before, took sick at an inn and finally brought in and died at the hospital after 30 hours. After this case we immediately instituted "Medical inspection" on all Tientsin steamers. On receiving report of our "Medical inspection", the Port Health authority wired to enquire. When told of the said importation of a case of cholera by Tientsin steamer, they were surprised to hear it. The said steamer left port before the case was discovered and was not quarantined. But the 48 inmates from this inn were detained in our quarantine camp for 7 days.

Steamers Detained from July to October, 1929.

- S.S. Too Nan (Chinese) detained 7 days. One sailor sick and recovered.
- S.S. Shansi (British) one case died on board.
- S.S. Ninghai (British) one case died on board.

Passengers Detained from July to October, 1929.

- 25 persons (4 women) detained ex—S.S. Shansi.
- 16 " (4 ") " " " Ninghai.
- 48 " (8 ") " from Ho Yuan Inn, a city hotel
— where one case of cholera died.
- 89 Total

Steamers inspected from July to October, 1929.

<i>Nationality</i>	<i>Number</i>
Chinese	67
British	40
Japanese	24
Norwegian	3
French	1
Finnish	1

136 Total

Passenger and crew inspected from July to October, 1929.

Foreign passengers	74	Foreign Crew	1910
Chinese passengers	10,141	Chinese Crew	6014
	<hr/>		<hr/>
	10,215		7924

APPENDIX

PROPERTIES.

	<i>Building</i>	<i>Fixture & Inst.</i>	<i>Land</i>	<i>Drugs</i>	<i>Total</i>
Main Block.	30,000.00	12,000.00	7,000.00	2,000.00	51,000.00
Detention Camps.	40,000.00	2,000.00	—	—	42,000.00
Examination Block	10,000.00	2,000.00	—	—	12,000.00
Out Houses.	5,000.00	2,000.00	—	—	7,000.00
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total	85,000.00	18,000.00	7,000.00	2,000.00	112,000.00

C. S. LIN,
Senior Medical Officer
(Newchwang).

REPORT OF THE ANTUNG QUARANTINE HOSPITAL (For 1929—1930).

Dr. Wu Lien Teh,
Plague Prevention Service,
Harbin.
Sir,

I beg to submit you a summary of my report of the Antung Quarantine Hospital.

Antung is situated on the right bank of the Yalu river 25 sea miles above its mouth at Tatungkao (大東溝), and about 150 miles South-east of Mukden. It is an important station of the Fushan-Mukden Railway Line and is the gateway to Manchuria from Korea and Japan.

On the opposite bank of the river is the Korean town Hsin-yi-chow (新義州) which is fast growing under the skilful administration of the Japanese.

The *hsien* (district) of Antung was established in the Second year of Kwang-su (1875 A. D.) and the Treaty Port was opened in 1900.

Local Government.

Antung comprises the Chinese Territory and the Japanese Railway Area. During the last two decades there have been three changes in the system of the local government. From 1914 to 1928, Antung was one of the 19 districts under the control of the Tung Pien Tao-yin (東邊道尹), who resided in this city. In January of 1929, the Tao-yin system was abolished and the Office of the Antung Preparatory Municipality (安東市政籌備處) was established with a Mayor as the administrative head for the Port of Antung. The Mayorship was again abolished on April 1st of this year and since then the Antung Magistrate has become the civil head of the local government.

There is in Antung no foreign consul other than the Japanese Consul who resides at Ch'i-tau-kuo (i.e. the Japanese Railway Area.)

Population.

The total Chinese population of Antung and the surrounding villages amounts to 90,404 (Chinese Police Department Report, 1930).

The Japanese Railway Area is said to have a population of 66,255 persons of whom 45,037 are Chinese, 11,298 are Japanese, and 9,567 are Koreans.

According to figures obtained from the Public Safety Bureau (公安局), there were only 698 deaths among 90,404 persons during

1930, i.e. 7.8 per 1000 population. This record is certainly unreliable. Reports of the Japanese Police Station at Ch'i-tau-kuo (七道溝), on the other hand, give the Death Rate for Chinese as 11.7 for Japanese as 18.8, and for Koreans as 25.4 per 1000 population. The surprisingly low death-rate among Chinese in the Railway Area can perhaps be best explained by the fact that the Chinese people living there are mostly without wives and families, hence the number of infant fatalities among them is extremely small.

Municipal and Sanitary Improvements.

(a) *Streets*: The work of widening and metalling the streets was started by the Commercial Guild in 1925, and a sewage system was then introduced. In 1929, Mayor Chen Feng-chang (陳奉璋) did much in improving the condition of the streets and in rebuilding the native Market, and as a result, several streets were repaired and widened and trees were planted on both sides of nearly all big streets. To Mayor Chen and the Chamber of Commerce Antung is indebted for a new public park just close to the old park on the southern slopes of the Yuan Pao Shan (元寶山). The moat which formed the boundary line between the Chinese city and the Railway Area and which once remained a threat to public health, was filled up last year, a sewer substituting its purpose.

(b) *Hospitals*: The South Manchurian Railway Hospital is the best equipped one in Antung. It has 170 beds and a daily clinic of 80 patients in the winter and about 180 in the summer months.

The Danish Mission Hospital: This institution has grown steadily since 1912. There are 40 beds in the men's department and 26 beds in the women's ward. A new building for women to accommodate 40 beds is being built and will be completed this autumn. The staff consists of two Danish doctors (including one lady doctor) and two Chinese doctors who are graduates from the Mukden Medical College.

Water Supply.

The water works in the Railway Area were started in 1912 by the S. M. R. Co. for supplying 30,000 people at the outset. With the growth of population, there were complaints for shortage of water supply, and the Railway Co. supplemented in 1921 the rock bottom of the reservoir valley with a concrete dam to prevent leakage at the cost of Gold Yen 230,000.

But in the Chinese city there is as yet no running water system. The only place where running water can be purchased is a small shed adjacent to the native Market, and this is but an extension of the Japanese waterworks.

Waterways:

The course of the Yalu river traverses a track of country ranging from 124 20' to 128 40' E. Long. and from 39 50' to 42 15, N.

Lat., the course of its main stream affording a boundary line on the south-western side of Changpai Mountain (長白山), dividing the southern parts of Liaoning Province from the Korean provinces Kankyo Nando (咸鏡南道) and Hsian Hokudo (平安北道). The total length of the Yalu river is about 400 miles. Its source is traceable to a little mountain stream flowing out from the Lake Lung Wang (龍王潭), in the crater of the extinct volcano Mt. Pai-tou (白頭山), the highest peak of the Changpai group, rising 8000 feet above sea level, with a shining crown of volcanic rock that flashes the sunlight like perpetual snow.

The section of the river above Antung provides a means of water carriage available in Summer to junks and light draft motor launches drawing 1/2 ft. of water. At present, five motor glider-boats for passengers are trading up river as far as Lin Chang Hsien (臨江縣), 600 li from Antung, and junks and timber rafts are using these waterways. In going up, a common Chinese sampan makes a forty-day journey from Antung to reach Shih-san-tau-kuo (十三道溝). The most distant point whence any rafts are floated down is Changpai (長白), 90 days journey to Antung for ordinary Chinese rafts.

The section of the river below Antung has seen many changes within the last few years. There has been considerable erosion of the river banks, making the river wider and the navigable channel narrower.

San-tau-lang-tuo (三道浪頭) is the anchorage mostly used by steamers frequenting the port, but this anchorage is now threatened owing to the constant silting of sand-banks at and below this portion of the river.

Quarantine Anchorage.

The portion of the river just below the Hospital Jetty used to form a safe anchorage for vessels drawing 13 to 15 ft. and was the anchorage for vessels awaiting quarantine inspection or detained in quarantine. But at present this place can only be reached by steamers having a gross tonnage of 1000 tons or less, while vessels of 2000 tons have now to make berth at Niang Niang Ching (娘娘城), about 2 miles further down. Fear is generally entertained that if nothing is done, it will be a question of time when steamers cannot approach this port nearer than Tatungkuo or Kuawangkuo (挂網溝) which is ten miles from this Station. Even at the present time, all steamers have to wait for flood tide before they can come up or go down river.

Trade Position.

During 1930, 1862 vessels entered and cleared Antung.

This figure is subdivided as follow :

Maritime Customs, under General Regulations :

Ocean steamers	412
Sailing vessels (foreign type)	242
Native craft	34

Under Inland Steam Navigation rules :

Foreign, British,	748
Japanese	62
Chinese	364

The total tonnage of the Harbour for 1930 was 343, 706.

Quarantine Hospital :—

The Hospital was built in 1923 and opened in 1924. The buildings cost \$38,000, and the annual budget is Hk. Tls. 8,400, the funds being obtained by the Waichiao-pu from the Ministry of Finance and the Maritime Customs.

The Hospital is under the control and supervision of the local Quarantine Bureau (安東海口防疫局) the Port Health Officer acting as the administrative officer in direct charge of the Hospital.

The Port Health Officer is appointed to this office by the local Quarantine Bureau, which consists of a board of three directors, viz. the Customs Superintendent as Director, the Antung Magistrate as Co-Director, and the Customs Commissioner as Co-Director and Treasurer. The Directors of the Board are all honorary members. Until April of this year (i.e. before the abolition of the Mayorship) the Mayor was the Director and the Customs Superintendent was the Co-Director.

The Port Health Officer resides at the Hospital and is responsible for the medical inspection of vessels and the carrying out of necessary measures in the case of infected vessels.

The Hospital is situated on 12 *mou* of land on the slopes of a small hill close to the Customs Station at the back of San-tau-langtuo. The buildings comprise five separate blocks—namely, the Main Building, the Ward, the Detention House, the Disinfection Quarter and the Attendants' Quarter.

Mention was already made in the last report of the buildings and of the Hospital so I do not have to describe them again in this report.

Vessels Inspected in 1929 and 1930.

In 1929, quarantine work was started from May 4 till October 15. Twenty-eight vessels were examined; no case of infectious diseases was discovered. In last year (1930), Medical Inspection of vessels was commenced on March 10 and withdrawn on June 10, the number of vessels examined being only 18.

REPORT OF THE ANTUNG QUARANTINE HOSPITAL
(FOR 1929—1930).

211

No epidemic of infectious diseases occurred in Antung in the past two years. But at present it is said that there are many cases of scarlet fever breaking out in the city.

We have not declared any port infected since the river opened at the end of the last March and therefore no quarantine inspection of vessels has been started yet.

Our Medical Staff comprises one Doctor, one Dispenser and one graduate nurse (male). Besides the Medical Staff, there are 8 employees on the Lower Staff, viz., 1 Boatman (for the motor sampan) 2 Policemen, 1 Water-carrier, 1 Gate-Keeper and 1 Cook.

I have the honour to be,

Sir,

Your obedient Servant,

(Signed) TANG TSUNGREN,
Port Health Officer.

SUMMARY OF SEVENTEENTH ANNUAL GENERAL REPORT, 1929.

(To the His Excellency, Minister For Foreign Affairs, Nanking.)

Sir,

I have the honour to submit a Summary of the Seventeenth Annual General Report of the North Manchurian Plague Prevention Service for the year ending September, 1929.

2. *Plague.* It is gratifying to report that for the twelve months under review North Manchuria has been free from Plague either in the pneumonic or bubonic form. South Manchuria is however, not so happily situated, for there seems to be no doubt that we have to deal with a new menace in the form of possibly a perennial epidemic of bubonic plague in the now well-known Tungliao area. The problem to be dealt with here is somewhat different from that in the north, for as usual in connection with bubonic plague, the rat and ratfleas are closely concerned. For this reason, the situation is more grave and the problem more difficult because the domestic rat, once infected, is automatically a source of danger to the inmates of the homes. The spread of infection is insidious and likely to be wide. Once human cases have made their appearance, the human fleas and the bed-bugs which are so abundant are able to take a part in conveying the infection from man to man. From this it can be seen that the chances of the appearance of bubonic plague in man are much greater than in the case of pneumonic plague, the origin of which depends on the infection derived from contact with the tarabagan, an animal always found living in the fields away from human habitations.

Harping back to the Tungliao area, the staff of our Service were the first to establish scientifically that bubonic plague was the disease which caused a number of deaths in Chienchiatien in September of last year. We were able after 2 months' work to put an end to the epidemic. Apparently this was not the first appearance of bubonic plague in that region. Indeed each autumn for the past five years reports of suspiciously sudden deaths have been received by the railway authorities. The deaths, however, mostly occurred in villages some little way from the stations with no possibilities of ascertaining the true diagnosis. The outbreaks were probably all started among Mongols in or near to the Mongolian territory and spreading slowly south-eastwards.

In the course of our regular antiplague work we were able to prove by experiments that the local rats were plague-infected and that human fleas were also able to convey infection. The most severely affected spot was the village of Chienchiatien where 352 persons died out of a population of 1700. Other cities invaded by plague were :—Tungliao

SUMMARY OF SEVENTEENTH ANNUAL GENERAL REPORT, 213
1929.

and vicinity (40), Chengchiatun (2), Talin (27), Pamiencheng (1), Sanlin (23), and Chiang Yu (62), north and elsewhere (90) total being 597.

As expected, bubonic plague once more made its appearance in the Tungliao area this year, the first known focus being Ouli station on the Tungliao-Chengchiatun section of the Ssutao railway. The staff of our Service soon put an end to this small outbreak of 8 cases. But during August and September some 20 localities were infected with plague. These villages were situated some little distance from the railway area, somewhat isolated and in sparsely populated districts. They are to be found all along the Ssutao railway, both along the Tungliao-Chengchiatun section, and the Taonan-Chengchiatun section. Usually only a few deaths occurred in one village. Up to this day the outbreak has not entirely subsided, but the total number of cases is approximately 400. The list of the infected places and the number of cases is as follows:—

LIST OF INFECTED LOCALITIES.

12th October, 1929.

<i>Locality.</i>	<i>No. of cases.</i>	<i>Date of infection.</i>
I. Ouli	13	11th July
II. Kai Tung District	30	6th August
III. San Lin District	5	8th „
IV. Small Sanchiatze	11	9th „
V. Hauptala	?	11th „
VI. East Pa Ying Ta La	13	17th „
VII. Ou Ping Tai	23	18th „
VIII. San Chia Tze	11	21st „
IX. Wu Chia Tze	27	22nd „
X. Nungan District	97	24th „
XI. Si Chia Gan Tu Li Ka	27	25th „
XII. West Pa Ying Ta La	15	26th „
XIII. Wu Mung Tun	9	31st „
XIV. Ni Mu Tai	39	3rd September
XV. Si Pe Ying Tze	?	10th „
XVI. Chiang Yu District	16	Date of Rep. 21st „
XVII. Wu Tao Wan	?	?
XVIII. Tao Teh Ying Tze	50	„
XIX. Ni Mu Tai (West)	8	21st „
XX. North Pa Ying Ta La	10	25th „

404 plus

There are signs to show that the epidemic will come to an end before long. The big towns and railway station towns have thus far been kept free from infection, and thus the danger of a wide spread seems to be removed. To guard against future epidemics much still has to be done, for as yet no ideal or fundamental measures have been

adopted. Certain grave considerations may be mentioned to account for the necessity of some action. First of all, the type of plague is exceedingly virulent, the mortality being over 90%. This is to be expected when plague invades a new territory.

The localities affected are mostly villages in newly settled areas, which though sparsely populated, are nevertheless dotted with small collections of families consisting mostly of farmers. This newly developed region is exceedingly fertile and in recent years excellent crops of kaoliang and millet have been reaped. The population is being increased by immigration from famine-stricken areas and we may look forward to a more thickly populated country before very long. Secondly, direct railway connection between Tungliao and the South Manchurian Railway and also with the Pei-Ning Railway renders rapid spread of the infection possible. With the prospect of the development of Hulutao, a new sea-port on the Fengtien coast, more traffic will have to be reckoned with between Tungliao and the Pei-Ning railway. The proposed scheme to develop a net-work of railways in these regions is also dangerous in an epidemiological sense. Thirdly, this plague invasion from Mongolia south-eastwards not only involves the Fengtien border and the Kirin border (the Nungan District was invaded last year as well as this year), but also Shansi Province (2000 deaths were reported last year). The contiguous territories are therefore exceedingly extensive.

For these and other reasons it is evident that the task of controlling bubonic plague epidemics is gigantic. Nevertheless, it is not hopeless and it is our bounden duty to devise ways and means for the future.

3. *Cholera*. North Manchuria has been free from cholera last summer, although this disease was exceedingly prevalent in Shanghai. The first cases appeared there at about the end of July, reaching a maximum towards the middle of August and finally declined at the beginning of October. The total number of recorded cases was said to be about 3500 with a mortality of 302 cases. These figures are considerably worse than last year when a total of 50 cases of cholera was reported. From this point of origin, several ports in North China, South Manchuria and Japan were infected. Concerning South Manchuria, a few cases appeared in Dairen and about 12 cases in Newchwang. In the latter place our Quarantine Hospital, cooperating with the local police, ably coped with the situation and soon suppressed the outbreak. Among the activities of the local anticholera bureau, notable mention may be made of the prophylactic inoculation of 6000 persons with anticholera vaccine, which was manufactured in our Harbin Laboratory. Thanks to our vigilance in Newchwang and the activities of the Health authorities in Dairen, cholera was prevented from penetrating further northwards.

4. *Other Diseases.* In the autumn of 1928 Scarlet fever was very prevalent, more so than the year before. Small pox was often seen during the winter. Epidemic meningitis claimed a few victims in the spring of this year (this disease was exceedingly common in the Yangtze Valley, especially Shanghai at that time). We encountered the usual summer diseases in considerable numbers, such as gastro-enteritis, enteric fevers and dysentery. Of recent years the incidence of Malaria and dysentery seemed to be much higher than formerly.

Owing to the need of having a standardised form of Registration of infectious diseases for the whole of Harbin, we invited representatives of the Health Bureaux of the Chinese Eastern Railway, Harbin Municipality, Pingchiang City, Military Department, and leading practitioners to a conference at our Institute in June. It was decided to follow the instructions of the Ministry of Health and to report monthly on the following communicable diseases, Typhoid, Plague, Cholera, Smallpox, Dysentery, Diphtheria, Scarlet Fever, Typhus, and epidemic Meningitis through a Central Epidemic intelligence bureau of Greater Harbin (哈爾濱聯合傳染病統計處) to be located in our Institute. The various Health organs of Harbin agree to send us regularly at the end of each month full information about the occurrence of infectious cases as well as statistics regarding births and deaths. We hope by this means to improve the system of health reporting.

5. The following figures show the number of outpatients treated at various station hospitals of our Service :—

	1928-29	1927-28	1926-27	1925-26	1924-25
Harbin	9058	8883	12077	16943	22874
Taheiho	4204	4434	5445	3246	4669
Sansing	1145	3643	4105	3816	6603
Lahasusu	1789	1284	1356	2388	1629
Newchwang	11685	6637	6588	6263	4675
Manchouli	1893	1977	2038	1674	3234
Hailar	8193	5905	5420	2567	—
	<hr/> 37967 <hr/>	<hr/> 32763 <hr/>	<hr/> 37027 <hr/>	<hr/> 36897 <hr/>	<hr/> 43684 <hr/>

6. The personnel of the Service for 1928-29 are as follows :—

Dr. Wu Lien Teh, Director and Chief Medical Officer.
 Dr. Chun Wing Han, Senior Medical Officer, Harbin.
 Mr. Paul Barentzen (Commissioner of Customs), Lay Director and Treasurer.
 Dr. Lin Chia Swee, Senior Medical Resident Officer, Harbin.
 Dr. R. Pollitzer, Bacteriologist of the Service.

Dr. H. Jettmar, Serologist of the Service.
Dr. Yang Ting Kuang, Senior Medical Officer, Newchwang.
Dr. Shih Chi Liang, Resident Medical Officer, Harbin.
Dr. Kwan Jen Min, Resident Medical Officer, Taheiho.
Dr. Li En Chang, Resident Medical Officer, Manchouli.
Miss Liu Chieh Shih, Senior Nurse, Harbin.

7. In conclusion I wish to take this opportunity to express my thanks to various departments of the Chinese Eastern, South Manchurian, and the Ssutao railways for facilities rendered to our staff in the execution of our work. I am also indebted to the Customs officers and Postal authorities throughout Manchuria for helping our medical officers whenever needed.

I have the honour,
to be,

Your obedient Servant,

J. W. H. CHUN,
Acting Director and C. M. O.

SUMMARY OF EIGHTEENTH ANNUAL GENERAL REPORT OF THE MANCHURIAN PLAGUE PREVENTION SERVICE, 1930.

To
His Excellency,
The Minister for Foreign Affairs,
Nanking.

Sir,—I have the honour to submit a summary of the Eighteenth Annual General Report of the Manchurian Plague Prevention Service for the year ending September 30, 1930.

2. *Plague.* This critical year (1930) is apparently passing away without any serious fear of pneumonic plague breaking out in the endemic region of Transbaikalia, for up to date no report has yet come in of any case occurring either among the tarabagans or human beings. It may be remembered that the two last great epidemics started in Siberia in the autumn of 1910 and 1920, and caused respectively 60,000 and 9,000 deaths.

On the other hand, the newly discovered endemic foci in South Manchuria bordering Inner Mongolia continue to give us much anxiety. The earliest affected area this year appears to be Tungchia Wopo, near Kaitung Station on the Ssu-Tao Railway, which reported the first case of the bubonic variety on July 29. From here the outbreak spread and involved 13 other villages inhabited mostly by Mongols or Chinese dealing with Mongols.

Up to the middle of October, six localities had been affected, namely, Kaitung, Nungan, Taipingchuan, Tungliao, Talin, and Taonan, involving a total area of many thousand square miles. The disease seems to have sprung from different foci, but owing to the scarcity of population, the number of victims was limited to about 260, the last case occurring on October 16.

As soon as news of the plague was received, our Plague Prevention Service sent medical officers with equipment to investigate and easily confirmed its true nature under the microscope. Much anti-plague vaccine was prepared by our Harbin Laboratory and distributed in the affected districts. We received close co-operation from the railway and local authorities. The Liaoning Government kindly sent us \$5,000 for urgent expenses, and as usual showed the greatest concern over the welfare of the populace and desire to see the quick end of the infection. The cases were all bubonic or septicemic, none pneumonic.

Some bubonic cases were reported in September from the Suiteh district of N. Shensi and later on in adjoining parts of Shansi Province.

Detailed information is not yet to hand, but the outbreaks were evidently limited and not pneumonic in character.

Viewing the plague situation as a whole, we note in Africa a small number of cases in Algeria, numerous ones in French West Africa, British East Africa and Madagascar. In Asia, India still presents wide-spread epidemics, the total cases from March to July being nearly 8,000 (6,000 fatal). In Java, 453 cases (445 fatal) were recorded during the same period. Plague still continues in India and Java.

TABLE OF PLAGUE INFECTED AREAS, SOUTH MANCHURIA, 1930.

<i>Village.</i>	<i>Nearest center.</i>	<i>Date sickness.</i>	<i>No. deaths.</i>
13 villages	Kaitung Station	29/7 to 21/9	67
9 villages	Nungan district	17/7 to 8/10	154
Hsinanli	Taipingchuan	13/8 to 10/9	26
One village	Tungliao	12/9	1
Suchuantun	Taonan	1/9 to 10/9	8
	Talin	7/10 to 14/10	11
	Chengchiatun	16/10	1
Total			268

3. *Cholera.* Manchuria has been entirely free from cholera this year. As usual in the past, most large cities in India (Calcutta, Bombay, Madras, Rangoon, etc.), Siam, French Indo-China showed large numbers of cases. In the Philippines, the infection was first reported in Cebu then Ilo-ilo and finally reached Manila, which however escaped with a limited number only. Up to October 17, the officially counted cases number 4053, including 2363 deaths. The outbreak in India and Philippines is still on, though milder.

In Shanghai an intensive study of the cholera situation was undertaken at the instigation of the Minister of Health (Dr. J. Heng Liu) and early in spring various medical experts and high officials of the three Municipalities were invited to three meetings to devise ways and means of presenting a united front to the common menace. At the third conference of May 9, it was decided to establish a Central Cholera Bureau in Shanghai with me as Director, so that the work of the health authorities of the International Settlement, French Concession and Greater Shanghai might be co-ordinated, standardised vaccines used, standard case reports adopted at various hospitals and an epidemiological study made of the disease, especially in the matter of *carriers*, conveyance by junks, water used, etc. Dr. R. Pollitzer and Asst. Medical Officer Wang Yi-chen of our Harbin Laboratory proceeded to Shanghai to assist me and commenced work from June 1. Nearly 600,000 doses of anticholera vaccine were manufactured by the Central Hygienic Laboratory (Shanghai) and used by the three municipalities. Inoculation

SUMMARY OF EIGHTEENTH ANNUAL GENERAL REPORT OF 219
THE MANCHURIAN PLAGUE PREVENTION SERVICE, 1930.

was started on May 15 and up to the end of September 537,034 inoculations had been done thus:

Greater Shanghai	404,675
International Settlement	66,338
French Concession	66,021
<hr/>	
Total	537,034
<hr/>	

It may be that mass vaccination on such an unprecedented scale among the most susceptible part of the population of Shanghai might have been partly responsible for the late appearance and mild nature of the disease. The first case was recorded on August 28, after which less than four or five cases occurred daily. Up to October 19, when the last patient was admitted, only 128 (including one carrier) had been counted. Of these 16 ended fatally, that is 12.6 per cent. We are soon publishing a full scientific report on our investigations performed this year. The information gathered represents a distinct advance on our past knowledge of the cholera problem in Shanghai, and we trust that as a result the health authorities will be able to deal even more effectively with future visitations of this troublesome malady which upset both commerce and the public weal almost every year.

On the whole, China may be said to have been free from Cholera in 1930.

4. *Other Infectious Diseases.*

Owing to the large influx of refugees from the war zone in North Manchuria during last winter (Oct. Dec. 1929), both poor Chinese and Russians underwent severe trials, leading to over-crowding in Harbin and a severe outbreak of *Typhus Exanthematicus*. The incidence was highest between February and May 1930, when at least 454 cases were reported. *Relapsing Fever* claimed 549 victims between November 1929 and May 1930.

Of other communicable diseases, Smallpox, Scarlet Fever, Diphtheria were encountered but not to any unusual extent. During the summer and autumn many cases of Typhoid Fever were recorded.

5. *Sino-Soviet Conflict.* The sudden and almost unexpected clash between Chinese and Soviet forces in Heilungkiang last winter (1929) caused much misery to a large number of innocent persons, including ourselves. Our staff at Taheiho were obliged to evacuate the Hospital in November 1929 and take the overland route during the severe winter months to Harbin. Conditions were sufficiently improved in early summer for our Resident Medical Officer Wang Wenyung to return to his duties. At Manchouli we were not so fortunate, for our Resident Medical Officer Li Enchang was killed on November 17, 1929 by an aeroplane bomb intended for the Wireless Station situated in the

next compound to our Hospital premises. Our hospital was not directly hit, but the explosion shattered the windows and woodwork. During the occupation of Manchouli by the Soviet troops, our Hospital was looted and all equipment, medicines and valuable scientific instruments were removed. It is a sad reflection upon modern methods of warfare that a humane undertaking like our well-equipped Anti-plague Institute of Manchouli, which for years had served as a research centre for the investigation and dissemination of knowledge pertaining to plague for the benefit of the world should have been attacked and cleared of its contents by merciless soldiery. We have since this spring resumed work at Manchouli Hospital.

6. *National Quarantine Service.* In April I was appointed Chief Technical Expert of the Ministry of Health and also Director of the National Quarantine Service with headquarters in Shanghai. The former Sanitary Service of Shanghai Port was abolished on July 1 and its functions taken over by the Quarantine Service. The Fumigating Plant of the Shanghai Disinfecting Company was passed over to us at the same time. The Quarantine Service in Shanghai started with six medical officers, all Chinese, who have graduated in the best medical colleges of England, America, Hongkong and China. All speak the English language as well as Chinese and have received a good grounding of scientific medicine. The Ministry of Finance has appropriated the sum of \$60,000 per annum for the work in Shanghai, but this will be augmented by fees received from the fumigation of vessels. Once the Shanghai Service has been placed upon a sound footing, other ports of China will be taken over and staffed by officers who have received their training properly. By the end of two years it is expected that the Quarantine Service will function efficiently throughout the maritime ports of the country and effectively co-operate with other nations in preventing the importation and exportation of communicable diseases.

I was sent by the Central Government to attend the annual Meeting of the Advisory Council of the Eastern Health Bureau League of Nations, held at Bandoeng, Java, in February this year. It was decided to have the Malabar (Java) wireless Station broadcast epidemiological information daily instead of weekly as heretofore, thus enabling all governments and passing steamers to receive the quickest information about epidemics. Truly immense progress has been made in international health work since the establishment of the Eastern Health Bureau in Singapore six years ago.

7. *Staff Movements.* Since April 15 of this year I have spent most of my time in Shanghai, taking charge of the new Quarantine Service and also the Central Cholera Bureau established by the Ministry of Health. With my chief Assistant Dr. J. W. H. Chun, himself an old Cambridge graduate, acting in Harbin, I feel quite at ease, for he has been associated with me for the past fifteen years.

SUMMARY OF EIGHTEENTH ANNUAL GENERAL REPORT OF 221
THE MANCHURIAN PLAGUE PREVENTION SERVICE, 1930.

Dr. H. Jettmar was sent to attend the first International Conference of Microbiology in Paris (July) and read two papers prepared by Dr. Wu Lien-teh and H. Jettmar, entitled :

- a. Comparative Studies upon Blood Groups among Domestic Animals of North Manchuria.
- b. Bartonellosis and Grahamellosis among Wild Rodents of East Asia.

He returned to Harbin on September 8 after a profitable experience visiting important research centers of Europe.

Dr. Wen Chinchang, graduate of Edinburgh and Lausanne, was appointed a Senior Medical Officer at Newchwang to take charge of the clinical work from May 1.

Dr. Lin Chiaswee was transferred from Harbin to Newchwang in March to be Senior Med. Off. in charge at Newchwang.

Dr. R. Kuntschik (M. D. Wien) joined our Service as Pathologist on July 16 and has been able to renovate our Museum.

Dr. Yang Ting-kuang, Senior Med. Off. Newchwang, was given a League of Nations Fellowship to study quarantine methods in Europe and America. He left in March and returned to China at the end of October. He is now stationed as Senior Quarantine Officer in Shanghai.

Dr. R. Pollitzer and Asst. Med. Off. Wang Yi-chen stayed in Shanghai from June 1 to October 31 carrying out cholera research.

Since September 1, the Commissioner of Customs has passed over the care of accounts and safekeeping of funds of the Service to our own care, so that we are now responsible direct to the Ministry of Finance. For this purpose, Mr. Tsai Chin-chi has been appointed accountant in charge of this department.

8. *Hospital Statistics.* Owing to troubled conditions, as mentioned above, four of our hospitals were closed (Taheiho, Sansing, Lahasusu, Hailar) while others were not able to function at their full strength. The number of out-patients treated as compared with past years are as follow :

	1929-30	1928-29	1927-28	1926-27
Harbin	9632	9058	8883	12077
Taheiho	—	4204	4434	5443
Sansing	—	1145	3643	4105
Lahasusu	—	1789	1284	1356
Newchwang	12564	11685	6637	6588
Manchouli	—	1893	1977	2038
Hailar	—	8193	5905	5420

At Harbin Hospital we admitted 502 in-patients, of whom 147 were medical and 355 surgical. Quite a number of interesting operations were performed, but the most common were still upon bones and joints.

9. *General.* The unprecedented fall in the price of silver has inflicted much hardship upon those depending upon it for their living. Since January the fall has been steady, until now one hundred local dollars fetch only 40 gold yen or less than 25 American dollars. Remittance fee to Shanghai varies between 22 and 25 premium. At one time it soared up to 33. The result is a great increase in the cost of living and price of commodities. Because the Chinese Eastern and South Manchurian Railways charge in gold currency, freight and passenger rates have also been doubled. Add to this the slump in the bean and fur trade, and business may be said to have come to almost a standstill. No wonder the two principal railways say they have lost tens of millions of gold yen and roubles. It is necessary for them to lower their tariffs considerably so as to improve conditions.

In spite of trade depression, which appears to be worldwide, it is estimated that 2500 new houses were built this year in all Harbin. But at least 500 are unoccupied. Property owners are not finding things too easy. The Chinese City of Pinchiang (formerly Fuchiatien) has now a Municipal Council with a go-ahead Mayor (Mr. Chung Yu) in charge. Benefitting by the experience of Canton, Amoy, Nanking and Yinkow, he has forced house owners to tear down their illegally acquired projections into streets and constructed a new main throughfare (Ta-hsin Chieh or New Avenue) extending for fully a mile from the Public Garden along the River Bank into the Railway Area. The electric tramways have been extended from the Railway Area into Pinchiang. A definite tax upon house property is now charged for upkeep of the streets and other municipal utilities. Along the widened street of Yinkow (Newchwang), autobuses now ply daily between important points, and communications are easier and quicker.

10. *Personnel.* The personnel of the Service for 1929-30 are as follows:

- Dr. Wu Lien-teh, Director and Chief Medical Officer.
- Dr. Chun Wing-han, Senior Medical Officer, Harbin.
- Mr. R. C. L. d'Anjou, Commissioner of Customs, Lay Director and Treasurer (ceased to function September 1.)
- Dr. Lin Chia-swee, Senior Medical Officer, Newchwang.
- Dr. R. Pollitzer, Chief Bacteriologist of the Laboratory.
- Dr. Yang Ting-kuang, Senior Medical Officer, transferred to Quarantine Service, Shanghai.
- Dr. H. Jettmar, Serologist of the Service.
- Dr. H. Kuntschik, Pathologist of the Service.
- Dr. Wen Ching-chang, Resident Medical Officer, Newchwang.
- Dr. Kwang Jen-min, Resident Medical Officer, (on sick leave.)
- Dr. Li En-chang, Resident Medical Officer, Manchouli, (killed by Soviet aeroplane bomb, Nov. 17, 1929.)
- Dr. Liu Cho-hsin, Resident Medical Officer, Manchouli.
- Dr. Wang Wen-yung, Resident Medical Officer, Taheiho.
- Miss Liu Chieh-chih, Senior Nurse, Harbin.
- Miss Ho Fu-teh, Senior Nurse, Newchwang.

SUMMARY OF EIGHTEENTH ANNUAL GENERAL REPORT OF 223
THE MANCHURIAN PLAGUE PREVENTION SERVICE, 1930.

11. This report covers the nineteenth year of our activities. Early next year we hope to celebrate the twentieth anniversary of our Service, and publish a special Scientific Report, having as companion a Book on the History of Chinese Medicine from the Earliest Times. Few Government Services in China have been able to function continuously throughout the past twenty years of turmoil and travail as we have done. For this we are indeed grateful to the successive heads of the Central Government who have from the first looked upon our work as non-political and most essential for the happiness and credit of the country. Whatever success has been achieved has been largely due to the unstinted efforts of my staff from the medical officers to the attendants, who have worked with commendable will and enthusiasm. With the limited means at our disposal, new buildings have been constructed, new equipment has been purchased and installed and important research has been carried out with benefit to China and the world. Their share in the progress of modern medicine in China should receive due recognition.

I am also indebted to the co-operation of the various officers of the Chinese Eastern, Ssutao and South Manchurian Railways for assistance rendered. To the Customs and Postal authorities I wish also to express my thanks for helping our medical officers whenever needed.

I have the honour,
to be,

Your obedient Servant,

WU LIEN-TEH,
Director and Chief Medical Officer.

Harbin, November 15, 1930.

ANNUAL REPORT OF THE NEWCHWANG QUARANTINE HOSPITAL.

1ST JULY, 1928 TO 30TH JUNE, 1929.

Newchwang, 2nd July, 1929.

Dr. Wu Lien Teh,
North Manchurian Plague Prevention Service,
Harbin.

Dear Sir,

I beg to submit herewith the Annual Report of the Newchwang Quarantine Hospital from July 1st, 1928 to June 30th, 1929.

During this period we have treated the following number of patients.

11254	Outpatients including 1594 female cases.
40	Medical in-patients.
61	Surgical in-patients.

11355	Total from 1st July, 1928 to June 30th, 1929.
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Bubonic Plague :—Outbreak of Bubonic Plague was first reported on August 11th, 1928, at Tungliao District. I went with a local police inspector named Chi to investigate. Leaving on September 14th, and returning on the 17th, 1928. Our two dressers Lu Pin San and Tang Pao Lin were sent to Tungliao district on September 19th, 1928, and stayed there until the situation was over. They returned to Newchwang on November 22nd, 1928. There were 433 deaths occurred from September 1st, to the end of November, 1928.

The following are the cases inspected at Chien Chia Tien, on September, 16th, 1928. viz :—Mrs. Liang age 54 years with double inguinal glands enlarged.

1. Her son 34 years and a grand son 6 years died 4 days previous. Her daughter-in-law and another grand son age 8 years living.
2. Mr. Liu age 33 years with left inguinal glands enlarged, sick 3 days with fever, headache and malaise. Confirmed by microscopic examination.
3. Mr. Sun 46 years old, left axillary glands enlarged with a slight cough sick 3 days. Living with several others in same kang. Confirmed by microscopic examination.
4. Mr. Shen age 30 years old, left inguinal glands slightly enlarged, first day of sickness.

5. Mrs. Yang, age 33 years, taken sick 4 days ago when mother-in-law age 61 years old died. Swollen left maxillary glands. Confirmed by microscopic examination.
6. Mr. Wang age 55 years old, sick one day with headache, fever and malaise, no enlarged glands seen.
7. Mr. Chow age 37 years old, sick 2 days with headache, fever and malaise, no glands enlarged. Living in same house as Mr. Wang with several other well persons.
8. Miss Shang age 8 years old, sick 1 day with chill, fever, headache and no enlarged glands.
9. Mr. Wang 32 years old, with chill, fever, headache, and sore throat and unable to sit up. Operating a bean curd factory. Sick only two days. Confirmed by microscopic examination.

Those with enlarged glands died within 2 days and those without died within 7 days.

Meningitis in Shanghai:—Cerebral Spinal Meningitis broken out in Shanghai early April, 1929. Up to April 13th, there were 79 deaths including 20 foreigners and 59 Chinese.

Quarantine Declared against Shonghai:—Quarantine was declared against Shanghai for Meningitis from April 18th, 1929, to June 29th, 1929.

Quarantine Declared against Swatow:—Quarantine was declared against Swatow for Small-pox infected from May 7th, to June 14th, 1929.

Tiao Shi Chang age 22 years, died on board S.S. Hua Heng on September 16th, 1928, from Beriberi.

Yu Chen age 22 years, native of Chekiang, was detained from S.S. Too Nan for 2 days. Nothing found only being seasick.

Fan An Tang, age 28 years, was sent in by the city police with symptoms of "cholera" on June 26th, 1929. He was discharged on the following day as non cholera infected.

The following are the list of crews and passengers we inspected as from April 18th 1929, to June 29th, 1929.

515	Foreign crews.
2778	Chinese crews.
23	Foreign passengers.
1929	Chinese passengers.

5245 Total.

The following are the list of steamers we inspected during this period.

23 Chinese, 18 British, 5 Japanese, 2 Norway, 1 Finland.

The following statistics are since the opening of the hospital on July 10th, 1920.

(a) Outpatients treated		Inpatients treated				Total
		Medical		Surgical		
1920-1	3225	21		22		43
1921-2	3367	10		—		10
1922-3	2919	44		21		65
1923-4	4412	10		18		28
1924-5	4343	10		43		53
1925-6	5812	18		44		62
1926-7	6034	60		35		95
1927-8	7960	38		32		70
1928-9	11254	40		61		101

(b) Infectious Diseases treated during the same period :—

Names.	1920-1	1922-3	1923-4	1926-7	1927-8	1928-9
Cholera	—	36	—	35	01	—
Erysipelas	—	—	—	03	08	02
Diphtheria	01	—	—	—	09	—
Scarlet Fever	02	—	—	01	—	02
Measles	—	—	—	01	01	02
Smallpox	01	—	—	—	01	01
Typhoid	02	—	01	—	—	—
Parotitis	—	—	—	29	05	09
Meningitis	—	—	—	—	—	02

(c) Percentage of three important diseases among outpatients :—

	1920-1	1921-2	1922-3	1923-4	1924-5	1925-6	1926-7	1927-8	1928-9
Gonorrhea	12%	15%	20%	18%	14%	09%	06%	06%	06%
Syphilis	12%	21%	20%	10%	08%	06%	04%	03%	03%
Tuberculosis	16%	12%	10%	09%	08%	06%	03%	03%	02%

The following figures are the population of different nationalities in the city of Newchwang :—

Chinese	67,632	males,	31,611	females	
British	27	„	22	„	
American ..	3	„	3	„	
French	1	„	1	„	
Germany ...	6	„	4	„	
Holland ...	2	„	3	„	
Japan	114	„	102	„	
Korean	59	„	66	„	
Russian	11	„	8	„	
Sweden ...	2	„	2	„	
Japan	1,265	„	1,239	„	in S.M.R. area.
Korean	84	„	74	„	in S.M.R. area.

ANNUAL REPORT OF THE NEWCHWANG QUARANTINE
HOSPITAL.

227

The number of Brothels are as follows :—

Chinese class 2, 117	...(father died	27
	(mother died	12
	(orphans	20
	(parents living	58
		<hr/> 117

class 3, 338	...(father died	56
	(mother died	25
	(orphans	171
	(parents living	86
		<hr/> 338

class 1, 96	...(father died	24
	(mother died	4
	(orphans	15
	(parents living	53
		<hr/> 96

class 4, 264	...(father died	37
	(mother died	20
	(orphans	140
	(parents living	67
		<hr/> 264

Chinese class 5, 40	.....(husbands died	10
	(orphans	5
	(parents living	25
		<hr/> 40

Chinese total	827	
Japanese Singers	36	in S.M.R. area.
Japanese waitress	15	in S.M.R. area.
	<hr/> 878	Total in Newchwang.

The number of Births and Deaths are as follows:—

<i>Births</i>	505 males,	483 females.
<i>Deaths</i>	552 „	367 „

The movements of personel are as follows:—

Commissioner of Customs Mr. C. N. Holwill handed over charges to Mr. R. A. May, on October 15th, 1928.

Mr. G. Boezi assumed charge as Acting Commissioner as from November 2nd, 1928, to April 18th, 1929.

Mr. B. D. Tisdall assumed charge as Acting Commissioner of Customs on May 2nd, 1929.

New Magistrate Pei relieved Mr. Chin on August 9th, 1928.

Mr. Li An Jen relieved Mr. Pai as head of the Fishery Bureau on December 24th, 1928.

Mr. Hung Wei Kuo relieved Mr. Meng as Superintendent of Customs on October 24th, 1928.

Dr. Yang Shi Husan relieved Dr. Shao as head of the city Isolation Hospital on June 20th, 1929.

The first snow fall of the year was on October 27th, 1928. The Liao river was completely frozen over as from January 18th, 1929, to March 12th, 1929. The first steamer in was the S.S. Hsin Kong on March 18th, 1929.

The New National flag was hoisted over the city on December 29th, 1928.

The local Police Headquarter has been renamed the "Yinkow Peace Preserving Bureau" as from February 1st, 1929.

The local Taoyin's has been renamed the Special Municipal Office under Sze Chin Wan Esq., at the head as from February 15th, 1929. He is making the main street wider allowing 60 feet for same. The tearing down of buildings on the south side of the said street was begun soon after the thaw and is progressing rapidly.

It was reported under London, January 23rd, 1929. The Influenza epidemic which started in the southwest United States two months ago now extends over the entire world, the chief centre at present being Spain, the British Isles and Hungary, 500,000 cases being reported in the last named country. It has also extended to the South Sea Islands. There are 5,000 cases in the city of Mukden.

Am enclosing the reports of the Public Health works for Newchwang as from January to June 1929, as prepared by our workers. Same are made out in Chinese.

In conclusion may I express my appreciation of the valuable services rendered by the local officials, the Customs staff and lastly to our own staff for their faithful performanc of duty.

I remain,

Your obedient servant,

E. B. YOUNG,
Resident Medical Officer.

SUMMARY OF IN-PATIENT DISEASES.

(HARBIN AND NEWCHWANG HOSPITALS).

FROM SEPTEMBER 1928 TO AUGUST 1930).

	Harbin Hospital.	Newchwang Hospital.
<i>Fracture and Dislocations.</i> 骨折及脫臼		
Fracture Thigh 大腿	2	4
„ Tibia 脛折骨	6	—
„ Humerus 上膊骨折	2	—
„ Ankle 踝節	—	1
Dislocation Hip 大腿關節脫臼	—	1
„ Spine 脊骨脫節	1	—
<i>Injuries.</i>		
Frost bite 凍瘍	5	—
Gun Shot 槍彈瘍	32	6
Stabs and Wounds 刺及創瘍	45	14
Burn 火瘍	6	14
Crush 壓瘍	1	—
<i>Diseases of Genito-Urinary System</i> 生殖及泌尿器病		
Nephritis 腎炎	4	1
Phimosis 包莖	4	7
Stricture urethra 尿管狹窄	1	1
Bubo 橫痃	9	18
Gonorrhoea 淋病	3	5
Orchitis 睪丸炎	3	1
Cystitis 膀胱炎	1	2
Rupture urethra 尿道破裂	2	—
Balanitis 莖頭炎	3	—
<i>Diseases of Alimentary Canal.</i> 消化管病		
Dysentery 赤痢	8	1
T. B. Peritonitis 腹膜結核	6	—
Hernia 小腸氣	6	1
Piles 痔核	8	1
Fistula in ano 痔漏	38	4
Constipation 便秘	2	—
Gastritis 胃炎	3	—
Dyspepsia 消化不良	18	4
Appendicitis 盲腸炎	1	1
Intestinal obstruction 腸閉塞	1	—
Gastro-enteritis 胃腹炎	1	1
Diarrhoea 瀉洩	1	9
Peritonitis 腹膜炎	1	1

	Harbin Hospital.	Newchwang Hospital.
Ascites 腹水	3	1
Imperforate anus	1	—
Gastric ulcer 胃潰瘍	1	—
Gall-stones 膽石	1	—
<i>Diseases of Skin.</i> 皮膚病		
Eczema 濕疹	7	—
Ulcer 潰瘍	22	6
<i>Diseases of Women.</i> 婦科病		
Dysmenorrhoea 月經痛	1	1
Endometritis 子宮內膜炎	1	1
Abortion 小產	2	4
Puerperal fever 產褥熱	1	—
Leucorrhoea 白帶	1	1
Atresia vaginae 陰道窄	—	1
<i>Circulatory and Respiratory System.</i> 循環及呼吸系病		
Pneumonia 肺炎	1	2
Mitral 僧帽瓣症	14	1
Phthisis 肺結核	21	16
Pleurisy 肺膜炎	5	—
Bronchitis 氣管支炎	3	1
T. B. Adenitis 結核腺腫	10	9
Apoplexy 腦卒中	3	—
Asthma 喘息	1	—
Endocarditis 心囊炎	1	1
Aortic disease 動脈弓病	1	—
<i>Tumours.</i> 瘤		
Fibroma 纖維瘤	2	8
Sarcoma 肉腫	3	—
Carcinoma 癌腫	3	—
Papilloma 刺瘤	9	1
Cyst 囊腫	1	—
Dental cyst 牙袋	1	—
Sebaceous 脂腺腫	—	3
Gumma 護膜腫	1	—
Epithelioma 上皮腫	1	—
Venereal Wart 花柳腫	—	4
Adenoma 腺瘤	1	—
Ovarian cyst 卵巢囊腫	5	—
<i>Diseases of Nervous System.</i> 神經系病		
Paraplegia 腦梅毒	2	—
Meningitis 腦膜炎	2	2
Paralysis 癱瘓	1	—
Tabes 不和動症	—	1

	Harbin Hospital.	Newchwang Hospital.
Neurasthenia 神經衰弱	4	2
Convulsion 抽搦	1	1
Cerebral abscess 大腦瘻	1	—
General Paralysis Insane 全麻痺狂	1	—
Epilepsy 癲癇	1	2
Dementia 癡症	1	—
Paralysis agitans 顫癱	1	2
Neuralgia 神經痛	1	1
Dementia Praecox 酒	1	1
Delirium Tremens 酒狂	—	1
Septic Cases. 化膿症		
Abscess 膿瘍	25	18
Gangrene 壞疽	1	—
Boil 癰	1	—
Carbuncle 癰	2	3
Erysipelas 丹毒	1	—
Cellulitis 連翹炎	5	2
Diseases of Eye. 眼病		
Entropion 臉捲內	3	2
Trachoma 腺粒炎	—	7
Pannus 角膜派勞斯	1	1
Conjunctivitis 腺炎	1	2
Irido-cyclitis 睛籠并圓炎	1	—
Panophthalmia 眼球膿炎	—	1
Keratitis 腺炎	—	2
Ectropion 臉捲外	—	1
Diseases of Bones, Muscle and Joints. 骨節及關節病		
Rheumatism 寒濕節痛	20	4
T. B. Bone 骨結核	58	7
T. B. Joint 關節結核	7	7
Necrosis 骨死	2	2
Gon. Arthritis 淋症節炎	—	2
T. B. Spine 脊髓結核	3	3
Arthritis 關節炎	—	3
Fevers. 熱病		
Influenza 流行性感胃	1	3
Scarlet fever 猩紅熱	2	2
Mumps 耳下腺炎	—	3
Catarrhal fever 加答兒熱	3	—
Small-pox 天花	3	—
Typhoid 腸室扶斯	10	1
Tonsillitis 扁桃腺炎	2	1
Relapsing fever 回歸熱	2	—

	Harbin Hospital.	Newchwang Hospital.
<i>Various.</i> 雜症		
Opium Habit 中鴉片毒	7	2
Maternity 生產	9	18
Syphilis 梅毒	5	16
Morphine Habit 中嗎啡毒	—	2
Poison 中毒	1	2
Tetanus 破傷風	—	1
Splenomegaly 脾臟脹大	2	—
Cholera 虎列拉	—	6
Exophthalmic goitre 突眼嬰瘤	1	—
Oxyuriasis 線虫	1	—
Hare-lip 兔唇	1	—
Leukaemia 白血病	1	—
Anaemia 貧血病	—	1
	<hr/> 551	<hr/> 297
	<hr/>	<hr/>



LIST OF OPERATIONS FROM SEPTEMBER, 1928 TO AUGUST 1930, HARBIN HOSPITAL.

<i>Amputations.</i> 肢截斷術		<i>Plastic.</i> 畸形術	
Toe 腳趾	3	Hare-lip 兔唇	1
Fingers 手指	2	Imperforate anus 無肛門	2
Leg 小腿	11	<i>Various.</i> 雜類	
Thigh 大腿	6	Lengthening knee tendon 長腱術	1
Foot 足	28	Clean wound knee 潔傷膝節	1
Arm 臂	3	Needle in thigh 針在大腿內	2
Hand 手	5	Extract bullet 取彈	6
<i>Bones and Joints.</i> 骨及關節		Suture wound 縫傷	5
Resection Metatarsus 蹠骨切除術	2	Extraction tooth 拔牙術	1
Scraping Necrosed bone 括腐骨	14	Hydrocele 腎囊水	1
Setting fracture 接骨術	1	<i>Skin, Fascia, Tendon.</i> 皮膚筋鞘韌帶	
Sequestrectomy 取死骨術	2	T. B. Gland 腺結核	1
<i>Genito-urinary</i> 生殖器及尿道		Cellulitis 蜂窩織炎	1
Castration 割去睪丸	1	Abscess 癰瘍	9
Phimosis 包莖術	6	Scraping ulcer 括潰瘍	1
Ruptured urethra 尿道破裂	1	<i>Tumours.</i> 瘤	
<i>Alimentary Canal and Abdomen.</i> 消化道及腹		Cyst 囊腫	1
Piles 痔核	7	Sebaceous cyst 皮脂腫	1
Fistula in ano 痔漏	35	Sarcoma 肉腫	1
Hernia 小腸氣	7	Fibroma 纖維腫	8
Resection ileum 去小腸術	1	Papilloma 癌腫	11
Draining Peritoneum 腹膜引流術	1	Adenoma 腺瘤	1
<i>Eye.</i> 眼		Ovarian cyst 卵巢袋瘤	2
Entropion 眼內捲	4	Epithelioma 膚疽	1
Enucleation eye 眼球剝割術	1	Dermoid cyst ovary 有毛之	1
Ectropion 眼外捲	1	卵巢袋瘤	





SUMMARY OF MEDICAL OUT-PATIENTS TREATED AT MANCHURIAN PLAGUE PREVENTION SERVICE HOSPITALS FROM SEPTEMBER 1928 TO AUGUST 1930.

I. SPECIFIC INFECTIOUS DISEASES 特別傳染病

(a.) BACTERIAL DISEASES. 細菌病

ALL INFECTIOUS DISEASES		特別傳染病		HARBIN HOSPITAL.				TAIHEIHO HOSPITAL.				SANSING HOSPITAL.				MANCHOUKI HOSPITAL.				LAHASUSU HOSPITAL.				NEUCHWANG HOSPITAL.				HAILAR HOSPITAL.			
BACTERIAL DISEASES.		細菌病		1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.	1928.	1929.	1930.	Total.
1.	Typhoid fever	傷寒熱症		2	16	10	28	8	6	0	14	0	0	0	0	0	0	0	0	0	0	3	3	41	33	0	74				
2.	Erysipelas	丹毒		6	26	11	43	3	11	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	11	39	0	50			
3.	Diphtheria	白喉症		0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0		
4.	Pneumonia	肺炎		2	14	8	24	14	10	0	24	0	0	0	0	1	0	1	0	0	0	1	1	2	58	51	0	109			
5.	Influenza	流行性感冒		17	82	52	151	0	10	0	10	0	0	0	13	9	0	22	21	12	0	33	0	0	0	194	316	0	510		
6.	Whooping cough	百日咳		1	9	16	26	0	0	0	0	24	0	0	24	2	6	0	8	4	3	0	7	0	0	0	20	0	20		
7.	Gonococcus infections	淋毒傳染症		31	87	68	186	24	25	0	49	22	10	0	32	36	39	3	78	22	38	0	60	22	84	77	183	284	401	0	685
8.	Dysentery	赤痢症		14	84	77	175	9	23	0	32	21	0	0	21	0	17	4	21	5	29	0	34	0	0	23	23	0	98	0	98
9.	Cholera	霍亂症		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4	
10.	Plague	鼠疫症		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11.	Tetanus	破傷風		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12.	Leprosy	麻風		0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13.	Tuberculosis	肺結核症		29	134	84	247	63	245	0	308	40	10	0	50	31	16	1	48	26	56	0	82	157	296	106	559	122	213	0	335

(b.) NON-BACTERIAL FUNGUS INFECTIONS. 黴菌傳染病

(c.) PROTOZOAN INFECTIONS 原生動物傳染病

1. Malaria 瘧症	0	2	2	4	2	38	0	40	15	0	0	15	0	0	1	1	19	30	0	49	0	9	19	28	49	95	0	144
2. Relapsing fever 回歸熱	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Syphilis 梅毒	42	159	96	297	53	169	0	222	32	13	0	47	54	74	2	130	36	36	0	72	26	444	195	665	391	546	0	937
4. Yellow fever 黃熱症	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(d.) METAZOAN DISEASES. 原虫症

1. Intestinal Cestodes, Tapeworms 帶虫類	2	16	15	33	2	3	0	5	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0	0	2	
2. Diseases caused by Nematodes 線虫類	3	38	27	68	5	13	0	18	0	0	0	0	0	0	0	0	0	0	0	0	8	23	6	37	2	9	0	11
3. Parasitic insects 寄生虫	9	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	94	9	151	272	431	0	703

(e.) INFECTIOUS DISEASES OF UNKNOWN ETIOLOGY. 未知病原之傳染病

未知病原之傳染病																														
1. Small-pox 天花	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2. Chicken-pox 水痘	0	4	13	17	0	0	0	0	0	0	0	0	0	0	0	2	6	0	8	0	0	0	0	0	0	0	0	0	0	0
3. Measles 麻疹	6	20	9	35	0	27	0	27	0	0	0	0	2	7	0	9	0	0	0	0	0	2	3	5	0	0	0	0	0	0
4. Scarlet fever 猩紅熱	0	7	7	14	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
5. Epidemic Parotitis (Mumps) 流行性耳下腺炎	1	29	17	47	8	6	0	14	0	0	0	0	0	0	0	0	0	0	0	0	5	10	15	2	4	0	0	6	0	0
6. Typhus 發疹傷寒	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	23	0	36	0	0
7. Rabies 狂犬病	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Rheumatic fever 傷風濕熱病	0	0	0	0	3	11	0	14	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	140	247	0	387	0	0	0
9. Acute Tonsillitis 急性扁桃腺炎	45	98	61	204	5	17	0	22	0	0	0	0	0	0	0	0	0	0	0	0	17	81	30	128	109	107	0	216	0	0
10. Acute Catarrhal fever 急性加答兒熱症	0	4	0	4	2	3	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	13	14	37	8	0	45	0	0	0

II. INTOXICATIONS. 中毒

a. Alcoholism 酒精中毒	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b. Morphine Habit 嗎啡中毒	0	13	16	29	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	2	12	6	20	1	15	0	16
c. Lead poisoning 鴉片中毒	8	16	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	6	0	0	0	0
d. Arsenical poisoning 砒霜中毒	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	7	0	0	0	0	0
e. Food poisoning 食物中毒	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4	2	6	0	0	0	0
f. Beri-beri 腳氣	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2	0	0	2	0	0	0	0

III. DISEASES OF METABOLISM. 新陳代謝病

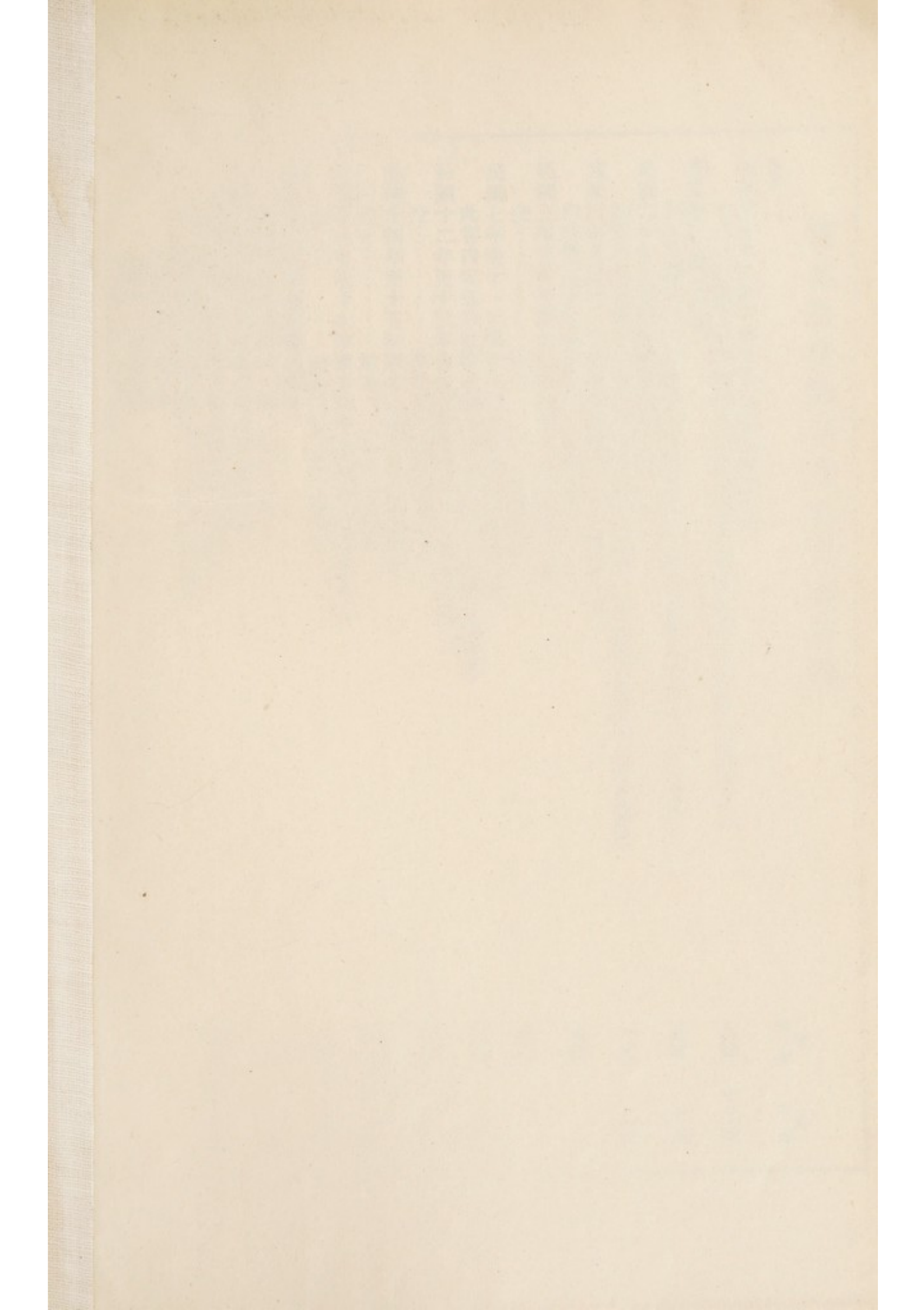
a. Gout 痛風症	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	135	0	213
b. Diabetes 糖尿病	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Rickets and Scurvy 軟骨及血枯症	1	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
d. Rheumatism 傷風濕症	113	328	217	658	22	95	0	117	100	25	0	125	10	87	4	101	48	63	0	111	0	14	36	50	45	134	0	179

IV. DISEASES OF THE DIGESTIVE SYSTEM. 消化系病

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