

Bèri-bèri : its etiology, symptoms, treatment, and pathology : with an appendix ... / by Arthur J.M. Bentley.

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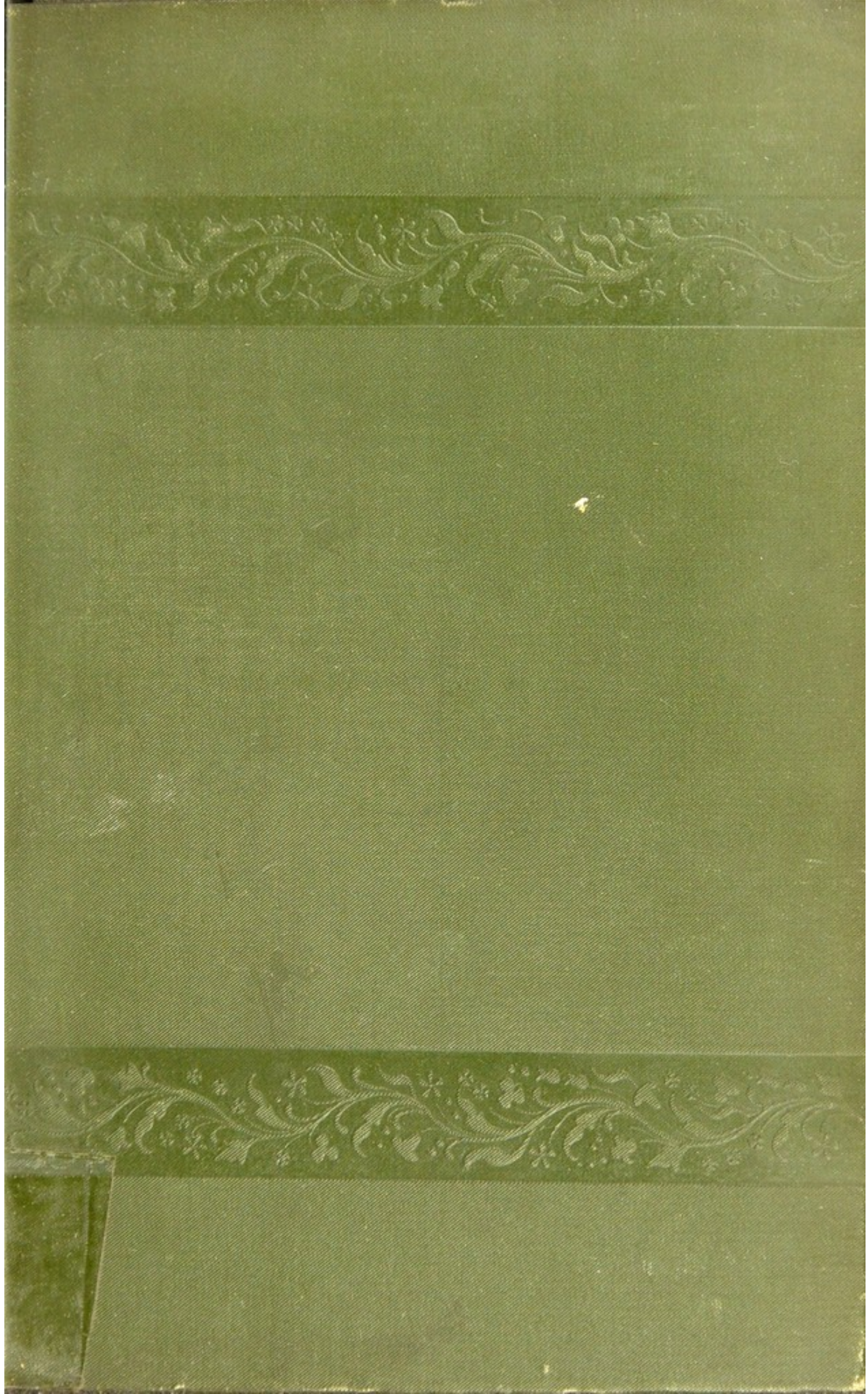
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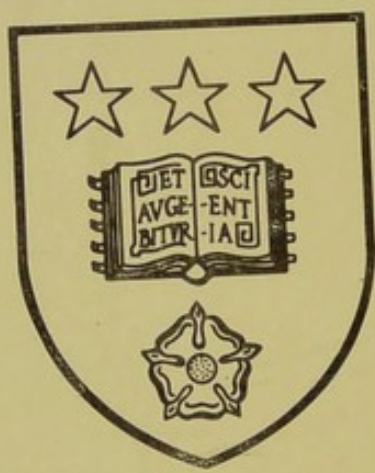
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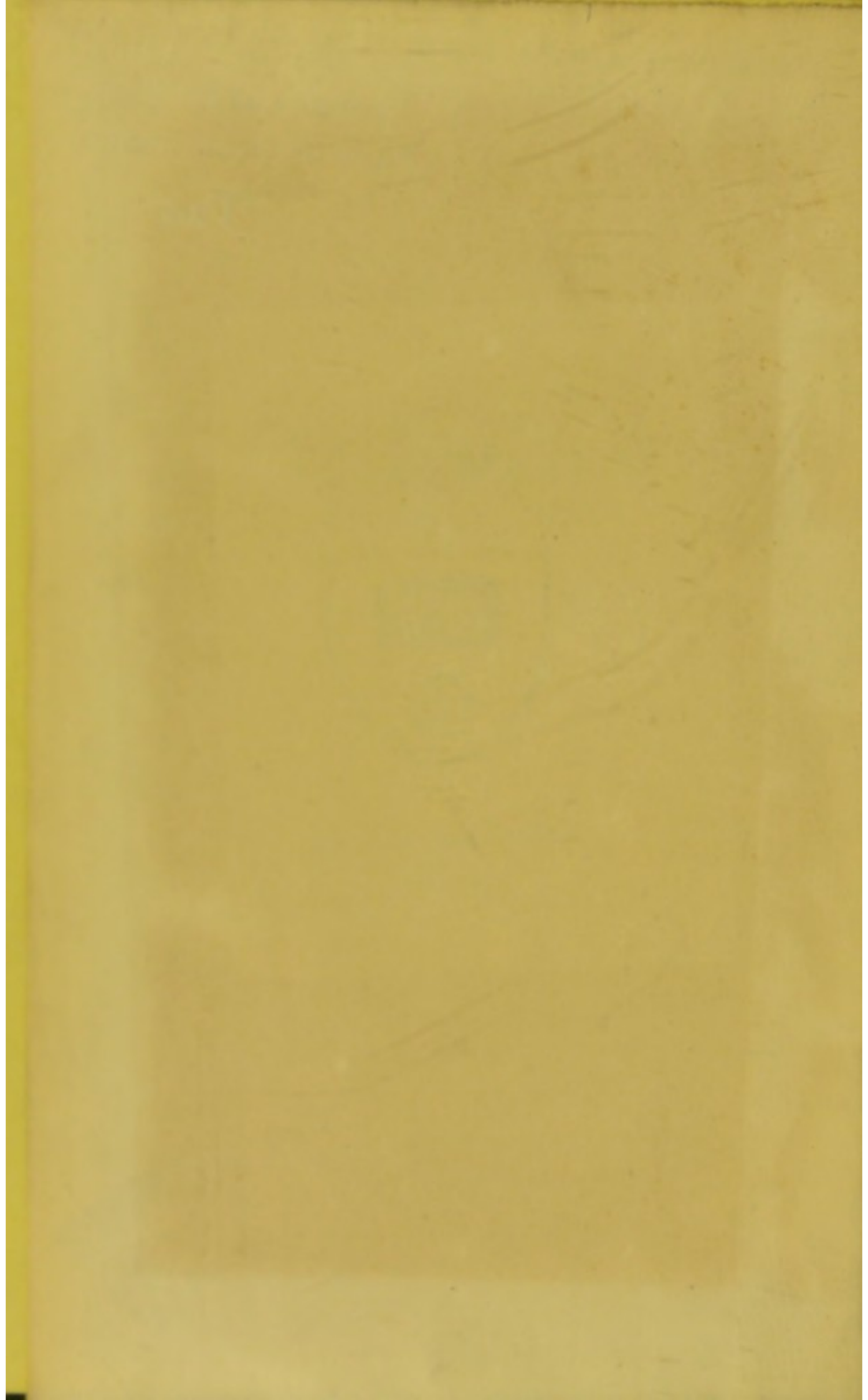
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BÈRI-BÈRI:

ITS ETIOLOGY,
SYMPTOMS, TREATMENT, AND PATHOLOGY,

WITH

An Appendix,

CONTAINING

A DETAILED CLINICAL ACCOUNT OF 52 CASES, AND THE
MORBID APPEARANCES SEEN IN 19 POST-MORTEM
EXAMINATIONS,

With Characteristic Illustrations of the Disease,

BEING A THESIS SUBMITTED FOR THE M.D. DEGREE OF
THE UNIVERSITY OF EDINBURGH IN 1889,

BY

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PHYSICIAN TO H.H. THE SULTAN ; PHYSICIAN TO THE LOCK AND
CHINESE HOSPITALS, AND VISITING PHYSICIAN LEPER
HOSPITAL, SINGAPORE, ETC., ETC.

Published for the Author.

EDINBURGH & LONDON:
YOUNG J. PENTLAND.

1893.

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DEDICATION.

TO

THOMAS IRVINE ROWELL, C.M.G., M.D.,

LATE PRINCIPAL CIVIL MEDICAL OFFICER, STRAITS SETTLEMENTS,

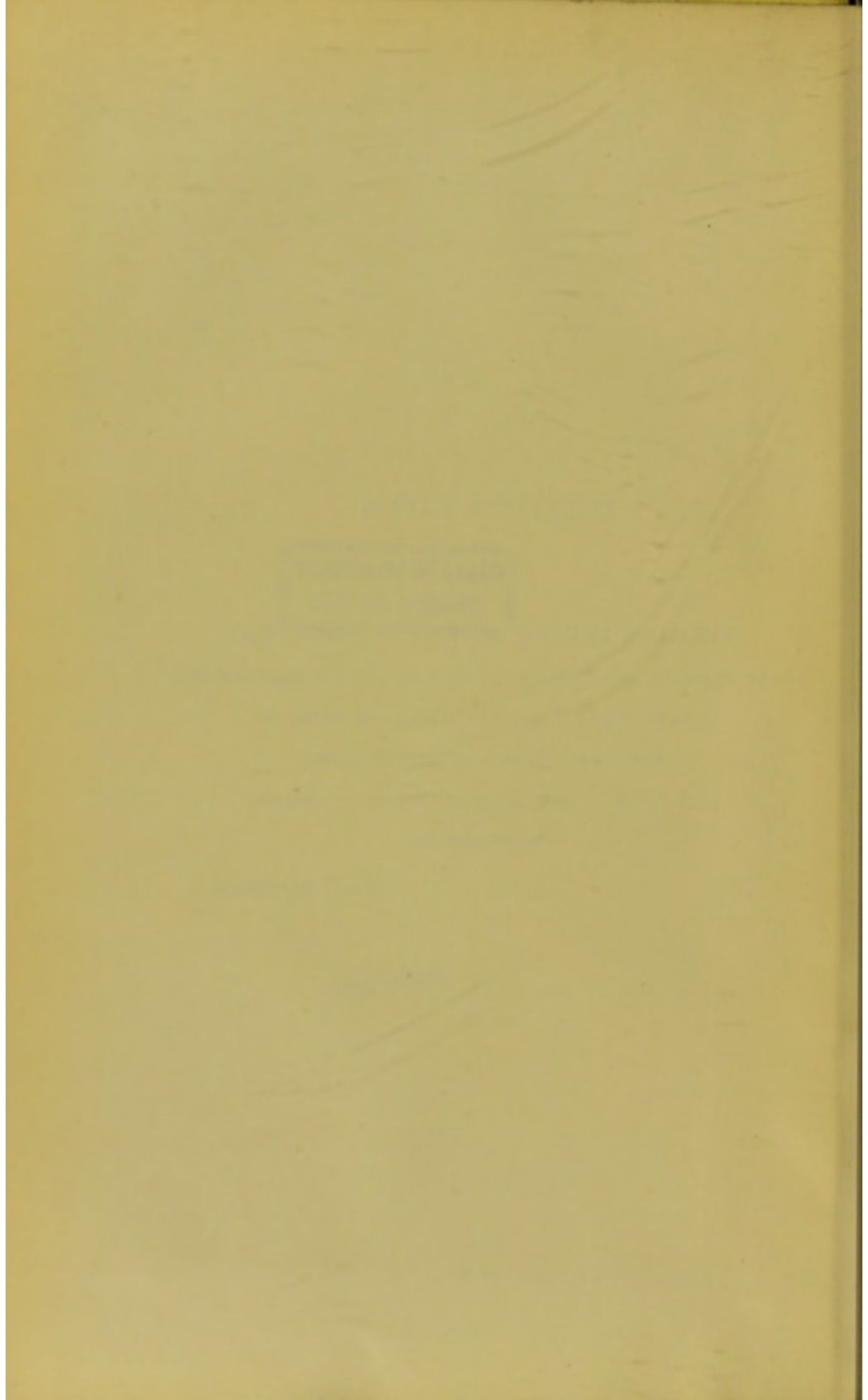
UNDER WHOM I WAS PRIVILEGED TO WORK AS

COLONIAL SURGEON FOR MANY YEARS,

THIS WORK IS DEDICATED IN TOKEN OF SINCERE

FRIENDSHIP BY

THE AUTHOR.



PREFACE.

IT is now four years since I submitted this Thesis for my M.D. degree. That it obtained a Gold Medal might have been considered a sufficient justification for its appearing in print at the time. The delay in its publication, however, has been due to inability to consider it worthy of a more extended circle of readers, and to the hope that the subject here treated would find an abler chronicler. As, however, up to the present few works on this interesting disease have appeared in the English language, I have, at the request of disinterested friends, consented to its publication, in the hope that it may be of some use to those who, whether at home, or in India, or in the Colonies, may have occasion to see cases of Bèri-Bèri. For its many omissions and imperfections I must crave the indulgence of the Profession. I have tried to explain, in the "Introduction," the many difficulties in the way of its compilation. It is chiefly in its clinical aspect that anything original is attempted. I am indebted to Dr. T. Irvine Rowell, C.M.G., for his great kindness in revising the work while being printed. A few slight typographical errors have crept in. These, though blemishes, are not of vital importance, and my absence in practice in Egypt while the work was in progress, is my only excuse for their appearance.

CAIRO, *March* 1893.

THE END

The end of the world is not a date, it is a process. It is the slow, steady erosion of the earth's crust, the gradual fading of the sun's light, the silent march of time towards a final, inevitable conclusion. We are living in the twilight of an era, and the shadows are lengthening. The great empires of the earth are crumbling, the mighty nations are falling, and the world is in a state of chaos and confusion. The end is near, and we must prepare ourselves for the day when the curtain will fall on this mortal coil.

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ERRATA.

On page 2, in 7th line from top, for 68 read 52.

„ „ 12, „ 12th „ „ „ „ after *has* insert *not*.

„ „ 14, „ 8th „ „ „ „ for *Prisoners* read *Cretos*.

„ „ 28, „ 10th „ „ „ „ 1878 „ 1875.

„ „ 28, „ 10th „ „ „ „ *Takagi* „ *Takaki*.

„ „ 35, „ 8th „ „ „ delete *came*.

„ „ 77, „ 11th „ from bottom, for *Scarpus, triangle* read *Scarpa's triangle*.

„ „ 79, „ 14th „ from top, for *under* read *other*.

„ „ 80, „ 16th „ „ „ „ *tibiæ* „ *tibial*.

„ „ 230, „ 16th „ „ „ „ *thightness* read *tightness*.

„ „ 238, „ 9th „ „ „ „ *depression* „ *oppression*.

Wherever *Muira* occurs read *Miura*.

THESIS ON BÈRI-BÈRI.

INTRODUCTION.

I have taken the subject of the disease known as Bèri-Bèri for my Thesis on account of the varied experience I have had connected with it during my practice in the East, where I have had cases brought under my notice since 1873, when it caused such ravages amongst the Dutch troops, then and still at war with the Sultan of Acheen, in the north end of the Island of Sumatra. It was not, however, until 1880 and the subsequent ten years that, as Colonial Surgeon in Singapore, I became more intimately acquainted with its nature and symptoms. Prior to this only a few sporadic cases had come under my observation as a private practitioner; but in that year an epidemic outbreak occurred in the Criminal Prison of that island, the peculiar character of which assisted much in clearing up some of the difficult points in the etiology, symptoms, pathology, and treatment of this strange affection. This epidemic, though at first more or less confined to the prison itself, gradually extended to the outlying districts, until it became generally endemic in the Straits Settlements, and surrounding countries. It was as

Colonial Surgeon, attached to Tan Tock Seng's Hospital, that the cases detailed in this paper were seen.

During the six years of my office there, I saw on an average, 200 fresh cases yearly, but, with a limited staff and much arduous private work, I was only enabled to study with accuracy comparatively few of that number, and I have chosen therefore, from among them, 68 cases which occurred during the latter half of 1884, and the first half of 1885. These I have taken as the basis of my Thesis, and have detailed them as fully as possible. Nineteen of them were fatal, on which I performed post-mortem examinations as concisely as my powers of observation would allow. They were all performed within a few hours after death—a necessity in a tropical climate. I regret the absence of microscopical examinations of the nervous system, and of the muscles, and of electrical tests. The reason for their absence from the reports is not due to any oversight, or want of appreciation of their value. At each of the post-mortems, pieces of the various nerves of the spinal cord, and of the muscles affected, were removed, placed in spirits or in Muller's Fluid, and sent to a confrère in a neighbouring colony, whom I thought better versed in pathological research than I deemed myself then to be* (1873-1884). The results of his observations, however, never came to hand. The electrical tests were not employed because of want of proper apparatus, and of the time to work out abstruse pathological points, without skilled assistance, in a Hospital of 700 beds, of which I had sole

* See end of Introduction.

charge, aided only by an apothecary and ten native dressers, to whom, however, I am much indebted for their co-operation in collecting, under my supervision, the details of the notes of the cases.

Great difficulty was experienced in eliciting the necessary information from patients, who were, with only one exception, Chinese, and were, like myself, speaking a foreign language (Malay); but the cases recorded are accurate in so far as the facts are concerned, and I lay them before the Profession with a hope that they may prove useful in clearing up some of the obscure problems in the pathology of Bèri-Bèri, and perhaps of the nervous system.

In the arrangement of my Thesis I have divided the cases into three groups. The first seven are related in great detail, and show the actual conditions and appearances in typical cases of Bèri-Bèri. I have done this with the object of endeavouring to pourtray as vividly as possible, to those who have not had an opportunity of seeing a case, the chief characteristics of the disease, and from a perusal of which they may judge of its nature and pathology. The second group of nineteen cases are related as indicating the ordinary course of the disease in fatal cases, and the post-mortem appearances seen therein. The third group of forty-two cases are given to signify the usual progress of the disease in such as recover. *The subject of treatment* I have purposely avoided in their detail. There is nothing in the nature of a specific so far known, so I have condensed the subject under a separate heading at the end of my Thesis. I have, in some instances, curtailed the notes taken

in the daily progress of many of the cases. The temperatures and other clinical observations are to be seen in the chart at the end of each case. They are chiefly of interest, however, from their negative results.

From my circumstances as a busy practitioner, and without the means of conducting a really scientific investigation into nervous pathology, or able to elaborate histological and pathological research, I do not attempt to give a disquisition on pathological points in neurology generally, which are found associated with Bèri-Bèri, but base my Thesis merely on the clinical facts here recorded.

Where "hyperæsthesia" is said to exist in the clinical records of the cases, it refers generally to the muscles and deeper parts, unless the situation is specially mentioned. It is not intended to convey the idea that it is present always in the skin.

In the charts at the end of each case the following abbreviations are used:—

- W = watery.
- N = normal.
- H = hard.
- P = pale.
- H C = highly colored.



T H E S I S .

(a) *Etymology*.—Bèri-Bèri, or Barbiars, as it is sometimes called, has been known from early times. One of the first writers on it was Bontius, who, in 1645, introduced the term Bèribèria into Medical nomenclature, and tells us of its Oriental origin (De Medicinâ Indorum, cap. I.). Sauverges, in 1772, copied it into his list of "nomina barbara seu nec graeca nec latina." Mangetus states that the disease was known to Erasistrâtus, but certainly not under this name. Eustatius, however, has βέρβερι, but not under this sense, as they used the word in a different way. According to others the name is derived from the Singalese word "Bèri," or "weakness," Bèri-Bèri meaning *great* weakness. It is also termed "The bad sickness of Ceylon," and "The sleeping sickness of Africa," although it seems doubtful whether the last-mentioned is the same disease. Herklott suggests the Hindi word "Bheree"—a sheep—from the fancied resemblance of the straggling gait of persons so affected to that of this animal. "Soondbheree" comes from words numbness and sheep. Soond-Ke-Baiee signifies numbness and rheumatism. Bher-bheri, a Hindoo word, signifies a sore, a swelling. Carter suggests Bahri—sailor, from Bahr—the sea—and Bhayr—shortness of breath (Quain's Dictionary of Medicine).

(b) *Geographical Distribution*.—Bèri-Bèri prevails endemically in Ceylon, Japan, and India, especially on the Malabar coast, and in the Northern Circars and China, and over the whole Malayan Peninsula (where most of the cases reported in this Thesis occurred). It is common also in Burmah, as also

amongst ship's crews on the Persian Gulf, Red Sea, and African coast, in the Bay of Bengal, in Siam, the Straits Settlements, the Malay Archipelago, in the Australian Seas, on the West Coast and other parts of Africa (where it is erroneously known as the "sleeping sickness"), and, lastly, it is met with in South America.

(c) *Etiology*.—The causes of Bèri-Bèri are not generally understood. Various theories have been adduced as to its causes. These may be considered under two heads—pre-disposing and exciting.

PREDISPOSING CAUSES.—Bèri-Bèri has been, as a rule prevalent during the decline of one monsoon and the setting-in of another, when vicissitudes of temperature are at their greatest, as well as during certain loaded states of the atmosphere, and whenever the rainfall has been excessive. During the whole of the rainy N.E. monsoon, the number of admissions has always been augmented. Reference to Table A. will shew this (see next page). A certain length of residence in the Criminal Prison at Singapore was found essential for its production there, but this period became more and more curtailed with the development and intensification of the disease. Damp and moisture have had their unquestioned influence in adding to the numbers of those attacked; Sir Joseph Fayrer thinks that amongst the predisposing causes are all influences that tend to depress the vital energies, impoverish the blood, and starve the nerve centres.

With regard to the influence of season on the production of Bèri-Bèri, Mr Christie states "That the 72nd Regiment was severely attacked with it in the autumn of 1797, not many

A.
 TABLE SHEWING THE ADMISSIONS AND DEATHS FROM BERI-BERI
 FROM 1878 TO MAY, 1880.

YEARS.	1875.		1876.		1877.		1878.		1879.		January to May, 1880.	
	Ad- mitted.	Died.	Ad- mitted.	Died.	Ad- mitted.	Died.	Ad- mitted.	Died.	Ad- mitted.	Died.	Ad- mitted.	Died.
Chinese	58	5	45	3	1	1	22	1	217	43	482	39
Malays	61	9	34	11	1	1	81	16	65	15	89	16
Indians	8	1	7	...	...	...	39	6	33	7	31	2
TOTAL	127	15	86	14	2	2	142	23	315	65	602	57

months after its arrival in Ceylon, and continued to suffer from it until the ensuing spring; and that the 80th Regiment, which relieved it in March, 1797, was equally attacked with it in the ensuing November. He also maintains that it was more frequently to be found amongst those who had previously weakened their constitutions by sedentary habits and a life of debauchery." Mr. Christie also remarks "that during his stay in Ceylon he never met with an instance of this complaint in a woman, an officer, or a boy under 20." As it is more common in men than in women, sex, therefore, is a predisposing cause. It is rarer amongst women, but I have seen it attack them shortly after childbirth, when it makes its appearance during the second week—before the disappearance of the lochia. The most remarkable instance of this occurred in the family of a native prince, where three of his relations, all young women in the prime of life, were at intervals of about a year each, attacked with this disease—in one of whom it proved fatal after a duration of six months—from the sudden onset of acute symptoms. A very peculiar fact, and one which I am quite unable to account for, is the susceptibility of women after childbirth to be attacked with Bèri-Bèri. Is it that they are then more liable to any acute infectious disease, as they undoubtedly are, for instance, to Scarlet Fever and other exanthemata? If so, it will go further still to prove my conviction that the *Materies Morbi* is an organic particulate poison. The disease is very much more common amongst natives than Europeans, and a certain lengthened residence in an infected locality appears to be necessary for its production. This period varies with the ex-

posure, intensity, and concentration of the poison, as was well exemplified in the outbreak in the Criminal Prison, Singapore, and again points that a definite poison must exist. Mr. Hamilton, writing in the *Edin. Med. Chir. Trans.*, vol. 2, page 21, with regard to this, states, "There is no instance on record of an individual being attacked with the disease immediately upon his arrival in India."

I am firmly of opinion that anything that lowers the vital and resisting powers of the system predisposes to Bèri-Bèri (as the history of my cases will show).

*Amongst the alleged predisposing Causes may be mentioned also the following:—**

- (a) Over-crowded, badly-ventilated rooms, which Ruppert and Scheube lay great stress on.
- (b) Meteorological conditions, becoming epidemic in the west monsoon, which brings cold and wet weather. Malaria flourishing most in the east monsoon.
- (c) Conditions of soil: Inland almost exempt, and exempt above 2,000 or 3,000 feet. When ground-water high, Bèri-Bèri increases, when low, diminishes.
- (d) Age, sex, and climate: Predisposition increases with residence. Children and women free even in same places as the soldiers. Young and strong generally the victims.
- (e) Physical exhaustion and mental depression: The above Weintraub believes to be the most important predisposing causes.

Exciting Causes.—Dr. Rodgers, writing in 1808, looks upon it as a dropsical affection commencing in the chest. Malcolmson in his prize essay (1883) considered it as a rheumatic condition in which the spinal cord was temporarily disordered, the paralytic and dropsical symptoms being

* *Wiener. Med. Woch.* 1887, No. 33, p. 1088.

secondary results. Others have thought Bèri-Bèri allied to albuminuria—of which, however, there is no evidence (see urine charts and cases). Morehead imagined the scorbutic diathesis a predisposing cause, rendering the system prone to serous effusions on exposure to cold, particularly if the kidneys from disease could not readily take on compensating action. Coming to more recent times, it would appear that the six agents chiefly considered in the production of Bèri-Bèri are: Diet, Impure Water, Damp and Moisture, Scorbutus, Exposure to Cold, and Great Alternations of Temperature and Malaria.

Diet.—Dr. Rowell, then Principal Civil Medical Officer, Straits Settlement, in his report to Government, dated 14th June, 1880, on the outbreak in the prison at Singapore (to which reference will subsequently be made) says: "I feel assured that the dietary *per se* cannot be credited with having been a factor in the causation of the disease. It is a prison diet, but it is one which is liberal, sufficiently nutritious, and varied. [The scale of food supplied to the prisoners will be found by reference to Table B. (See p. 11.)] The nitrogenous element is certainly deficient in it. It is the same diet which is in use in the gaols of the sister Settlements of Penang and Malacca, and is that which the native female prisoners have had, and who fatten on it. It is the same as the prisoners have had who have been sent to the Civil Prison for treatment, and is a diet unquestionably better than the mass of prisoners, previous to entering the gaol, enjoy outside; and, in liberality will vie with that of almost any of the gaols in India. It is, moreover, a dietary on which two-thirds of the prisoners gain

B.
DIET TABLE IN USE IN THE CRIMINAL PRISON, SINGAPORE.

Long Term Prisoners.			Short Term Prisoners.			
Articles.	Quantity.		Articles.	Quantity.		Frequency.
	lbs.	ozs.		lbs.	ozs.	
Rice	1	14	Rice	1	12	Daily, includes 6 ozs. for Congee in the morning
Fresh Beef	0	6	Fresh Beef	0	6	Once a week to Malays
Fresh Pork	0	6	Fresh Pork	0	6	" " Chinese
Fresh Fish	0	6	Fresh Fish	0	4	Thrice a week to Chinese and Malays, four times a week to Indians
Salt Fish ...	0	4	Salt Fish ...	0	3	Thrice a week to all
Vegetables	0	6	Vegetables	0	6	Daily
Oil or Lard	0	0½	Oil or Lard	0	0½	"
Curry Stuff	0	0½	Curry Stuff	0	0½	"
Salt	0	0½	Salt	0	0½	"
Wood	2	0	Wood	2	0	"

weight, and some largely so. That this disease is not caused by any particular diet is clearly proved by the fact that all classes of individuals are liable to contract it—natives or Europeans—whether under favourable or unfavourable circumstances as regards food. It has occurred to persons when exposed to its influences, who have had the same diet all their lives, in free men who have had a choice of diet, in European officers as well as men, and in natives working on their own account, having quarters of their own selection, who unfortunately have been in circumstances where they have been exposed to its influences. The history and progress of the outbreak too, have shown conclusively that the diet has been a cypher in its production." I think it right to add, however, that Dr. Rowell five years later (1885) having been in touch during the whole interval with the disease, which never disappeared, although at times varying in intensity, introduced a change in the diet with the most satisfactory results. He did this by largely increasing the amount of nitrogen, and decreasing that of the carbohydrates. The allowance of rice was materially lessened while that of dhol was increased, and wheaten flour (rich in nitrogen) in the form of a chupatty, and a kind of black bean were added to the diet. The results were most excellent, for not only did the cases of Bèri-Bèri at once become fewer and fewer, and soon ceased altogether, but the general sick rate was diminished, while those already in hospital, suffering from the disease were soon discharged cured. The effect, too, has proved of a permanent nature, for the disease has not appeared since, and this applies not only to the Singapore Prison itself, but to the Prisons in the sister settlements of Malacca and

Penang, where the epidemic had shown itself, and the same dietary change was introduced.

Dr. Rowell, therefore, considers that although the former diet had nothing perhaps to do with the actual or direct causation of the affection, yet its poverty in respect of its nitrogenous constituents did, undoubtedly, predispose the blood of the prisoners to the reception of the poison, whatever the peculiar nature of that virus may yet be discovered to be. Dr. Anderson, of Japan, writing on the question of whether a non-nitrogenous, or largely rice diet is an exciting cause of Bèri-Bèri says: "That the coolie class, who live more exclusively upon rice than the soldiers, sailors, or traders yet suffer far less from Bèri-Bèri than these do in the Calcutta epidemic." Dr. Kenneth MacLeod could not attribute the disease to poverty of living, nor to any dietetic condition whatsoever, for well-fed Mahomedan butchers accustomed to generous living were equally seized. Surgeon-Major White of Ceylon gives his Labuan experience with the Ceylon Rifles and says: "That diet has nothing whatever to do with its production." Dr. Duane Simmons, of Yokohama, has observed that those who are in a condition able to afford good and abundant food are most liable to Bèri-Bèri. He remarks, however, "that rice even of excellent quality is badly tolerated by the stomach of the Bèri-Bèri patient, is often rejected, and appears to aggravate the symptoms. Whether this arises from its constipating qualities or the deficiency in this grain of potash, I am not in a position to say, but certain it is, that this influence seems to be counteracted by the addition to the diet of a pulse, such as dhol, which is

rich in this element." Dr. Mugliston, Col. Surgeon, Singapore, writing in 1886 on the subject, says that he is inclined to the belief, that the disease is Scorbutic, but gives this opinion as one open to correction. Mr. Takaki's views in regard to diet as a factor in the causation of the disease are as follows: "In 1883 there was a serious outbreak of Kakke (Bèri-Bèri) in Japan, the percentage of cases amongst the prisoners in the Japanese Navy being 61.06, in 1884 it was 57.03, in 1885 there were no cases." The outbreak was due, according to him, to the great deficiency of nitrogen in the dietary, and to the very large quantity of rice containing a great excess of carbo-hydrates, so that the nitrogen was quite insufficient to perform the nutritive function, and a large excess of carbon was left. The better result of last year (1885) he attributes to the great diminution in the quantity of rice given, and the substitution of barley and wheat, containing an amount of nitrogen which was almost sufficient to counteract the excess of carbon and enable the nutritive processes to be normally performed. (*Sei-J-Kwai Medical Journal*, April, 1886.) Others again have considered that the disease may be owing to unwholesome epiphytic rice, but experience does not in any way tend to support it. The question of errors of diet being the cause, I think, cannot be maintained. I have seen Bèri-Bèri attack all sorts and conditions of men, the well fed as well as the underfed, the richest and the very poorest in the land; it is no respecter of persons. It was especially prevalent amongst certain members of the family of a native Prince, three of whom I professionally attended. I mention this to show that diet

alone could not have been the cause, for they had all that the best of the land could produce. A study of the history of the various cases detailed will show, I think, that the majority of patients were living under as favorable conditions as regards diet, at the time of their attack, as in any previous period of their lives. The question of diet, therefore *per se*, may be, I think, dismissed from the category of exciting causes of Bèri-Bèri.

Impure Water.—There have no facts, to my mind, been adduced to prove that impure water can cause an attack of Bèri-Bèri. As a predisposing cause in lowering the health it may assist, but otherwise it is powerless.

Damp and Moisture.—In the tropics, these two conditions are, to my mind, synonymous with malaria. There are very few instances indeed in which heat, damp, and moisture, and malaria are not found together. In well-drained districts Malaria is almost absent, and there can be little doubt that without damp and moisture the exciting cause of Bèri-Bèri could not exist, but that to my mind is only a strong proof of the malarious origin of the disease. The influence of rain-fall (damp) as a cause is well shown in the epidemic in the Prison at Singapore, as Table C illustrates. (*See p. 16.*)

Scorbutic Origin.—This theory has been held by several distinguished observers, Morehead amongst others. Dr. Mugliston's opinion under this heading has already been given under the heading of diet. For my part I fail to see anything in common with it and scurvy, except the spongy condition of the gums seen in some cases, but by no means in all. (*See Clinical Details of Cases.*) In no case

C.

TABLE SHEWING THE MONTHLY ADMISSIONS AND DEATHS FROM BERI-BERI IN THE PRISON AT SINGAPORE,
FROM 1875, WITH RAINFALL.

	1875.			1876.			1877.			1878.			1879.			Jan. to May, 1880.					
	Admitted.	Died.	Rainfall. Inches.	Admitted.	Died.	Rainfall. Inches.	Admitted.	Died.	Rainfall. Inches.	Admitted.	Died.	Rainfall. Inches.	Admitted.	Died.	Rainfall. Inches.	Admitted.	Died.	Rainfall. Inches.			
Jan.	3	...	2.53	3	1	4.31	1	1	2.81	...	...	13.81	56	11	20.00	96	9	4.46	
Feb. ....	...	...	6.35	6	...	2.61	...	...	7.04	...	...	6.28	38	17	8.45	82	2	7.71
Mar. ....	...	...	20.93	1	1	4.35	...	...	4.78	*	...	1.90	12	4	12.36	225	7	7.67
April ....	...	...	8.70	2	...	8.52	...	...	1.80	7	1	9.83	47	12	6.65	188	33	13.37
May	6	1	5.69	...	...	7.95	...	...	3.60	8	1	11.17	21	4	12.00	7	6	8.53
June	9	1	10.33	...	...	13.34	1	1	13.53	8	2	4.13	56	7	9.16	...	...	...
July	26	6	4.53	2	...	4.51	...	...	7.21	6	1	5.14	11	2	4.57	...	...	...
Aug.	19	5	9.41	5	...	9.84	...	...	4.78	21	2	17.36	...	...	7.42	...	...	...
Sept.	29	...	9.58	41	4	7.72	...	...	3.27	19	3	3.27	1	...	5.89	...	...	...
Oct.	17	2	9.74	21	4	12.55	...	...	1.68	7	2	6.57	8	...	14.21	...	...	...
Nov.	13	...	16.16	4	4	15.88	...	...	5.21	23	5	10.73	42	5	8.21	...	...	...
Dec.	5	...	6.72	1	...	9.90	...	...	5.48	43	6	9.76	23	3	8.02	...	...	...
Total ...	127	15	110.67	86	14	101.48	2	2	61.19	142	23	99.95	315	65	116.94	602	57	41.74			
Percentage of Deaths to Admissions }				11.81			16.28			100.00			16.20			20.63			9.47		

* The Sluice Gates at Institution Bridge were closed from this month.

under my observation have I seen ecchymoses or a brawny hardness or contraction of the muscles at all to be mistaken for scurvy. Many of the patients, again, were persons in robust health before being attacked with the disease.

Exposure to Cold.—All observations show that exposure to cold or night air may be the exciting cause in bringing on an attack of Bèri-Bèri in those who are already in a low state of health, or debilitated from any previous existing disease, such as Syphilis, Malaria, or privations in food or clothing, &c., in those who live in localities where certain atmospheric conditions and states are present. Whether, therefore, with all these predisposing causes combined, true Bèri-Bèri could be excited without the presence of the actual Bèri-Bèri germ poison, is to me a very doubtful question. Case No. 11 is one favourable, however, to this view, and to it I would particularly draw attention. Dr. Thomas writing in 1825, states: “It attacks both natives and strangers, especially during the rainy season, commencing in November, and terminating in March or April, but most violent on the Malabar coast. During this season the land winds issue every morning about sun-rise from the neighbouring mountains with remarkable coolness; and such as are tempted by the serenity of the atmosphere to sleep exposed to these winds are often suddenly seized with the disease.”

According to Rankin, Bèri-Bèri has been ascribed to disease of the kidneys, but I have never seen any fact to corroborate this view. The weekly examinations, which were conducted regularly and carefully in the cases related in this Thesis, have never shown any albumen, or other abnormality in the

urine, and the results of the post-mortem examinations also negative this theory.

Diphtheria, alcoholism, and lead-poisoning, the most common cause of peripheral neuritis seen in this country, must be eliminated as exciting or predisposing causes. In none of the cases is there any history of one or the other, but what is very peculiar is the frequency with which the fauces were found to be inflamed (see clinical history of cases). I have not seen any reference made to this in any previous observations on Bèri-Bèri.

Sir Joseph Fayrer describes it as due to malaria, and other undefined atmospheric and telluric influences. *Dr. Anderson*, of the Imperial Naval Hospital, Tokio, Japan, who has seen much of the disease in that country, and has written an excellent treatise on it, says that this complaint, "which prostrates annually tens of thousands of the population of the most important towns in Japan, and, in one form, kills as cruelly and speedily as cholera itself," is "a specific disease, endemic in low-lying parts of Japan, associated with overcrowding and bad drainage, non-contagious, capable of remaining latent in the system for long periods, and of manifesting itself in places remote from its source, and tending to recurrence independently even of a renewal of the primary causative conditions." The native Japanese doctors put it down to unhealthy exhalation from the soil, and *Dr. Anderson*, after summing up the evidence afforded him by a number of facts, concludes that an atmospheric poison of local origin is the materies morbi. He also says that defective drainage has a great deal to do with its origin.

Dr. Duane Simmons, President of the Foreign Health Board of Yokohama, in a very interesting contribution he has written on Kakke, in the 19th issue (31st March, 1880) of the Imperial Maritime China Customs Medical Reports, after commenting on the difficulties in arriving at its exact etiology, says that "all his investigations of the exciting causes of Bèri-Bèri go to justify the conclusion that it is a specific miasm, or ground exhalation, by the striking resemblance which exists between the circumstances and conditions which appear to give rise to it, and to malarial affections generally." He gives a good instance of its local characters, which is well worthy of quotation in full: "On my arrival here (Yokohama), 19 years ago, four months after the opening up of the country, I found a small fishing village stretching along the shore of a deep bay at the mouth of one of the numerous valleys, with high bluffs on either side, such as everywhere break the coast line of this sea-girt empire. Behind the somewhat elevated gravel belt occupied by the town, and stretching inland for three or four miles, were low rice fields on either side of a sluggish stream. As the town grew these fields were filled in by soil from the bluffs, until to-day a city of 50,000 inhabitants rests on this new-made land, in some parts below the sea level. This is the description of the parts where the disease is most prevalent. As may be seen, drainage is difficult, and the soil is saturated to within a few inches of the surface with brackish water. One of the results of this exposure of new earth, much of which was not immediately covered by houses, was the appearance of marsh-malarial disease in severity and

frequency before unknown. Their number remained proportionately small for some years, but the disease later on took an epidemic form." This authority then goes on to describe how the spores of the disease may be wafted, airborne, to a locality at a distance from its source, and instances an example of a low-lying valley in the town with a hill on either side, and how in the south-west monsoon (which is the damp one there) the germs are conveyed in the atmosphere up the slope of one bluff in the direction of the wind, attacking the inhabitants, whilst those residing on the opposite side of the valley enjoy complete immunity. This would indicate that an elevated spot does not necessarily mean or ensure protection from the disease, provided there is low-lying swampy ground little raised above sea-level in the vicinity, in which it may be generated. *Surgeon-Major White*, of Ceylon, who has had experience of Bèri-Bèri in Labuan, while serving in the Ceylon Rifles, looks upon Bèri-Bèri as a very intense form of malarial poisoning. *Dr. Roy*, of Bohwanipore, in the Indian Medical Gazette of May 1st, 1880, says that Bèri-Bèri is due to a poison generated in a suitable soil, under a certain amount of heat favourable to its production and multiplication, and is not communicable from individual to individual, and thinks it may arise from the presence in the atmosphere of a kind of microscopic vegetable fungus.

I think I may now, without further comment, give an extract from the report presented to the Government of the Straits Settlements by my friend, Dr. T. Irvine Rowell, P.C.M.O., under whom I had the privilege of serving as

Colonial Surgeon from 1880 to 1886, during which time Bèri-Bèri was epidemic all over the Malayan Peninsula. "The prison is built on an old mangrove swamp, at an average level of only two-and-a-half feet above high water mark, is surrounded by high walls, and along one side of it runs a tidal stream much contaminated with organic impurities. The drains connected with the prison are surface drains, carrying off the water from the roofs of the different buildings. There is no deep subsoil drainage of any kind. Opposite to the European and more elevated portion of the building, a stone embankment exists, which effectually prevents the percolation of the canal water into the soil in this locality. Here too, the bank is higher, and no overflow has ever taken place. In this portion of the gaol, which is some two feet higher than the native part, is placed the Hospital and the Dormitory for the female native prisoners in separate enclosures. Opposite to the part of the prison occupied by the natives the bank of the stream is very low, the result being that, at high tides and after heavy rains, the water rises to a level of the surface of the prison enclosure, and overflows into it through the outlet drains. This evil has been very much aggravated by the erection of sluice-gates close to Raffles Institution Bridge, in March, 1878. These gates were on occasions naturally closed, and as the water could not pass through them, it found its way back to the gaol compound through the outlet drains. On representation to the Municipality, these gates are now kept permanently open. The foul water, too, from the canal finds its way by percolation into the gaol soil, there being no stone embankment

to prevent it. There can be no doubt that these gates materially affected the increase in the sickness, which it will be seen corresponds with the date of their erection. A reference to Table C. will show how this is borne out. The surface soil is a made one, averaging two feet in depth, consisting of about six inches of white sand on the top, then twelve inches of red earth, and, lastly, six inches of black sand, resting on mangrove mud. It is loose and permeable, readily absorbing and retaining moisture, and capable of the easy transmission through its substance of the gases resulting from the oxidation of the organic matter beneath it. On digging down into it, water may be reached at a depth varying from between one-and-a-half to three, or at the most four, feet in different parts of the compound, a ground water level far too high to be compatible with health. The depth of this ground water would vary with the amount of rainfall and would also be under tidal influence. In one spot mangrove roots were found at a depth of about one-and-a-half feet from the surface. The chemical constitution of the water was analysed, and was found to contain, under the microscope, organic vegetable cells in a more or less disintegrated state. The vessel containing it, when closed for 48 hours and then opened, emitted a bad smell. Nestler's test for ammonia was also used, with a positive result. It was only found, however, in small traces. To produce malaria, three principal components are required, viz., the presence of decomposing organic matter in the soil, humidity, and solar heat, which are all therefore in existence in the Prison. Overflowings, whether from sea or river, or an ad-

mixture of both, as has been the case here, are from the action of the sun's rays, and the resulting high temperature penetrating to the lower alluvial strata of the soil, well-known to be fruitful sources of endemic disease. The high walls around the Prison stagnate the air within it and prevent its escape, thus favouring the condensation of malarial poisons, circumscribing its limits, and increasing and intensifying its influence on the human economy. This accounts, in a great measure, for those resident in the vicinity of the Gaol not being attacked by it. There are no high walls, and the air, therefore, surrounding their dwellings is quickly renewed and carried off, and to this must be added, of course, the absence of the many evils, such as confinement, the massing of men together in association, &c., which are incidental to gaol life. From the above it has been fairly proved that Beri-Beri is a malarial poison arising from the decomposition of organic matter in the soil, favoured and strengthened by damp and moisture, and is inhaled into the system through the lungs.

This poison is a great depressor of the vital powers, its first operations being in the quality and distribution of the blood. The recent increase of the disease is almost entirely owing to the heavy rainfall, and the increased dampness thrown on the ground by the inundations from the canal, and caused by the erection of the sluice gates noticed above (see Table C.). Besides the above-mentioned causes, there are other circumstances which have had a certain amount of influence in keeping up the unhealthiness of the Prison, but which, had the Gaol been built on a healthy site,

would have been negative in their action in this endemic. I allude to the high walls, the intersection of the Prison quadrangle by cross walls, the sheds and dormitories being too much crowded together, the system of association among the prisoners, the dormitories being built on the ground in place of on open basement arches to admit of a free current of air under them, and, perhaps, the too sedentary labour of the mass of the prisoners."

It seems then hardly necessary for me to state, after what I have already written on this head, that I hold to the opinion that the essential cause of the disease is an organic particulate organism. From the varied circumstances under which the different patients have lived whose cases I have detailed in this Thesis there is no other cause ever-present to account for its production. It probably exists in every place where cases of Bèri-Bèri occur. It is the only cause that can account for such a wide-spread disease occurring under such different circumstances, and amongst such varied bodies of men. It explains too, the fact that most of the epidemics have occurred in the rainy monsoon, and least so in the hot season, during which the temperature is more equable, and the vicissitudes less—an important factor also in the production of all forms of malaria. There is nothing against its being of malarial origin in its having broken out on board ship, far from land. Instances of where this has occurred in ordinary malarial fevers are also common, the poison in each case—a miasm—being carried by the wind and atmospheric currents (more probably by fomites) miles away from its origin. The conditions necessary to produce malaria were

all markedly present in the Prison, as already seen, where the epidemic occurred. Neither heat, temperature, water, or decaying vegetable matter in themselves will alone cause the ague poison. For its production there must be a certain porous character of the soil—a certain degree of saturation of the soil with water (the surface having recently undergone desiccation) and a certain elevation of temperature (Bristowe). Anyone who has practised in the tropics, and has seen the protean types assumed by fevers of undoubted malarial origin, from the quartan tertian and quotidian to the severe paroxysmal bilious remittent, can I think persuade himself that there is nothing impossible or improbable in a miasm of malarial origin causing yet another type of equally great variety, namely Bèri-Bèri. I have seen fevers in Java, undoubtedly true remittent malarial fevers, only an hour or two after their commencement, which have resembled in almost all particulars the algide stage of cholera. Why then should there be anything in the nature or appearance of Bèri-Bèri which should exclude all malarial origin. As in remittent and intermittent fevers the specific cause of Bèri-Bèri will, I feel sure, be found to be a particulate organism of similar origin. Before leaving this part of the enquiry it will be well to quote the epitomised opinions of the latest foreign writers on the various causes of the disease.

* Ruppert does not consider *diet* as a cause, on the ground that—if so, it should be much wider than it is. The native often eats little except rice and dried fish

* Ruppert. *Deutsche Archiv. f. Klin. Med.* 27, 1885, p. 507, *et seq.*

and yet though extremely emaciated and often liable to malaria does not get Bèri-Bèri.

He is more inclined to attribute it to the *soil* and to *night sentry duty* which exposes those under fatigue to the noxious influence of the night air.

The natives seem to enjoy an *immunity* which Europeans, Javanese and others do not. Aliens in time also enjoy a certain immunity.

He is very sceptical about the disease being seen in animals, hens, pigs, sheep. Probably these are caused by Entozoa.

Weintraub discusses the various alleged causes of Bèri-Bèri in the following manner :—*

- (1.) A rheumatic disease, because increased in wet season and in ill-clothed soldiers. Although Weintraub formerly thought it to be rheumatic in nature, he has since discarded this opinion.
- (2.) Allied to Pernicious Anæmia, as Wernich holds and Lodewyks in later years. Wernich says it depends on a blood decomposition, for which there is no precise pathological technical term, but allied to Pernicious Anæmia and Chlorosis.
- (3.) Referrable to Diet. Weintraub denies the diet origin, quoting as proof against it in the Indian Archipelago among the day labourers diet is all rice, fish and fruit. Flesh very seldom. The native soldiers have rice and bacon, and only occasionally salt and dried fish. The native

* Weintraub. *Wiener Medizinische Wochenschrift*, 1887, No. 29, p. 964, *et seq.*
No. 30, p. 995, *et seq.*

convicts have a very scanty flesh diet, yet we see Bèri-Bèri in soldiers and convicts endemic and epidemic, while very rare in natives.

Overbeck de Meyer, Van Lieut, and Lodewyks attribute disease to want of albumen and fat, but Weintraub thinks much more due to bad hygienic conditions of the warships.

Weintraub concludes by saying that his experience in the recent epidemic convinced him as to the futility of the Diet and Deterioration of Blood Theory.

- (4.) Depends on ruined condition of the rice grain or on some parasite.

Rice, the great food of the Asiatics, but Weintraub thinks this only supported by English physicians while the Netherland and Dutch who have studied the question deeply, do not hold it. It has been suggested that Pellagra is due to a disease of the grain also, but there is no analogy between the two.

Gelpke has attributed it to dried fish, but it occurs among soldiers who do not eat dried fish, except seldom, and among the Chinese inhabitants of the Indian Archipelago with whom dried fish is a great diet, Bèri-Bèri is very rare.

- (5.) Some attribute it to intestinal worms, *Tricocephalus Dispar*, *Ankylortomum Duodenale*, and even *Ascaris Lumbricoides*, but evidence is wanting.
- (6.) Malarial Infection dependent upon Miasma.

Furnée and Simmons both hold it, but as far as Weintraub studied the question in Indian Archipelago, Bèri-Bèri and Malaria did not coincide in districts, and the symptoms are markedly different. It must be borne in mind, however, that the two may co-exist in one patient, or that a Beri-Beri patient may have an enlarged spleen from old-standing malaria.

Muir in his relation of Beri-Beri to Diet, &c.,* refers to Dr. Takagi's theory,† viz., that the diet in the navy was a cause of the disturbance of the equilibrium in the body between carbon and nitrogen, and that the origin of Bèri-Bèri depends on this.

He therefore ordered bacon, bread, and vegetables, only certain sorts of sea-fish, and a much less quantity of rice than usual. This novelty produced a most satisfactory state of things, in this year not a single case of Bèri-Bèri appeared in the navy. And, in those ships in which very often endemic Bèri-Bèri cases occurred, no others happened after this change.

Again, in the Penitentiaries,‡ which use a barley diet freely, cases occur with great rarity among the prisoners, while many officers and physicians had it. Many prisoners arriving with it, quickly recover from it there. This Muir attributes to the barley diet.

Muir examined four prisons, and found:—

(1.) Unhealthy Sites.—Of four prisons examined, one

* Muir. *Virchow's Archiv.*, Bd. cxiv., Hft. 3.

† Page. 389, *et seq.*

‡ Muir's Observations on Prisons.

lay on a Delta, one surrounded by a rice field, a third on damp ground. Only one was healthy.

(2.) Drinking Water.—Officers and prisoners in only one instance used spring water, all the rest used canal water.

(3 and 4.) Cells and clothing good.

(5.) Diet.—Chiefly vegetable, seldom bacon, of fish chiefly dried herrings, rarely fresh fish, occasionally salted salmon. No plain rice, but mixture of four parts rice to six parts barley equal.

This is obviously an unsuitable diet, and consequently the wounds in convicts heal very badly.

Muir then contrasts these two conditions in the Navy and in the Prisons, and asserts the cause cannot therefore be found in nitrogenous excess or deficiency.

The one factor common to both, which prevents the entrance of the kakke poison, is the exclusion of regular fish food from the diet.

This is also proved, by the presence of kakke amongst the seacoast inhabitants, and not among Europeans and Americans who do not eat fish to the extent the Japanese do.

And the fact that kakke spreads inland afterwards, he takes to prove as shewing transmission by good as well as by bad fish.

Varieties of Bèri-Bèri.—Bèri-Bèri has been generally classified under three types or varieties, namely: (1.) The acute dropsical; (2.) Atrophic; (3.) Acute pernicious.

I would be inclined to add two others, namely: (4) The Spasmodic; (5.) The mixed. The initial symptoms of all these varieties are remarkably similar as will be seen by a

perusal of the clinical histories of the cases described. The differences in the symptoms of each variety being due to the particular part or extent of the nervous system which is affected by the poison.

The acute Dropsical.—In this the œdema is a prominent feature. It is, however, always accompanied with severe paralytic symptoms. (See cases.)

The Atrophic.—This is well seen in Case No. 4, p. 82. which will give a better idea of the disease than any condensed report could do. It is a typical case of the acute atrophic variety. It is interesting also as showing the sudden onset of the attack, and the very rapid wasting of the muscles that sometimes takes place, the patient being reduced in three days from being a strong muscular man to a helpless wasted being.

Acute Pernicious.—This form frequently sets in suddenly in the course of any of the other varieties of the disease. It also attacks men in apparent health. It is well exemplified in Case No. 11, p. 102, the record of which will sufficiently describe the symptoms that are present. It formerly was looked upon as a separate disease (the P.M. appearances in this case are exceptionally interesting).

Spasmodic Form.—This is well exemplified in Cases Nos. 1, 2, and 3, pp. 73 to 82, and many others. In them the paralytic symptoms are generally preceded or accompanied by marked spasmodic contraction of the various muscles of the legs, arms, and back, and when in the latter, they may be so severe as to throw the patient backwards (see Case No. 13 p. 109). It is very rare for these cases not sooner or later

to be complicated with dropsy, and they then would form what I would term the mixed variety.

Mixed Form.—Under this heading I include all those cases in which dropsical, paralytic and spasmodic symptoms are all present at the same time. It is seen in most of the cases detailed.

Symptoms.—The following is a brief summary of the chief symptoms of Bèri-Bèri. These may be gradual in their appearance, or be at once sudden and spreading over a period of a few hours to as many months, and are as follows:—

As seen in the Criminal Prison, Singapore, and described by Dr. Rowell, they are: "A feeling of weakness, lassitude, and languor, inaptitude for exertion, stiffness and formication of the legs and thighs followed by numbness, and later on by œdema and sometimes paraplegia. This numbness, in course of time, extends to the upper extremities and abdominal walls. The body then, generally, commences to swell, there is a distressing sense of fulness at the pit of the stomach, increased after meals, tension and weight at the præcordia, difficult breathing, especially on motion, and the usual train of symptoms attending thoracic effusion. With the progress of the disease, the dyspnœa becomes extreme, sleep becomes uneasy, there is difficulty in lying down, vomiting is often present, and muscular spasms of different parts of the body occur. The pulse is increased in frequency and feebleness, there is fluttering about the heart, the lips and countenance become livid, there is a scared aspect, the extremities become cold, and the patient soon dies nearly suffocated."

In the more sudden cases these symptoms follow one another with the utmost rapidity, and a few hours suffice to close the scene. The bowels are as a rule torpid. The intellect remains unclouded, and consciousness is retained till the last. Relapses are common. In mild cases there is little else but numbness and rheumatic pain in the legs, without œdema.

Premonitory Symptoms.—In nearly all the cases there has been observed some premonitory symptoms of longer or shorter duration. These consist of lassitude, a feeling of weakness in the muscles, especially of the legs, and in some there was fever.

I have noted this latter in Cases Nos. 1 and 2, where these symptoms were experienced for about a month prior to the onset of the nervous symptoms. (See cases Nos. 1 to 5.) The feverish state in nearly all of them was unaccompanied by rigors, showing that it probably was not of the true malarial intermittent type, but was dependent on the action of the Bèri-Bèri poison.

The initial or premonitory symptoms of all forms of Beri Beri are remarkably alike.

After a period varying from about a month to two weeks or even less, according to the intensity of the poison, the characteristic symptoms of the initial stage set in. They differ only according to the part of the nervous system which is chiefly and primarily affected, and they are all referable generally to the nervous system. An attack of Bèri-Bèri may be divided into three stages: Firstly, numbness and localised œdema. Secondly, passive congestion and more or less general

anarsarca, and, Thirdly, paralysis and atrophy. It is, however, not necessary, for every case to go through all these stages. In mild cases there may be nothing but a feeling of weakness in the legs, and a sensation of pins and needles or formication in the skin with some unsteadiness in gait, without any hyperæsthesia or hypogastric discomfort. A case well illustrating this form is seen in Case No. 29. The numbness generally precedes the œdema, the former passing into stiffness, and anæsthesia and paralysis, with hyperæsthesia of the muscles, the œdema commencing in the feet and extending later to the body generally, effusion taking place into the cellular tissue and serous cavities and tissues, at the same time dyspnœa becoming urgent, and hyposternal pain most severe, and accompanied with this there is great anxiety as of impending death, with gasping for breath. This condition may last an hour or several hours when, if not relieved, death takes place. These latter symptoms constitute a distinct stage or variety known as the acute pernicious form. They were formerly thought to constitute a distinct disease.

When these acute symptoms are recovered from, the patient may or may not pass into the paralytic stage with the characteristic Bèri-Bèri gait, and more or less marked general paralysis of nearly all the muscles of the body; or he may recover completely and quickly from all his symptoms. The heart's action in Bèri-Bèri is always irritable and excited.

Analysis of the Symptoms :—

Anæmia.—In the literature of this complaint anæmia has been given a most prominent place; so much has this been

the case that the disease has been called acute anæmia of Ceylon, or acute anæmic dropsy. Sir Joseph Fayrer in his article in Quain's "Dictionary of Medicine," goes so far as to say that in Europe, pernicious anæmia is possibly the same disease. I have particularly gone into this point in detailing the clinical history of each case, and it will be seen on reference to the cases that out of the whole number, anæmia has been absent entirely in the great majority of them. I am of opinion therefore, that anæmia has nothing whatever to do with the causation or pathology of Bèri-Bèri.

Gait.—This is very peculiar and characteristic. It resembles very much that seen in locomotor ataxia. The legs in walking are raised suddenly high up, with a jerk, from the ground, and the foot is brought down as if the hamstring muscles acted spasmodically on the leg at the knee, while the lower part of the leg, below the knee, is powerless, especially the foot at the ankle joint. The foot is always brought down flail-like flat on the ground with a movement at the same time slightly backwards. This is well seen in Case No. 11, p. 103. (This case also exemplifies in a marked manner the sudden onset of the disease, the patient being in apparent health the day before his attack. It is also a case in which cold or sudden chill seems to have been the immediate exciting cause.)

Edema.—This symptom, which has been held to be by most writers of as much importance as anæmia, is by no means so constant or pathogomonic as the nervous disturbances. It almost invariably appears *after* the nervous symptoms are developed, as is well shown in the clinical histories of the cases, the general order of the attack being

(1) lassitude, (2) twitchings, (3) numbness, (4) œdema. It was absent altogether in Cases Nos. 29, 35 and 36. It was present in all the others at one time or another, and sometimes was the first symptom to attract the patient's attention, in others not appearing until twenty days after the nervous symptoms as in Case No. 16, page 119; in others not until ten days after. In Case No. 5, p. 85, it came on after sensory symptoms (pain), and before the motor. It was present in some, absent in others, with no regular order in its appearance, in the train of other symptoms when present, and varying in amount in different cases, in some, being of such a degree as to give a distinct type to the disease. In those cases in which it was present it generally first made its appearance on the dorsum of the feet and gradually extended up the front of the leg, appearing also in the backs of the hands; while in the acute dropsical cases it involved the whole of the subcutaneous tissues of the body, and all the serous cavities, as seen in the fatal cases. (See P. M. Reports.)

A separate description here, of its extent and symptoms in each case would necessitate a recapitulation of what has already been written in the clinical histories and post-mortems. A good example of how extensive it may be, is seen in Case No. 1, p. 73.

Appetite.—This is generally unaffected, and remains good almost to the end. Gastric troubles, when present, are of exceedingly ill omen. Vomiting is a most serious prognostic sign, if it sets in the chances of recovery are small. It is generally the precursor of the acute pernicious type which as a rule ends fatally in a few hours or even less.

Bowels.—The bowels are generally constipated (see Tables). Dysentery and diarrhea, so common in the tropics, may complicate a case, but it is not necessarily concomitant, and when present they impede seriously the chances of recovery.

Urine.—The urine which I had tested regularly in the different cases for months, every week, involving an immense amount of time and patience, showed nothing abnormal (for result of the examinations see tables at the heading of each of the cases). I have not noticed in any case suppression of urine, but in some there was frequency of micturition at night observed.

Fauces.—I would especially draw attention to the result of the examination of the fauces in the cases detailed. In almost all of them they were found more or less congested and inflamed, varying from a considerable blush to a state of intense hyperæmia. I do not know what value to place on this, but as a clinical fact it may be of importance. It suggests a similarity to diphtheria with its sequela, diphtheritic paralysis.

Temperature.—The temperature charts are of interest from their negative results. In no case could an onset of acute symptoms have been foretold by the observations of the temperature chart. It is essentially a non-febrile disease. The most remarkable variation from the normal occurred in Cases Nos. 24, and 8, p. 140 and 93. In case No. 24, the temperature went down to 95 (great precautions were taken to guard against error—see Case). In Case No. 8 the temperature before death went down to 94 (the P.M. appearances in this case are very noteworthy).

Relapses.—Bèri-Bèri is exceedingly prone to relapses and exacerbations, and with each relapse the danger of a fatal termination increases, from the liability to the onset of the acute pernicious form. This is exemplified in Cases Nos. 18 and 35, where the patient had suffered from a similar disease fifteen months previously.

Swallowing.—Case No. 27 is the only case in which difficulty of swallowing was noticed; and it also shows the localised sensitiveness to cold, which is often seen in Bèri-Bèri. It is also interesting as showing how rapidly in favourable cases, serious symptoms pass off.

The Mental Faculties.—These are never involved, they remain as a rule intact to the last.

Sight.—In only one of the cases, No. 44, was the sight affected, this became so with the onset of the disease, and lasted throughout it.

NERVOUS SYMPTOMS.

Sensory Disturbances.—These are very various both in degree and in the order of attack in different cases. In some they precede, while in others they follow on the motor symptoms. The first symptom that may be complained of is lassitude, but as this first shows itself, in some cases, a month or six weeks before the gradual onset of the disease, I would be inclined to think it a premonitory symptom. In the milder cases the sensory symptoms set in after the motor. In others the lassitude is followed by numbness over the epigastrium, and then by twitching of the legs and hands.

(See Case No. 3, p. 78.) While in the most severe forms pain in the arms and legs is the first symptom complained of. (See Case No. 4, p. 82.) The sensory disturbances are of the most varied description, from a simple numbness and feeling of pins and needles to pains of the most intense gnawing character, very difficult to describe. All the patients whom I tried to get to explain its nature, persisted in describing it as not an acute pain, but one of a dull, aching, numb character. Its severity was well shown in Case No. 4, p. 82, where the patient's expression of face was that of one in tetanus—the apprehension of pain, or pain if touched was very severe.

Pain is very marked in the muscles of the calves of the legs, and between the radius and ulna. It is always worse at night than in the day (see case 45, and during loaded states of the atmosphere, and on wet rainy days. It is increased on walking and movement of any kind, such as turning in bed, or sitting, or lying for any length of time in one position. Over the loins the pain is much increased if the patient lies on his back. It is increased by pressure (see case 4, page 82).

The sensation of pins and needles was felt in the palms of the hands, in case No. 2, page 76, where there was also a pain commencing on one side of the little finger and running up the inner side of the forearm. In case No. 29, the patient experienced a feeling of formication over the dorsum of his feet.

The tingling or numbness is sooner or later followed by complete anæsthesia of the skin, with muscular hyperæsthesia

(The sensory disturbances are generally first seen and most marked in the lower extremities, and in the hands and arms, but are seldom confined to that locality—all parts of the body may be affected).

In the face anæsthesia is most commonly found on the upper lip (cases No. 30, 35, 42). It sometimes is present on the skin over the epigastrium—over the bladder, penis, and scrotum (see case No. 13, page 109). In some cases the line of demarcation of the anæsthesia is very distinct—as seen in case No. 2, page 76, where the numbness was in the hands and palms, extending up to a circle drawn round the wrist-joint, but no higher, and similarly in the feet.

Flatulence and Feeling of Cold.—These are prominent symptoms. In some cases cold causes well-marked goose-skin, and the patient complains at the same time very much of the feeling of cold. In others cold sensations are more or less localised to certain areas, as seen in case No. 27, where there was a feeling of coldness from the knees to the toes.

Girdle Pain.—In many of the cases the patient complains of a tightness in the abdomen, round the loins (see case No. 42).

Knife or Lightning Pains.—I have not noticed these in any case.

Perversions of Sensation.—Amongst other sensory phenomena I draw attention to those seen in case No. 1, page 73, where the patient had a sensation of heat conveyed to the skin of the leg when gently rubbed with the hand; and also case No. 6, page 88, where the conduction of sensory

impressions to the brain was evidently imperfect—the prick of a pin being felt only some time after it had been made, and when felt it was referred to a different place than the point of contact of the pin.

Motor Symptoms.—These generally vary in the order of their occurrence. They sometimes precede, and sometimes follow the sensory symptoms. In no case have I seen them occur alone—they are always accompanied with anæsthesia of the skin, and hyperæsthesia of the muscles. The first motor disturbance noticed in most of the cases was twitching of the muscles of the legs, arms, and hands. This in some cases continued throughout the attack—in others it passed into complete paralysis of the muscles affected. It never affected an entire limb, but picked out, as it were, certain muscles with a special predilection for the extensors of the foot and hand leading to well-marked dropping of the wrist, and ankle. The flexors are also involved, and in severe cases all the voluntary and some of the involuntary muscles of the body, but not those of expression. There seems to be no defined order of attack, except that the chief and principal muscles in all cases are those at the periphery, which are also (in all cases) those first attacked. In the acute paralytic variety the motor symptoms are most marked, and are well detailed in case No. 4, page 82, which is also an excellent example of how general the paralytic symptoms sometimes are. The motor disturbances are invariably associated with rapid wasting of the muscles involved, with contractures later on—in some cases so severe as to make it impossible to overcome them by passive movements, and causing in the leg

marked talipes equinus, and in the hand contraction of the fingers. I have seen, in consequence, patients who on standing, could not touch the ground except with the ball of the great toe.

In no case have I seen the opposite leg and arm at the same time affected, but Case No. 26, on admission was found to be suffering from wrist-drop in the left hand only, which, however, subsequently attacked the right hand twelve days later.

The Buccinator muscles were affected in Case No. 32.

Tip of the tongue in Case No. 28. Intercostals and the diaphragm are apparently always affected in the severe paralytic form.

The muscles of the larynx are only affected in the severer forms, causing loss of voice as seen in Case No. 4, page 82.

The sphincters are in no cases involved. There was difficulty in swallowing noticed in one case only. There is never any tendency to the formation of bed sores or other nutritive changes in the skin.

Reflexes.—All deep reflexes are in the majority of cases lost, as also the plantar, but the spermatic and abdominal may remain normal, see Cases Nos. 3 and 4, pages 78 and 82.

Vaso-Motor Disturbances.—In such a widely spread nervous affection as Bèri-Bèri vaso motor disturbances of some kind are sure to occur. They are seen in the coldness of the extremities, especially marked in Case No. 27, and in the peculiar sensitiveness to cold which was

a marked feature in most of the cases. The general and rapid œdema seen in Bèri-Bèri is probably due to very marked implication of the vaso-motor nerves by the poison.

The Cardiac symptoms are most probably due to the same cause (namely—implication and possible degeneration of the nerves controlling the blood-vessels and heart).

Could not the remarkable low temperature which is seen in Cases Nos. 24 and 8, pages 140 and 93, be due also to this cause?

Summary of Symptoms.—To sum up then the foregoing symptoms of Bèri-Bèri we have the following:—A non-febrile disease (apt to recur and undergo exacerbations) involving both sensory and motor functions associated with a sensation of tingling, numbness, anæsthesia, and œdema, with spasms and paralysis of the extensors of the leg and arm, and muscles of the trunk, followed by atrophy of the muscles and absence of reflexes (and according to recent observers with electrical changes), with no implication of the mental faculties, or of the bladder and rectum, or trophic changes in the skin.

Is it Contagious or Not?—In a report of an epidemic at Mauritius, of what is called “Acute Anæmic Dropsy,” which is considered to be allied (though perhaps not identical) to Bèri-Bèri, it was considered not to be infectious. Dr. Kenneth Macleod, Health Officer, Calcutta, in his report on the recent outbreak at that port of Bèri-Bèri, was the first to express his opinion on the possibility of its contagiousness. Against the theory of contagion, I may briefly enumerate the following facts:—

When the disease first broke out in the Singapore Gaol in

1875, a number of the sick were sent to Penang Prison at a time when the "separate system" did not exist there, and when the prisoners therefore slept in association, using the same latrines, &c., yet not one of the Penang prisoners caught the disease.

No case of propagation occurred in the Malacca Prison, where no separation was maintained, and association was the rule, and the cases sent from Singapore there were picked out as the very worst cases among the whole number, and the most likely to die. The cases of released prisoners who were sent to the Pauper Hospital after leaving the Prison, have not, in a single instance, spread the disease there, and yet they and the patients used the same latrines indiscriminately.

Farther, the native coolie attendants on the sick rarely if ever, contracted the disease. This fact has been commented on by other observers. If the theory of its being contagious was correct, these are the very men who would be most likely to contract the disease in this way, living in the very midst of it, and having the same latrine accommodation.

Nor, again, do we find patients admitted for other ailments, having the disease communicated to them by their next-bed neighbours; and this holds good, not only as regards the Singapore Prison, but equally refers to the General Hospital. Cases of Bèri-Bèri sent in from Java, Acheen, and elsewhere, are repeatedly admitted there for treatment, and have been so for many years. They mix freely with the other sick in the wards, there is no attempt at isolation, they are provided

with a common latrine, but a single case of the diffusion of Bèri-Bèri in this way has never been known to occur.

During the year under review (1875), cases from outside have been admitted into the General Hospital at Malacca, without any untoward results. In Java—the very hot-bed of the disease—no isolation is attempted, nor is it supposed to be contagious.

From these observations, and from the clinical histories of the cases related in this Thesis, I am of opinion that it is not contagious. I believe, at the same time, that the organism, when endemic in a locality, finds its way into the human system from the soil, and that it is a cumulative poison adhering to walls of buildings, soil, &c.

Where many sick are together, or have been treated in a building, the poison is in an intensified condition, and the disease easier contracted.

Weintraub sums up the arguments as follows that it is an infective disease :—†

- (a) Like other infective diseases in Indian Archipelago, endemic and epidemic, with narrow limitation which is characteristic of the infective nature.
- (b) Confined to certain points of the Archipelago.
- (c) Not autochthonous, because carried on board ships by Bèri-Bèri patients.
- (d) Definite stage of incubation.
- (e) Removal from infected area cures the disease.
- (f) Remarkable escape of women and children.
- (g) Infective, but not contagious as is malaria.

† *Wiener Med. Woch.* 1887, No. 38, p. 1238, *et seq.*

Percentage of Death.—This would vary according to the type and intensity of the poison. It varies also in different epidemics, and in different countries—under all methods of treatment.

In Singapore it would seem that the percentage of deaths from Bèri-Bèri, in the Gaol, varied from 16·2 in 1878 and 20·9 in 1879 to 8·02 in 1880. The army returns for the whole of Japan for 1875 show a death rate of 17·65. Of all cases of this disease treated in Hospital in South Brazil the mortality has been as high as 25 per cent. under the most favourable treatment. In India the range is from 14 to 26 per cent., while in Acheen and other places the death-rate is well-known to have exceeded this. In the Mauritius epidemic the percentage of deaths among the people in town was 20 per cent., and in the suburbs 44 per cent. In Calcutta the death-rate was much the same.

Treatment.—Under this heading I will also include prophylaxis. There is nothing known of the nature of a specific for the cure of Bèri-Bèri. The treatment which was adopted by Dr. Rowell, in the Singapore Gaol was a simple one, but varied according to the nature, variety, and stage of the complaint. In the acute dropsical form, the patient was submitted to a long daily vapour bath of about two hours duration, until a free and profuse diaphoresis had occurred. As an adjunct to this, each patient, while having the bath, was made to swallow in divided doses a quart of water containing in solution half-a-drachm of nitre and the same quantity of jaborandi. In addition a purgative was given twice a week of compound jalap powder, and three doses daily of steel

diuretic (a mixture of steel and acetate and nitre of potash and spirits of nitre). On about the third or fourth day of this treatment, the swelling was observed to decrease, when convalescence rapidly progressed. If, however, perspiration by these means could not be induced, the patient was nearly sure to die. This happened in the worst type of the disease, and when the epidemic was at its height. When dyspnœa was urgent, and collapse threatened, the hypodermic injection over the heart of 15 drops of ether, and repeated if required, was found serviceable. Drastic purges were only used when there was obstinate constipation, and the dropsical symptoms marked. For the constipation a 10 to 20 grain dose of calomel was found to answer well, as also $\frac{1}{2}$ to 1 grain dose of elaterium in combination with 4 or 5 grains of pil rhei co, or a half-drachm dose of pulv. jalapae co. After the bowels were well evacuated, the symptoms of œdema, and tightness about the body were found much lessened.

Oleum nigrum, an oil procured from India, and of great supposed efficacy, was tried, but disappointment was the result.

Lime juice was used, and though continued for some time, had little or no effect.

Cream of tartar drink was freely given to the sick. A mixture of gin and acetate of potash and nitrate of potash was tried, and answered fairly well.

The combination which succeeded best and yielded most uniform good results was one of twenty drops tinctura ferri perchloridi, with ten to fifteen drops of tinctura digitalis in a vegetable tonic infusion, given three times a day.

When dyspnœa set in, diffusible stimulants—ammonia æther, and camphor—in large and repeated doses were given with alcoholic stimulants. A dose of gin at bed-time was given to almost all cases.

In the more chronic and rheumatic cases, iodide of potassium and tincture of aconite in suitable doses were given, and when paralytic symptoms were present, ergot and nuxvomica combined were the most reliable drugs.

The diet consisted of food easily assimilable, milk and sago, bread and milk, beef tea, chicken soup, and stimulants as required, and gin to almost all cases.

Local Treatment.—The local treatment is of much importance. Daily frictions of the extremities with some stimulating liniment and flannel bandaging. When dyspnœa set suddenly in, the application of a large blister to the chest is the best remedy, aided by mustard poultices to calves of legs, &c.

Mustard cataplasms over epigastrium, blistering the spine, counter irritation over the kidneys, the button cautery to the spine, have all been found useful in suitable cases. The milder and more chronic cases are simply enough treated, but in sudden and severe cases the physician feels himself as helpless, as if he were in the presence of cholera of the worst type.

Prophylaxis and General Treatment.—This should consist of increased vigilance in all points relating to sanitary condition of barracks, camps, gaols, and all places where the disease is endemic, and large bodies of men are of necessity kept together. Thorough ventilation of worksheds and

latrines and dormitories. Thorough drainage is all important, which should be sufficiently deep so as to withdraw all moisture from the stratum of ground containing decomposing organic matter. Thorough disinfection of the floors and walls of dormitories in which the sick are sleeping, should be carried out. Tar and sulphur may be burned in them for purposes of fumigation. Where possible a sea trip—though of short duration—is attended with the best results. Exercise in the open air was found most beneficial. Thinning of the number of persons affected was found to stop the spread and virulence of the disease in those that went away and also in those that remained. This would appear to show that the poison in Bèri-Bèri, whatever its nature, was dependent on its intensity and cumulative effects.

PATHOLOGY.

Morbid Anatomy.—For a detailed account of the post mortem appearances presented in cases of death from Bèri-Bèri, I would refer to the account of the post-mortem examinations of the cases in which they were held (see pages 93 et seq.). The appearances presented in them were very uniform and consisted chiefly in first serous effusions into the areolar tissues through the body (this, however, was absent in some of the cases, especially such as had a short duration and had been suddenly fatal). Effusions of varying amount into the chest and pericardium—the quantity effused into the latter space has averaged from 2 to 8 ounces—more or less serous effusions into the abdomen, but rarely amounting to ascites. In all cases effusion was found in the

ventricles of the brain, and also on the surface of the cerebrum itself. The quantity of this was variable. There was effusion under the dura mater of the spinal canal. The *heart*, as a rule, was large and flabby, surrounded by deposits of fat—the valves were healthy. In the heart cavities were found generally large masses of clot and coagulated lymph. The left ventricle was generally found to be contracted—the right flaccid. The weight of the heart varied from eight to thirteen ounces.

The *lungs* were œdematous.

Kidneys were found to be pale and enlarged.

Spleen was enlarged, in some cases pale, in others congested.

Liver was usually large and congested.

Brain was found congested, as well as the dura mater.

Spinal Cord was found in all the cases enormously congested—softened and œdematous in some.

Pathology of Alcoholic Paralysis and Bèri-Bèri Contrasted.—I may commence this subject by stating that I do not consider myself sufficiently versed in neurology generally, nor had I sufficient material to go upon, to venture any dogmatic opinion on the pathology of Bèri-Bèri. The absence of microscopical examinations, and of the scientific electrical tests have been already referred to and accounted for. The stress of work to which I was subjected as a general practitioner prevented me from working out scientific problems, and from going more fully into minute histological examinations of the tissues; I therefore base any opinions that I offer, as to the pathology of this very interesting and anomalous disease, entirely on naked eye observations, and clinical studies of the complaint

during my residence in the tropics. Bèri-Bèri is essentially a nervous disease, the activity of the poison is observed chiefly in the nervous system, involving both its motor, sensory, and vaso-motor functions. This is shown by a study of the cases detailed in this thesis, and it is a fact which was not generally known at the time they were clinically studied. It was on account of the absence of any reliable data at that time to go upon, that the cases were taken so minutely, in the hope that some points might be found which would elucidate its true nature. I may pass over the older ideas of its pathology and at once come to recent times; the honour of first attracting attention to a class of nervous lesions of which this is now supposed to be but another example, belongs to Professor Grainger Stewart, of Edinboro', who in March, 1881, published three cases in which the hands and feet were affected with paralytic symptoms, without spinal lesions being discovered in the cord after death, and which were then described as being due to a neuritis. In 1885, Dr. Buzzard wrote a valuable paper on some forms of paralysis dependent on peripheral neuritis, and since then the literature on the subject has yearly become more voluminous. Various forms of paralyses, formerly thought to be due to some undiscovered central lesion in the cord, now are thought to be due to a peripheral lesion in the nervous system. As examples of these, alcoholic paralysis may be taken as a type, also lead palsy, and that due to diabetes, diphtheria, and lastly, but by no means least important, Bèri-Bèri.

In peripheral neuritis, the changes which occur in the nerves affected are seen in the peripheral nerves primarily,

and affect them either alone, or involve the cord secondarily ; they are sometimes degenerative changes, at other times inflammatory, and are unattended with any marked naked eye appearances in the nerves themselves. On microscopical examination in the earlier stage, the myeline sheath is swollen and more translucent, and splits up into segments. At the same time the protoplasm proliferates round the myeline sheath, and increases at the same time as the myeline sheath breaks up—thus producing a finely granular protoplasmic mass with increase of the nuclei. The axis cylinder remains unaltered, or shows transverse fissures. Later on the myeline sheath breaks down, and the protoplasm in the sheath increases in size—changes very similar to degeneration in a nerve after section. As the change continues the nerve fibres become irregular in shape, some parts of the tubules becoming dilated, others empty and contracted, the axis cylinder disappearing. Later on still there is only seen the atrophied sheath of Schwann.

In the second inflammatory form, there is more distinct evidence of inflammatory congestion, and swelling of the nerve protoplasm, and there may be marked adhesion of the nerve trunk to the tissue around. Microscopically there is seen marked evidence of inflammation. The vessels are dilated in the nerve trunk, and there is proliferation of the endothelium, and round the vessels leucocyte exudation, and in advanced stages proliferated connected tissue corpuscles, and fat is seen in droplets in the nerve, with fat cells in the connective tissues. The degenerative changes in the tubules are the same as those already described.

On transverse section there is only seen here and there a few nerve fibres with axis cylinders, and in very advanced conditions the sheath may disappear, and connective tissue is only present. In non-medullated nerves, such as the sympathetic, the changes seen are mainly dependent on the normal staining reactions of the axis cylinders.

The changes seen in the cord are insignificant, and do not necessitate any general description, the lesions in the nerves being considered of themselves of sufficient gravity, to cause all the symptoms seen in cases of peripheral neuritis.

A very brief summary of the symptoms seen in a typical case of peripheral neuritis, namely, that following on alcohol poisoning, may not be here out of place, as they will be found to correspond very closely with those seen in Bèri-Bèri. Sensory symptoms prominent—such as pain in the heels and also extremities—especially when the muscles are kneaded or squeezed—limbs become weaker, the extensors being more affected than the flexors, leading to wrist and ankle drop—hyperæsthesia of the skin with anæsthesia later on, or you may get the two combined, forming anæsthesia dolorosa. There may be trophic disturbances such as an attack of herpes, &c. If the motor fibres are affected, there may first be spasms from irritation—later on, if they are destroyed, you get atrophy. To briefly sum up the symptoms of typical peripheral neuritis—It is a non-febrile disease, affecting both sensory and motor nerves associated with hyperæsthesia at first, and then with anæsthesia, and later still with paralysis of the extensors of the leg and arm, associated with great

atrophy—absence of the reflexes, and with electrical changes, and no alterations in the bladder and rectum.

From the foregoing summary it will be seen that as regards mere symptoms, Bèri-Bèri and alcoholic peripheral neuritis are almost identical.

To return to Bèri-Bèri, arguing from the fact of the invariable symmetrical arrangement of the symptoms, it seems probable that the poison must come through the medium of the blood—a point which is also borne out by the fact of the multiplicity of the nerves affected. This would bring it—if a neuritis—under the category of multiple, but arguing from the symptoms alone there is nothing to my mind to show that it is of peripheral origin. By a peripheral neuritis, I understand a neuritis commencing in the periphery, and extending up the nerves towards or to the spinal cord. What is there then, in the symptoms against the idea of its central origin? Supposing a man's system to be poisoned by a deleterious agent circulating in his blood—be it alcohol, lead, or malaria—and that it induced a sub-acute inflammation of his spinal cord, the symptoms I would expect to follow (supposing I knew nothing of the cases related in this thesis) would be—first, sensory and motor irritation, consisting of formication, tingling, pins and needles in the extremities, cramps in the limbs, and spasms with irritable reflexes, pains in the joints and muscles with painful sensations in the skin; then as the irritation increased (which would be followed by œdema of the cord) I should expect to find the irritation ending in anæsthesia with loss of sensibility in the skin, motor weakness chiefly seen in the extensors (from the extensors

being stronger than the flexors) and loss of reflexes—all the symptoms in fact which are found in Bèri-Bèri. They would vary only with the extent and part of the cord chiefly affected—for instance, if the inflammation was situated in the lumbar region, the legs would chiefly suffer—if higher up, the respiratory muscles, and higher still, the arms, &c.—all quite consistent with what has been seen, and detailed in the cases narrated.

The rectum and bladder are not implicated, but they are not always affected even in cases of undoubted spinal disease, while the œdema, which is certainly a striking feature in most of the cases, can be accounted for, and is suggestive of very marked implication of the vaso-motor nerves. The effects produced by œdema when considerable are serious, but variable, depending on its amount and situation. I do not think, however, that it is accountable for the heart symptoms. The precordial anxiety is I think due to implication of the nerves supplying the heart muscle, for the cardiac irritability and cardiac dyspnœa were most sudden and severe in those cases where there was least outward sign of disease, or where œdema of the body was absent.

The pulmonary dyspnœa which was most common in the acute dropsical form, was undoubtedly due to acute pulmonary œdema, which was recognisable during life, and was detected after death. Sudden death with symptoms of cardiac dyspnœa was undoubtedly due in some instances to cardiac emboli. Instances of this will be found among the cases. In this case only one ounce of fluid was found in the pericardium, while in other cases, such for example as Case No.

12, p. 105, six ounces of fluid was found in the pericardium, yet urgent cardiac dyspnœa was at no time present, though difficulty of breathing was experienced throughout the attack.

The muscles in all the cases seen in post mortems were pale and flabby, and in those that recovered also, the muscles underwent rapid atrophy.

This in itself would not prove, without electrical examination, where the disease in the nervous system was situated. It might have been central in the anterior horns of the grey matter of the spinal cord, or in the nerves connecting the cells in the anterior horns with the grey matter.

The heart was in almost all cases found to be very considerably enlarged. In the fifteen cases in which the heart was weighed the average weight was found to be 10 ozs.; in two of the cases it was 13 ozs., in other two it was 12 ozs., in three others 11 ozs., and in two other cases 10 ozs.

The most marked changes, however, to which I would draw attention were found in the spinal cord, and it is these which have caused me to hesitate in accepting the general view, that the disease is a peripheral neuritis, and not one due to a central lesion. As before remarked, the cord in all cases was found to be in a state of marked congestion, and I will here very briefly recapitulate some of the facts seen by the naked eye in some of the cases:—

Case 8. Cellular tissue jelly-like, great congestion of dura mater.

Case 9. Slight congestion, &c.

Case 10. Congestion and serous effusion, cord soft, &c.

Case 11. Congested patches everywhere along whole length of cord, 4ozs. of fluid.

Case 12. Much congestion in sacral canal, cord soft, etc.

Case 13. Great congestion, cord firm, &c.

Case 14. Slightly congested in patches, cord firm, &c.

Case 15. Pia mater patches of lymph (head), cord highly congested, &c.

Case 16. Extravasation opposite each spinous ligament, 4 ozs. fluid, &c.

Case 17. Great congestion and clotted blood in canal, &c.

Case 18. Great congestion, cord firm &c.

Case 19. Much congestion, cord firm, &c.

Case 20. Great congestion, &c.

Case 22. Much congestion, &c.

Case 23. Much congestion, &c.

Case 24. A few spots of congestion, &c.

Case 25. Slight congestion, lymph here and there, &c.

The point then, as I understand it, is this: that post mortem examinations have been made by others in cases of Bèri-Bèri, which have shown degenerative changes in the nerves with degenerative atrophy of the nerve endings and of the muscles, the pathological changes being mainly in the periphery, the cord lesions being absent or very slight. This, however, is not sufficient to prove by itself that the disease is a peripheral one. It is open to doubt whether all forms of so-called peripheral neuritis are not due to some central change. The absence of any discovery of a central lesion in cases where motor and sensory disturbances in the periphery are well marked, does not prove that it is of peripheral

origin. Epilepsy, for instance, is characterised by a motor and sensory peripheral disturbance, with no central lesion to be discovered even with the microscope after death, in most cases, yet it cannot be regarded as a peripheral nervous disease. It is undoubtedly of central origin. I only refer to this to show that I think that even where no central lesion can be found in a given case of supposed peripheral neuritis its central origin would not be disproved. How much more then would this be the case, with such an array of facts as I have given in the post mortem result of the cords in the nineteen cases that I have examined. In the whole of them there is distinct evidence of cord affection. They were, even to the naked eye, markedly changed. They were so gross as not to require the use of the microscope to see them, for in some—only a few hours after death—the cord was soft and diffuent with hæmorrhages, marked congestion, and extensive œdema, quite sufficient in themselves to cause all the symptoms. The suddenness and rapidity with which too the serious symptoms are recovered from, as will be seen in Case No. 38, are rather I think in favour of the central cause, such as congestion, than to its being due to degenerative change in the peripheral nerves, the congestion being more or less rapidly relieved, leaving the cord and its membranes tolerably healthy. Such rapid recovery could not take place if it were a peripheral degenerative change.

Judging from the symptoms also, I think the condition cannot be a polio-myelitis anterior acuta alone. The sensory phenomena (hyperæsthesia and anæsthesia) prove this clearly. My observations go to prove that it is a cord lesion

which involves both motor and sensory functions of central origin—a sub-acute inflammation of the spinal cord and its membranes.

ADDENDA.

Since this thesis was for the most part written, there has appeared in the *Lancet*, of March 4th and 11th, a review of a work by Drs. Pikelharing and Winkler, entitled “An Investigation into the Nature and Origin of Bèri-Bèri, and the Means to be Adopted for Counteracting the Disease.” The original work I have not been able to see, and the extracts which I give are taken from the review of their work. I will refer to pathology chiefly, as it is in this that my cases do not agree with what were seen by them. The conclusion of the writers is “that Bèri-Bèri must be classified under those maladies which are commonly designated peripheral multiplex neuritis.” The expression “commonly designated peripheral multiplex neuritis” is well chosen, since “multiple neuritis would not coincide with the previously expressed opinion “that the neurosis must be regarded rather as a nerve degeneration than a nerve inflammation.” From their research it likewise appears that “in every post-mortem examination of Bèri-Bèri patients, there are to be found evidences of degeneration, as well as regeneration in the peripheral nervous system.”

The pith of their examination of (1) the anterior and posterior roots of the spinal nerves, and (2) the intervertebral ganglia is as follows:—The anterior roots are very slightly if at all affected; the process extends to an atrophy of the

fibrils of that portion of nerve lying betwixt the mixed nerve and the intervertebral ganglion. "Here, in this ganglion, the limit, as it were, is antecedently marked out, so that, when in case of long continuance of the disease the ganglion fails, the posterior roots themselves degenerate, their continuation, direct or indirect, atrophy, and the atrophic change is demonstrable as far as the columns of Goll" (see *Lancet*, May 1st, page 941).

As regards their other views I am at one with them in most points as will be seen by my previous observations. I noted the great enlargement of the heart in some cases, and its general enlargement in mostly all. I have also noted the fact of death being sometimes due to asphyxia, in some following cardiac dyspnoea, in others pulmonary œdema. Their remarks on disinfection I thoroughly endorse, and the fact that anæmia has no dependence on Bèri-Bèri is fully proved from the clinical study of the disease. The similarity of the initial stage of all varieties of the disease has been also noticed. Whether it is contagious is still, I think, a doubtful point, but that the virus does exist in the soil independent of the human body, and that its virulence and multiplication is aided by the congregation of human beings in camps, barracks, and gaols, is fully proved by observation, but how and in what manner it is brought about is still a matter for further observation.

It is not infectious.

How the poison finds its way into the body is still an undecided point—perhaps by respiration as suggested. As regards treatment, much can be done in ameliorating the

symptoms and mitigating the severity of the disease in all cases, except perhaps the acute pernicious form.

SUMMARY.

1. It is a disease of the nervous system.
2. It is not as a consequence associated with Anæmia, and has no dependence on it for its production.
3. It has a premonitory stage of longer or shorter duration.
4. The initial stage is in all varieties very similar.
5. The differences of the symptoms in different varieties are due to the intensity of the poison, and extent and part of the nervous system affected.
6. There is always atrophy of the muscles at some period or other of the disease.
7. The cause is probably a specific particulate organism generated in the soil.
8. Its effects are due to its introduction into, and circulation in the blood.
9. It is not directly contagious, but the poison is increased in its intensity by bringing together cases of the disease.
10. The poison is diminished in virulence by thinning of the cases in a locality; or in a person affected by fresh air, a sea trip, or simple removal from the infected locality.
11. Its effects are seen in the motor sensory and vaso-motor functions.
12. In the absence of microscopical examinations, the chief

parts affected, according to naked eye appearances, seem to be in the spinal cord and its membranes.

13. The effect of treatment is most beneficial in the acute dropsical form, but its good results are seen in all varieties. They are least apparent in the acute pernicious form.
14. The poison appears to be cumulative as a certain lengthened time of residence in an infected locality is necessary for its production, but the time varies immensely according to the concentration or intensity of the virus.
15. The bowels, appetite, or urine, or intellect are not affected.
16. The heart is in all cases enlarged, and frequently after death is found filled with clots, especially the right side.
17. Death when it occurs may be due to cardiac failure, or pulmonary asphyxia from œdema, or to asthenia, or to embolism. When sudden it is probably due to cardiac failure due to nervous influence.

Since the date when this thesis was written, 1889, a considerable amount of attention has been given to the nature of this interesting disease, resulting in a very valuable mass of pathological work by various foreign observers, an epitome of which I have the pleasure of now reproducing through the kind assistance of my friend, Dr. Gordon Sanders, of Edinburgh, for without his invaluable help in the translations of the various scattered papers, I would have been unable to show in this work the latest views on the disease.

A. PATHOLOGICAL ANATOMY—

Muira's observations on the pathology are thus summarized :—

CENTRAL NERVOUS SYSTEM.*—*Naked Eye*—nothing constant in brain, cord, and membranes, save blood extravasations in various places, œdema of pia mater, and increase of fluid.

Microscopic—stained with usual reagents haematoxylin, picrocarmin, acid fuchsin, and nigrosin. In three cases he found vacuolation of the cells in the anterior horn. The vacuoles occur singly or in groups, greater or smaller size, sharply differentiated from one another, and always in the neighbourhood of the nucleus; the body of the cell is often largely occupied with the vacuoles, while the nucleus is little altered.

Corpora amylacea, found in spinal cord, brain, cerebellum, and peripheral nerves, pons and medulla, staining with bismarck brown, gentian violet, iodine, saffranin, eosin, haematoxylin, and Muira holds from their reactions probably very similar to altered myelin.

The partially obliterated central canal in the spinal cord has no significance in Kakke.

HEART.—He agrees as to usual dilatation and hypertrophy. Coronary arteries unchanged.

Fatty degeneration *not* constant. Here he disagrees with Scheube, but agrees with Baelz.

LUNGS.—In one case great œdema of glottis. In three cases great hyperæmia and œdema of lungs, occasional pleuritic adhesions.

KIDNEYS.—Microscopic—epithelium swollen, degenerated and finely granular.

Tubules filled with homogeneous cylinders or fine detritus.

Stroma filled with small cells, occasional distinct increase of the connective tissue, injection of small vessels, whose walls are thickened.

Glomeruli filled with nuclei, normal size, or enlarged, or diminished in size from exudation between capsule and glomeruli, evidently a condition of glomerulonephritis.

SPLEEN.—Generally normal.

STOMACH.—Mucous membrane swollen, hyperæmic, ecchymosed.

LIVER.—Generally normal.

* MUIRA.—*Beiträge zur Pathologischen Anatomie der Kakke. Virch. Archiv.* CXI. Band, Heft. 2, S. 361.

PERIPHERAL NERVES.—Negative in results.

MUSCLES.—Agrees with Scheube and Baelz in their descriptions, but questions if these appearances are due to Kakke or not, and finally comes to the conclusion that the question is still *sub judice*.

He finds (*loc. cit.*, p. 375) that two general classes of muscular changes occur in the bodies of Kakke patients. The first set consist in an appearance of very numerous muscle bundles, of various thickness, regularly or irregularly discoid in shape, which collect in the interior of the sarcolemma, so that the sheath becomes diminished and scanty. The portions may lose their transverse striation, but rarely their longitudinal striation. These muscle bundles often occur with partially spindle or ball-formed swellings, such parts being very glistening and homogeneous.

There may also be fractures of the muscle bundles in transverse or spiral form, or masses may occur within the sarcolemma, with or without transverse striation.

The following are additional Extracts from recent writers on the Pathological Anatomy of the disease :—

BRAIN.—(*Scheube*.*) Considerable venous engorgement of the membranes, œdema of the pia mater, and hyperæmia of the brain substance. Frequently there is an increase of the fluid of the ventricles, and more or less œdema and anæmia of the brain substance.

SPINAL CORD.—(*Scheube*.†) If affected shews venous hyperæmia of membranes, and serous effusions into peridural and subarachnoid spaces.

Corpora amylacea in six cases, but by no means pathognomonic.

In one case degeneration of cells of the anterior horn, but he regards these as purely secondary.

In one case in which change had advanced very considerably, the connective tissue of the related spinal ganglion was infiltrated with nuclei.

(*Ruppert*.‡) Injection of meninges and thickening. Extravasation of blood, local spots of softening, especially in cervical and lumbar regions, occasionally softening of cauda equina, and fluid in spinal canal.

* *Virch. Archiv.*, Bd. 95, S. 146.

† *Loc. cit.*

‡ *Deutsch Archiv. fr. Klin. Med.*, Bd. 27, S. 506.

NERVES.—Microscopic examination of nerves. Scheube* gives elaborate report of their examination. Finds marked and constant changes. Stained fresh with osmic acid the nerves show swelling of the medullary substance, and, at points, strangulation of it, the myelin splits up and becomes granular, and like fat droplets of various sizes. Later there occurs complete absorption of the medulla and axis cylinder, so that only the empty and collapsed sheath of Schwann remains. In hardened sections there is a considerable loss of nerve bundles, exhibiting varying degrees of thickness, and between them atrophied degenerated bundles in groups staining with carmine, but showing with difficulty the distinction between white substance and axis cylinder.

The nuclei of the Endoneurium are much increased, and within the bundles marked inflammatory changes occur. The vessels are often thickened, and the Endoneurium in chronic cases may be greatly increased, separating the bundles into loculi.

In the twigs of nerves in the muscles the degeneration is least evident, the fibres may be little altered or even normal.

Scheube* also found the *vagus* affected. Having reflected that the condition of the heart in the disease might be due to a neuritis of the *vagus*, he examined the trunk and cardiac plexus and the branches in the large interventricular sulcus, and found a slight amount of degeneration. Single bundles are seen in which the white substance had become like balls. Similar changes found twice in the *vagus*, once in the recurrent branch, and also in the pulmonary branches. But the *vagus* trunk and its branches were not so markedly degenerated as the peripheral nerves. In one case of acute emphysema, occurring as a sudden acute distension, he found a degeneration of the pulmonary fibres. But this requires further confirmation.

MUSCLES.—*Degeneration in muscle proceeds *pari passu* with that in nerves. An atrophy of the bundles, with as a rule, fatty degeneration, marked increase of the nuclei, are the most constant changes. These often proceed to colloid degeneration of the whole or part of the muscle, the bundle appearing thinned, homogeneous or split into fine fibrils. The colloid degeneration is seldom seen so marked as in advanced Bèri-Bèri. A great increase of the con-

* *Virch. Archiv.*, Bd. 95, S. 146. Also *Deutsche Archiv. fr. Klin. Med.*, Bd. 32, S. 86, *et seq.*

nective tissue occurs with proliferation of the nuclei, and considerable inflammatory changes in the vessels. The degenerative changes may exist in patches, but it is rare not to find some degree of cirrhosis of the muscle.

HEART.—*Scheube** describes heart as showing a fatty degeneration of distinctive character, and found it always secondary to a neuritis of the vagus. The degeneration is diffused over the heart muscle, not patchy as in pernicious anæmia. As a rule it affects the right ventricle more than the left, but this is not invariable, inasmuch as sometimes the left ventricle is more conspicuously affected. These changes are however not universal. In two uncomplicated cases of *Scheube*, he notes a condition of diffuse interstitial myocarditis, very similar to that described by *Leyden* and others in the heart in diphtheria, and suggesting an interesting analogy between the two diseases.

These heart changes are of extreme importance, and great frequency in *Bèri-Bèri*, but he mentions three cases in which there was no degeneration in the muscle. This he suggests bears out the analogy to diphtheria still further.

The alterations in the cavities were as follows:—

Dilatation of right ventricle	in 14 cases	= 70 per cent.
„ „ both	„ 4 „	= 20 „
Hypertrophy of left	„ 5 „	= 25 „
„ „ both	„ 4 „	= 20 „

There is, in addition, occasional punctiform hæmorrhage into the endocardium or muscle, endocarditis affecting mitral and aortic valves found in one case, but this was complicated by syphilis; otherwise no vegetations.

Ruppert† saw fatty degeneration forming a placenta-like appearance of ventricle almost invariable. Frequent patchy degeneration of muscle. Hydropericardium frequent.

BLOOD VESSELS AND BLOOD.—*Lodewyks* and *Weiss* (quoted by *Scheube*‡) describe endoarteris in the walls of the blood-vessels of the upper segment of the body, the increase of tissue in the vessels is very considerable. To this they attribute the heart disease and hypertrophy, the vessels losing their elasticity, and undergoing fatty degeneration from loss of oxygen.

Scheube always looked for atheroma. In seven cases the aorta was healthy to the naked eye. In the remainder there was slight atheroma. His cases however were chiefly young persons.

* *Loc. cit.*

† *Loc. cit.*

‡ *Loc. cit.*, p. 171.

BLOOD.—Probably any change observed occurred either post mortem or *in articulo*.

LUNGS.—Generally hyperæmic and œdematous, but to varying extent. Emphysema frequent. Otherwise normal. All observers agree as to this.

LIVER.—Generally some fatty change in the cells, otherwise no marked alterations. *Scheube* refers to the presence of small clumps of cells in the liver, as also in the kidneys, without stating their significance. They occurred within the interlobular septa.

Ruppert—Nothing important, occasionally nutmeg and fatty.

KIDNEYS.—*Scheube**—Generally full of blood. Cells show some cloudiness of nuclei and fatty deposit in the protoplasm, often visible to the naked eye. Small hæmorrhages seen twice in the pelvis. In some hardened sections a few groups of cells found as a rule immediately under the capsule. The nature not determined.

In one case complicated with typhoid, small abscesses in the kidney.

SPLEEN.—More or less increased in *Scheube*'s cases examined in Batavia. Not constant. In one case enlarged with small tumour. In another not enlarged, but capsule wrinkled, showing previous enlargement. It must be borne in mind that malaria may have pre-existed, and caused enlargement of the spleen.

Ruppert.—No hypertrophy or marked alteration.

INTESTINAL CANAL.—Venous congestion of various amount, occasional hæmorrhages in mucous membrane, and œdema of the tissues.

In Java, *Scheube* saw occasional follicular swellings of the large intestine, sufficiently frequent to be looked on as complication.

PARASITES.—Two chief described by some as cause of Bèri-Bèri, viz.: (1) *Ankylostomum Duodenale* and the (2) *Trichocephalus Dispar*.

Of former *Scheube* found in fifteen cases—

Ankylostomum, 13 times, 86 per cent.

From five in Kioto, none.

In Japan much less frequent than in Java.

In Kioto found parasite in 13·5 per cent. of all autopsies.

In Batavia, 88·2 per cent.

Erni.†—Suggested due to *Trichocephalus Dispar*.

GENERAL CONDITIONS—*Dropsy*.‡ Chiefly in pericardium, also in pleura and peritoneum.

Punctiform hæmorrhages in pleura and pericardium.

* *Loc. cit.*

† *Berl. Klin. Woch.*, 1876, p. 614.

‡ *Scheube. Virch. Archiv.*, Bd. 95, S. 175.

As a rule cases are uncomplicated.

TABLE.

Eleven Complicated Cases of Kakke.

Typhoid	1
Tuberculosis	2
Gummatous Encephalitis	1
Pleurisy	3
Follicular swelling, Large Intestinë	4
Amyloid Degen. Liver and Spleen, and Kidney following Peritesticular Suppuration	1

The preceding detailed examination of the descriptions of pathological anatomy shew that in the opinion of Scheube, Baelz, Pekelharing, and Winkler, and others, the greatest changes are to be found in three sites :—

- a. The Nerves.
- b. The Muscles.
- c. The Heart.

The *Nerves* show a marked degree of inflammation, affecting more especially the peripheral nerves, and especially the lower limbs and, later, the trunk and upper limbs. (Scheube, Baelz and others.) Not only the motor, but the sensory and vaso-motor fibres are affected; the cranial nerves as a rule escape, but may also be involved.* (Telgersman in review of Pekelharing and Winkler's book.)

The *vagus* also may be largely affected, but, in contradistinction to what obtains in the peripheral nerves the trunk is less liable to be affected than the smaller ramifications.

Muscles.—The voluntary muscles are affected *pari passu* with the nerves. A large degree of fatty or colloid degeneration with subsequent atrophy or entire replacement by connective tissue, is the rule in the whole or part of the affected muscles. The lower limbs are first affected, but the muscles of the rest of the body are affected, the face not escaping.

The *Heart* is very extensively affected with fatty degeneration of a diffused type, implicating generally the right ventricle, but not universally. According to most observers it depends on the degeneration of the *vagus*, especially as regards its smaller branches, as the muscles of the limb degenerate subsequently to inflammation of the motor nerves.

The *Effusions* into the serous cavities and subcutaneous tissues are

* *Loc. cit.*

frequent and extensive, that into the pericardium being the most constant. The occurrence of these has been explained by the theory of interference with the vaso-motor nerves, and also possibly by an altered condition of the blood.

The remaining tissues, brain, spinal cord, etc., do not, according to these authors, show anything definite or frequent enough to suggest a causative element in the disease. Miura* dwells at considerable length on the vacuolation of the cells of the anterior horns, but his ideas are not endorsed by others.

B. PATHOLOGY—

Masnari Ogata of Tokio, 1885 (quoted by Weintraub†), describes the bacillus he found. In spinal cord and nerves, and also in the blood he found a peculiar schizomycete. This grows in nutrient media, and animals and could be inoculated with them.

The bacilli are smaller in size than the malarial, and are chiefly straight, rarely curved. They form spores, shorter and thicker than the anthrax, and the spores themselves are generally rounded. In gelatine these organisms produce a cloudy appearance, not penetrating downwards, but making a ring round the wall of the tube. On agar agar they appear as a vigorous cultivation on the surface as well as in the interior of the substance. The superficial colony was sharply circumscribed, irregularly defined, yellowish white in colour, lustrous in appearance, smooth, but later becoming faint and wrinkled. The organisms did not grow at summer temperature. Mice inoculated died after from twelve hours to some days, death apathetic and paretic in parts, hind feet swollen. Dogs shewed similar appearances.

Hence Ogata concludes that in Kakke bodies, and in the blood of the patients bacilli occur which cause the disease.

Earlier than this Baelz and Scheube had described it as a pan-neuritis, and some years later the Dutch Government deputed Drs. Pikelharing and Winkler‡§¶ to proceed to the Netherland Indies to study the disease on the spot, with all the equipments of modern bacteriology.||

* *Loc. cit.* † *Wein. Med. Wochen.*, 1888 No. 37, S. 1212.

‡ *Deutsch Med. Woch.*, 1887, No. 39. § *Central. f. Nervenheilk.*, 1889.

¶ *Verhandl. des Int. Med. Congr.*, 1890, Bd. v., S. 1.

|| De Lacerda, in 1883, had concluded from experiments that Bèri-Bèri, was caused by organisms, and therefore his claim to priority must be allowed. *Berl. Klin. Woch.*, 1886.

Their enquiry has resulted in several papers of great value and in an extensive work on the subject. They found constantly in the blood of Bèri-Bèri patients, bacteria and micrococci. These often occur when only equivocal symptoms of the disease are present, and the patient does not feel ill. They found micrococci constant in the patients in Atjeh, and not in healthy individuals. The blood of a Bèri-Bèri patient placed in a nutrient culture plate develops cultures of micrococci, and these organisms cause Bèri-Bèri in guinea-pigs by injection.

There is, however, this peculiarity about the organism, one injection does not suffice to cause the disease, but it requires repeated injections, 20-30, varying with the animal. They further suggest that the rods and cocci are but different developments of the same species, but they do not for the present commit themselves to any view.

They also collected the air from an infected prison, and injected this solution into guinea-pigs. From the blood of these animals micrococci could be cultivated which again caused Bèri-Bèri.

Later, Pekelharing gives more details as to the organisms, and their variability. In twelve out of fifteen cases they found bacilli which yield white cultures, and are the cause of Bèri-Bèri, but re-asserts that the data to settle the question of variability are not at hand.

These micrococci, cultivated from the blood of Bèri-Bèri patients cause degeneration of nerves in dogs and guinea-pigs. The essential is a marked degeneration of the peripheral nerves, and is clearly proved by the presence of an organism to be the cause of the disease.

Sigismund Mayer asserts that these degenerations exist in normal dogs, but this is not the case to an equal extent, and Chinje Dourembos shewed that neither inanition, nor malarial infection, nor daily injections of hay bacilli, nor chronic suppuration can produce it.

It has been suggested that these animals had not Bèri-Bèri, but this is mere logomachy. If, Pekelharing says, the organisms by injection cause a degeneration of nerves, there can be little reasonable doubt the disease is one and the same.

He concludes that the organism is difficult to find in the blood and tissues, and that hence it probably exists in the air or soil, and gains entrance by the Respiratory tract, being rapidly destroyed in the blood, but not before it has given rise to a poison sufficient to cause a neuritis.

Further, he refers to the variability of the organism, and to its effect on liquefying gelatine, and to the colour it produces, as Ali Cohen asserts. Professor Forster of Amsterdam, has shewn that the culture which begins as white micrococci, develops a red colouring matter, and also varies in virulence. He finally asserts that Bèri-Bèri belongs to the infective diseases, but occupies a peculiar place amongst them, the difference is quantitative, not qualitative.

The most recent paper is by *Leopold** who refers to the work of Mousso and Morelli.

Cultures of Bèri-Bèri blood made in Loeffler's meat broth, in glycerin bouillon 6 per cent., with serum, in agar-agar, in peptonised gelatine, and in potato chips, four micro-organisms isolated.

1. Staphylococcus pyogenes albus.
2. Micrococcus of chain form.
3. A small streptococcus, colourless, of unknown character and difficult cultivation.
4. Micrococcus which by inoculation in animals, guinea pigs and dogs causes a degenerative neuritis, and is described as the the typical micrococcus of Bèri-Bèri.

Intrameningal injection of the micrococcus of Bèri-Bèri made in pure culture, under Dura mater in Lambdoidal suture, symptoms same as subcutaneously, viz., Parenchymatous neuritis, paresis of hinder extremities, muscles, especially adductors, much atrophied, softened in consistence and white. Microscopically a gelatinous exudation under the myolemma, increase of protoplasm, muscle nuclei staining feebly with aniline and picrocarmine.

He injected twenty animals—eight rabbits, ten guinea-pigs and two dogs—and produced the effects in all.

In the œdematous form of Bèri-Bèri these micrococci were found in colonies in the epicardium and myocardium, causing finally a myomalacia, the muscle cells become a fine detritus. Proliferation of the connective tissue proceeds *pari passu*.

He confirms the observations of Baelz and Scheube* in the neuritis of the peripheral nerves, and notes the occasional appearance of attempts at regeneration; smaller axis cylinders lying amongst the larger.

* *Central. f. Bact und Parasit*, 9, 1892. *Berlin Klin. Wochen.*, 1892.

KAK'KE GLEANINGS IN JAPAN,

1893.

THE UNIVERSITY OF CHICAGO

1892

Dr. TAKAKI ON ETIOLOGY.

TOKYO, *June*, 1893.

WHILE in Japan this summer, I availed myself of the opportunity of visiting, amongst other distinguished Japanese Medical men, Dr. Kanehiro Takaki, late Director-General of the Tokyo Naval Hospital, whose experiences in Bèri-Bèri are second to none, and whose views therefore, gleaned on the spot, on the Prophylaxis and Etiology of the disease I have much pleasure in relating; and more especially as they coincide with those long held by Dr. T. Irvine Rowell, C.M.G., late P.C.M.O., Singapore.

As already stated on page 14 of this thesis, Dr. Takaki attributes the disease solely to errors in diet, believing the cause to be due to an improper proportion of the carbon and nitrogen in the dietary, which instead of being as 1N to 15C, he found invariably in all outbreaks he inquired into in Civil life, Army, Jails, and the Navy to be as 1N to 22C. This excess of carbon so alters the composition of the blood, as to induce or cause Bèri-Bèri, and so sure is he that his opinion is correct, that he affirms, that given a hundred healthy individuals, he could by dietary alone produce Bèri-Bèri in them in six months, or given a hundred recovered cases he could prevent a relapse by dietary alone. (It must probably be understood that Dr. Takaki refers only to those countries where the disease is endemic).

In support also of his opinion, he mentioned several interesting facts, which I consider worthy of publication, and which I committed to paper while still fresh in my memory, *i.e.*,

1.—Some years ago the Japanese authorities considered that rice was too expensive a luxury to give to prisoners, and ordered barley to be substituted for it. At the time Bèri-Bèri was rife in a jail. The change of diet was followed by a very noticeable diminution of the disease, which happy and fortuitous circumstance continued, so that in two or three years from the change Bèri-Bèri ceased to exist, and this without any other remedial measures being resorted to.

2.—When asked how he accounted for the fact of the disease attacking women after childbirth, and seldom, if ever, at other times, Dr. Takaki stated that in Japan it is the custom for women to forego all nitrogenous food, such as meat, fish, eels, &c., and to feed entirely on soft rice, &c., almost from the time of conception to recovery after delivery. This he considers so reduces or alters the blood's character as to bring about changes which induce Bèri-

Bèri, and in substantiation of his opinion he stated that in his own practice, where from the first he feeds his patients well with barley, meat, &c., in addition to rice, he has not for years seen a case occur after parturition in his extensive practice.

3.—As regards Bèri-Bèri being more prevalent in summer than in winter, this he considers to be due to the fact that in hot weather the general custom in Japan is to live on the lightest diet, consisting chiefly of rice, tea, and hot water, fish being partaken of sparingly about three times a month. It is after a certain period on this poor hydro-carbonaceous diet that Bèri-Bèri appears, and to prove to his mind that it is not due in any way to the *warm* state of the atmosphere, he related that in one of the islands to the North of Japan, Bèri-Bèri occurs only in the depths of winter, attributable to the fact, that in summer the natives are able to vary and increase their dietary by the addition of fish and game caught in the summer months, while in the winter the seas and lakes and the country generally are frozen, and the natives have to subsist almost entirely on rice.

4.—*Damp*.—Dr. Takaki eliminates this entirely from the category of causes *per se*, for if an exciting cause, the disease would attack the farmer and farm labourer in Japan par excellence, whose houses are surrounded by rice swamps from January to the end of July, when rice cultivation is in vogue, the labourers being engaged ploughing knee-deep in mud and standing in water the whole time. These on the contrary are very rarely attacked, but only the poor denizens of the towns and villages.

5.—*Foul Emanations*.—These also in his opinion, seem harmless, as during the rice season decaying masses of leaves, vegetables, refuse, &c., are spread as manure, emitting most disagreeable odours, yet the disease is not present then.

6.—Dr. Takaki disagrees entirely with the alleged predisposing causes laid down on page 9, stating in regard to the first, *viz.*,

(a) *Defective Ventilation*—that this is excessive in all houses in Japan, both in towns and country—overcrowded they may be at times, but ventilation is free from all sides.

6.—*Meteorological Conditions* (*i.e.* rainfall and barometrical pressure). These as causes, he thinks, are negated by the facts shown in the outbreaks on board the ships "Ryujo" and "Tsukuba," when on voyages to South America and New Zealand in 1883 and 1884, a short condensed epitome of both voyages being given in the annexed tabular report.

No.	Description	Date	Amount
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* COMPARATIVE TABLE SHOWING THE DURATION OF VOYAGE AND NUMBER OF CASES OF KAK'KE DURING THE VOYAGES

Period.	Date.	Voyage.	Duration of Voyages Stay,
Voyage of <i>Ryujo</i> (1882—1883).	1st PERIOD.	Dec. 19, 1882, to Jan. 31, 1883.	Shinagawa to Wellington.
	2nd PERIOD.	Feb. 1, 1883, to Mar. 31.	Wellington to Valparaiso.
	3rd PERIOD.	Apr. 1 to May 31.	Voyage continued; stay at Valparaiso; to Callao stay at Callio; to Honolulu.
	4th PERIOD.	June 1 to July 31.	Voyage continued; stay at Honolulu.
	5th PERIOD.	Aug. 1 to Sept. 15.	Stay at Honolulu; to Shinagawa.
	TOTAL 271 days.		
Voyage of <i>Tsukuba</i> (1884).	1st PERIOD.	Feb. 3, 1884, to Mar. 31.	Shinagawa to Auckland; stay at Auckland.
	2nd PERIOD.	Apr. 1 to May 31.	Stay at Auckland; to Valparaiso.
	3rd PERIOD.	June 1 to Sept. 31.	Voyage continued; stay at Valparaiso; to Coquimbo; stay at Coquimbo; to Honolulu.
	4th PERIOD.	Aug. 1 to Sept. 30.	Voyage continued; stay at Honolulu.
	5th PERIOD.	Oct. 1 to Nov. 16.	Stay at Honolulu; to Shinagawa.
	TOTAL 287 days.			Voyage. Stay.

* Review of the Preventive Measures taken

OF STAY IN PORT, STATE OF WEATHER, AMOUNT OF FOOD,
E BY THE "RYUJO" AND "TSUKUBA" TO SOUTH AMERICA.

Temperature. (Fahr.)	Barometer.	Weather.	Daily Amount of Food taken by one Person.	Cases of <i>Kak'ke.</i>
66—87	29.75—30.19	Clear. 16 days. Fair. 17 " Cloudy. 8 " Rain. 3 "	Animal. 25.57 Vegetable. 351.97	3
67.5—74	29.98—33.26	Clear. 11 " Fair. 25 " Cloudy. 15 " Rain. 8 "	Animal. 37.63 Vegetable. 276.70	7
67.5—79.7	27.62—30.16	Clear. 29 " Fair. 16 " Cloudy. 13 " Rain. 3 "	Animal. 38.07 Vegetable. 290.89	25
81.5—83.8	29.99—30.18	Clear. 47 " Fair. 13 " Cloudy. 6 " Rain. ... "	Animal. 61.68 Vegetable. 279.99	125
81.8—86.0	26.30—33.56	Clear. 1 " Fair. 34 " Cloudy. 5 " Rain. 1 "	Animal. 69.95 Vegetable. 223.28	...
Max. 87 Min. 66	Max. 33.56 Min. 26.30	Clear. 104 " Fair. 105 " Cloudy. 47 " Rain. 15 "	Animal. 12,623.18 Vegetable 77,118.47	160
63—98	30.98—30.13	Clear. 24 " Fair. 16 " Cloudy. 10 " Rain. 7 "	Animal. 125.59 Vegetable. 363.12	5
69—74	29.89—29.98	Clear. 29 " Fair. 20 " Cloudy. 10 " Rain. 2 "	Animal. 125.91 Vegetable. 351.43	7
68—70	27.71—30.86	Clear. 31 " Fair. 13 " Cloudy. 12 " Rain. 5 "	Animal. 114.66 Vegetable. 342.62	1
74—83	27.99—32.97	Clear. 30 " Fair. 15 " Cloudy. 13 " Rain. 3 "	Animal. 114.87 Vegetable. 308.83	3
75—84	33.37—29.68	Clear. 17 " Fair. 12 " Cloudy. 16 " Rain. 2 "	Animal. 126.88 Vegetable. 324.38	...
Max. 98 Min. 63	Max. 33.37 Min. 27.71	Clear. 131 " Fair. 76 " Cloudy. 61 " Rain. 19 "	Animal. 34,893.46 Vegetable. 97,017.48	16

most *Kak'ke* in the Imperial Navy. Tokyo.

No.	Name	Age	Sex	Color	Remarks
1001	John Smith	25	M	White	...
1002	Mary Jones	30	F	White	...
1003	James Brown	20	M	White	...
1004	Elizabeth White	28	F	White	...
1005	Robert Green	35	M	White	...
1006	Sarah Black	22	F	White	...
1007	William Grey	40	M	White	...
1008	Ann King	18	F	White	...
1009	Thomas Lee	32	M	White	...
1010	Jane Hall	27	F	White	...
1011	George Young	24	M	White	...
1012	Frances Adams	31	F	White	...
1013	Richard Scott	29	M	White	...
1014	Elizabeth Hill	26	F	White	...
1015	John King	33	M	White	...
1016	Mary Lee	21	F	White	...
1017	James Hall	38	M	White	...
1018	Sarah Young	19	F	White	...
1019	William Adams	42	M	White	...
1020	Ann Scott	23	F	White	...

It will be seen therefrom that the temperature and barometrical pressure had nothing to do with the increase of cases, amounting to 123 on board the "Ryujo," when she arrived at Honolulu (which she had great difficulty in reaching owing to all the stokers being down with the disease, volunteers having to be enlisted for the work). On arrival at Honolulu the use of rice was discontinued altogether; meat and bread was given *ad libitum*, and the epidemic ceased, no new case occurring on the vessel.

The "Tsukuba" sent on the same course, under similar circumstances, in the following year, 1884 (except for the changed dietary), had only 16 cases during the voyage, though the maximum temperature during the voyage of the "Tsukuba" was higher (98°) than was experienced on the "Ryujo" (87°), the barometrical pressure being about the same in both cases. The number of rainy days was greater also in the case of the "Tsukuba" (19 days) as against those for the "Ryujo" (15 days). The following is an account of subsequent voyages made by these vessels:—

"The "Tsukuba," left the bay of Shinagawa for Australia on the 9th of February, 1886, returned on the 13th of November by way of Hawaii, having had no case of *kak'ke*, although her route was the same as that which she and the "Ryujo" had once taken, when they had a great many cases of *kak'ke*. This good result was due to the fact that, in addition to the proper supply of food carried by her, she was able to get good fresh bread and meat at the various ports where she stayed for a period of some length."

"Since the year 1887, *kak'ke* has become almost extinct amongst the men of the Navy. In addition, the general health has gradually improved, year by year, since 1884. The "Ryujo," which sailed on the 1st of February, 1887, and returned on the 11th of September, had no case of *kak'ke* on board, notwithstanding that she followed the same course as on a former occasion, when there was a large number of cases of *kak'ke*. It was the same with the "Tsukuba," which sailed on the 4th of September, 1887, and returned on the 6th of July, 1888, although she followed the same course between Shinagawa and San Francisco, as on a former occasion, when there was much trouble from *kak'ke*, and although she visited Mexico, Central America, the Society Islands, and Honolulu, thus being in the tropics for a considerable length of time. All of the foregoing good results were entirely due to the improvement in the scale of diet which has been taking effect since 1884." *

* *Loc. cit.*

Herewith is a table showing "The daily allowance of food for each healthy person on board the "Tsukuba," when on her first trial voyage." (I regret I have not been able to get the diet scale of the "Ryujo" for comparison.)

DAILY ALLOWANCE OF FOOD FOR ONE HEALTHY
PERSON ON BOARD.

	<i>momme</i> *	
Rice	180.	(Bread 160 <i>momme</i> , biscuit 130 <i>momme</i> .)
Meat.....	80.	(When eggs are substituted, each egg to be reckoned as equivalent to 10 <i>momme</i> .)
Fish	40.	(Where there is no fish, 20 <i>momme</i> of meat may be substituted.)
<i>Miso</i> (see footnote page xii).	14.	
<i>Shoyu</i> (Sauce)	16.	
Vegetables	120.	
Beans	12.	
Wheat flour	20.	
Tea	2.	
Fat or oil.....	4.	
Sugar	20.	
Milk	12.	(If condensed milk, 1½ <i>momme</i> to be given.)
Vinegar.....	2.	
Spices	0.3.	
Alcoholic liquors	24.	{ This is in the case of Japanese liquors, and when other liquors are used, the quantity shall be fixed in proportion to the amount of alcohol contained. }
Salt	2.	
Pickles	20.	
Fruit.....		(To be given with care.)
Total	568.3	

If the amount of fifty-one *momme* of liquid food is subtracted, there remain,

517.3,	when rice is used.
497.3,	when bread is used.
467.3,	when biscuit is used.

It is not necessary to give the exact allowance every day, but if the food of two weeks is averaged, the average daily allowance should be equivalent to the daily prescribed amount.†

*One *momme*—58 grains Troy.

† *Loc. cit.*

(c) *High Altitudes*.—Up to a few years ago, it was thought in Japan that high land was exempt from Bèri-Bèri, hence army sufferers were sent to Hakone, a hill station in Japan, but it is now known that Bèri-Bèri can occur at any altitude.

(d) Dr. Takaki agrees that the disease is not common in children, but he has seen it attack those of either sex as young as five years.

Sex.—Women are certainly less frequently attacked than men, but he thinks that this again is entirely a matter of diet. He thinks that the greater amount of work done by men naturally requires a larger amount of nutritive elements to compensate for the same than women require, who work less, except in the case of field-labour, but here Bèri-Bèri is almost unknown to either sex. If, he says, women worked as hard on the same diet, they would be equally attacked. Instead of the men's diet being proportionally more, it is really less than the women's. For instance, the ordinary shop-assistants, who are the greatest victims, live very poorly, *i.e.* fish once or twice a-week, or even in many cases only three times a month, about 2 ozs. at a time, whereas the womenfolk, treat themselves much better as regards food, having the entrée to the kitchen, which they make good use of.

An average Japanese shopman's diet consists of a thin pea-soup, with rice and pickles and boiled vegetables during the day, and in the evening simply rice and pickles. The maidservants, who prepare the food, help themselves to the best, often before even supplying their masters.

(e) *Physical Exhaustion*.—It was proved by observations on the army, that a body of men on a march lost weight, previous to 1884, (when the new improved scale of diet was introduced), but that after 1884, on the improved dietary, under severe physical exercise the weight increased, and all sicknesses lessened, Bèri-Bèri disappearing at the same time.

I think I cannot do better than give here a *verbatim* report published by the Central Sanitary Bureau Navy Department in 1890, on the "Preventive Measures taken against *Kak'ke* in the Imperial Navy," also a table from the same pamphlet showing the general health of the Navy and the comparative number of *Kak'ke* cases from 1878 to 1889, together with the regulations in regard to food supply, introduced into the Navy on February 1st, 1884, from which date Bèri-Bèri may be said to have been stamped out of the Navy.

REVIEW OF THE PREVENTIVE MEASURES TAKEN AGAINST KAK'KE
IN THE IMPERIAL NAVY.

“That the health of our Navy has improved year after year, during the past few years, is an undeniable fact, which is made plain in the annual reports of the Navy Department. The most striking result is the extinction of *Kak'ke*, which has been considered to have had a great influence upon the progress of the Navy. It is true that, with the progress of society, persons in the Navy came to take care of their health, even where they have not been in connection with medical or sanitary matters, so that their health generally has been much improved. It is also true that such improvement of individual health has its effect upon the general improvement, but the extinction of *Kak'ke* must be attributed to the improvement in the scale of diet which was carried out in 1884.

“There is a wonderful difference in the amount of the cases of *Kak'ke* in our Navy before and after the improvement in the scale of diet. Table No. I shows the general condition of the health of the Navy during the space of twelve years, from 1878 to 1889, which is divided into two periods, before and after 1884, this being the year when the improvement in the scale of diet took place. It will be seen from the Table that the number of cases of *Kak'ke* in the first period of six years was 9,516 for the average sum* of the force of 29,321. In the second period of six years, the number of cases was only 765 for the average sum of the force of 48,275; that is, the number of *Kak'ke* cases was about $\frac{1}{3}$ in the first period, whereas in the second period it had decreased to about $\frac{1}{63}$ of the total number of the force. Moreover, these 765 cases were not evenly distributed over the period of six years, but 718 cases appeared in 1884, when the improvement in the scale of diet had just commenced, and therefore the effect was not yet satisfactory; forty one cases appeared in 1885, when the effects of the improvement began to be manifest; and three cases appeared in 1886, when the effects were very apparent. In the period of four years from 1887 to 1890, there were only three cases, of which two cases occurred after the men had run away from the Navy, when they could hardly obtain even the commonest food, so that the number of cases actually occurring in the Navy was only one.

“Before the improvement in the scale of diet took place, there were

* The average sum of the force is the sum of the mean force of every year added together, and the number taken in estimating the force is, in all cases, the number of petty officers and men below them.

many cases of *Kak'ke* in every ship which made a long voyage, while there were no cases after the improvement, except in the *Tsukuba*, which sailed just after the improvement had commenced. It is clear, then, that *Kak'ke* in the Navy has been extirpated by the improvement in the scale of diet. * * * * *

"Previous to 1881, the number of the cases of *Kak'ke* in the Navy was about three-fourths of the whole number of cases. In 1882, when there was trouble with Corea, a great many of the crew of the "Fuso," "Kongo," "Hiei," and "Nisshin," which were then amongst our strongest men-of-war, were suffering from or died from *Kak'ke*, so that they would have been of no use if war had actually broken out. Furthermore, the health of the Navy up to 1883 was generally bad, so that one person suffered, on an average, three or four times, or even oftener, in a year, and it was anxiously questioned whether the Navy would be of any use in the time of war. But there was a sudden improvement of health after the improvement in the scale of diet in 1884, so that one person suffered on an average, only 0.34 times in a year, while *Kak'ke* became entirely extinct after two or three years. The Navy is now composed of strong men, worthy to protect our Empire, a favourable result which has been obtained entirely by the improvement in the scale of diet.

"From the end of 1880, when Director-General Kanehiro Takaki, then Deputy Inspector-General, was the Director of the Tokyō Naval Hospital, he determined to inquire into the cause of *Kak'ke*. He noticed the great difference between the number of *Kak'ke* cases on board ships and in barracks, and also the same difference in the ships which went on long voyages, and began to think that such difference must be due to the difference between the articles of food given on board ships and in barracks, as other things were the same. Obtaining permission from the Minister of the Navy Department, he made an examination of food, by visiting ships and barracks within the limits of the district of Uraga. He obtained a report showing the articles and quantities of food given in each ship or barrack during a week, and found on examination, that the amount of carbohydrates was too great for the due preservation of health.

"He then concluded that the occurrence of a large number of cases of *Kak'ke*, whether in men on long voyages or amongst ordinary students and shop-assistants on shore, must be due to the food used, this being the cause of the great number of *Kak'ke* cases occurring in the ships and barracks within the limits of the Uraga District, and he inferred that the cause of *Kak'ke* must be in the improper

proportions of carbon and nitrogen contained in the food. On the 17th of February, 1882, when he was appointed Vice-Director of the Medical Bureau, in consultation with Director-General Bunkai Totsuka, the Director of the Medical Bureau, he issued a form of table for registering the details of *Kak'ke*, and presented a memorial in regard to preventive measures against *Kak'ke*; he also commenced the selection and examination of food. On the 29th of November, 1882, he made a personal statement to His Majesty the Emperor, for the first time, in regard to the cause of and preventive measures against *Kak'ke*. Subsequently, as a greater number of *Kak'ke* cases had occurred in the "Ryujo," which had made a voyage to South America in 1883, a committee for examination was specially appointed, in accordance with his request, and the inquiries of the members were represented by 10,465 questions and answers. The "Tsukuba," with the improved scale of diet, was ordered to take the same course as the "Ryujo," when the examining committee, which was specially appointed on board that ship, found that the improved diet had a good effect in preventing the occurrence of *Kak'ke*. Deputy Inspectors-General Kagami, Kawamura, Toyozumi, Mæda, Yano, Shimada, and Shiba-oka were from time to time called together to fix the plan of procedure for carrying out the improvement in the scale of diet, and each Deputy Inspector-General was instructed to use his best efforts to improve the food, and to give orders to the surgeons under him to carry out the improvements with all their energy. In doing this, many difficulties were met with, but by the united efforts of all persons concerned in the matter, the food was more and more improved, and the object aimed at was attained gradually.

"On the 19th of March, 1885, Deputy Inspector-General Kanehiro Takaki, the Director of the Medical Bureau, again obtained an interview with His Majesty the Emperor, when he reported that the improvement in the scale of diet had a good effect in extirpating the source of *Kak'ke*, so that it might sooner or later become extinct in the Navy. Since then, *Kak'ke* has been actually extirpated, as stated above, and the general health of the Navy has been improved at the same time.

"There were a great many difficulties in carrying out the improvement in the scale of diet, as it was a sudden breaking up of the old system. Notwithstanding this, Count Sumiyoshi Kawamura, the Minister of the Navy Department, instructed the officers to engage in this difficult work, and, the officers diligently following the

instructions, the favourable result spoken of was finally obtained, in spite of many hindrances. Whereupon, on the 16th of October, 1890, Director General Kanehiro Takaki, the Director of the Central Sanitary Bureau of the Navy Department, presented to His Majesty a table which gives the general health of the Navy, and showed that by the improvement in the scale of diet, *Kak'ke* had been extirpated, in addition to there being an improvement in the general health of the Navy."

TABLE No. 1.

Comparative number of the cases of <i>kak'ke</i> during several years.	YEAR.	FORCE.	CASES OF <i>kak'ke</i> .	RATIO OF CASES OF <i>kak'ke</i> PER 1,000 OF FORCE.	DIED.	RATIO OF DEATHS PER 1,000 OF FORCE.	INVALIDED.	RATIO OF INVA- LIDED PER 1,000 OF FORCE.
	1878	4,528	1,485	327.96	32	7.07	19	4.20
1879	5,081	1,978	389.29	57	11.22	8	1.57	
1880	4,956	1,725	348.06	27	5.45	9	1.82	
1881	4,641	1,163	250.59	30	6.46	16	3.45	
1882	4,769	1,929	404.49	51	10.69	17	3.56	
1883	5,346	1,236	231.20	49	9.17	4	0.75	
1884	5,638	718	127.35	8	1.42	1	0.18	
1885	6,918	41	5.93	...	...	1	0.14
1886	8,475	3	0.35	...	...	...	...
1887	9,106	...	...	...	...	...	...
1888	9,184	...	...	...	...	...	...
1889	8,954	3	0.34	1	0.11	...	...

REGULATIONS IN REGARD TO THE SUPPLY OF FOOD TO THE
PETTY OFFICERS AND MEN IN SHIPS AND BARRACKS.

Art. I. The food of petty officers and men in ships and barracks shall be under the control of the principal officer under whom they are serving, and the articles of food shall be bought with the money allotted for the purpose, and supplied to them.

Art. II. The articles of food shall be as follows: rice, bread, beef (fresh or preserved), salted beef, salted pork, fowls or eggs, fish, *miso*, * *shoyu* (sauce), vegetables (potatoes, carrots, radishes, cabbages, and onions), beans, wheat flour, tea, fats and oils (suet or lard, butter, olive oil, oil of the sesamum orientalis), sugar (and starch), milk, vinegar, spices, alcoholic liquors, salt, pickles.

If any of the articles above named cannot be obtained, similar articles may be substituted for them.

Art. III. The articles of food shall be bought by the paymaster by order of the officer in command, and they shall be given out after being examined by the surgeon.

Art. IV. A record of the articles of food shall be kept by the paymaster, which shall frequently be examined by the officer in command.

Art. V. If the preserved articles of food are found to be in a bad condition, the matter shall be reported by the paymaster to the officer in command, who, in turn, shall order the surgeon or the officer to examine them and shall report the matter to the Minister of the Navy Department through the chief of each different department.

The improvement in this dietary over that previously in force, consisted in increasing the amount of meat and bread and was followed by the great diminution in the number of cases from 1,236 in 1883 to 718 in 1884, and 41 in 1885, &c. It was found however in 1884 that the men, partly from Bhuddist sentiment and partly from natural aversion to meat in any form, disliked their new diet, so crushed barley was partially substituted for meat in 1885, with rice in equal proportions. To show the great importance that was attached to these measures I give an address delivered by Deputy Inspector-General Takaki, &c., in 1885.

* A kind of sauce made of beans, barley and salt.

ADDRESS DELIVERED BY DEPUTY INSPECTOR-GENERAL TAKAKI,
THE DIRECTOR OF THE MEDICAL BUREAU AT SUIKOSHA, ON
THE 25TH OF FEBRUARY, 1885.

All of the gentlemen here present will remember the Orders G. No. 2,743 (2), issued on the 29th of November, 1883, and C. No. 7, issued in January, 1884, by which regulations regarding food were made for the first time. By last year's experience, we have found that most of the men dislike meat as well as bread, and we do not know what we shall do next. But if we leave the matter to their wish, we shall certainly have a great many cases of *Kak'ke*, as has hitherto been the case, especially as more than 1,000 new men have been enlisted this year. Now there is nothing better than barley food for preventing *Kak'ke*. As, however, barley is coarse in appearance, we are afraid that some of the men who do not understand the object of the improvement in the scale of diet will feel dissatisfied. We consequently wish to speak about the preventive measures to be adopted against *Kak'ke* and to take this opportunity of reporting the result of the examination into *Kak'ke* on board the "Ryujō.

That *Kak'ke* can be prevented by an improvement in the scale of diet has been deduced from scientific reasoning, and has been proved by experience in our Navy, and for a long time we were planning such preventive measures. Fortunately, G. No. 2,743 (2) was issued on the 29th of November, 1893, directing that nutritious food should be given as far as possible, to which followed the Regulations in regard to the Supply of Food, which were issued with C. No. 7, in January, 1884. According to those regulations, the Medical Bureau drew up tables showing the proper amount of food for healthy men and invalids, and distributed these to vessels, barracks, and hospitals, thus trying to ensure the health of the men. As, however, we had expected, these suggestions often could not be carried out, especially in the case of newly enlisted men, who not only dislike bread, but cannot take a proper amount of meat. If things are left in such a condition, there is no doubt, from recent experience, that we shall again have a great many cases of *Kak'ke* this year, in spite of the favourable result shown in the decrease of cases of *Kak'ke* which was obtained in the year which followed the improvement in the scale of diet. This is why we decided to give the barley food. We believe that the majority of the men in our Navy have been used

to take barley food from their childhood, so that in reality they can eat it, although they show their dissatisfaction at it after becoming accustomed to the rice given to them since they entered the Navy. It is accordingly considered that the best preventive measure, at present against *Kak'ke*, will be to give barley, which it was directed should be given to the Navy in general from the month of March by the Order of the 21st inst. If this Order is carried out strictly, we are sure to find no case of *Kak'ke* in our Navy. We consequently ask, gentlemen, that you will kindly help us in the work of prevention, for the good of our country.

In 1886, *three* cases only occurred in the Navy, which in previous years had amounted to from 30 to 40 per cent. of the whole force.

Below is a table showing the amount of each nutritive element of the average daily amount of food 1884 to 1889.

THE AMOUNT OF EACH NUTRITIVE ELEMENT OF THE
AVERAGE DAILY AMOUNT OF FOOD.

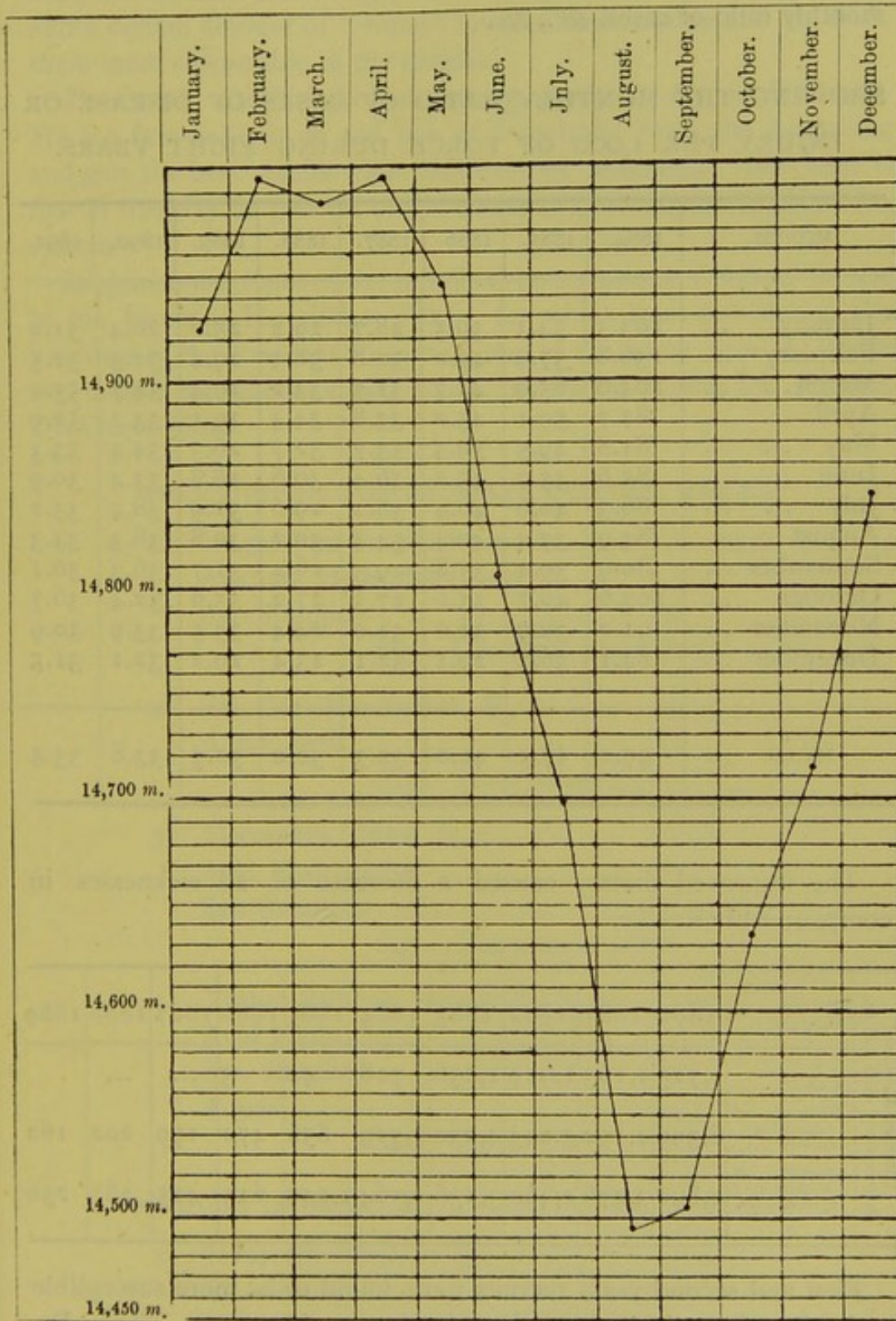
Year.	Albu- minates.	Fats.	Carbo- hydrates.	Total.	Ratio of car- bon to one of nitrogen.
	<i>momme</i> *	<i>momme</i>	<i>momme.</i>	<i>momme.</i>	<i>momme</i>
1884	52.17	11.67	206.16	270.00	16
1885	52.43	12.13	211.95	276.51	17
1886	56.73	12.86	204.66	274.25	15
1887	49.70	12.79	185.19	247.68	16
1888	48.57	11.78	177.38	237.73	15
1889	51.46	11.99	191.48	254.93	16

* One momme = 58 grains troy.

“The body weight in the foregoing Scale is the average of the individual weight of 4,308 men in 1884, of 5,329 men in 1885, of 6,649 men in 1886, of 7,932 men in 1887, of 8,728 men in 1888, taken once in every month, and of 8,586 men in 1889, of 8,433 men in 1890 and of 9,642 men in 1891, taken twice a year in the months of March and September. It was found by the experience of the five years (1884—1888) that the increase or decrease during the period between January and December was almost the same in each year as shown in the following scale. Consequently, it became unnecessary to weigh every month as before, since 1889.”

It was found that a man's weight was greatest in February, March, and April; that it gradually decreased till August and September, when he was 4lbs. lighter. These fluctuations were considered normal, and quite irrespective of any loss of the normal, healthy, standard of the men.

AVERAGE BODY-WEIGHT FROM 1884 TO 1888.



It was noticed before the alteration in the diet scale in 1884, that not only was Kak'ke rampant, but that the percentage of all sicknesses *varied* very much. The following table shows the monthly ratio of cases, &c., &c.

SHOWING THE MONTHLY RATIO OF CASES OF DISEASE OR INJURY PER 1,000 OF FORCE DURING EIGHT YEARS.

MONTH.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
January ...	163.3	54.1	39.5	28.7	29.2	25.6	26.4	31.2
February ...	136.8	57.9	49.0	30.8	38.4	29.4	32.3	32.5
March ...	104.8	65.9	44.7	31.3	33.2	29.4	34.7	35.4
April ...	87.7	59.1	45.2	33.8	34.3	29.1	33.2	32.9
May ...	81.8	49.5	39.3	33.7	32.7	26.3	34.4	33.3
June ...	85.6	45.7	45.2	36.4	30.6	28.8	33.4	30.9
July ...	86.3	40.6	46.4	38.2	29.6	31.9	38.2	35.2
August ...	83.9	37.4	40.4	34.4	30.2	30.8	38.3	34.3
September ...	80.9	39.4	35.8	29.3	26.4	31.7	36.3	36.1
October ...	103.6	40.7	33.0	27.3	27.2	35.6	32.4	36.7
November ...	91.2	39.9	32.0	31.0	24.4	35.5	33.9	30.9
December ...	84.1	36.2	29.1	32.1	23.4	29.2	32.1	31.5
MEAN ...	99.2	47.5	40.0	32.3	30.0	30.3	33.8	33.4

The improved dietary caused a decrease of all sicknesses in company with Kak'ke.

DISEASE	YEAR.										
	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	
Kak'ke	1,725	1,163	1,929	1,236	718	41	3	...	...
Diseases of digestive system	6,399	4,192	3,043	4,230	2,519	856	472	199	202	162	
Diseases of respiratory system	4,890	3,476	2,400	3,136	2,164	1,249	615	415	287	250	

First and second years recruits were found to be more susceptible to kak'ke, than those in their 3rd year or older men. This Dr. Takaki considered was due to their wages being smaller, and their

clothing not so good, and secondly to their inexperience of the ways of barrack life, and consequent inability to procure as much food combined with amusements with their money as the older hands ; in other words, their small wage, their strangeness to town and port life, and a certain amount of "ennui" lowered their vitality and so made them more susceptible to the disease.

Treatment. Dr. Takaki had nothing special to offer on this head. He is a firm believer in the use of Purgatives from the beginning and gets the best results from Sulphate of Magnesia. His idea is that in this way he gets rid of the excess of Carbo-hydrates from the system.

Subjoined are some of the principal prescriptions I found in use in the Imperial Hospital at Tokyo, for which I am indebted to the kindness of the Resident Physician, and at the same time I tender my thanks for much courtesy shown me by Dr. Miura, Dr. Miyake, Dr. Osawa (Jun).

PRESCRIPTIONS FOR ORDINARY CASES OF KAK'KE.

1. Magnesium Sulphuricum 8,0—15,0
 Acidium Hydrochloricum 1,5
 Syr. Simplicis 10,
 Sig. : Use three times daily.

2. Sal. Carolinensis fact. H. 15,0
 Aquæ distil..... 8,0
 Sig. : Three times a-day.

3. Decoctum Chinæ (4,0)..... 100,0
 Acid Hydrochlor. 1,5
 Syr. Simplicis 8,0
 Sig. : Three times a-day.

4. Vinum Rubrum (seu Port Wine) 30,0
 Acid Hydrochlor. 1,5
 Syr. Simplicis..... 8,0
 Aquæ 100,0
 Sig. : Three times a-day.

IN CASES OF PARALYSIS OF THE HEART (SHOSHIN).

1. Infusi fol. Digitalis (0,5—1,0.)... 1,000
 Syr. Simplicis..... 8,0
 Sig. : Use six times a-day.

2. Tinct. Strophanthi..... 30—50 gtt.
 Aquæ distil..... 100,0
 Syr. Simplicis 8,0
 (M.D.S. pro die) Sig. : Use six times a-day.
3. Camphoræ 1,0—2,0
 Sac. lactis q. s.
 Divide in partes equales. No. 6.
 Sig. : Six for a dose daily.
4. Caffeinum Natro-benzoicum..... 2,0
 Aquæ distil..... 10,0
 Sig. : Six times daily, or every hour in
 serious cases.
5. Caffeinum Natro-Salicylicum ... 3,0
 Aquæ distil..... 10,0
7. Use Ice-bags to the heart.
8. Nitro-glycerine.*
 Sig. : A drop placed on the tongue
 occasionally.

*(This was found very efficacious in Singapore, when the dyspnoea was urgent.)

PRESCRIPTION FOR PAINS IN THE GASTROCNEMII AND LEGS.

1. Antipyrin Injections (pro dosi 0,5) Aquæ 10,0
 Antipyrin 5,0
2. Chloroform and Olive Oil, rubbed in.

FOR PARALYSIS.

1. Massage.
2. Constant Current.

FOR PARALYSIS OF THE HEART.

1. Blood-letting.

FOR PARASTHESIA OR BENUMBED LEGS.

1. Induction with Electric Brush.
2. Faradisation.

CHARACTERISTIC ILLUSTRATIONS.



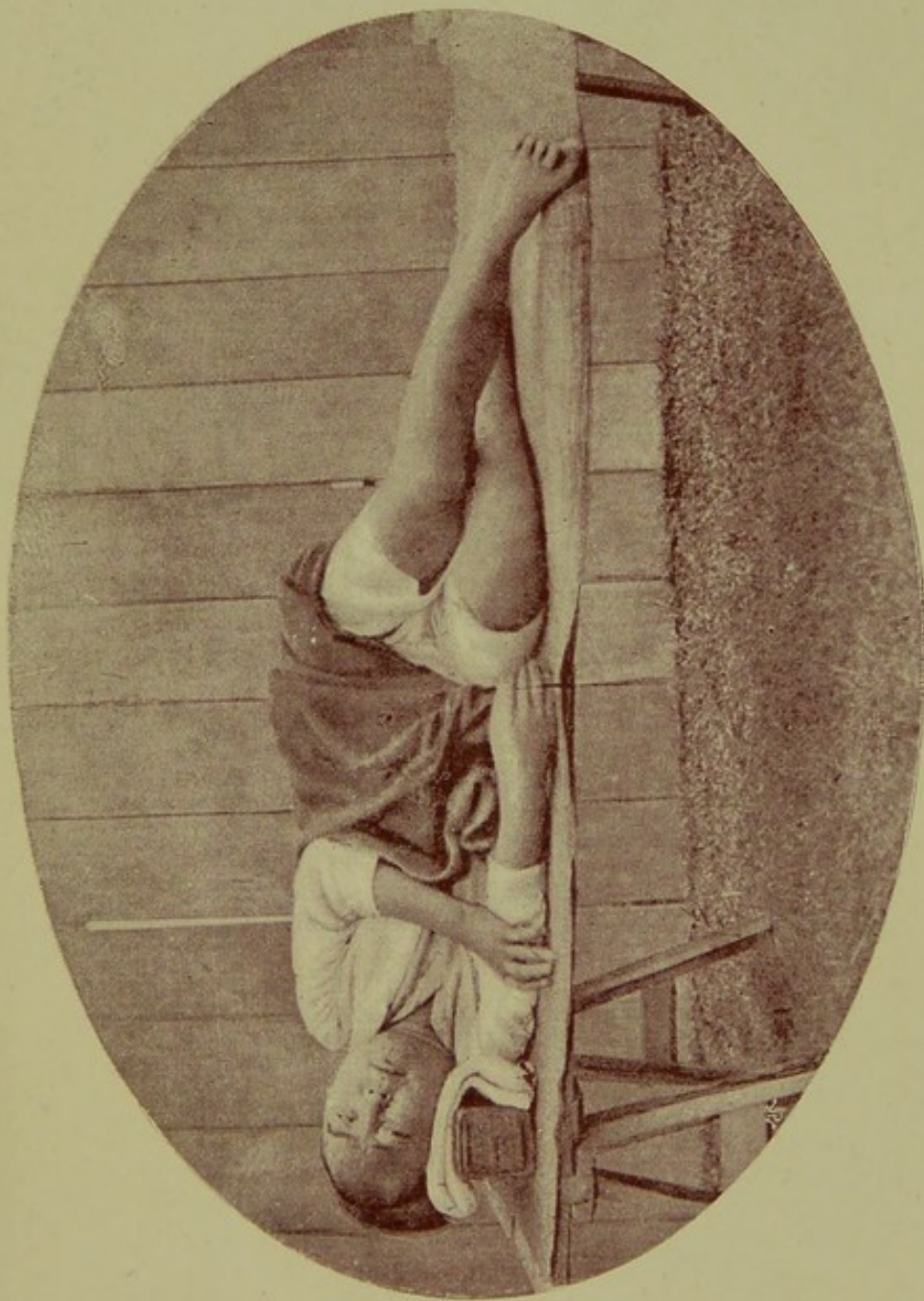
THE accompanying ten plates were obtained by me during my recent visit to my old hospital in Singapore, in April last (1893), where I also again had an opportunity of renewing my acquaintance with this interesting disease, after an absence of six years from the colony. The reproductions are from instantaneous photographs, and give a very fair idea of some of the principal phases of Bèri-Bèri.

Among the chief symptoms, those that specially struck my attention after so long an absence, were : (1) the markedly spasmodic nature of the disease, causing in them such tonic contractions of the body as almost in some cases to throw the patient off his balance, *backwards*; and (2) the marked anæsthesia of the upper lip in all the acute cases that I saw in Japan. These symptoms, though already noticed in this thesis, were so remarkable and pronounced, that I feel I will be excused for again referring to them.

ACTING SECRETARY

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Plate No. 1.



This shows a typical case of the Acute Dropsical or Wet form of Beri-Beri. The generally swollen dropsical condition of the whole body is well shown. (This patient died from the disease one month after his admission to the Hospital.)

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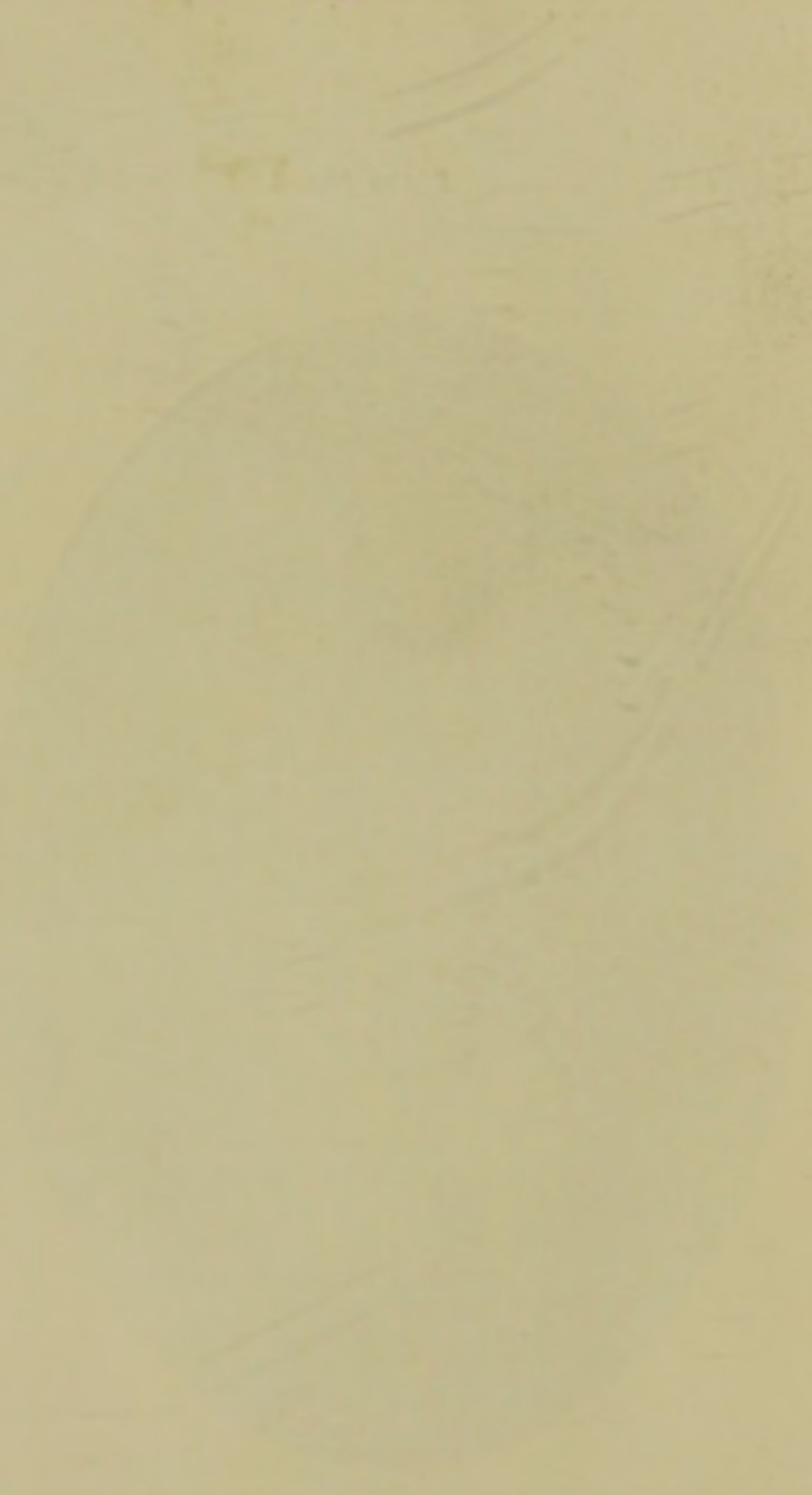


Plate No. II.



A case of the Dry, or Paralytic variety—in the convalescent stage. He can balance himself only with the aid of a stick. The patient had already gone through the Dropsical and the Complete Paralytic stages before arriving at his present convalescent condition. He might well, therefore, at a former period, have passed as the Dropsical or Mixed form. The attitude is characteristic, *i.e.*, body well forward, legs spread far apart, knee-joints locked, and position of the stick, all to form as broad a triangular base of support as possible.

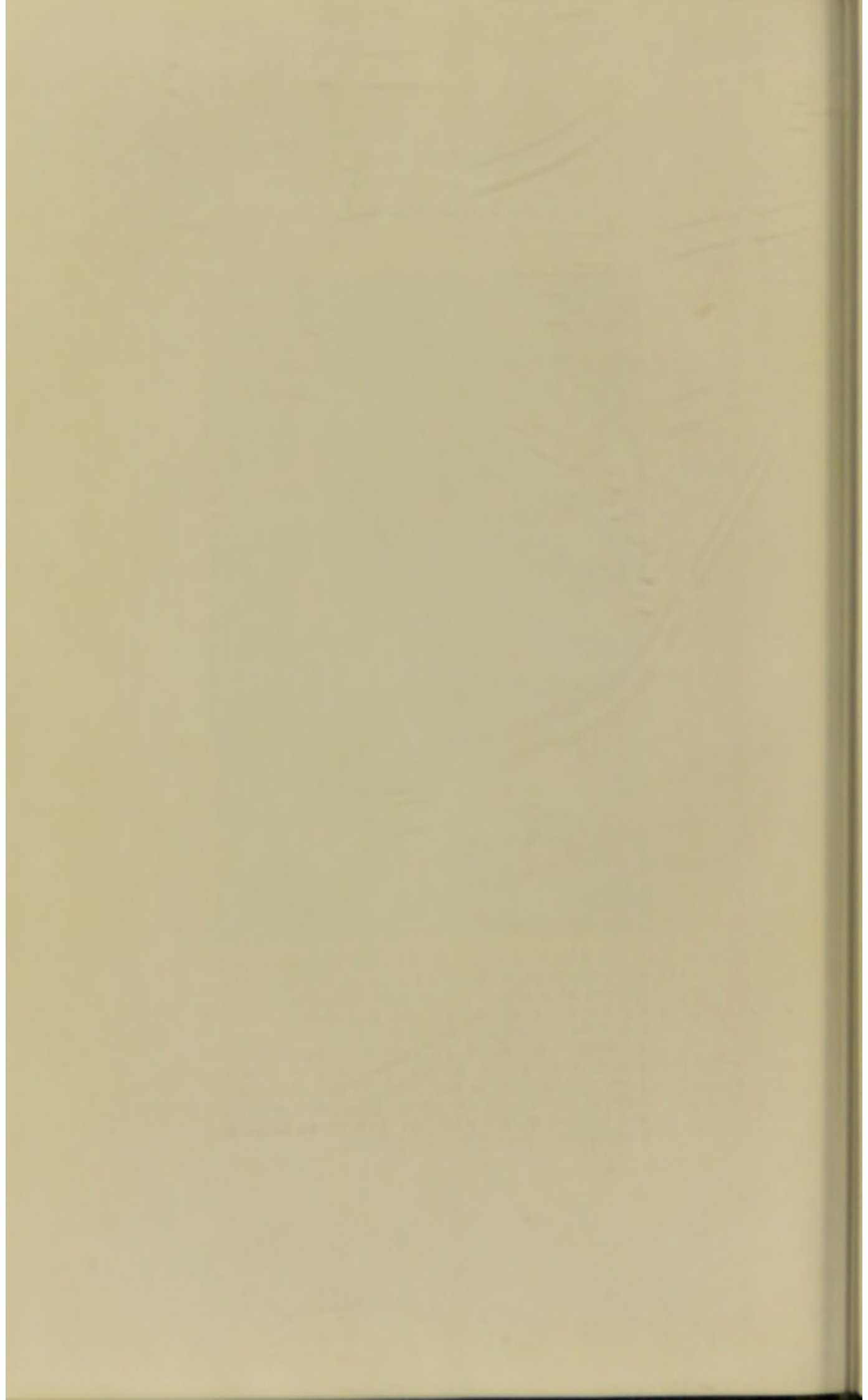
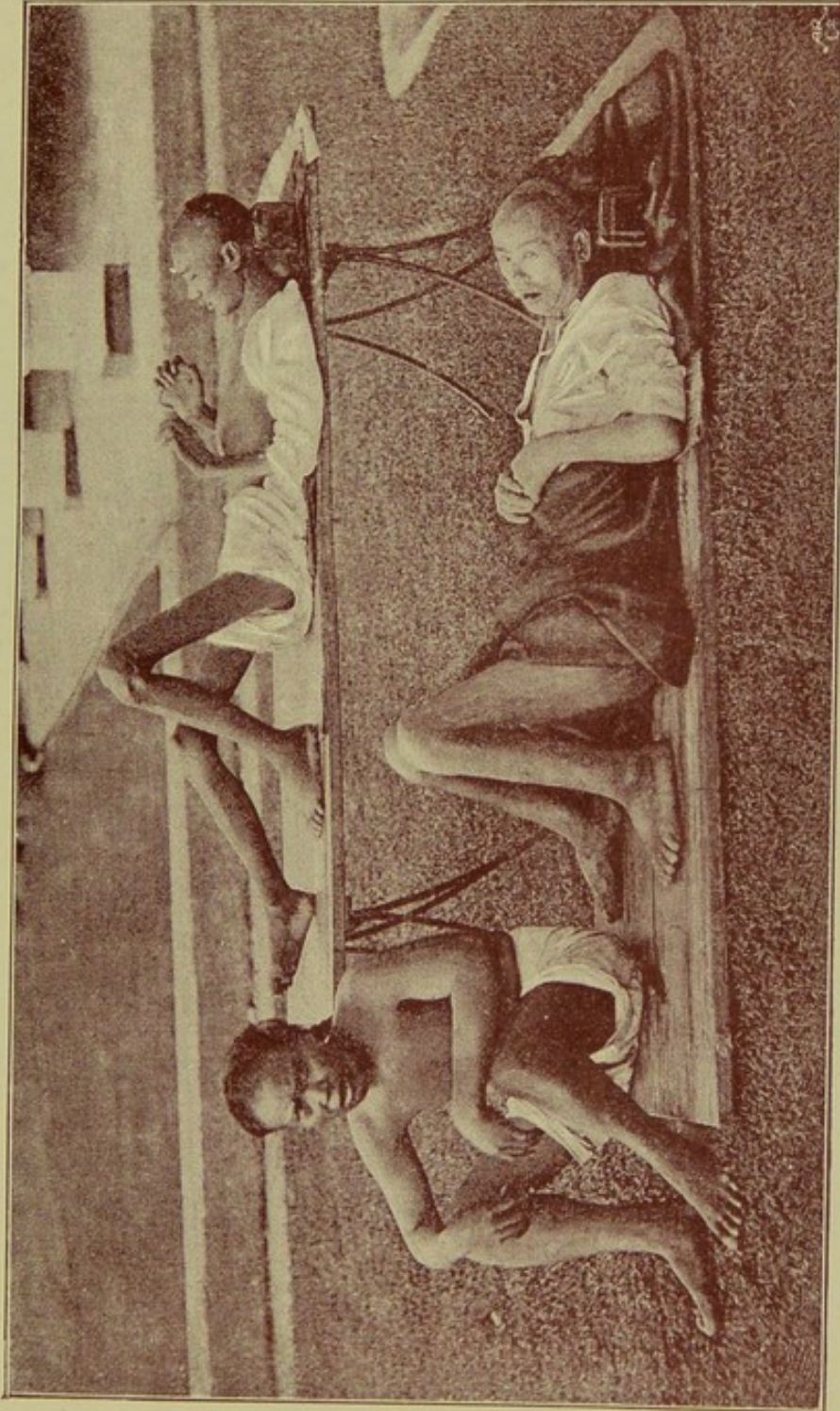


Plate No. III.



This group shows (1) the Dry or Paralytic form on the raised bed — with contractions of the fingers only, occurring, however, when the patient attempted to overcome the wrist-drop, from which he was suffering. (2). The Mixed variety, where there is Atrophy, Paralysis, and some oedema of the arms and legs; and (3), a mild attack in a strong, muscular man, showing no wasting or oedema. (Convalescent.)

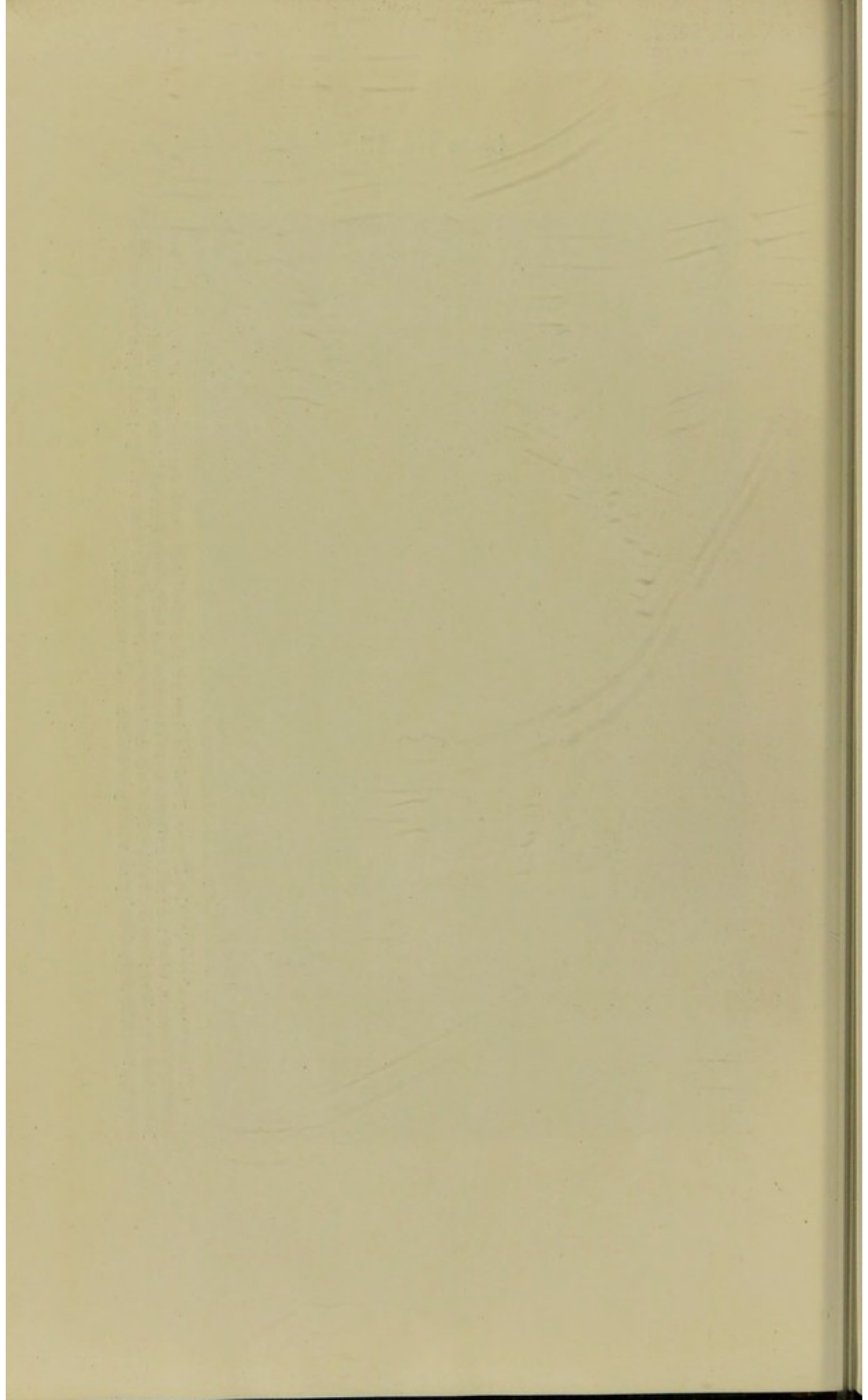
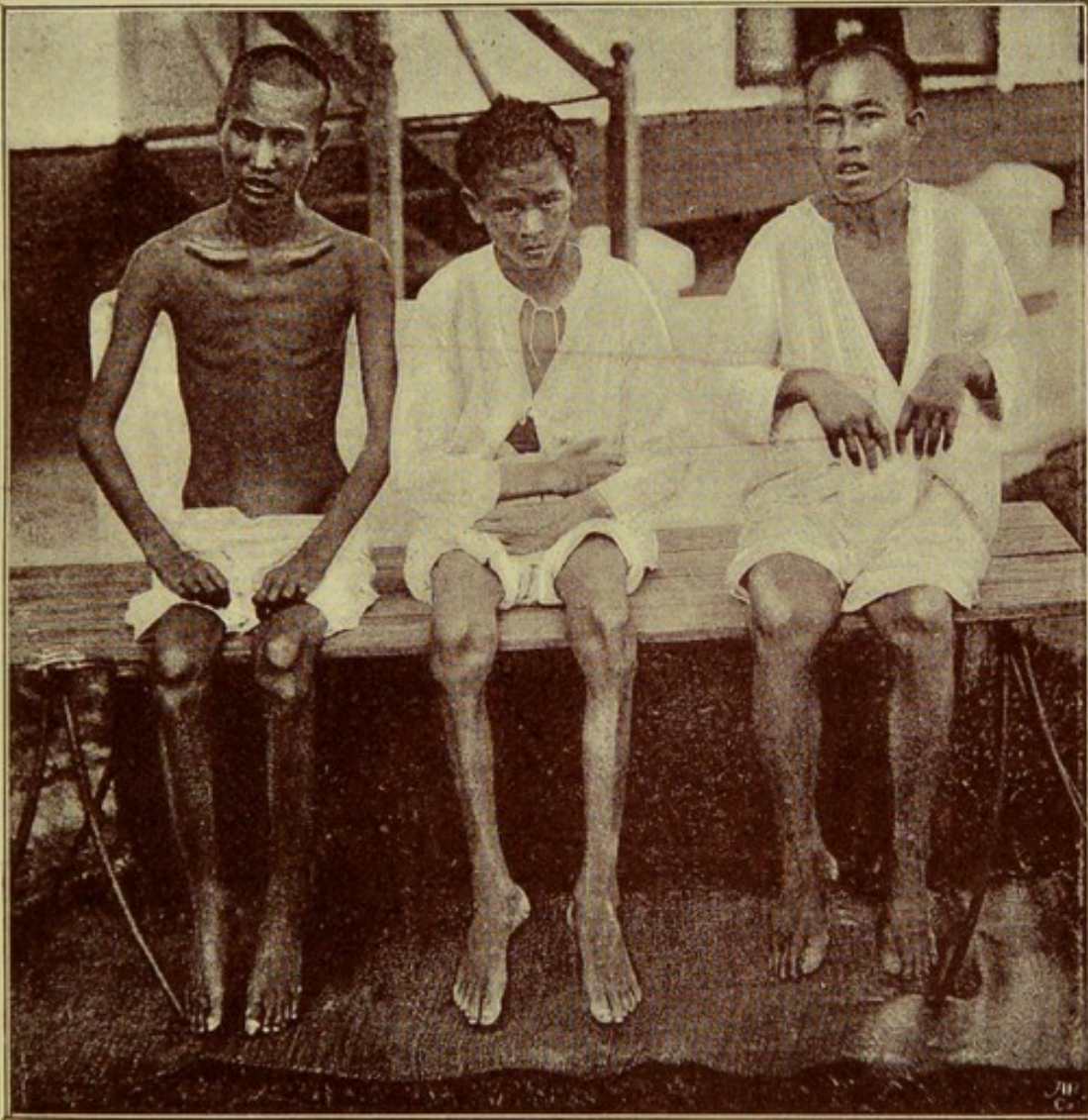


Plate No. IV.



A group of three cases—all suffering from the Paralytic variety—showing ankle-drop in all, and marked wrist-drop in one.

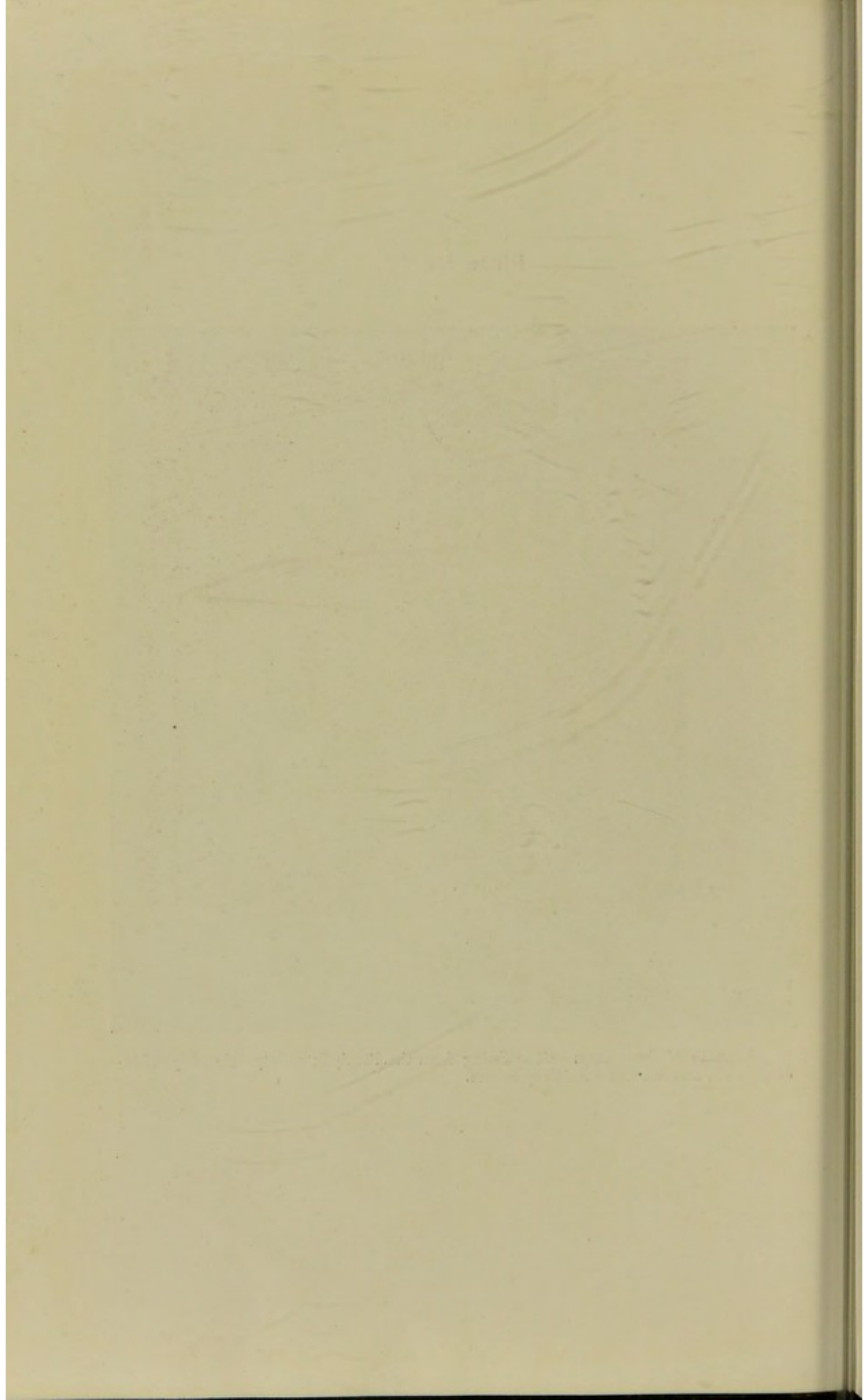
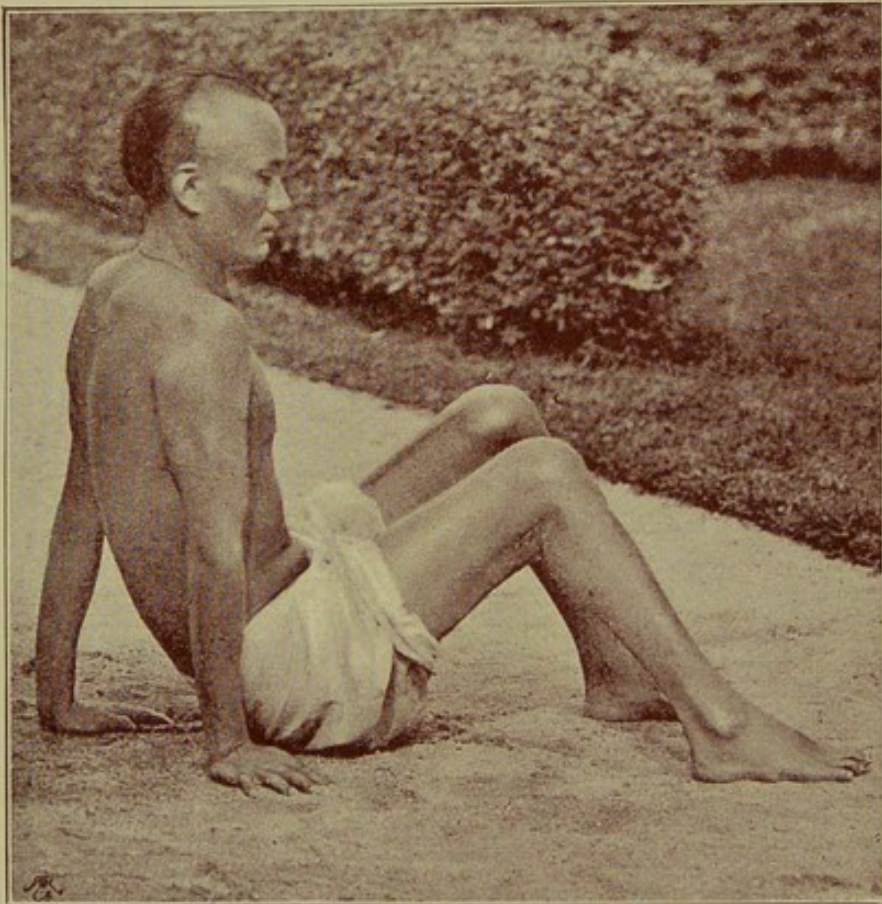


Plate No. V.



This plate shows the usual mode of Progression resorted to by those suffering from the paralytic form, when quite unassisted or unsupported by crutches—on hands and buttocks. The inco-ordination of the leg-movements during progression is in severe cases very marked.

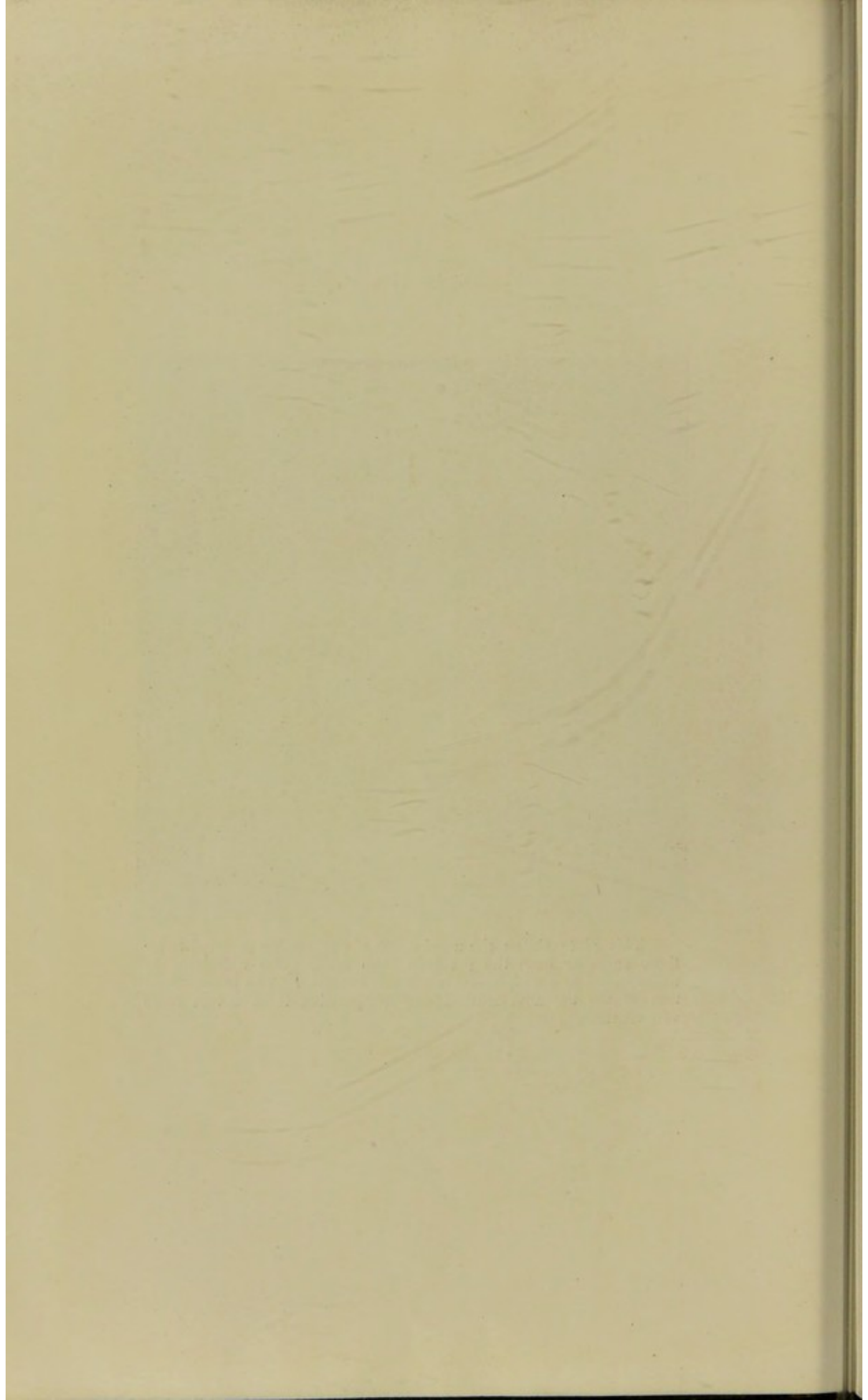
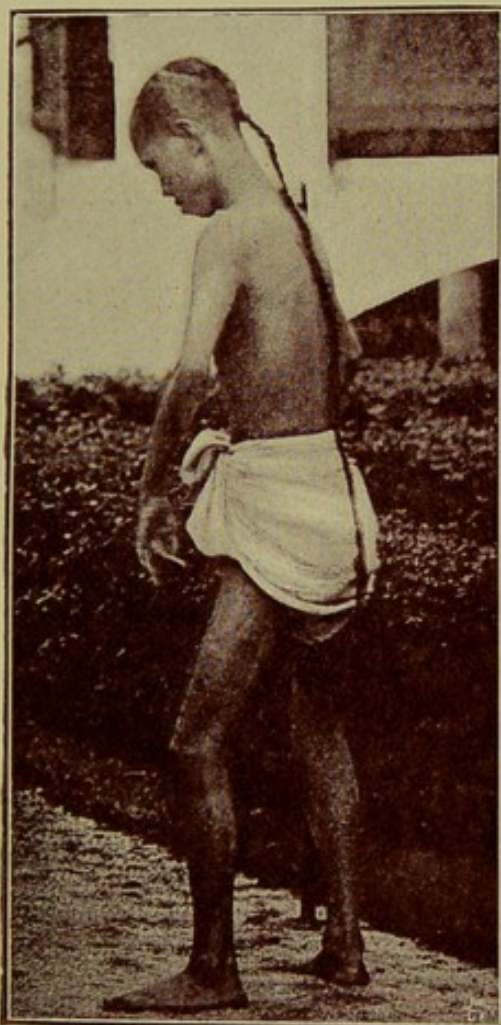
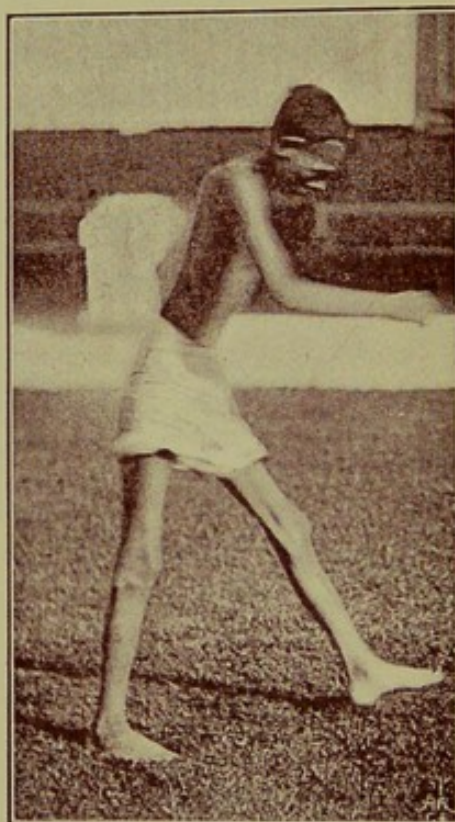


Plate No. VI.



This plate shows spasmodic contraction of the fingers—from the effort of balancing himself—in a paralytic case. The patient can manage to walk only with the help of a stick.

Plate No. VII.

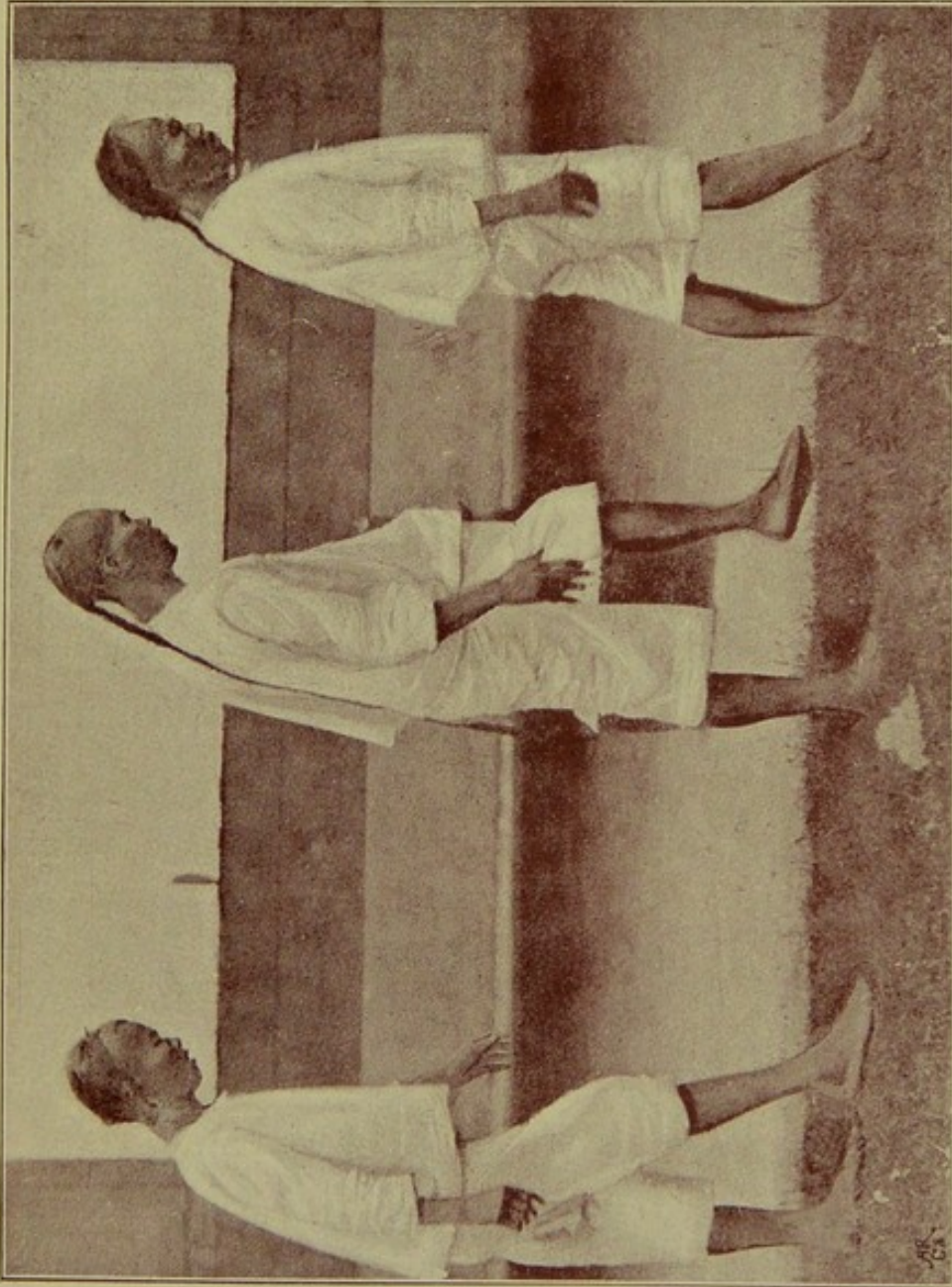


This shows inco-ordination of the legs with the balancing of the body by outstretched arms, and forward position of the body, the eyes at same time fixed on the ground. The general attitude is characteristic.

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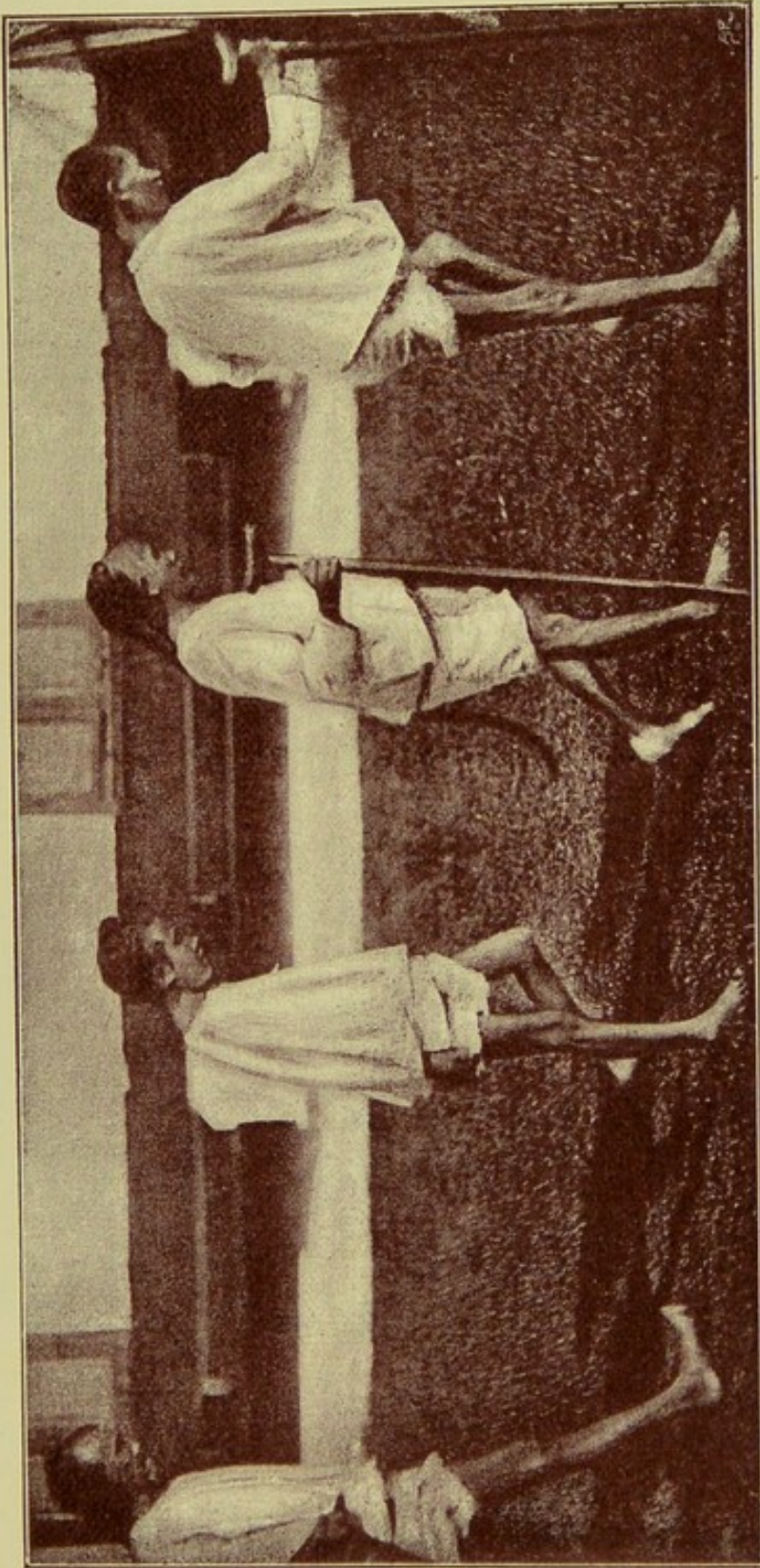
Plate No. VIII.



A group of three in the act of walking. The locked joints and rigidity of frame are seen in the first, the high action of the leg is seen in the second, and the balancing efforts seen in all three. The fixed gaze and forward inclination of the body are noticeable.

THE END

Plate No. IX.



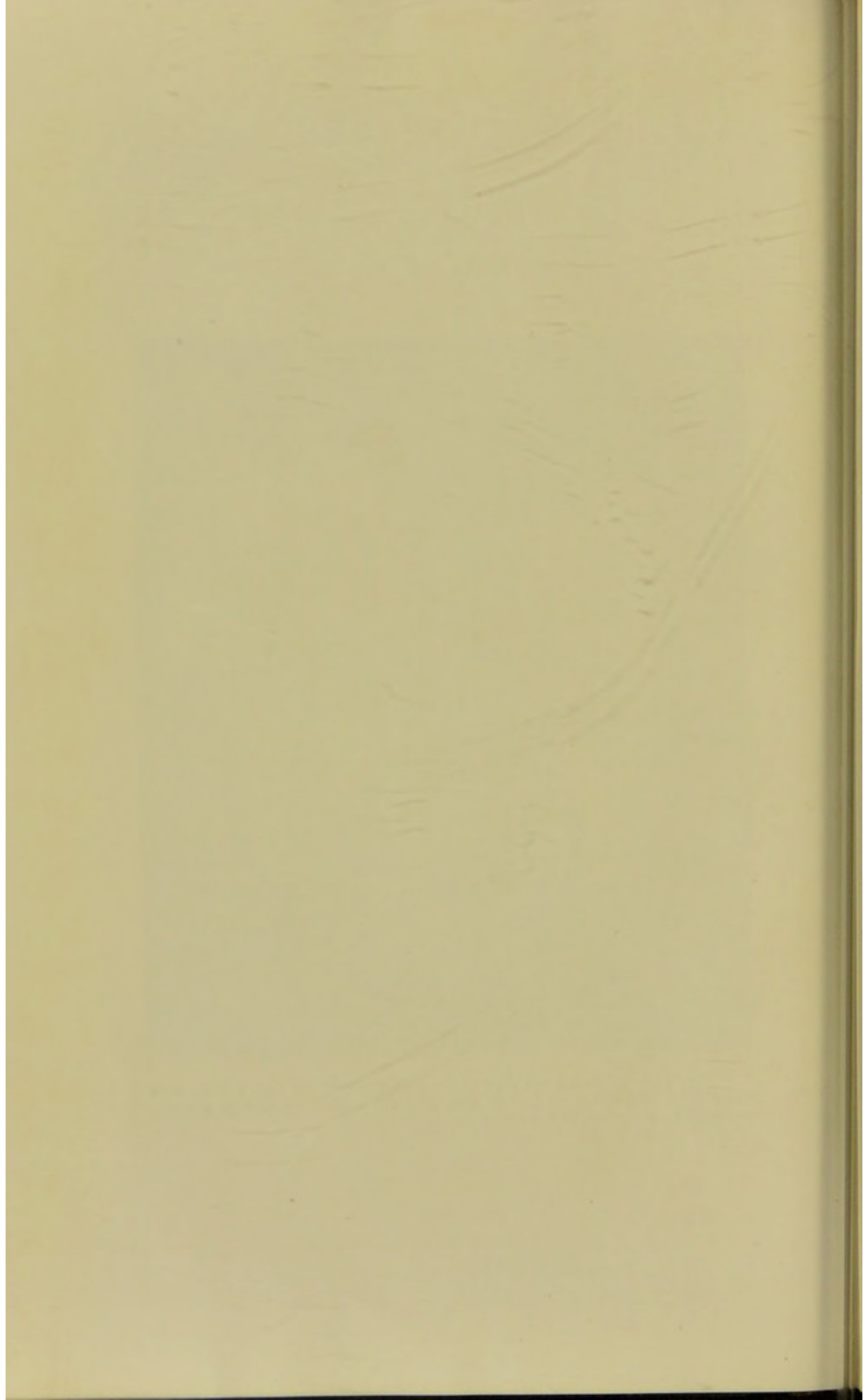
Group of four. Paralytic variety. This shows the inco-ordination of the legs and the characteristic gait.

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Plate No. X.



This plate gives a front view of the gait, showing the high action, with ankle-drop and inverted foot in one, and the very characteristic attitude assumed by the other, in the act of standing.



APPENDIX.

1838
1839

APPENDIX

Detailed Clinical Account of Typical Cases.

CASE NO. I.

LOW LYE WOH (MALE), age 35, *Gambier Coolie*. Taken ill at *Johore*; Duration of Disease, 45 days. Admitted 1st December, 1884.

History of Present Illness.—The disease came on gradually. He was last at work three months ago, he stopped work because he felt unwell, and experienced a feeling of lassitude. On the evening of the same day he had rigors, headache, and fever. These symptoms continued for a month, the fever coming on at times with intermissions of a day, or every other day. A month after the onset of the fever he felt twitchings in the tendons of the feet and legs; the fever now left him. Ten days after he experienced a feeling of numbness in his hands and feet, and inability to walk steadily, and subsequently after a lapse of about twenty days his feet began to swell and with that the numbness of the extremities, and the inability to walk steadily increased.

The patient attributes his disease to exposure and cold. He states that he had been to Singapore, and whilst returning to Johore he was exposed to rain for the whole of a night. Two days after this occurred he felt unwell, and had to give up work. There is no history of infection, but he states that three deaths have occurred in his village from a similar disease.

Previous History.—He has suffered from frequent attacks of intermittent fever during the five years he has been in Johore. He has not suffered from any other illness to his knowledge.

State on Admission.—He is a tall well-made man, muscular, well nourished, not anæmic. *Skin* normal, soft and cool, except on the front of the chest, and the upper part of the back, where he is suffering from an eruption (*Tinea imbricata*). *Face* slightly puffy

and has a tired, weary, dull expression. Complexion normal, not sallow. *Eyes* normal, right conjunctivæ a little more injected than the left. Slight puffiness on lower lids. *Pupils* slightly dilated, action normal. *Alae Nasi* normal. *Mouth* straight, lips normal, gums spongy, receding from the teeth; they bleed slightly on pressure and have bluish ulcerated edges, teeth irregular, no sordes, tongue protruded, and withdrawn normally, the dorsum tremulous and covered all over with a thin white milky coating, edges and tip reddish, papillæ not prominent, fauces slightly swollen as if œdematous, and inflamed with a uniform blush, breath foul.

Pulse full 76, easily compressible and irregular. In the neck pulsation is visible above the clavicles, no fulness of the veins in the neck.

Thorax.—Skin covered with eruption of tinea, its form natural, intercostal spaces normal, respiratory movements 22, not painful. Nothing abnormal felt on palpation.

Cardiac Impulse normal, first sound appears accentuated and shallow. Heart's apex difficult to detect, it is one inch inside the nipple, between seventh and eight ribs. There is considerable tenderness on pressure over the intercostal spaces, and over the pectoralis major on grasping its anterior fold.

Percussion.—Resonance slightly impaired over both sides.

Auscultation.—Inspiration shallow (a little harsh), the chest is not freely moveable, the sterno mastoids being brought into play; respiration is abdominal, the expiration is short.

Vocal Resonance normal.

Heart.—First sound is short and indistinct, second sound is dull. Rhythm normal, but the whole action appears laboured.

Abdomen.—No ascites, but œdematous.

Palpation.—Tender on pressure all over the abdomen, but especially over the epigastrium, not deep but situated in the muscles of the abdomen.

Percussion.—Liver slightly enlarged, measures six inches in the nipple line. Percussion causes pain over the stomach, which is tympanitic.

Lower Extremities.—Glands slightly enlarged in the left groin, legs are very œdematous, extending from the thighs down to the feet, especially well marked over the tibiæ and over the dorsum of the feet. He has no nausea or vomiting after eating. He feels a tired feeling in the epigastrium which lasts until his stomach gets empty (about 2½ hours). Bowels move twice daily. Defecation causes

pain in the epigastrium due to straining. He experiences more difficulty in defecating than natural owing to loss of expulsive power. He thinks this condition has been for about six weeks.

Micturition normal.

Sleep.—He cannot sleep at night on account of the pain throughout his body and legs. He gets spasms in his legs, they feel heavy. His hands and arms feel painful and numb, and if he moves his body or hands he feels pains in his epigastrium.

Nervous Symptoms.—There is a marked state of paralysis of his lower limbs. He walks with difficulty, with feet apart. He throws his feet up with a jerk and lets his foot fall flat on the ground. He has also paralysis of the hands and arms. He holds his cup with both hands and is unable to use his chopsticks in eating. The flexor muscles of the fore-arm and hands are involved. He can only with difficulty partially open his hands. The thumb and index finger are not implicated. The other three fingers he can flex, but can extend them only partially. He cannot flex the hand on the wrist freely owing to a contracted and stiff condition of the flexors.

Legs.—He can slightly flex the foot at the ankle, but cannot do so well on account of the spasm of the flexors which he feels to be about the knee-joint. He cannot move his toes. In walking, he feels a spasm extending from his toes up to the top of his thigh, to the groin.

Hyperæsthesia.—The whole body is hyperæsthetic especially the calves of the legs, and the upper side of the thighs. The hyperæsthesia is more severe in the tendo Achillis, and vastus externus. It is more below the knee than above. The arms are painful, more so below the elbow. It is very severe on pressure over the lower half of the forearm, between the radius and the ulna in the tendinous expansion of the extensor communis digitorum. The tendons of the sterno-mastoid and other muscles not painful. There is a slight weak feeling in the muscles of the back. On walking he feels pain in the tendons of the knee joint. After a little time the pain ceases and a dull numb heavy feeling comes over his legs.

Anæsthesia.—There is alteration of sensation in the skin of the leg. If the skin is gently rubbed he complains of pain, and a tingling sensation is communicated to the muscles below. On rubbing the skin of the back of the fore-arm he feels heat. On the front of the fore-arm it is the same with the addition of some pain in the muscles. He can raise himself from a sitting position by the help of both hands, on the arms of a chair, and when standing he keeps his knee-joint firmly locked, otherwise he would fall.

CASE NO. 2.

WEE GEE LONG (MALE), age 20, Carpenter. Taken ill at Singapore. Admitted 3rd December, 1884.

History of Present Illness.—He states that the disease came on gradually three months ago with an attack of fever which lasted four days, leaving him too weak to walk. His legs got weak first with twitchings of the tendons of the feet and legs, and a feeling of numbness in his hands and feet which prevented him from walking. He had pains in the calves of his legs and the dorsum of his feet and a feeling of pins and needles in the palms of his hands. He states that the present attack is a relapse of the disease he had in Malacca, seven months ago, where it was epidemic at that time. He does not recollect having suffered from any disease subsequent to the attack in Malacca.

State on Admission.—He is a spare built man, flabby, not muscular, not anæmic, conjunctivæ normal, skin warm and dry, can sleep in any position, natural expression, pupils slightly dilated, gums healthy, teeth regular and clean, tongue flabby, tremulous on the surface, covered with a thin whitish film, fauces and uvula a little congested, breath natural, respiration 19, temperature 98·2, pulse 80, of good volume but compressible. No fulness of the veins in the neck, carotid pulsations feeble, no enlargement of the thyroid.

Thorax.—Inspection, palpation, percussion and auscultation normal.

There is slight œdema on the dorsum of both feet, nowhere else. He complains of slight pain on pinching his toes, more in the tendons than on the sides of the toes. The pain is much more severe over the dorsum, and in the interosseous spaces. He cannot bear any pressure there. The tendo Achillis is very painful when grasped, but the most pain is in the muscles of the calf of the leg. There is no pain over the anterior tibial muscles. There is slight pain on pressure in the muscles of the thigh, anteriorly and posteriorly, a little more so over the tendons of the flexors. He complains of a feeling of pins and needles round his ankle-joint extending to the toes; and round the wrist-joint extending to the tip of the fingers. There is pain, on pressure, in the interosseous spaces and also between the radius and ulna. This increases until reaching the fleshy parts between these bones, where on pressure the pain is unbearable. No pain complained of anywhere else.

No *cough*, no *thirst*, *appetite* bad. No nausea or vomiting, no discomfort after food.

Bowels constipated. Complains of difficulty in defecating owing to loss of expulsive power.

Sleep.—Cannot sleep well from a feeling of stiffness and pain all over his body. Turning in bed gives him pain.

Paralysis.—He can only with great difficulty raise himself from a chair without use of his hands owing, as he says, to a feeling of weakness in the muscles of the back, and tendons of the knee joint. He cannot, he says, lift his body up sufficiently to get the joints locked. He walks without much difficulty, with a jerky movement, lifting the foot high off the ground, due, he says, to a spasmodic contraction of the tendons of the *gastrocnemii*. On close questioning, he attributes this spasm on walking, to the lower angle of the popliteal spaces. On walking he spreads out his toes and the tendons of the extensors of all the toes are plainly visible, owing to their spasmodic contraction. If he flexes his foot, he says that he has pain over the dorsum of the feet, between the interosseous spaces chiefly.

Hands and Arms.—He cannot quite close his hands owing to a contracted state of the tendons of the extensors, this feeling is chiefly felt to be in the tendons along the backs of the hands. The thumb and index finger, he can move in all directions, but with difficulty owing to the contracted state of the extensors, *pollices* and *indicis*. The extensors of the three other fingers are also seen to be spasmodically contracted when in action. The flexion at the wrist-joint is difficult owing to a contracted feeling over the back of the joint. On raising his arm straight above his head he feels a contraction commencing at the side of the little finger, and running up the inner side of the fore-arm and arm along the outer edge of the *latissimus dorsi*, down the ribs into the groin and along the outer border of *Scarpus*, triangle to the inside of the knee, where it diffuses itself over the calf of the leg; along this course, and in the arm and leg there is pain on pressure, but on no other part of trunks. He can hold his chop-sticks, but cannot use them owing to a contracted condition of the middle finger.

When sitting down with his knees drawn up, the bellies of the *gastrocnemii* appear to hang down loosely as if powerless.

Anæsthesia.—He complains of numbness over the palms and dorsum of the hands commencing in a circle drawn round the wrist-joint. It does not extend at all further up the arm.

The feet are similarly affected on the soles and dorsum, but it ex-

tends here to a slight degree up the leg to a circle drawn round the ankle-joint, above which it does not extend.

There is not any other feeling of numbness now over the body, but he states, that in the previous attack in Malacca, he had numbness over the hypogastrium, and a full uncomfortable feeling over the epigastrium which lasted for about a month.

CASE NO. 3.

TAN AH CHOON (MALE), age 28, *Road Coolie*. Taken ill at *Johore*. Admitted 16th October, 1884, for *Primary Syphilis*, and on 25th November, 1884, for *Bèri-Bèri*.

History of Present Illness.—The disease came on gradually. He first felt his legs getting weak and then numb. These sensations gradually increased with twitchings in the tendons of his legs, two days after which he felt the same sensations in his hands. Ten days after the disease showed itself his feet began to swell, he was then unable to walk, and the calves of his leg became very painful. The œdema gradually extended up his legs, and appeared also in his hands and face. He got a primary sore on his penis a month before these symptoms showed themselves. He is unable to attribute this disease to any cause, none of his comrades suffered from it.

Previous History.—He has enjoyed very good health and was always a strong hard-working man, and suffered from no disease before he got syphilis, except the ordinary diseases of childhood.

State on Admission.—He is a short thick-set man, well built, not anæmic. Skin warm, dry, and rough. Decubitus in any position.

Head and Face.—Expression natural. Face puffy, especially the underlids. Complexion sallow, pupils normal. Gums firm but edges retracted, purplish, and slightly ulcerated. Teeth regular. Tongue movements normal, it has a whitish fur on the dorsum with edges red, and is indented by the teeth. Fauces congested, especially the uvula. Respiration regular 24. Temperature normal. Pulse 84, full and compressible. Neck œdematous. Resistance and vocal vibrations normal. Cardiac impulse one inch below and slightly to the right of nipple—between 7th and 8th ribs. Inspirations a little jerky and tremulous.

Heart.—Heart's first sound muffled and dicrotous. Second sound dicrotous over pulmonary area, very indistinct, no murmurs.

Abdomen.—Œdematous, bulging at the sides a little, no tenderness on pressure. Liver dulness normal.

Lower Extremities.—There is œdema over the tibiæ and dorsum of the feet. No enlarged glands. Appetite good, no vomiting, slight discomfort after eating.

Bowels.—Constipated, no difficulty in defecating.

Paralytic Symptoms.—If the patient, when lying on his back, is asked to get up, he first flexes the leg opposite to the side on which he wishes to turn. The foot thus drawn up acts as a fixed support by which he raises and turns the pelvis on to the side with a little jerk, then he flexes the other leg on its side on the bed, he makes another fixed point with the elbow of the side he is turning on, he brings the arm which is free across his body, and with the palm on the bed lifts himself and draws the under elbow under him, and thus with the aid of his two arms raises himself into a sitting posture (the action is very similar to that of a rising quadruped). He cannot raise himself without the help of his hands. He says that his back is not weak, but that the muscles along the backs of his thighs and the flexors of the feet (pointing especially to the gastrocnemii) are thrown into a state of spasmodic contraction, which absolutely prevents him from raising his body from the recumbent position without the assistance of his hands. In a state of rest he also occasionally experiences spasmodic contraction in his flexor muscles, but as soon as he wants to bring them into use they feel (to the patient) to be thrown into a state of tonic contraction. When sitting with his feet hanging over the side of the bed, the toes point to the ground and the foot is inverted (which is very characteristic). He cannot bring his foot up to the ordinary position of one in health, owing, he says, to a contracted feeling running down the leg behind the inner malleolus, which pulls the foot down to the extended position. He also complains of a paralysed, dead feeling on the dorsum of the foot, over the extensor tendons, and a contracted feeling in the tendo achillis (There is to be noticed when the patient is quiet, slight spasmodic contraction of the toes and fingers).

The patella reflex is entirely lost.

On putting his legs to the ground, the toes come first in contact with it, and then the soles of the feet are brought down by the weight of the body bent forward and with eyes fixed on the ground (If he raises his head or shuts his eyes he becomes unsteady and falls). He endeavours to keep his knee joints locked, which he can do for a moment or two. He states that the joint flexes irresistibly from a

spasmodic contraction of the tendons at the back of the knee joints, and not because he has lost the power over the extensors. On grasping the thigh with the hand—anteriorly—the apparent full rounded condition is felt to be flabby and soft. The bellies of the muscles are not to be distinguished.

The patient can extend his leg on his thigh when sitting, with considerable power, almost into the straight position, but he states it is difficult for him to do so owing to the contracted feeling of the flexors of the foot. He says that the feeling of contraction is in a line running down the calf behind the internal malleolus, along the inner side of the sole of the foot to the terminal phalanges of all the toes.

When the patient extends his leg, the foot becomes more and more inverted and flexed, until it resembles very closely the position of the foot in talipes varus. The tendo Achillis is also slightly contracted. He does not feel any contraction in the anterior tibiæ muscles.

The Ankle Joint.—The patient can flex his ankle joint slightly, but it will move back to its original extended position, beyond which he has no power of further extending it. In making attempts to do so he can only effect a slight lateral action on the joint. The extensors are apparently paralysed. When sitting he cannot cross one thigh over the other. He can flex the thigh readily at the hip joint, and can bring one leg across the other, resting the lower third of the leg on the opposite knee. He cannot bring it further down owing to the contracted muscles of the calf flexing the leg at the knee and preventing the leg slipping down over the other one. (With a little force I brought the thigh down over the other one, causing great pain however in the fleshy part of the calf muscles). On supporting the patient on one leg and telling him to swing the other at the hip-joint he can do so in all directions.

He can flex the thigh, but in doing so the knee joint is brought forward semi-flexed, from a paralysis in the quadriceps extensor. He can also adduct and abduct, extend or flex the thigh on the hip-joint, but these movements are done slowly and with some difficulty. (He was able to support, for a few moments, the weight of one of the clerks on his back, and in the sitting position he could support the clerk on his shoulders for some time, without difficulty).

Upper Extremities.—These are now much less affected than when he was admitted into the hospital. He has free movement now in the shoulder joints, elbow joints, and wrist joints. He can straighten

the wrist joint with the fingers flexed, but not with the fingers extended. On flexing the fingers and bringing the joint into the straight position, and then telling the patient to open his hand, he cannot do so owing to the contracted condition of the flexors of the fingers. The contracted condition of these flexors can be easily felt by grasping the forearm with the hand. The flexor longus pollicis is felt to be very contracted, but the patient says it is not more so than the other tendons. He is unable to extend the thumb from paralysis of the extensors, as well as contraction of the flexors. He has only slight power of extending the index finger, due to partial paralysis of the extensor, and not on account of the contraction of the flexor. The three outer digits he can only semi-extend owing to contraction of the flexors. The semi-extension of these fingers can be effected more rapidly than the index finger.

Face and neck muscles intact.

Anæsthesia.—His legs are numb generally. He cannot define any particular spot; he says it is worse below the knee. It is more so on the dorsum of the foot than on the sole, and more on the extensor than on the flexor surface of the leg. The numbness feels to him to be in the skin. He has anæsthesia over the whole of the leg, down the front of the tibiæ, especially over the upper third. It is generally over the leg, but in some spots more marked than others. He feels the point of a probe drawn over his leg, but over the dorsum of the foot the skin feels to him to be thick, and the sensation woolly. Over the thigh it is not so.

Arms.—There is numbness over the back of the hand, extending down very slightly to the tips of the fingers, and on the back of the fore-arm. The front of the fore-arm is also numb. The palm of the hand, he says, is not numb, but there is a thick feeling in the skin. The tips of the fingers are numb. In the upper arm—the sensation is normal.

Hyperæsthesia.—Pressure on the leg anteriorly causes slight pain. The tendo Achillis is not painful. Over the flexors, one inch above the internal malleolus, great pain is felt on pressure. This extends up the internal edge of the tibia, to a spot a little above the middle, where it is unbearable. The fleshy calf muscles are very tender on pressure. Above the knee joint normal.

Upper Extremities.—He has no pain in the fingers, but has pain in the muscles between the finger and thumb. Ball of thumb painful. Pain is felt on pressure just above the wrist joint anteriorly and extends up the fore-arm, between the bones, getting

worse until the fleshy part of the upper arm is reached, and then it ceases.

Extensor surface of the fore-arm not painful. No pain in the pectoral muscles, but a slight tight feeling on raising the arm above the head.

CASE No. 4.

CHUA KONG SONG (MALE), age 27, Coal Heaver. Taken ill at Tanjong Pagar; Duration of Disease, 12 days. Admitted 3rd December, 1884.

History of Present Illness.—The access of the disease was sudden. He was last at work thirteen days ago, he went to bed alright, but on attempting to get up the next morning he could not do so. He could not raise his legs, which were numb all over. His hands also were numb, and he felt slight pains in the dorsum of his feet, and the calves of his legs. He says before this attack he always had sufficient to eat. He occasionally suffered from attacks of fever. He also says that several of his friends have suffered from this disease. He says that as a coal-heaver he was a strong muscular man, he never knew what it was to feel tired. He lost all his muscle three or four days after being attacked. For six days after the onset of the disease he suffered from fever, during which time he could not walk. Following this, pains came into his arms and legs, he lost his appetite, and felt a numbness over his epigastrium. He did not at any time notice any œdema.

Condition on Admission.—He is a tall thin man, wasted, not muscular, anæmic; conjunctivæ with a yellow tinge. *Complexion* sallow, with a distressed, listless, worn expression. Skin dry, warm, and rough, no perspiration anywhere. *Decubitus dorsal.* He was sitting on a chair during the first part of his examination, but he could not bear the pressure owing to the numbness of the buttocks and the pains in his legs. His head also fell backwards, he having lost control over it—just as one in sleep. He is in a state of apparent general paralysis—utterly helpless in every way, and lies with his legs extended, and feet everted, as immoveable as if dead.

Face is vacant, drawn, and anxious, and if moved has a distressed look. *Brows* knit. *Complexion* very sallow. No puffiness of the face. *Eyes* natural, pupils normal. *Gums* spongy, receding, with

bluish line and ulcerated edges, bleeding on pressure. *Teeth* covered with a yellowish film (*sordes*). *Tongue* tremulous, flabby, indented at the edges, and covered with a slight yellowish fur on the dorsum, tip and edges red. *Temperature* 98. *Pulse* 84, small, compressible, regular. *Neck* thin, no fulness. Arterial pulsation seen above the sternum and in the carotids is very marked. No venous fulness.

Thorax well formed, surface normal. *Ribs* easily seen, intercostal spaces do not move with the respirations, which are regular—24 in a minute. Respiration easy, not painful. There is a numb feeling over the epigastrium on deep respiration. Resistance on palpation wooden. *Vocal vibrations* distinct. *Cardiac impulse* cannot be felt, but a slight tremor can be seen between the 5th, 6th, and 7th spaces, one inch below and to inside of nipple. On pressure over the spaces, patient says they are numb all over, but there is no pain except between the 1st and 2nd intercostals, and between the 7th and 8th ribs on both sides (insertion of the diaphragm and pectoralis muscles). He cannot bear pressure on these spaces, even slight pressure causing pain. There is no increased irritability of the muscles.

Percussion note boxy. Cardiac area decreased. *Heart*—first sound is dull. There is a systolic murmur at the apex, but heard more plainly at the base over the pulmonary area. Second sound accentuated, distinctly dicrotous over the pulmonary area, but not so over the aortic area, where it is only accentuated. Heart's rhythm normal. *Lungs*—*Inspiration* harsh, slightly jerky; *Expiration* short, harsh, no superadded sounds, no cough, vocal resonance normal. *Voice*—there is a decided loss of voice, he is unable to call aloud, it is husky, hoarse, and cracked (he speaks as if he had a hoarseness, not in a whisper). He loses his breath if he speaks or makes any exertion. If told to count numbers, his whole chest moves in a laboured, circular stolid manner. He commences one, two, three, with an inspiration and with expiration, says *one* as if it were forced out by the weight of the thorax descending. He takes a fresh inspiration for each number, but he can get three or four words quickly spoken into one expiration, when he loses his breath. *Abdomen* thin, receding, and very flat. *Skin* has a brawny scurf on it; it is dry, and the abdominal pulsation is distinctly visible.

Palpation—on rubbing the finger gently over the surface the patient makes grimaces of pain, and puts on a very distressed expression. He says it causes great irritation of a tickling character.

Firm pressure causes a numb pain all over, very bad to bear, but worse in some places than in others. Both iliac regions are excessively tender on pressure, and also on both sides of the abdomen, but in the centre line there is a pain which is very slight in comparison.

Percussion note over the whole abdomen is dull, and causes pain over the left iliac and epigastric regions. He seems to fear as much the numb feeling as the pain. He says he feels as if he would get a start in a moment (convulsions) when percussing him, and he persists in saying that it is not actual pain, though his expression betrays great fear—brows knit, eyes are anxious, mouth retracted.

Mouth feels dry.

The patient answers questions very slowly and with effort, as if the intellect was dulled. Questions have to be frequently repeated. He says he is not deaf.

Paralysis.—The patient is perfectly helpless, quite unable to stand, his arms are also helpless, his hands hang down at the wrist joint like flails, with the fingers semi-flexed. On being asked to rise from lying position, the patient makes the same movements as in Case No. 3, showing apparently that the same muscles are affected. He attempts to get, first, on to his side by drawing up his leg and throwing his arm across the body, he cannot get further round than his side, when he tries to help himself up by his arms as in Case No. 3, but he is quite unable to raise himself from the bed. He is able slightly to flex the thigh on the pelvis; he is quite unable to extend the leg on the knee, also quite unable to flex dorsally the foot at the ankle. Toes also are unable to be moved. The foot is extended in the usual way, and he can flex the toes a little; ankle joint unmoveable, it is extended to its utmost from contraction of the tendo Achillis; forcible flexion of the foot causes great pain in the tendon of the calf muscles. Hamstring tendons are not tense.

Hyperæsthesia.—The great toe is painful on pressure and numb; other toes numb only; foot numb on pressure over the dorsum, no pain. Extensor surface of the leg numb; no pain. Sole of the foot numb. Tendo Achillis very tender, but one inch above its insertion is very painful. This increases as we work up, until the greatest pain is felt in the fleshy belly of the calf muscles, where slight pressure is unbearable. The lower half of the popliteal space is very painful, the upper half not.

Thigh.—*Anteriorly.*—The lower half is not painful; upper half over the belly of the rectus very painful; also over the upper outer part of the thigh. Over the origin of the rectus is painful.

Posteriorly.—All the hamstrings are painful. Over the gluteal muscles, on pressure, very painful, which are greatly wasted (as well as all other muscles of his body).

Upper Extremities.—Shoulder and elbow joints movements normal. He can pronate and supinate the fore-arm.

Wrist-joint.—With the fingers flexed, he can flex and extend the joint, though action of extensor is very feeble. The fingers are in a semi flexed condition, especially the little and ring fingers.

Thumb.—Any extension impossible. He can adduct the thumb as a whole, but he cannot flex the thumb at all.

Index Finger is semi-flexed when in a state of rest, but he is unable to move it in any direction. The three outer fingers are more flexed than the index. These he can flex a little, and bring the points to the palm of the hand, and he can extend them back again to their original semi-flexed position.

Hyperæsthesia.—Ball of the thumb is painful, over the wrist joint ; there is no pain on pressure, but immediately above pain begins and extends upwards between the bones, where it is very tender, slight pressure being unbearable. Pain diminishes at the elbow joint, and is very slight in the upper arm. Over the pectoral muscles it is increased. Posteriorly, over the extensor surface there is no pain on pressure anywhere.

Anæsthesia.—Very marked at the tips of the fingers, slight in the palms of the hands, slightly over the flexor surface of the fore arm, less so over the extensor surface.

No Anæsthesia, hyperæsthesia, or paralysis about the face.

Spermatic and abdominal reflexes normal.

CASE NO. 5.

SOO AH LENG (MALE), age 20, Sawyer. Taken ill at Salapong-Rhio. Duration of Disease 10 days. Date of Admission 19th November, 1884. Discharged cured 9th January, 1885.

Urine {	Reaction - -	1st week Acid	2nd week Slightly Acid	3rd week Slightly Acid	4th week Acid
	Sp. Gravity -	1014	1014	1014	1016
	Albumen -	o	o	o	o
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	o	o	o	o

His Present Illness.—Patient states that he has worked for over one year and eight months as a sawyer in Salapong-Rhio. The saw

pit has always been damp. He also has worked as a wood-cutter and frequently has had to cross streams and marshes in his work. He was ill-fed; rice, saur-kraut, pickle-cabbage, and dried fish, was all he got to eat. No pork or fresh vegetables. The rice was black, but he says it was good. Several of his friends there have had this disease, and several have died from it. For the last three months he has suffered much from attacks of fever, coming on every ten or twelve days. It commenced at 6 o'clock in the morning, lasted for seven hours, and left him very weak for four or five days, during which he could not work and had no appetite; he always felt a full oppressed feeling in the stomach after eating. He never suffered from the cold stage of fever. He was always very hot while the fever was on him. His bowels were a little relaxed after the fever passed off, when he felt pains in his knees and ankles. These pains never left him entirely, but became increased with each new attack. After suffering in this way for twenty days swelling of the legs and the backs of his hands came on, from which he is still suffering. He attributes his disease to bad drinking water.

State on Admission.—On admission the following short notes were taken of his case:—"Has general dropsy, hands, feet and abdominal walls numb, extensors slightly paralysed, pain in calves on pressure, able to walk, but got very exhausted."

Condition on December 8th (when his case was fully taken).—Patient is a small-built youth, thin ill-developed muscles, height 5ft. 2½in. He is a little anæmic. *Skin* soft and natural; palms of the hands normal. *Expression* natural. *Complexion* sallow. *Eyes conjunctivæ, mouth and lips* normal. *Gums* pale, a little spongy, not ulcerated, blue line along the edges, and bleed slightly on pressure. *Temperature* 98·4. *Pulse* 84. *Volume* natural, regular, but compressible. No fullness in the neck, but distinct arterial pulsation over the sternal notch, and up the sides of the neck. *Veins* not full or visible.

Thorax.—Heart's action distinctly visible between third, fourth, and fifth, also 6th interspaces. Along the sternal border, the action is very superficial, and remarkable. It commences over the right auricle and runs, as a wave, over the ventricle. Apex beat faintly seen between fifth and sixth ribs, one inch below and one inch to the inner side of the nipple. Respiratory movements natural, but apparently more abdominal than thoracic. He says that inspiration causes him to have a tired feeling in the epigastrium. No pain on pressure. There is slight œdema of the whole chest.

Percussion normal. Heart's area not increased.

Auscultation.—*First Sound* is dull, rough, harsh, distinctly dicrotous, and this is chiefly heard over the area, one inch to the right of apex beat, where the heart's action is most distinctly heard to be laboured and occasionally irregular. The double first sound can be distinctly heard all over the heart's area. *Second Sound*, also distinctly accentuated, dicrotous over the pulmonary area. Slightly so over the aortic area, where the second sound is dull. The accentuation and dicrotous *second* sound is very distinct over the whole of the heart's area, and is very distinctly heard over the apex; it is also distinct between the third and fourth ribs on the left edge of the sternum.

Lungs.—Inspiration and expiration rough. Vocal resonance increased, no cough.

Abdomen round, soft, natural, no bulging, gurgling, tenderness or oedema.

Percussion normal over all areas except to the right of the umbilicus, where it is dull; no pain anywhere on pressure; percussion over the epigastrium causes no uneasiness. There is a slight indistinct abdominal pulsation visible.

General Condition.—Patient lies on his back with his feet everted and legs extended. He has no thirst, has fair appetite, no vomiting or nausea, slight feeling of oppression in the epigastrium after eating. Very sensitive to slight draughts of air on his body. *Bowels* move twice daily, normally; he has to rise three or four times in a night to micturate, while in health once only. He passes twenty ounces daily, acid reaction, sp. gr. 1.014, no albumen. *Sleep.*—His sleep is not so good as when in health, he wakes up to micturate. He says that he has more pain in his legs at night, than in the day; the pain is situated over the patella and over the external malleolus, in the bone, and also between the first and second metacarpal bones in the backs of the hands.

Paralysis.—The patient can stand, walk, or rise, from the recumbent posture to any position without assistance. Hip-joint, knee joint and ankle-joint movements intact. Can flex and extend the toes, complains only of weakness.

Upper Extremities.—All movements perfect, but weak. Flexion of the hand causes slight pain over the first metacarpal interspace.

Hyperæsthesia.—Lower Extremities: Slight pain on pressure over the gastrocnemii and over the belly of the rectus femoris muscle. Upper Extremities: Pain on pressure over the dorsum of the hand

and up the flexor surface of the forearm, especially between the bones; extensor surface normal.

Anæsthesia is only found on the backs of the hands, where there is very slight numbness.

CASE NO. 6.

WONG AH CHOON (MALE), age 23. *Barber. Taken ill at Singapore. Admitted 17th November, 1884.*

History of Present Illness.—Patient states that three and a-half months ago he suffered from fever (hot stage only). This lasted for three days when he felt a weakness in his legs. This was followed by a tight feeling in the epigastrium, and then the leg trouble increased till he lost power in them altogether.

Previous History.—He suffered from chancres and bubo a year ago; otherwise he has enjoyed good health; he has not suffered from fever, before the attack which was followed by this illness.

Condition on Admission.—Patient is a man 5ft. 3in. in height, not muscular, anæmic, sallow, slightly emaciated, skin dry and warm. *Head and Face.*—*Complexion* very sallow. *Expression* natural. *Eyes, nose, mouth and lips* normal. *Gums* pale, not spongy, a faint red line at the edges, not ulcerated, but bleeds slightly on pressure. *Tongue* tip and edges bright red; papillæ bright red (strawberry), dorsum covered with a whitish fur with bright points interspersed here and there through the fur. Thick yellow fur at the base with large papillæ at the base, red and swollen. *Fauces* congested. *Pulse* 116, small, thready, compressible, regular. *Temperature* 100·2. Neck enlarged all round at the base, but not œdematous. Pulsations of the vessels visible above the sternum, and along the carotid. No venous fulness.

Thorax well formed, surface slightly œdematous. Heart's action distinctly visible; apex beat seen thumping in a line one inch immediately below the nipple, between fifth and sixth ribs very violent and circumscribed. Heart's action is also seen along the left border of the sternum, between the fourth and fifth ribs. *Respiratory* movements natural, not painful. *Palpation* normal. *Vocal Resonance* normal. Heart's action felt to be laboured with distinct thrill over the apex. *Percussion* normal.

Auscultation.—*First Sound*, dull, thumping, muffled, a little obscured by a distant systolic murmur which increases on approaching the

base. It is heard loudly to the left of the sternum between fourth and fifth ribs, also louder over the pulmonary and aortic areas than at apex. The first sound at the apex is also slightly dicrotous. *Second Sound* over aortic area dull, no murmurs. Over pulmonary it is accentuated and dicrotous, no murmurs. A systolic murmur is heard distinctly along the lower border of the clavicle, and is continued into the vessels of the neck. *Lungs* normal.

Abdomen.—Epigastric pulsation very distinct, surface natural, skin dry, rough abdominal walls retracted, no bulging. (The patient says he has not bathed for three months.) There is pain on pressure in the right iliac fossa, and in the left side, over the spleen where the muscular walls are tense. (The pain appears to be in the muscles.) *Liver* and spleen areas normal.

No cough or thirst; appetite bad; has nausea. Vomits his food. (This may be due to some Dover's powder which he had taken for dysentery.)

Bowels move twelve times in twenty-four hours, dysenteric, accompanied with tenesmus and pain in the anus, and griping in the stomach before each motion.

Urine twenty ounces in the twenty-four hours. High colour, slightly acid sp. gr. 1,004.

Sleep broken, kept awake, he says, from a feeling of suffocation in his throat. He says he feels as if his throat would close.

Paralytic Symptoms.—The patient can raise himself from a lying to a sitting posture by going through the same movements as described in Case No. 3. He is unable to stand or walk; hip-joint and knee-joint movements normal. *Ankle-joint*.—The foot is in a state of extension. He is unable to do anything with it except make the slightest lateral movement. Extension and flexion is completely lost. *Toes* completely immovable. (He is suffering from total loss of power, in all movements below the ankle-joint.)

Upper Extremity.—All the movements are quite normal, no paralysis in any of the muscles, but he says they feel weak. All the movements of his fingers are intact. He can feed himself with his chopsticks, but his hands shake in doing so. All other muscular movements natural.

Anæsthesia.—There is general anæsthesia all over the lower extremities. He feels the prick of a pin, but not at once. There is evidently a loss of power in his nervous ductility. He only feels the prick some considerable time after the stimulus has been applied. The anæsthesia is most marked over the external surface of the

patella, and over the dorsum of the feet. There is also general anæsthesia over the forearm and hand, especially in the tips of the fingers, in the thumb, the palms of the hands and extensor surface of the forearm. There is slight anæsthesia over the upper half of the epigastrium and all over the front of the chest, well marked over the sternum. The anæsthesia is of the degree, that the point of a pointed probe drawn over the surface lightly is felt at times with uncertainty. Occasionally it is also felt in a different place to the part that is actually touched, but in about the same position and direction. For instance, if the leg is touched, the sensation is referred to a point about six inches lower down. (I have also noticed this phenomenon in other patients.)

Hyperæsthesia of Muscle.—There is pain on pressure over the extensors of foot and leg (the muscles here are greatly wasted), the pain is chiefly felt in the fleshy parts in the upper half of the leg, between the tibiæ and fibulæ. No pain in the muscles of the foot; tendon of the tendo Achillis not painful, but about three inches above its insertion into the belly of the muscle it commences and increases as we proceed upwards to the bellies of the gastrocnemii, which are very tender, so that patient even cries out if touched there; no pain on pressure in the muscles above the knee-joint. The muscles of the calves are flabby and wasted.

Upper Extremity.—There is no hyperæsthesia, but he has a peculiar sensation on pressing the muscles, which he says is “weakness.”

CASE No. 7.

GOH TIAM SIN (MALE), age 31, Sawyer. Taken ill at Sarapong (Rhio). Admitted 31st July, 1884.

Condition on 11th December, 1884 (4½ months after admission).

Patient is a well-built man, 5 feet 4 inches; he is anæmic: dry, rough, and cold skin; legs, feet, hands, and body œdematous; he can only sit up, being unable to lie down owing to difficulty in breathing whilst doing so.

Face and Head.—His face is sallow, œdematous all over, especially below the eyes; brows knit, expression anxious, lips separate, eyes natural, but on any exertion they become staring, conjunctivæ slightly anæmic and sodden looking, but capillaries are distinctly visible. Alæ nasi round and large, dilating with respiration, lips

thick, gums pale with bluish edges which are ulcerated ; they bleed on pressure, and are covered with a thick whitish secretion along the edges of the teeth. *Gums* in the upper jaw very blue and ulcerated. *Teeth* are well-formed and regular, not decayed. *Tongue* clean and moist. *Fauces* slightly congested : mucous membrane of the cheeks and of the palate very pale. *Temperature* 100. *Pulse* 116, weak, thready, compressible, regular. *Neck* pulsations not visible, muscles of the sterno mastoid brought violently into play each inspiration.

Thorax surface natural.

Inspection.—*Chest* well formed, respiratory movements hurried, laboured, difficult, accompanied with wheezing. *Heart's* action can be seen along the edge of the sternum indistinctly, apex beat felt $1\frac{1}{2}$ inch below and in line with the nipple. The heart's action is very distinct and rapid (accompanied with a slight thrill) and over the left border of the sternum. The systole and diastole can be distinctly felt. He says all the intercostal spaces are tender on pressure.

Percussion.—Note dull all over, especially over the left apex, where the note is quite flat, above and immediately below the clavicle.

Auscultation.—*Inspiration* is harsh all over, puerile over both apices. *Expiration* loud, harsh and rough, twice as long as inspiration, with no appreciable pause between expiration and inspiration ; there is no crepitation, great breathlessness in speaking ; chest walls œdematous.

Heart sounds very indistinct ; first sound muffled, no murmurs ; second sound indistinct at apex, second sound is louder than the first, no murmur (the respiratory sounds are so loud that heart's sounds difficult to hear). *Heart's area* dullness commences between the third and fourth ribs and extends to the apex beat, between fifth and sixth ribs ; internally it commences over the centre of the sternum and extends out to the nipple line.

Abdomen is full, œdematous, with slight bulging at the flanks and tympanitic.

Liver and spleen normal. *Percussion* note on both flanks dull.

Cough.—The patient has a troublesome cough accompanied by a bloody tenacious sputum. The cough is wheezing and moist. No thirst ; appetite very bad ; no vomiting ; sleep bad owing to difficulty of breathing ; patient cannot lie down.

Paralytic Symptoms.—Patient cannot rise from the recumbent to a sitting posture without help. Movement at the hip joint intact. He can extend the leg and the knee, but not to its full extent (this

is owing to the œdematous condition of the joint, there is no paralysis).

The Ankle Joint.—There is not the full extension of the ankle joint as seen in most severe cases (there is great œdema of the foot and leg which must hinder all movements). There is no paralysis of the extensors or flexors of the joint. He can flex and extend the toes. On getting the patient on his legs it is seen that there is a contracted state of the muscles of the calf; he stands with assistance with his legs stiff, he cannot straighten his knees and his heels are raised off the ground. The quadriceps extensor femoris are felt to be hard and tense as also his gastrocnemii (the great œdema may account for some of this), his whole frame seems in a vice, he cannot straighten his back, he says that his back is stiff.

Patient's own statement is that his "oorat tarek," which means literally "his muscles," are in a state of spasm, pointing especially at the same time to the calves of his legs, and to the upper and inner parts of his thighs over Scarpa's triangle, and on questioning him he also states that the muscles over his sacral region are also in a state of spasms.

Anæsthesia.—There is slight anæsthesia over the backs and palms of his hands, extending down to the tips of his fingers, none higher up (on admission it extended up to the top of his shoulder). His legs are slightly anæsthetic all over, but mostly so over the calves and the inside of the foot and great toe. No anæsthesia over the abdomen and chest, but formerly all this region was affected. Over the sacral region, where the stiff feeling is felt, there is complete anæsthesia; it commences over the last lumbar vertebra, and extends down to the end of the sacrum; it seems to be confined to the skin over that bone, as the coccyx is not affected.

Hyperæsthesia.—There is pain on pressure over the calf muscles, but not in any other region. There is no pain on pressure between the radius and ulna; slight pain on pressure over the posterior fold of the axilla, no pain in the muscles of the back or vertebra.

Appearances seen in 19 Post Mortem examinations with Cases.

CASE No. 8.

LIM BUN SING (MALE), age 36. *Duration of Disease, 25 days.*
Admitted 9th December, 1884; Died 23rd December, 1884, at 9 p.m.

History.—Patient states that he had been in hospital suffering from diarrhoea and was discharged cured 28 days ago. Two days after he left hospital he ate a dish of fish and pig's blood, which caused a relapse (of the diarrhoea); a week after this he felt numbness over his feet and was unable to walk.

Condition on Admission.—He has numbness all over his feet and legs, extending to the hip joint, his left hand is also numb. There is a feeling of constriction and numbness across his chest and abdomen, especially over the umbilical region; there is pain in the calves on pressure, he is able to walk a little, but is afraid to do so as he feels that his legs are weak and soft, and give way under him, his gait while walking is unsteady. He attributes his disease to his having indulged in the dish of fish and pigs' blood, which he partook of on three consecutive days.

Progress of the Case.—*December 12th.* Patient complains of tightness and numbness in his chest and abdomen. His hands and legs are numb and painful, and his feet are slightly œdematous; he feels thirsty, tongue red, appetite bad; bowels moved three times, watery; sleeps well at night. *13th.* Patient had fever yesterday evening, causing him to have a sleepless night, otherwise the same. *14th.* No change. *15th.* Symptoms just the same; temperature taken this morning per rectum (of 20 minutes), 96·6 (see temperature chart). *16th.* Patient is in a low condition; temperature 97; tongue red, dry, and clammy; no appetite, and has difficulty in breathing. *17th.* He complains of tightness, pain, and numbness in his chest, numbness in his abdomen, and pain and numbness in his hands and legs, also pain in his loins over the lumbar vertebræ.

Complains of thirst, has no appetite, bowels moved three times, could not sleep well on account of the chest symptoms. Temperature taken at 7 a.m. 95.4 (per rectum, 10 minutes), taken again at 9.0 a.m. and found to be the same. 18th. Patient has pains in his bones and body, has numbness in his chest, hands, loins, abdomen, arms, and legs; he is in a very low condition, tongue red and dry, no appetite, diarrhœa continues, no sleep, temperature 95.8 at 9.30 a.m. 19th. Temperature 95.6, otherwise the same. 20th. Patient has weakness and numbness in his body as before, all other symptoms the same, 23rd. Patient sinking, diarrhœa constant, pulse 72 in the large arteries, at the wrist imperceptible; temperature 95, teeth and lips covered with black sordes, patient delirious; died at 8.0 p.m. quietly.

Post Mortem taken twelve hours after death.

N.B. Patient's body was kept lying on its face from the first, to see if position made any difference in the congestion of the spinal canal, as seen in all the other cases hitherto recorded. For this same reason the *P.M.* was delayed in this case for twelve hours. *Body* emaciated, muscles of the back good colour, no œdema; on cutting into the muscles on the sides of the lumbar region there was a small amount of fluid present.

Spinal Column.—The cellular tissue lining the column is of a bright red colour, highly congested over the lumbar region, and also over the dorsal region. This congestion commenced over the first dorsal vertebræ, and extended down the canal to the lumbar vertebræ. It is most intense over the central dorsal vertebræ, where the cellular tissue has the appearance of a mass of jelly. The dura mater over the first dorsal has numerous fine congested blood vessels running through it, this extends down to the lumbar region; On leaving the cord the cellular tissue covering the *bodies* of the vertebræ is congested, slightly so in the dorsal region, but getting more intense as we proceed down, until on reaching the lumbar region the congestion is considerable, while in the sacral canal the appearances are of the darkest purple; the whole cellular tissue, in fact, of this region is most intensely congested, extending down to the last piece of tissue in the sacral canal.

In the hollow of the lumbar region, about the commencement of the cauda equina, there are some adhesions of the dura mater to the bodies of the vertebræ, which on being cut through caused considerable venous hemorrhage, the black fluid blood having to be continually sopped up with a sponge (this was also present in the

previous cases examined, see cases). On opening the dura mater the vessels over the cervical part of the pia mater are very congested. This extends all down the cord until in the lumbar region, where it is very considerably congested. The vessels of the cauda equina are also very congested, and at the terminal branch there is a transparent bladder-like enlargement on the vessel.

The dura mater contained three-quarters-of-a-drachm of fluid.

Head.—On removing the calvaria the veins of the dura mater are seen greatly congested, veins of the pia mater are in a similar condition; the large veins between the convolutions of the cerebral hemispheres are standing out full of black blood, extending into their small ramifications.

Whole surface of the brain congested.

Lateral ventricles contained about half-a-drachm of fluid.

Chest.—No fluid in the thorax.

Heart.—3vj. of fluid in the pericardium; right side of the heart full; left side empty; valves normal; weight 10 ozs.

Lungs slightly congested; left weighed 16 oz.; right more congested than left, weighed 20 oz.

Gall-bladder full.

Spleen enlarged, congested, weight 1 lb. 3 ozs.

Kidneys both congested, weighed 5 ozs. each.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 11		112		28		101	3 W	8 N
12	96	102	24	24	99	99·8	3 W	12 N
13	108	104	21	24	97·6	99·6	2 W	10 N
14	108	108	18	22	98·4	99·8	5 W	8 N
15	102	114	16	17	96·6	97·8	2 W	6 N
16	108	112	14	17	97	98·2	3 W	„
17	102	112	12	17	95·4	96·4	3 W	„
18	90	102	12	17	95·8	96·8	3 W	„
19	90	102	12	17	95·6	96·2	5 W	„
20	78	114	16	16	97·2	96·4	4 W	„
21	96	98	12	14	95·4	95·2	6 W	„
22	80	72	20	22	95·2	95	15 W	„
23	72	72	16	24	98	94		

CASE NO. 9.

HENG AH LOCK (MALE), age 37, Gambier Coolie. Taken ill at Johore; Duration of Disease, 45 days. Admitted 22nd December, 1884; Died 30th December, 1884.

		4th week.	
Urine	{	Reaction - -	Slightly Acid
		Sp. Gravity -	1008
		Albumen - -	0
		Chlorides -	Excess
		Phosphates -	0

History of Present Illness.—Patient states that he has resided in Johore for a little over two months, during which period he worked in a gambier plantation as a coolie for a month, where he got sick. He first stopped work on account of an attack of intermittent fever, after suffering from which for five days he observed that his feet were getting numb and his legs weak; these symptoms gradually increased for thirteen days, when he first experienced the same sensation in his hands. He also had pain and uneasiness in the pit of his stomach the same day as the numbness appeared in his hands; two days after this, on attempting to get up from his bed, he found that he was unable to do so, but with a stick he managed to stand up with difficulty, but fell on attempting to walk; he says he had enough to eat in Johore, taking food five times daily, which consisted of the following:—

- 4.30 a.m. Congee and salt fish fried in pork lard.
- 9.0 a.m. Rice, salt fish fried in pork lard, and fresh or salted vegetables.
- 12.0 noon. Congee and salt fish fried in pork lard.
- 5.0 p.m. Rice, salt fish fried in pork lard and fresh vegetables.
- 9.0 p.m. He sometimes partook of congee and salt fish, pork once a month during one meal only, no fresh fish.

His wages were about twelve dollars a month, all of which he spent in chandoo (opium used for smoking).

Previous History.—He came from China sixteen years ago and resided in Johore for ten years, during which time he has suffered very often from intermittent fever, frequently from diarrhoea. Six years ago he came to Singapore and resided in Wayang Satu, planting vegetables, and rearing pigs; two years ago, while in

Wayang Satu, his legs became weak, but he got all right in three months without medicine. He lost all his money there from opium-smoking, so he went to Johore.

Condition on Admission.—He is a spare-built man; he lies on his back with his legs drawn up; he says they hurt when he stretches them; he also says he is obliged to lie on his back on account of his inability to turn on his side; there is numbness all over the legs up to the hip joint, and in his arms and hands up to the shoulder joint; there is a feeling of fulness and distress in the epigastrium, there is pain on pressure over the dorsum of the feet, calves of the legs, and the whole length of the inner side of the tibiæ, and in the anterior aspect of the fore-arm, between the ulna and radius, and also between the intercostal spaces; he has no pain in his back; he feels as if the tendons in the back of his legs are tense.

Face and Head.—His expression is anxious and distressed, his eyes are dull, alae-nasi normal, corners of the mouth cracked and sore, gums firm and retracted, teeth slightly irregular, tongue coated with a thick white patchy fur in the centre, with red centre and red edges, fauces inflamed, there is a thick whitish exudation covering the whole of the soft palate and fauces; the patient is continually moaning, he cries and complains of great distress all over his body, but generally about the epigastrium; he is in a very low state.

Paralytic Symptoms.—Patient is unable to get up in his bed, or move, without help; quite unable to walk or stand; pulse, 114; respiration, 27; temperature, 99.

Bowels costive, *appetite* bad.

Progress of the Case.—December 27th, 1884. Patient could not sleep well last night, owing to a difficulty in breathing and a tightness in his chest and abdomen, bowels constipated. 28th. No improvement, could not sleep, otherwise the same. 29th. He is much distressed, voice hoarse, and complains of great trouble in the lower part of his body and of the numbness in his arms, up to the shoulder joint; respiration much laboured, and the heart's action is distinctly visible through the chest wall; his hands are semi-flexed, and he cannot open them; he complains of pain over the lumbar region; he says that he feels hot inside, and asks for cooling medicines; pulse, 120, at times almost imperceptible at the wrist; heart's action felt to be dicrotous, and is very superficial; there is slight œdema over the chest wall; the sounds of the heart are dull but regular, no murmurs; he has no appetite, and states that if he eats anything he gets pain in the stomach, and a tight oppressed

feeling in his epigastrium. 30th. The patient is very bad, bowels moved freely after an enema; temperature, 95 (thermometer kept in the rectum for eight minutes); pulse low, almost imperceptible; his whole body is paralysed; his breathing is labored. 2 p.m. died.

Post Mortem was made the same afternoon; body fairly well nourished, face calm, lips pale, mouth open, abdomen retracted, looking like that of a man that had been starved; rigor mortis not present. *Back* muscles, when exposed to open the spinal canal, very dark red in colour, and a little bloody fluid oozed out on cutting them; the spinal canal opposite the seventh cervical vertebra contained blood, dark and venous, which kept oozing as long as the canal was being examined, and seemed to come from one of the veins of the body of the seventh cervical vertebra; in the lumbar regions there was slight congestion, also of the spinal veins; great difficulty in cutting the cord out; opposite the six upper dorsal vertebra, there seemed to be adhesion of the dura mater to the posterior spinal ligament; the rest of the canal normal. *Brain*. There was a slight congestion of the veins at the base, it was healthy, with the exception of a slight extravasation on the valve of Vieussens, lateral ventricles contained half a drachm of fluid. *Lungs* healthy. *Heart*, 8 ozs., muscles very red, left ventricle contracted, right ventricle flaccid, no clots in the cavities, valves healthy. *Liver*, 45 ozs., markedly cirrlosed. *Spleen*. 14 ozs., and soft. *Kidneys*, left, 6 ozs., right, 5 ozs., slightly congested, capsules of both peeled off easily. *Bladder* full.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 24	114	120	27	28	99	100·4		28 H.C
25	116	114	28	24	99·4	100·2	1 H	36 H.C
26	120	134	20	23	98·6	98·6	1 H	56 H.C
27	104	136	20	24	98·4	98·4	"	32 H.C
28	106	120	20	24	98·8	98·8		35 H.C
29	120	134	20	26	98·8	98·8	6 W	42 H.C
30	104		20		95	95		

CASE 10.

TEO AH CHEO (MALE), age 28, *Coolie*. Taken ill at Singapore ;
Duration of Disease, 20 days. Admitted 18th February, 1885 ;
Died 21st March, 1885.

	1st week.	2nd week.	3rd week.
Urine {	Reaction - -	Acid	Acid
	Sp. Gravity -	1010	1008
	Albumen -	0	0
	Chlorides -	Normal	Normal
	Phosphates -	0	0

History of Present Illness.—Patient was a coolie employed in a rice mill ; he has been four years in Singapore, during which time he has been employed in several capacities as a coolie, and has suffered from two attacks of fever ; the first occurred a year after his arrival from China, from which he recovered in three days ; the second attack lasted for eight days, and came on three years after his first arrival ; about six weeks ago he suffered from diarrhœa, which continued up to two days of his admission into hospital ; at about the same time he felt a weakness in his legs and feet, and inability to walk, even with assistance. He had no swelling in his feet, but about five days after this he began to feel numbness in his hands and legs, and four days after that his hands, loins, and legs, particularly in the calves, became painful. Simultaneously with the setting-in of the diarrhœa, epigastric symptoms also appeared, a fulness after food and a tightness about his chest, and these symptoms continued until his admission into hospital. His monthly pay was five dollars, subject to fluctuations depending on his work. He states that he never was in want of food, which was supplied by his employer. His meals, three in number, were as follows :—

6 a.m.	Rice, salt fish, fresh fish, vegetables	} Supplemented by pork on Sundays.
11 a.m.	Rice, vegetables, and salt fish	
6 p.m.	Same as at 6 a.m.	

State on Admission.—Patient is well developed, but has lost flesh ; he is able to sit up and turn in his bed, but with difficulty ; he is unable to walk, his hands and feet are slightly œdematous ; he has lost considerable power over his lower limbs and is unable to raise his legs in bed, the flexors are wasted and more or less powerless, upper extremities normal.

Paralytic Symptoms.—There is loss of sensation over the thighs and legs, but the soles of the feet are sensitive.

Upper Extremities normal.

Hyperæsthesia.—There is pain on pressure in the calves, muscles of thighs and arms, also in the epigastrium. *Tongue* is furred, but has no anæmia. *Gums* firm, hard, and healthy.

Progress of the Case.—*March 1st.* Patient complains of numbness and pain in his hands and legs, also of flatulence; *tongue* clean, *appetite* good, *bowels* regular, he could not sleep well last night owing to the pain in his legs. *9th.* Patient was attacked with dysentery last night, bowels moved ten times, passed blood only with tenesmus, tongue clean, he could not sleep well last night owing to the pain in his stomach. *11th.* Bowels moved only once last night, otherwise he is much the same. *12th.* Patient complains of difficulty in breathing, and of the pain and numbness in his hands, fingers, knee joints, calves of his legs, tibia and dorsum of the feet, and of flatulence, also of numbness and tightness in his chest; he feels thirsty, has pain in his throat and has lost his voice; he cannot move in bed at all; tongue is flabby, indented at the edges; bowels moved ten times, stools watery; he could not sleep well last night owing to the pain and numbness all over his body. *19th.* Pain and numbness in his hands and legs have increased, he feels great difficulty in breathing, his hands and legs are swollen, bowels moved only once during the last twenty-four hours—watery. *21st.* Patient evidently sinking, bowels moved five times. *5.30 p.m.* Patient very low, suffering from great shortness of breath, pulse imperceptible, complains of great pain and numbness, body much swollen. *12 p.m.* Died quietly.

Post Mortem.— $7\frac{1}{2}$ hours after death, rigor mortis present, body generally œdematous; there was congestion observed on either side of the dorsal vertebræ, corresponding congestion found within the canal; there was some serous effusion within the canal, and about 1 dr. of fluid within the dura mater and arachnoid; dura mater congested in patches; cord soft, especially about the centre; considerable venous congestion along the cord, especially at its lower extremity. *Head.*—There is some effusion of blood within the dura mater and arachnoid, 1 dr. of fluid within each lateral ventricle and also in the third ventricle. *Brain* substance soft, and there were some spots of effusion in its substance.

Chest.—6 oz. of fluid within the thorax, about 2 oz. of fluid in the pericardium; both sides of the heart filled with clots, *valves* normal, weight of heart eleven ounces.

Lungs highly congested.

Abdomen.—No fluid was in the abdominal cavity.

Liver slightly congested, gall bladder full, weight of liver, twenty-nine ounces.

Spleen congested and enlarged, ten ounces.

Kidneys.—Left, congested, six ounces, capsule adherent; right, slightly congested, capsule adherent, weight five-and-a-half ounces.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1889.								
Feb. 19		88		17		98.8		56 N
20	84	88	17	17	98.4	98.8	1 N	50 N
21	84	88	17	17	99.8	99.8	1 N	58 N
22	80	88	17	17	98.4	98.8	1 N	40 N
23	80	88	19	17	98.4	98.8	3 N	50 N
24	100	104	17	19	99.4	99.8	2 N	48 N
25	88	92	17	19	98.6	99.2	2 W	50 N
26	84	88	17	17	98.4	99.8	5 W	48 N
27	80	84	17	17	98	98.4		48 N
28	84	88	17	17	98.4	98.8	4 W	50 N
Mar. 1	84	88	17	17	98.4	98.8	1 N	42 N
2	84	84	17	17	98.2	98.4	1 N	48 N
3	84	90	17	17	98.4	98.8	2 N	46 N
4	78	84	17	17	98.2	98.4	2 N	42 N
5	84	80	17	17	98.8	99	2 N	40 N
6	90	84	17	17	99	99.2	2 N	42 N
7	84	80	17	17	98.8	99	2 N	40 N
8	96	96	17	17	99	99.4	3 D	42 N
9	96	84	17	17	99.6	99.2	1 D	40 N
10	90	84	17	17	98.8	99.2	1 D	42 N
11	96	90	17	17	99	99.8	10 D	40 N
12	100	96	17	17	99.6	99.8	10 W	43 N
13	90	80	17	17	99.4	99.6	15 W	40 N
14	96	96	17	17	99	99.2	15 W	42 N
15	90	84	17	17	98.8	99	7 W	40 N
16	96	90	17	17	99	99.2	7 W	46 N
17	80	84	17	17	99	99.2	2 H	47 N
18	78	80	17	17	99.2	99.6	1 H	46 N
19	96	84	17	17	99.8	99.4	2 W	42 N
20	90	80	17	17	99	99.8	5 W	40 N
21	96	80	17	24	99.4	96.4		

CASE NO. 11.

CHEE AH CHUAN (MALE), age 35, Gambier Coolie. Taken ill at Batu Pahat; Duration of Disease, 1½ months. Admitted 16th December, 1884; Died 16th January, 1885.

		1st week Jan., 1885.	2nd week Jan., 1885.	4th week Dec., 1884.
Urine	Reaction - -	Acid	Acid	Acid
	Sp. Gravity -	1014	1012	1018
	Albumen - -	0	Trace	0
	Chlorides - -	Excess	Excess	Excess
	Phosphates -	Trace	Trace	Trace

History of Present Illness.—Patient states that he worked as a coolie on a gambier plantation in Batu Pahat (Johore) for four months. About six weeks ago he carried loads of gambier on board a ship, after which, feeling tired and hot, he took a cold bath to refresh himself. After the bath he had a shivering fit; went to bed without his supper. The next morning, on attempting to get out of bed, he observed that he could neither stand nor walk. He also felt slight numbness in his feet and hands. He had no swelling anywhere. His friends advised him to take some monkey soup and arrack (a native toddy), which he did four times, and finding no relief sought admission here. He was in receipt of five dollars a month, all found. His meals were as follows:—

- 6 a.m. Congee and salt fish.
- 9 a.m. Rice, salt fish, and fresh vegetables.
- 12 noon. Congee and salt fish.
- 7 p.m. Rice, salt fish, and vegetables.

He spent his wages partly in remittances to his relations in China, and the rest in clothing, gambling, and cakes.

Previous History.—He left China nine years ago and came to Singapore, where he worked in Tanjong Pagar as a coalheaver up to the day he left for Johore, four months ago. During the eight odd years that he was in Tanjong Pagar he on two or three occasions suffered from headache and slight fever, but was never seriously indisposed. In China he only recollects being ill once; that was from an attack of small-pox when he was ten years old.

State on Admission.—He is a spare-built man. He is able to lie on any side, but cannot lie longer than five minutes on his back, as it gets painful. He also feels pain if he sits up long.—*Face* normal, complexion sallow, expression sad. Eyes, nose, lips, mouth, and teeth normal. Gums slightly swollen, receding—ulcerated edges. Tongue clean, but looks rather redder than normal along the edges.

and tip. Fauces slightly inflamed. Face looks a little puffy. There is no œdema anywhere else.

Paralytic Symptoms.—The lower extremities numb all over, especially over the dorsum of the feet. Hands slightly numb, arms up to elbow joint numb, more so along the inner side. Hands and feet feel cold. There is loss of power in his hand and legs. There is pain in the calves of his legs and between radius and ulna in front aspect of arm when pressed. No spasms. He is not able to stand or walk without assistance. When supported on either side he moves with the greatest difficulty, almost dragging his legs after him. Pulse 80, respiration 15, temperature 98·4.

Progress of the Case.—December 28th : complains of no pain anywhere, but only of weakness in his legs. There is pain in the calves of legs when pressed. *Tongue* has a thin white fur over it. His appetite is good, he does not feel thirsty, sleeps well. January 1st, 1885 : Patient complains of feeling hot, tongue thick white fur and red edges ; did not sleep well last night owing to his feverish state, no thirst. 2nd : Fever is less, no thirst, no pain or numbness anywhere. 3rd : Still slight fever ; complains of feeling hot. 5th : Complains of difficulty in defecation on account of loss of expulsive power. He has more power to-day in his right leg than in the left, which he has been able to raise from the bed unassisted. 12th : Patient experienced difficulty in breathing last night, otherwise the same. 14th. The fever still continues, tongue covered with thick whitish fur in the centre and red on the edges ; still difficulty in breathing. 15th : Patient very weak, tongue the same, edges red and dry. Pulse 148, skin cold, complains of thirst, no sleep last night on account of difficulty in breathing, but has no pain anywhere. 16th : He is very low, temperature 100·8, difficulty in breathing continues, skin cold, pulse 168, almost imperceptible, feels inclined to vomit, complains of great thirst, 6.30 p.m. died.

Post Mortem twelve hours after death, body emaciated, rigor mortis absent ; over the spinal column in the lumbar region some congestion was observed, no congestion elsewhere. On opening the spinal column congestion was observed within the canal in the lumbar region. Dura mater distended with fluid. Dura mater removed easily up to lumbar region where it was more less adherent to the bodies of lumbar vertebræ all the way down. On the internal surface of the canal (over the bodies of vertebræ) there were congested spots everywhere along the whole length. Four drachms of fluid within the dura mater of cord, congested in patches. *Skull.*—

Veins distended. *Brain* apparently healthy. *Abdomen*.—Yellow flocculent lymph on peritoneum and omentum; great omentum congested; two ounces of yellow turbid fluid in the abdominal cavity. Right lung, old pleuritic adhesions, about one and a half-ounce of fluid in both cavities; lungs healthy. *Heart*.—pericardium contained two drachms of fluid, weight 11 ounces; heart healthy. *Left ventricles* contracted, right flaccid. *Liver* 3lb. 8ozs., slightly nutmeggy. *Kidneys* congested, right 5ozs., left 5½ozs. *Spleen* 10 ozs.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 18	76	80	17	18	98·	98·6	3 N	36 N
19	96	86	18	18	98·	99·	2 N	44 N
20	82	86	17	19	98·8	99·2	1 N	38 N
21	80	84	17	19	98·4	98·8	1 H	42 P
22	78	80	15	17	98·2	98·4	1 N	62 P
23	78	80	15	17	98·4	98·6	1 N	50 P
24	78	78	15	17	98·4	98·6	2 N	50 N
25	78	82	15	17	98·4	98·6	1 N	50 N
26	78	82	15	17	98·6	98·8	1 N	48 N
27	88	96	17	19	98·6	98·8	2 N	50 N
28	78	84	15	17	98·6	98·8	2 N	50 N
29	78	96	15	17	98·6	99·2	2 N	38 N
30	96	116	18	19	110·8	101·6	2 N	38 N
31	98	120	18	19	103·	103·6	1 N	38 N
1885.								
Jan. 1	104	120	19	21	102·6	103·4	2 N	38 N
2	94	114	19	21	100·8	102·4	1 N	44 N
3	94	94	19	19	101·8	101·1	1 N	28 H.C
4	94	94	19	19	101·2	101·4	1 N	32 H.C
5	98	100	19	21	101·6	102·4	1 H	28 H.C
6	88	94	18	18	101·8	102·4	1 N	32 H.C
7	88	88	17	18	101·8	101·8	2 N	30 H.C
8	88	88	19	19	100·2	100·6	1 N	28 H.C
9	84	88	19	19	99·4	100·6	1 N	38 H.C
10	88	94	19	19	100·2	100·6	1 N	38 H.C
11	88	90	19	19	101·4	101·6	2 N	32 H.C
12	88	104	19	21	101·4	101·8	2 N	38 H.C
13	88	124	19	23	98·2	104·2	1 H	28 H.C
14	124	128	21	23	99·6	98·4	1 H	28 H.C
15	148	150	27	27	100·6	100·6	1 H	28 H.C
16	168		29		100·8			

CASE NO. 12.

LIM AH LOCK (MALE), age 22, *Gambier Coolie*. Taken ill at *Johore*. Duration of disease 1 month. Admitted December 24th, 1884. Died January 19th, 1885.

	1st week Jan., 1885	2nd week Jan., 1885	4th week Dec., 1884
Urine {	Reaction - -	Acid	Acid
	Sp. Gravity -	1014	1012
	Albumen -	o	o
	Chlorides -	Normal	Normal
	Phosphates -	Trace	Trace

History of Present Illness.—Patient states that he arrived from China six months ago and remained for three months in Singapore as a fruit seller. He lost some money here which induced him—three months ago—to go to Batu Pahat (Johore). He worked in a gambier plantation as a coolie clearing “Lallang” grass for two months. A month ago he had to stop work on account of an attack of intermittent fever and a feeling of numbness and weakness in his loins. A week after the first attack of fever, finding that he was not improving, he started for Singapore in a launch. There was a heavy squall during the passage, and he was exposed on deck during the night. He had no blanket, and the cold he experienced after midnight was unbearable, preventing sleep. Towards daylight he felt an uneasy full sensation in his epigastrium. On landing in Singapore he found that his legs were so weak that his friends there would not receive him into their house, fearing that he would die, so he was obliged to live in the five feet pathway, and with the little money he had with him, buy such articles of food as were brought round for sale. He remained twenty days thus, sleeping on the cold flagstones of the passage of the shops in Boat Quay. Eight days ago he found that he was unable to walk or even stand, and, having no further means of livelihood, he begged the shopkeepers to send him to hospital. He did not take any Chinese medicine all this time. He was in receipt of three dollars a month wages—all found. He considers that he was well fed, he had four meals daily as follows:—

- 6.0 a.m. Rice, salt fish and pickle, and fresh vegetables.
 - 8.0 a.m. Congee and pickle.
 - 12.0 noon. Congee, salt fish, fresh vegetables.
 - 4.30 p.m. Rice, salt fish, fresh vegetables.
- (Pork four times a week, during one meal only; no fresh fish ,

After returning to Singapore he had to live on what he purchased from the travelling cooks and was therefore ill-fed.

State on Admission.—Patient is a spare-built man ; he lies on his side with his legs drawn up ; he says that when he stretches his legs he finds that the flexors of his legs are short and painful, he is unable to lie on his back on account of his having to keep his legs drawn, and gets pain in his epigastrium if he attempts to do so ; his back is weak, and there is a feeling of numbness there—no pain ; there is a slight feeling of numbness in his feet and legs up to his knee joint, no numbness in his hands, numbness in his epigastrium and back ; pain is felt on pressure on the dorsum of his feet, and calves of his legs, also in the anterior aspect of his arms, between the ulna and radius. He states that his hands and feet are weak, especially the wrist and ankle joints. He is unable to stand or walk, he has double wrist-drop, he cannot extend his fingers fully, but is able to close them. There is neither oedema nor anæmia present. Expression of face sad. *Gums* slightly spongy and bleed slightly on pressure. *Tongue* covered with brownish-white fur in patches, interspersed with red patches, edges red with prominent papilæ. *Fauces* inflamed.

Progress of the Case.—*December 30th.* Patient complains of tightness in his chest and difficulty in breathing, did not sleep well last night, pain in his back, the weakness and numbness are about the same ; *tongue* covered with a thick white fur, feels great thirst ; he is in a very low condition, *voice* hoarse. *31st.* Complains of pain in his back, had an attack of fever since yesterday evening, legs feel very weak, *tongue* less furred—moist, no pain. *January 1st, 1885.* Did not sleep well last night owing to difficulty of breathing, feels hot, temperature very low—97·6. *2nd.* He states that he feels a little easier this morning, pain and numbness in his legs and arms are about the same, chest tight and numb, has pain in his back, *tongue* furred and moist, very little sleep last night owing to pains in his legs. *3rd.* Complains of tightness and pains in his chest and difficulty in breathing, is feverish—100·8, legs cannot be straightened, he feels great thirst. *4th.* Great difficulty in breathing, had a feverish attack yesterday afternoon at three o'clock, temperature this morning 98, no pain anywhere, only a weakness and numbness in his hands and legs, *tongue* covered with a thick white fur and patches, red edges, no thirst. *5th.* Complains of tightness and hardness at the end of the sternum and epigastrium, and difficulty in breathing, which prevents him from sleeping ; complains of weakness.

and numbness in his hands, legs, and in the back—over the lumbar region; temperature normal, but he feels very hot; tongue cleaner, thin white filmy patches and red edges. 7th. Still feels tightness at the end of the sternum, difficulty in breathing continues, feels numbness from his hips to the tip of his toes, pain and numbness in his back, and numbness in his arms from his shoulders to his fingers. 8th. A little easier, less difficulty in breathing, slept well last night, still complains of tightness at the end of the sternum—feels hot, tongue clean; the rest, no change. 10th. Diarrhœa has set in, passed five watery stools, otherwise the same. 12th. No improvement, diarrhœa worse—ten stools, difficulty in breathing has returned with a feeling of tightness at the end of the sternum, feels very hot, temperature normal. 11 a.m., same day. Patient is very weak, moans, and complains of trouble in the pit of his stomach after taking an egg-flip. He is very weak, pulse 126, compressible, and thready. 13th. Patient is very low, tongue dry and complains of more tightness in his chest—no sleep in consequence, feels hot and has pain in his back over the lumbar regions, difficulty in breathing continues. 14th. Skin very hot, temperature 98. 15th to 18th. Same symptoms, very aggravated. 19th. Patient in a hopeless condition, he is very emaciated, tongue dry and black, teeth covered with sordes, had an attack of fever last night at six o'clock, diarrhœa still continues, cannot sleep at all; died quietly at 6.30 p.m.

Post Mortem ten hours after death; extremely emaciated, no œdema anywhere, rigor mortis present, decomposition commenced in the abdomen.

Back.—Congestion over the spinous processes of the five lower lumbar vertebrae, no congestion elsewhere, no effusion of serum; within the canal of the sacrum and over the terminal end of the cauda equina there is much congestion and blood passing into pus observed. On removing the cord there is some congestion over the bodies of the lumbar vertebræ, and within the sacral canal is to be observed 2 dr. of fluid within the dura mater; the cord is soft.

Head.—No congestion visible over the surface of the dura mater. *Brain* very much congested on the surface of the cerebrum and cerebellum, substance firm, no fluid in the lateral ventricles.

Thorax.—No fluid.

Heart.—Weight, 6½ ounces; 8 ounces of fluid within the pericardium; left side of the heart empty, right side full of clots, and two polypi; tricuspid valves at the base slightly thickened.

Lungs normal.

Abdomen.—No fluid in the abdominal cavity.

Liver.—2 lb. 14 ozs., slightly congested, gall bladder three-fourths full.

Spleen weighs 4 ounces.

Kidneys.—Right 4½ ounces, left 4 ounces, neither congested.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 26		96		20		98·8		
27	108	112	19	21	98·8	99·4	0	42 N
28	104	106	18	20	98·6	99·2	1 N	38 N
29	88	96	18	20	98·2	99·6	0	40 N
30	104	120	18	20	100·2	100·8	0	42 N
31	116	120	18	21	103·2	103·8	4 W	40 H.C
1885.								
Jan. 1	108	108	19	21	98·6	98·2	3 H	38 H.C
2	108	120	19	21	98·2	98·6	2 N	32 H.C
3	108	124	19	21	100·8	101·2	2 N	28 H.C
4	108	114	19	20	98·0	99·6	1 N	34 H.C
5	116	116	20	21	98·4	99·2	1 N	38 N
6	116	122	20	21	98·4	99·6	0	32 H.C
7	112	124	21	21	98·0	99·8	1 N	38 H.C
8	108	120	21	21	97·8	99·4	1 N	48 N
9	104	108	21	21	98·4	98·8	5 W	42 N
10	104	112	21	21	97·6	99·2	7 W	42 N
11	96	108	21	21	97·4	98·6	10 W	38 N
12	108	108	21	21	98·4	98·8	8 W	36 N
13	132	136	20	23	98·4	99·4	7 W	42 N
14	104	144	20	23	98·0	99·8	8 W	38 H.C
15	116	124	21	23	98·4	99·8	7 W	28 H.C
16	116	128	21	23	98·8	99·8	7 W	28 H.C
17	124	128	18	23	99·4	99·8	7 W	38 H.C
18	124	144	19	25	99·6	100·8	6 W	20 H.C
19	124	132	19	23	99·4	100·6		

CASE NO. 13.

HENG KONG HEE (MALE), age 28, Coolie. Taken ill at Singapore. Duration of disease 25 days. Admitted January 3rd, 1885. Died March 20th, 1885.

	1st week	2nd week	3rd week	4th week
Urine { Reaction -	Acid	Acid	Acid	Acid
Sp. Gravity-	1008	1010	1012	1010
Albumen -	o	o	o	o
Chlorides -	Normal	Normal	Normal	Normal
Phosphates -	o	Trace	Trace	Trace

History of Present Illness.—Patient states that he came from China four months ago and got employed at the municipal stores as a coolie. He moved broken granite from the sides of the crushing machine. He worked here until twenty days ago, when he had to stop work. The first symptoms of his disease, that he observed, was a feeling of numbness and stiffness in the calves of his legs twenty-five days ago. He continued his work, but experienced some difficulty in walking and getting up steps. A week or ten days after he had to give up work as his legs got very weak, and the numbness increased, and he was unable to walk without assistance. He also now experienced twitchings and contraction in the tendons at the back of his legs; whenever he attempts to walk the tendons pull him backwards and his body is thrown forward. Eight days ago a numbness and weakness appeared in his hands also. Fifteen days ago he observed a little œdema on the dorsum of his feet and front of his legs, but it disappeared three or four days afterwards. He was in receipt of six and a-half dollars a month. Of this he spent one dollar sixty cents on food, out of the remainder he sent half to China and the other half he spent in clothing. His work was always on damp ground. He had two meals daily as follows:—

12 noon. Rice, fresh vegetable, salt fish, or fresh fish.

5.30 p.m. " " "

(Pork four times a month during one meal.)

Condition on Admission.—Patient is a small built man, 5ft. 4in. He is able to lie on any side, but cannot keep his legs stretched out on account of the twitching of the tendons in the back of his calves. When lying on his back he is unable to rest the back of his legs on the bed because his calves then get very painful.

Hyperæsthesia.—There is pain on pressure in the muscles of his arms up to the elbow-joint, especially between the ulna and radius.

No pain in his hands. There is pain on pressure on the dorsum of the feet, tendo Achillis, calves of the legs and slightly in the muscles of his thighs.

Anæsthesia.—There is numbness at the tips of his fingers to the elbow-joint, and from the tips of his toes to the hip-joint; also over the region of the bladder, penis, and scrotum. There is no pain or numbness in his loins. Patient is unable to stand or walk without assistance. He is able to lift his legs off the cot when lying on it, but he cannot flex his feet. There is apparent loss of power in his feet and hands, he is unable to extend his hands fully; he is suffering from wrist-drop, but he is able to hold his cup and use his chopsticks. There is a slight feeling of numbness in the epigastrium. The tendo Achillis is contracted, the heel is drawn backwards. Patient is sallow, but there is no anæmia; there is no œdema anywhere. Gums slightly spongy and bleed freely on pressure, and are slightly retracted. Tongue covered with white film in the centre with red edges. On protruding the tongue, a peculiarity is observed; the raphé seems to pull the tongue inwards and downwards, showing the broad tip with a deep fissure in the centre. Breath foul; fauces slightly inflamed; pulse 84; respiration 17; temperature 98·4.

Progress of the Case.—Jan. 12th. Patient complains of numbness in the backs of his fingers to the elbow-joint, and from the tips of the toes to the hip-joint, with pain and numbness in his loins. Feels pain on pressure in his arms, especially between the two bones of the fore-arm. Has pain on the dorsum of the feet and calves of his legs. He is not able to stand or walk without assistance. Tongue covered with a whitish fur, red edges. Sleeps well; does not feel thirsty; feet cold. Had a feverish attack yesterday evening at 6 o'clock, 15th. Patient complains of stiffness, pain, and spasms in his calves especially at night. Feels tightness in his abdomen. He has numbness and weakness in his arms, from his elbow-joint to the tips of his fingers. Tongue covered with a thick white fur, red edges. Slept well last night; appetite good; does not feel thirsty. 25th. Still complains of tightness in the calves, arms and hands. Feels numbness and weakness and hot at night, could not sleep. Tongue, thick yellow fur in the centre, edges red; appetite good. 29th. Patient improving, able to walk with crutches; feels weak only in his legs. Feb. 1st. Patient feels less pain in the calves of his legs. He does not feel them weak, only numb. Tongue covered with a thin white fur in the centre. Slept well last night; does not feel hot at night now. Appetite good. 4th. Much improved. 6th. Pain and

numbness less, otherwise the same. 13th, Still improving, but he feels much pain in his calves when he walks. 14th. Able to walk without crutches; pain in his calves about the same. Feels no numbness anywhere. * March 2nd. Does not complain of anything, able to walk faster. Patient died on March 20th, 1885, intervening notes have been mislaid.

Post Mortem was made $1\frac{1}{4}$ hours after death. Rigor mortis present. Body well nourished; there is slight general œdema. On dissecting the back to expose the spinal column, great congestion was observed on either side of the spinous processes, and arches of the lumbar and three lower dorsal vertebræ. Corresponding congestion also observed within the canal; spinal cord firm. No congestion in dura mater spinalis. No appreciable increase of fluid between dura mater and arachnoid. Venous congestion of the cord, especially at its lower end.

Head.—On opening the skull a quantity of blood came away from between dura mater and skull. There is extensive congestion, with effusion of blood, on the cerebrum between dura mater and arachnoid.

Brain, substance firm. Nearly 1 dr. of fluid within each lateral ventricle, and bloody effusion into the 4th ventricle.

Chest.—8 oz. fluid in the thorax, 1 oz. 5 dr. fluid within the pericardium.

Heart fatty. Right side of heart empty. Left side filled with clots. Valves healthy, weight 13 ozs.

Lungs.—Both lungs highly congested.

Abdomen.—6 oz. of fluid in the abdominal cavity.

Liver firm, healthy, gall bladder partially full. Weight of liver, 1lb. 15oz.

Kidneys healthy, weight 4 ounces each.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 1	88	92	17	17	98.4	98.8	1 N	40 N
2	84	90	17	17	98	98.6	1 N	46 N
3	82	94	17	18	98.4	98.8	1 N	38 N
4	88	102	17	21	97.6	99.2	1 N	46 N
5	88	94	17	19	97.8	98.4	1 N	42 N
6	84	92	17	19	98.4	98.8	1 N	38 N
7	80	86	17	19	98	98.4	1 N	36 N
8	80	94	17	19	98.2	99.2	1 N	42 N
9	88	98	17	19	98.4	99.2	1 N	38 N
10	96	98	18	19	99.2	99.6	1 N	38 N
11	84	92	17	19	98.4	99.2	1 N	42 N
12	84	94	17	19	98.6	99.4	3 N	36 N
13	88	94	18	21	97.6	99.4	3 N	38 N
14	84	92	18	21	97.4	99.2	1 H	40 N
15	80	90	17	21	97.6	98.8	1 H	50 N
16	72	78	17	17	98	98.4	1 H	50 N
17	68	84	17	17	98.4	98.8	1 H	52 N
18	72	84	17	17	98.4	98.8	2 N	46 N
19	80	96	17	19	98.6	99.2	3 N	42 N
20	88	92	17	19	98.8	99.2	1 N	50 N
21	84	88	17	17	98.4	98.8	3 N	56 N
22	80	88	17	17	98.2	98.8	2 N	52 N
23	80	88	17	17	98.2	98.8	2 N	56 N
24	84	100	17	19	98.4	99.4	3 N	52 N
25	80	88	17	17	98.4	98.8	2 N	58 N
26	72	92	17	18	97.4	98.8	1 H	56 N
27	96	96	18	18	98.4	98.8	1 H	58 N
28	96	96	18	18	98.4	98.8	2 N	62 N
29	88	96	17	18	98.4	98.8	2 N	68 N
30	88	96	17	18	98.4	98.8	2 N	62 N
31	84	92	17	18	97.8	98.4	2 N	68 N
Feb. 1	84	88	17	17	97.8	98.4	1 N	68 N
2	82	88	17	17	98.4	98.6	2 N	64 N
3	80	88	17	17	97.8	98.4	2 N	62 N
4	84	88	17	17	98	98.4	2 N	62 N
5	84	88	17	17	98	98.4	2 N	76 N
6	84	88	17	17	98	98.4	2 N	64 N
7	84	88	17	17	97.4	98.2	2 N	68 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 8.	84	88	17	17	98	98.4	2 N	74 N
9	84	88	17	17	98.2	98.8	2 N	64 N
10	76	82	17	17	97.6	98.4	1 N	70 N
11	76	82	17	17	97.8	99.4	1 N	74 N
12	80	88	17	17	98	98.6	1 N	64 N
13	88	92	17	19	98.4	98.8	2 N	68 N
14	96	100	19	19	98.8	99.6	2 N	70 N
15	98	96	17	18			2 N	68 N
16	92	96	19	19	98.2	98.8	1 N	60 N
17	104	100	19	19	98.4	98.4	1 N	68 N
18	88	92	17	18	98	98.6	1 N	64 N
19	100	102	19	19	98.2	98.6	1 N	60 N
20	96	100	19	19	98.4	98.4	1 N	60 N
21	88	82	19	19	98.8	99.2	1 N	60 N
22	84	88	17	17	98.4	98.8	1 N	68 N
23	84	88	17	17	98.4	98.8	1 N	64 N
24	80	84	17	17	98.4	98.6	1 N	54 N
25	80	84	17	17	98.4	98.6	1 N	50 N
26	80	84	17	17	98.4	98.8	1 N	50 N
27	80	84	17	17	98.4	98.6	1 N	56 N
28	84	88	17	17	98.4	98.8	1 N	50 N

CASE NO. 14.

TAN AH CHAY (MALE), age 40, *Coolie (on board)*. Taken ill at Singapore; Duration of Disease, 4½ months. Admitted 21st February, 1885; Died 17th March, 1885.

Urine	{	Reaction -	4th week.
		Sp. Gravity	Acid
		Albumen -	1006
		Chlorides	o
		Phosphates-	Normal
			o

History of Present Illness.—Patient has been ten years in Singapore, during which time he worked on board ship and kept good health, the present being his first attack of illness. On

awaking one morning he found that his feet were cold and numb, four days after which he noticed the same sensations in his hands, these symptoms increased steadily, until six days from their first appearance he found that he was unable to walk; he recovered the use of his legs and feet twelve days afterwards; a month after this he had a relapse, being unable to walk, and four days after he lost the use of his hands; these symptoms continued to grow worse daily until his admission. His pay was twelve dollars a month; has never been in want, and always felt well; he never suffered from any symptoms in the epigastrium. His meals were three in number, as follows:—

- 9 a.m. *Varied diet*, rice, pork, vegetables, fish, salt fish.
 1 p.m. Congee, salt, vegetables.
 6 p.m. As at 9 a.m.

State on Admission.—Patient is well developed, he has lost flesh lately, he is able to sit up and turn in his bed, muscles of the calves are wasted, he is able to draw up his legs, but is unable to extend them. The extensor muscles of both upper and lower extremities seem to be the ones most affected; he is unable to extend his arms, but is able to bend them; he cannot use his wrist (wrist-drop), and is unable to flex his fingers.

Numbness.—He feels numbness from the toes up to the knee-joint, the upper lip is also numb, upper extremities numb from hands up to shoulders.

Hyperæsthesia.—He has pain on pressure in his hands and legs, arms and forearms, and the calves are particularly painful; there is no anæmia; gums swollen and bleed on pressure; tongue furred in the centre, clean at the edges; face puffy, no œdema in other parts.

Progress of the Case.—*March 1st.* Patient complains of feeling numb all over his body, especially in the legs and arms; hyperæsthesia the same; pain in epigastrium and back, over lumbar region; has an attack of dysentery, is not able to walk or stand, tongue is furred, appetite good, cannot sleep owing to the pain in his back, no thirst. *9th.* More pain and numbness in the legs and arms, and complains of pain in the epigastrium, dysentery about the same, tongue covered with thin yellow fur, sleeps well, complains of thirst. *12th.* Still complains of pain and numbness in his legs and arms, dysentery increasing, thirteen stools, feels very weak. *14th.* Dysenteric symptoms increasing, fifteen stools, pain and numbness about the same, tongue is clean. *16th.* Weakness increasing, diarrhœa

about the same, complains of numbness all over his body, otherwise the same. 17th. Patient very low and weak, hardly able to speak, diarrhoea worse, temperature 96. Died 11 a.m.

Post Mortem 1½ hours after death, rigor mortis present, body anæmic and dropsical, there is congestion over the lumbar region, with dropsical effusion external to the spine, corresponding congestion within the canal, 1 dr. of fluid within the dura mater, spinal cord firm, slightly congested in patches, corresponding to those on the dura mater.

Head.—Dura mater slightly congested, there is venous congestion on the surface of the brain. *Brain* substance firm; about half a drachm of fluid in each lateral ventricle.

Heart.—Small quantity of fluid found within the pericardium, bicuspid valves slightly thickened, weight of heart—eight ounces.

Lungs both congested, with tubercular deposits scattered throughout them; left lung adherent to the chest walls posteriorly.

Liver twenty-eight ounces, slightly congested.

Spleen six ounces, slightly congested.

Kidneys four ounces each, both congested.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 23							5 W	46 N
24	92	96	19	19	98.6	98.8	6 W	46 N
25	88	92	17	19	98.2	98.8	5 W	48 N
26	88	94	17	19	98.2	98.8	2 W	50 N
27	84	80	17	19	98.2	98.6	2 W	50 N
28	90	96	17	19	98.4	99	2 W	50 N
Mar. 1	90	80	18	17	98.6	99	9	44 N
2	84	96	17	17	98.8	99	2	46 N
3	80	86	17	17	99	99.6	1	50 N
4	92	96	17	19	98.4	98.8	2	46 N
5	88	92	17	19	98.4	98.8	2	49 N
6	92	96	17	19	98.6	98.8	3	44 N
7	84	88	17	17	98.4	98.8	3	48 N
8	88	89	17	17	98.2	98.8	2	50 N
9	84	86	17	17	98	98.4	5	46 N
10	80	84	17	17	98.2	98.6	2	49 N
11	84	88	17	17	98.4	98.4	2	52 N
12	84	88	17	17	98.4	98.8	22	50 N
13	84	88	17	17	98	98.4	15	44 N
14	84	88	17	17	98.4	98.6	10 W	46 N
15	80	84	17	17	98	98.4	6 W	49 N
16	84	84	17	17	98.4	98.8	4 W	50 N
17	96	84	19	17	98.6			

CASE No. 15.

ONG AH BOW (MALE), age 26, Coolie. Taken ill at Johore; Duration of Disease, 3 days. Admitted 26th July, 1884; Died 16th December, 1884.

		1st week.	2nd week.
Urine	Reaction -	Acid	Acid
	Sp. Gravity	1010	1008
	Albumen -	o	o
	Chlorides -	Trace	Trace
	Phosphates-	o	o

(This case is narrated more for the object of showing the post mortem appearances than for the full detailed history of symptoms and complaints.)

Condition on Admission.—(The following few short notes were

taken on admission.) Has no dropsy now. Hands and feet numb. Extensors paralysed. Pain in the calves on pressure; unable to walk. Suffered previously from intermittent fever in Johore. No albumen in the urine.

Progress of the Case.—*November 17th.* Hands and feet œdematous. *20th.* Diarrhœa has set in. *December 5th.* Diarrhœa continues: patient complains of pain in his back over the sacrum—especially when he lies down; swelling of the legs is decreasing; no pain in the stomach. *7th.* Diarrhœa the same; no pain in the stomach; had a feverish attack at four o'clock last night. *10th.* Diarrhœa about the same; vomiting set in; complains of great pain in the sacrum, otherwise the same. *13th.* Vomiting continues, other symptoms the same. *14th.* Patient complains of pain in his chest, abdomen, hands, and feet, and with headache; could not sleep well last night on account of his feverish state; he felt hot from yesterday evening, until about twelve o'clock. *15th.* Patient feels more unwell; diarrhœa about the same; cannot sleep on account of the pain in his back, and headache, and has more pain in his hands and feet; feels inclined to vomit. *16th.* Patient gradually sank and died at 10 a.m.

Post Mortem 4½ hours after death. Body anæmic; hands semi-flexed; feet in extended position, some œdema on the feet and legs.

Head.—A little fluid escaped on opening the dura mater; pia-mater roughened from lymph, over the surface of the cerebrum; about half a drachm of fluid in the lateral ventricles; veins on the surface half full of fluid blood; gastrocnemii very pale; glutei less so.

Spinal Canal.—Interior, opposite the first and second lumbar vertebræ, highly congested and in spots ecchymosed; the dura mater opposite this is congested. On removing the cord the dura mater, opposite the lumbar vertebra, is adherent to the bodies, where it has to be cut off to be removed. The vertebral canal at this spot is much congested, and between the bodies of the vertebræ it is ecchymosed. There are about three drachms of fluid in the dura mater. Pia mater congested, vessels very distinct.

Thorax contained no fluid. Pericardium contained four ounces of fluid.

Heart weighed ten ounces; right side filled with clots, left side empty; valves healthy.

Lungs pale, otherwise normal.

Liver pale, weight 3 lb. 7 oz. Gall bladder full.

Spleen enlarged, congested, weight 14 ozs.

Kidneys.—Right, 5 ozs.; left, 6 ozs.; both congested.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	98	96			99.2	102.4		
2	96	116			99.0	102.2		
3	96	100			99.8	102.0		
4	88	112			98.4	103.6		
5	96	108			99.4	103.6		
6	92	88			98.2	99.6		
7	64	68			97.6	97.8		
8	68	84			98.0	101.4		
9	80	88			98.0	99.8		
10	88	92			97.6	99.6		
11	80	116			97.6	105.6		
12	88	92			100.0	100.2		
13	80	84			98.0	99.2		
14	60	88			96.8	99.6		
15	60	88			97.2	97.6		
16	60	84			96.6	98.6		
17	68	88			97.0	99.0		
18	64	88			97.0	99.2		
19	68	96			97.6	100.6		
20	72	100			98.4	101.2		
21	96	104			100.6	102.0		
22	92	96			98.8	99.8		
23	72	88			99.0	99.2		
24	84	88			97.4	99.2		
25	68	92			97.6	99.6		
26	64	88			97.4	100.0		
27	68	84			97.4	102.8		
28	64	88			97.4	99.0		
29	92	88			98.8	100.0		
30	80	92			97.2	100.2		
Dec. 1	88	88	20	20	96.6	98.6	10	24
2	80	92	20	24	98.0	101.2	6	32
3	96	96	24	24	100.0	99.4	8	28
4	88	104	22	24	98.8	101.0	23 W	23 H
5	92	100	24	24	98.4	98.4	18 W	34 H.C
6	92	108	24	24	98.4	99.2	20 W	40 H.C
7	96	92	24	24	98.0	99.0	30 W	40 H.C
8	96	99	24	24	98.4	99.2	10 W	36 H.C
9	96	84	24	20	98.4	99.6	10 W	40 H.C
10	94	96	18	18	98.0	98.6	10 W	34 H.C
11	98	116	19	22	98.2	99.8	10 W	28 H.C
12	100	102	15	19	99.6	101.2	10 W	32 H.C
13	104	106	18	21	99.0	101.4	10 W	38 H.C
14	104	104	20	21	100.2	102.2	18 W	30 H.C
15	100	102	18	20	99.0	99.8	10 W	30 H.C
16	116		19		98.0			

CASE NO. 16.

TAN AH SENG (MALE), age 32, Tailor. Taken ill at *Campong Glam, Singapore*; Duration of disease three months. Admitted October 2nd, 1884; Died December 12th, 1884.

Urine	Reaction -	1st week.	2nd week.
		Acid	Acid
	Sp. Gravity-	1012	1014
	Albumen -	o	o
	Chlorides -	Normal	Normal
	Phosphates-	o	o

(This case is also related to show more the pathological conditions found than to give a detailed account of the case.)

State on Admission.—No dropsy. Hands and feet numb; extensors paralysed; pain in the calves on pressure. Not able to walk.

Progress of the Case.—*Dec. 5th.* Patient complains of numbness all over his body, he cannot use his legs and cannot sleep at night. Bowels moved three times, watery. *6th.* Patient complains of pain in the knee-joints when he stretches his legs. Has a griping pain in his abdomen when going to stool. Feels a pain and sense of constriction in his chest which prevents him from sleeping. *8th.* Complains of numbness in his chest, hands and legs; dysenteric symptoms continue. *9th.* Complains of numbness in his chest, hands, and legs, and tightness in his chest. Dysenteric symptoms the same. He feels thirsty; tongue clean. *10th.* Patient complains of feeling feverish at night. *11th.* Symptoms much the same. Temperature taken last night at 9 p.m. 102; pulse 124; respiration 38. *12th.* Complains much of tightness in the chest, in his hands, and legs. Bowels not moved during the last twenty-four hours. Unable to sleep from the tight feeling in his chest. Temperature taken at 9 p.m., 102.4; pulse 128; respiration 36. The same evening difficulty in breathing suddenly increased. Patient would not take any nourishment. Would answer no questions. He gradually became weaker and died at 3.30 p.m. without any struggle.

Post Mortem taken fifteen hours after death. Face calm, rigor mortis well developed. Hypostasis of the back, lividity of the feet and legs, below the knee, none in the hands. On cutting into the erector spinæ muscles they were found to be sodden with watery serous fluid which was easily sopped up with a sponge.

Spinal Canal.—There was extravasation of blood, the size of a

sixpence opposite each of the spinous ligaments of the first, second and third lumbar vertebræ. Arachnoid fluid half an ounce.

Spinal Cord.—Veins very distinct, especially in the lumbar regions; spinal cord removed.

Neck.—Much puffiness of the posterior triangle of the neck. On cutting into, it was found to be due to clear serous fluid in great quantity, infiltrating the subcutaneous fat separating the various lobules from one another.

Rectus abdominis muscle was green with commencing putrefaction.

Chest.—Lungs did not quite fill the chest, pericardium completely exposed on opening it. Left pleura contained 12 ozs. of serum, right $8\frac{1}{2}$ ozs.

Lungs.—Left lung free, right lung had four or five adhesions which were easily broken down.

Anterior Mediastinum.—The cellular tissue contained a lot of fluid and the fat lobules here were each separated by it.

Pericardium contained 4 ozs. of clear fluid.

Heart large, flabby, neither ventricles contracted; both, especially the right, contained decolorized clots (ante mortem). Valves healthy and competent. Weight of heart 12 ozs.

Lungs both œdematous, sinking easy in water.

Abdomen contained 6 ozs. of fluid, subcutaneous fat scanty. Intestines, especially the jejunum, congested.

Liver.—Nutmeggy.

Spleen.—1lb. 2 ozs., firm.

Kidneys.—Congested.

Brain.—Veins, especially at base, congested. No clots. About 1 oz. of fluid in the ventricles.

Punctæ Vasculosæ very distinct.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
Nov. 1	84	88			98.4	98		
2	88	102			98.6	99.4		
3	92	106			99	99.8		
4	80	94			98.4	99.2		
5	84	88			98.6	99.1		
6	72	92			98.6	99.2		
7	92	96			99	100.4		
8	96	104			99.6	100.2		
9	108	112			100	100.2		
10	96	100			99.6	99.8		
11	108	104			98.8	100.6		
12	96	100			98.8	100.2		
13	96	96			98	99.8		
14	92	96			97.4	98.6		
15	88	112			97.2	98.6		
16	04	120			99.6	101.2		
17	196	128			100	101.8		
18	16	132			100.2	102.4		
19	84	120			100.2	102.4		
20	116	112			100.2	101.6		
21	100	112			99.8	103		
22	96	100			100.8	102.2		
23	96	108			101	102.4		
24	100	100			100.4	103		
25	92	100			101.2	101.4		
26	112	108			101.2	103.6		
27	100	108			101.2	102.8		
28	114	118			102.2	102		
29	108	120			100.2	101.8		
30	108	128			99.6	101.6		
Dec. 1	102	112	30	24	99.8	103	2	16 ozs.
2	114	108	30	24	100.6	100.4	2 N	"
3	108	120	30	24	100.8	103	2 N	"
4	116	108	24	30	99.8	100.2	3 W	14 H.C
5	120	120	30	30	100.2	103	1 W	8 H.C
6	116	130	30	30	101.2	102.6	1 N	12 H.C
7	112	108	30	30	100.2	100.1	2 N	20 H.C
8	116	106	30	24	101.2	100	1 N	12 H.C
9	120	108	30	30	102.4	100.2	1 N	8 H.C
10	114	121	28	33	100.4	101	1 N	10 H.C
11	114	113	28	30	99.8	101.8	"	4 H.C
12	108		30		97			

CASE NO. 17.

LIEW TONG LIM (MALE). aged 20, *Plantation Coolie. Taken ill at Johore; Duration of Disease, 1½ months. Admitted 22nd January, 1885; Died 24th January, 1885.*

History of Present Illness.—He states that he went to Johore as a “sinkeh” (a new-comer) 7½ months ago, and worked on a pepper plantation for six months, when he had to stop work on account of a feeling of stiffness in his legs, and inability to walk steadily. These symptoms increased gradually for ten days, when he observed a swelling on the dorsum of his feet, and experienced a feeling of numbness in the calves of his legs. The inability to walk now increased, so much so that he was unable to stand without help. Five days after, the swelling and numbness appeared in his legs, he experienced numbness in his hands also, with twitchings and tightness in the tendons in the back of his legs, with numbness, and a sense of fulness in the epigastrium and difficulty of breathing. He was in receipt of three dollars a month and all found. Out of the three dollars he had to pay a monthly contribution towards his passage money (which was sixteen dollars). He had also to pay two dollars out of his six months’ wages, which he spent on three doses of Chinese medicine. He had three meals daily, namely:—

8 a.m. Rice and salt vegetables.

12 noon. ,, ,, ,,

6 a.m. ,, ,, ,,

(Pork he got once or twice a month, salt fish was served to him, but he never ate it on account of its bad smell.)

State on Admission.—He is a small built man; able to lie on any side, but moving his body from side to side is performed with difficulty. He is not able to lie long on his back on account of the pain in his loins, and pressure on the calves of his legs gives him pain.

Hyperæsthesia.—There is pain on pressure more or less all over his body, more so in the calves of his legs and his feet, and interior aspect of his arm between the radius and ulna. There is pain in the loins.

Anæsthesia.—Numbness from the toes to the hip joint, over the epigastrium, and from the tips of the fingers to the elbow joint.

Paralytic Symptoms.—He is unable to get up from his bed, stand, or walk at all; he is unable to lift his legs off the cot, flex his feet, or move his toes. There is loss of power also in his hands; he is

unable to hold his cup or use his chop-sticks ; he is not able to use or flex his fingers freely.

General Symptoms.—There is much œdema on the dorsum of his feet and legs and over the tibia, and slight general œdema all over his body ; there is also some œdema in his loins. *Face* puffy ; there is no marked anæmia ; patient looks sallow, and his expression is distressed. *Gums* firm. *Tongue* dry—covered with a dark brown fur in the centre, red edges. *Fauces* inflamed. *Lips* kept apart ; there is some difficulty in breathing, and patient at times moves his hands and feet and legs about inco-ordinately. *Pulse* 108. *Respiration* weak. Temperature 98·8.

Heart.—There is a blowing murmur with first sound ; second sound accentuated, and slightly dicrotous ; heart's action rapid.

January 24th.—Patient suddenly attacked with great distress and difficulty of breathing. At times he tosses his hands about and is very restless ; complains of great thirst ; tongue and fauces dry ; answers questions by the shake of his head, or in monosyllables. Died 11.30 p.m.

Post Mortem.—7.30 a.m. Eight hours after death. Rigor mortis present ; body swollen from dropsy.

Back.—There is congestion in lumbar and cervical regions over the spinous processes and neural arches—over the cervical region the congestion was greater than in the lumbar region, and more so than ever observed in former subjects. There was much fluid in the cellular tissues over the lumbar vertebræ. On opening the spine corresponding congestion was observed within the canal and congested blood over the dura mater in the cervical region. The handle of the scalpel passed over the detached partially clotted blood from the surface. Dura mater distended, showing fluid within. On removing the cord congestion was observed over the bodies of the cervical and lumbar vertebræ, extending into sacral canal ; 1 dr. of fluid within the dura mater, cord firm.

Head.—Congestion over dura mater ; brain surface congested ; dura mater adherent to both lobes of the cerebrum on the surface, over a patch one inch by half-an-inch, and had to be detached with a knife.

Brain soft, the cerebellum more so ; there was half a drachm of fluid in each lateral ventricle.

Chest.—About 6 oz. of fluid in the thorax ; left pleura adherent to the chest wall ; left lung very much congested, and adherent on the posterior surface ; right lung looks healthy.

Heart.—1 oz. of fluid found within the pericardium; both auricles and ventricles filled with dark coloured clots; valves apparently healthy; heart on removal appeared of enormous size, which was apparently due to the presence of the clotted blood inside. Weight of heart, after removal of all clots, thirteen ounces.

Abdomen.—8 oz. of fluid within the abdominal cavity.

Liver congested. Gall bladder quite full. Weight of liver—2 lbs. 15 ozs.

Spleen congested and enlarged—twelve ounces.

Kidneys.—Each weighed four ounces, both healthy.

The muscles of the body were red and apparently normal; no atrophy or discoloration.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1885. Jan. 22							1 N	46 H.C
23	92	100	18	21	98.4	99.8	1 N	32 H.C
24	108	126	21	23	98.8	99.8		

CASE NO. 18.

YAP AH SOH (MALE), age 33, *Cable Workman*. Taken ill at Singapore; Duration of disease 1 month. Admitted February 9th, 1885; Died March 20th, 1885.

		2nd week.	3rd week.	4th week
Urine	Reaction -	Acid	Acid	Acid
	Sp. Gravity-	1010	1008	1010
	Albumen -	o	o	o
	Chlorides -	Trace	Trace	Trace
	Phosphates -	o	o	o

History of Present Illness.—Patient was employed on board the "Sherrard Osborne" (a telegraph boat), and assisted in cable work. He has resided in Singapore for the last twenty years, and enjoyed very good health until last year, when he suffered from diarrhoea for about six days. After he recovered, he kept good health until two and a-half months ago, when symptoms set in by a feeling of numb-

ness extending from both feet up to the knees. Five days afterwards these parts became œdematous, the œdema disappearing within about the same period of time. After another eight days the swelling returned and lasted again for five days, and then left him. A month after this he felt a weakness in his legs and calves, and his gait became rather unsteady, so as to render walking unsafe for fear that he should fall. These symptoms gradually increased for ten days when he found he could not walk at all. This was accompanied by numbness all over his body, except the head. He continued in this state until his admission.

He received twelve dollars a month as his wages; he always lived well. He stopped work about a month ago, but worked for a short time during the first part of his illness.

State on February 29th (when the case was fully taken).—*Face*, hands, and feet slightly œdematous. He is able to sit up in bed, and turn on his side; he is unable to hold his chopsticks and cup. He has lost flesh; has a general feeling of pain all over his body. *Lower Extremities* feel numb, and are rather wasted. Feet œdematous, calves painful on pressure; power over extensors and flexors partially lost; wrist and elbow joint relaxed (wrist drop). *Upper Extremities* also numb. There is no uneasiness above the epigastrium, but a feeling of nausea after food, and also early in the morning; no anæmia.

Gums firm and healthy.

Tongue furred, but clean at the edges.

Hyperæsthesia.—More marked about the calves and fore-arm, and a general feeling of pain and lassitude.

Progress of the Case.—*Feb. 25th*. Patient complains of pain and numbness in his chest. His abdomen is numb also, he feels pain and numbness all over his body. Hands and legs are painful and numb, bowels regular, appetite bad, inclined to vomit. *March 10th*. Patient complains of pain and numbness in his hands, chest, legs, calves, tibia, and dorsum of the feet. There is some swelling on the dorsum of the feet, and slight œdema over the tibia, hands, and face. Nausea still continues, especially at night. Tongue clean, indented at the edges, appetite bad. Bowels move once a day, cannot sleep at night owing to the pain all over his body. *16th*. Patient complains more of pain and numbness in his hands and legs, œdema the same. *18th*. Pain and numbness increasing. Hands, legs, and face, and chest are swollen (œdematous). Bowels moved once, watery. Sleep bad. *20th*. Numbness and pain still continues. Œdema is in-

creasing, otherwise the same; same evening, 1 p.m., patient was found in a very low condition and suffering from shortness of breath. Pulse imperceptible. Complains much of pain all over his body. There is great œdema; 7 p.m. he died peaceably.

Post Mortem eleven hours after death, rigor mortis present. Body greatly swollen from œdema. On either side of the spinous processes and over the lumbar vertebræ and the five last dorsal vertebræ great congestion was observed. There was also some serous effusion. Corresponding congestion was also found within the canal. There was some little effusion into the canal. Dura mater congested in patches, especially at its lower end. No excess of fluid within the sheath of the dura mater.

Cord firm. Slight venous congestion of the cord, especially at its lower end.

Head.—Dura mater congested in patches, between dura mater and arachnoid there was some effusion of blood.

Brain substance firm; 1 dr. of fluid within lateral ventricles; also some fluid in the third and fourth ventricles. There was some effusion of blood within the substance of the cerebrum and cerebellum.

Chest.—12 oz. of fluid within the thorax, 1 oz. of fluid within the pericardium.

Heart surface fatty. Left side of the heart filled with clots. Right side empty, valves healthy. Weight of heart, 12 ozs.

Lungs slightly congested.

Abdomen.—There were 15 oz. of fluid in the abdominal cavity.

Liver firm, slightly congested, gall bladder partially empty. Weight of liver 30 ozs.

Spleen slightly congested and enlarged.

Kidneys healthy. Weight 4 ozs. each.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
Feb. 10		104		19		98.8		60 N
11	100	104	19	19	98.4	99.4	1 N	64 N
12	88	94	17	19	98	98.8	1 N	68 N
13	104	108	21	21	99.6	99.8	2 N	68 N
14	96	100	19	19	99	99.4	2 N	60 N
15	96	100	18	21			1 N	64 N
16	96	104	19	19	99	99.6	1 N	68 N
17	96	100	19	19	98.6	99.2	1 N	64 N
18	96	98	19	19	98.8	99	1 N	68 N
19	84	88	17	17	98.4	98.8	1 N	60 N
20	84	88	17	17	98.4	98.8	1 N	68 N
21	88	88	17	17	98.6	98.8	1 N	64 N
22	84	88	17	17	98.4	98.8	1 N	68 N
23	80	88	17	17	98.2	98.6	1 N	64 N
24	90	84	17	17	99	98.4	2 N	60 N
25	90	88	17	17	99.2	98.6	1 N	63 N
26	92	84	17	17	98.8	99.2	1 N	65 N
27	88	84	18	17	98.6	99	4 W	60 N
28	92	82	17	17	98.8	99.2	3 W	62 N
Mar. 1	92	90	17	17	98.6	99.2	2 W	63 W
2	92	92	17	17	98.6	99	1 N	65 W
3	90	90	17	17	99.2	99.6	1 N	62 W
4	90	90	17	17	98.4	99.2	2 N	60 W
5	90	90	17	17	99	99.1	1 N	68 W
6	90	90	20	20	99.2	99.2	2 N	59 W
7	90	92	20	18	99	99.2	2	60 W
8	90	90	20	20	99.8	99.8	2 N	58 W
9	92	92	20	18	98.6	99.8	1 N	60
10	90	92	20	20	99.6	99.8	1 N	60
11	80	90	17	20	98.2	99.2	2 N	50
12	80	90	17	20	99.8	98.6	2 N	50
13	80	90	17	20	90.2	80.2	2 N	60
14	80	80	17	20	90.2	80.6	1 N	50
15	90	80	17	20	90.2	90.6	1 N	45
16	84	90	18	20	80.4	99.6	1 N	33
17	80	90	17	20	98.2	99.6	1 N	60
18	80	90	18	17	98.2	99.6	1 N	50
19	82		20		94.2			

CASE NO. 19.

NG AH SEE (MALE), age 40, Coolie. Taken ill at Johore. Admitted March 5th, 1885; Died March 18th, 1885.

History of Present Illness.—Patient states that he left China thirteen years ago and went to Johore and worked in a gambier plantation as a coolie during the whole of his stay there. He had several attacks of intermittent fever during that time. He suffered from fever for a month during the first year and then was free for three years. Subsequent to this he got an attack every three years. Each time the attack lasted a month. His present illness is of five months' duration. The first symptom he observed was œdema on the dorsum of the feet, which, within a week, extended up his lower extremities to the scrotum and penis. He now got an attack of fever which lasted for three days, after which he was unable to walk without support. His legs were weak and numb, and he experienced twitchings of the tendons in the backs of his legs. Twenty days after these symptoms first appeared in his legs his hands commenced to swell and his feet became numb and weak. He was in receipt of seven and a-half dollars a month and all found. His food was good and he had four meals daily, namely:—

- 5 a.m. Congee, salt fish, and salt vegetables.
- 8 a.m. Rice, salt fish, and fresh vegetables.
- 11 a.m. Congee, salt fish, and salt vegetables.
- 7.30 p.m. Rice, salt fish, and fresh vegetables.

(Fresh fish five times a month, pork twice a month.)

State on Admission.—He is a man of feeble physique, and looks older than he says he is. He is able to lie on his side, and is able to keep his legs stretched out. There is general œdema, especially in the feet legs and hands, the patient is slightly anæmic. He is unable to get up or walk without assistance, and then only with great difficulty (he is not able to get beyond a few steps); he is unable to raise his legs from off the cot when lying down; he is unable to flex his legs, and he appears to have lost all power in his ankles. The feet are always extended (ankle drop); his hands are swollen and he is not able to extend or close his fingers fully. He is not able to hold his cup or use his chopsticks, he is in a very feeble state.

Anæsthesia.—There is numbness all over his body, especially in his hands, legs, and epigastrium. No numbness in the face.

Hyperæsthesia.—There is pain on pressure from the toes to the hip-joint, especially in the calves of his legs, and from the tips of his fingers up to the shoulder-joint, especially marked along the anterior aspect of the arms, between the radius and the ulna. There is pain also in the pectoralis major. He feels a sense of fulness in the epigastrium, combined with numbness and pain; there is slight pain in the lumbar region, and he feels great weakness across the loins.

General condition.—*Face* sallow, countenance wears a distressed look.

Gums swollen and ulcerated, and bleed slightly on pressure; several of his teeth are decayed. *Tongue* unusually red at the tip, edges, and centre, and there are patches of white fur over the dorsum. *Fauces* inflamed, appetite bad, bowels regular.

(I have taken no notes of the progress of the case, except that he died on the 18th March.)

Post Mortem was held four and a-half hours after death, rigor mortis present, body anæmic, slightly dropsical. On an incision to expose the spinal column much congestion was observed on either side of the spinous processes, and over the arches of the lumbar and three last dorsal vertebræ. On opening spinal column corresponding congestions were observed in the canal, no fluid within the dura mater, Venous congestion in parts of the cord.

Cord firm, dura mater slightly congested, venous congestion on surface of the brain.

Brain substance firm, a small quantity of fluid within the lateral ventricles.

Heart.—About two drachms and a-half of fluid within the pericardium. Heart normal, weight 10 ozs.

Lungs congested.

Liver slightly congested, 29 ozs.

Spleen enlarged.

Kidneys pale, congested, weight about 4 ozs. each.

CASE NO. 20.

LIEW YONG SWEE (MALE), aged 33, Shoemaker. Taken ill at Campong Glam, Singapore; Duration of Disease, 1 month. Admitted 15th March, 1885; Died 29th March, 1885.

History of Present Illness.—Patient states that he was a resident in Campong Glam (district in Singapore) for a year-and-a-half, as a shoemaker. He came from China for the first time a year-and-a-half ago, and has resided in no other locality; he has enjoyed very good health until a month ago, when he felt pains in his legs; ten days afterwards he observed a swelling on the dorsum of the feet; his legs now became numb, weak, and unsteady; the œdema in the feet disappeared within three days; the numbness and weakness in his legs increased, and in six days he could not walk at all; his hands now became numb, and he commenced to lose power in them. His wages were three dollars a month, all found; he lived well. He worked for fifteen days after the first appearance of his symptoms (namely, the pains in his calves). He had three meals daily, consisting of:—

- 5.30 a.m. Rice, fresh fish, and fresh vegetable.
 - 10.0 a.m. Rice and fresh vegetable.
 - 6.0 p.m. Rice, salt vegetables and pickles.
- (Pork twice a month only.)

State on Admission.—He is a moderately well built man—dorsum of the feet, backs of his hands, and anterior aspect of his legs are slightly œdematous. He is able to sit up in bed, and lie on either side. He is unable to hold a cup or to use his chop-sticks. There is no marked anæmia.

Anæsthesia.—There is numbness present from the toes to the hip joint; and in the upper extremities, from the tips of his fingers to the elbow joint, also in the epigastrium and lumbar regions.

Hyperæsthesia.—There is pain on pressure all over the lower extremities, especially in the calves of his legs; and in the upper extremities from the fingers to the elbow joint, especially along the anterior aspect of the arm, between the radius and the ulna. There is a feeling of fulness and uneasiness in the epigastrium; and there is pain in the lumbar regions, which prevents his lying on his back for any length of time.

Paralytic Symptoms.—Patient is unable to move his ankle joints. All motion in them is apparently lost. There is some loss of power in his hands.

General Condition.—Gums spongy and ulcerated, they bleed on pressure. *Tongue* flabby and foul, tremulous on the dorsum. *Fauces* slightly inflamed. *Breath* foul. *Appetite* bad. *Bowels* irregular. Has a cough and experiences a general feeling of lassitude.

(Patient died on 29th March, at 6 p.m.)

Post Mortem two hours after death. Rigor mortis present. Congestion over the spinous processes of the lumbar and two last dorsum vertebræ. There is also corresponding congestion within the canal, and some serous effusion into the canal. Two drachms of fluid within the dura mater. Venous congestion of the cord.

Head.—Dura mater in brain apparently normal. No excess of fluid in the ventricles. Brain substance firm.

Chest.—No fluid in the thorax. Lungs slightly congested.

Heart.—Weight, six ounces. Two and a-half ounces of fluid in the pericardium. Valves normal. Liver slightly congested. Gall bladder partially full, weighed twenty-eight ounces.

Abdomen.—No fluid in the abdominal cavity.

Spleen.—Eight ounces, slightly congested and enlarged.

Kidneys healthy—four ounces each.

CASE NO. 21.

CHIAM AH MUNG (MALE), aged 32, *Sawyer*. Taken ill at *Rhio*.

Duration of Disease, 1 month. Admitted 31st March, 1884

Died 8th December, 1884.

		1st week.
Urine	{ Reaction - -	Slightly Acid
	{ Sp. Gravity -	1008
	{ Albumen -	0
	{ Chlorides -	Normal
	{ Phosphates -	0

(The following few notes were taken on his case on the 22nd August, and are sufficient to show its nature.)

Patient has no dropsy, states that he has never had any. Hands and feet are numb. Extensors paralysed. Has pain in the calves of his legs on pressure. Has suffered from intermittent fever for the period of a month—two months ago.

Progress of the Case.—Nothing particular occurred until *November 17th*, when diarrhoea set in—thirteen stools in twenty-four hours. *24th*. Diarrhoea continues in spite of all treatment; there is a

feeling of numbness over the abdomen and chest. 28th. Ten stools in twenty-four hours; temperature and pulse high. December 6th. The patient complains much of numbness and pain all over his body, also of thirst and nausea. 7th. Still complains of pain and numbness, and experienced difficulty of breathing last night for the first time. The tongue is dry. Bowels move very frequently. Temperature very low (95.6). On the same evening he passed into a state of collapse and died quietly at 8.30 p.m.

Post Mortem fourteen hours after death. Rigor mortis well marked: fingers flexed; feet fully extended; body emaciated; blood fluid.

Spinal Cord.—There is a small layer of fat external to the dura mater over cervical and sacral regions; dura mater contained two drachms of fluid. There is a patch of congestion external to the cord over lumbar region.

Brain.—Pia mater congested. Brain substance in a sodden state. Much fluid escaped on opening the calvaria.

Chest.—Six drachms of fluid in the pericardium.

Heart small, pale, flabby; few patches of fat on the surface of the heart; ventricles empty; valves normal.

Lungs.—Right lung much congested; few tubercular deposits at the base.

Liver pale and friable. Gall bladder full.

Spleen normal.

Kidneys.—Right, congested; left, pale and slightly enlarged.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	72	88			97.2	100		
2	76	84			97.6	99.6		
3	76	84			98.4	99.8		
4	88	84			98.2	99.2		
5	88	96			98.8	100.8		
6	84	88			98.6	99.8		
7	92	96			98.4	102		
8	80	104			98.6	101.4		
9	84	112			99	101.8		
10	92	100			99.8	100.8		
11	88	96			99.8	100.4		
12	96	96			99.8	99.8		
13	96	96			99	99.4		
14	96	96			99	99.4		
15	96	88			98.6	99.6		
16	96	112			99	100.2		
17	96	108			99	100.2		
18	100	108			99.4	100.4		
19	96	108			99.6	100.4		
20	100	108			99.2	99.6		
21	100	108			99.2	100		
22	100	104			99.2	100.8		
23	96	100			99.4	99.8		
24	100	104			98.8	99.4		
25	92	92			98.4	99		
26	96	96			99	99.8		
27	96	100			99.6	100		
28	102	104			99.2	99.6		
29	96	108			99.2	99.2		
30	102	106			98.8	99.4		
Dec. 1	108	106	18	24	100	98.8	7	16 OZS
2	108	108	24	24	98.4	100	15	"
3	102	112	24	24	98	100.2	13 W	"
4	108	108	24	24	98.4	99.2	7 W	4 H.C
5	96	108	24	18	98.4	102.4	12 W	"
6	90	109	24	24	98.2	102.6		"
7	108	imper.	24	18	95.6	95		"

CASE NO. 22.

KOH AH FOO (MALE), aged 28, *Sawyer*. Taken ill at *Rhio, Salapong*; Duration of Disease, 1 year 8 months; Variety, *Chronic (Relapses)*. Admitted 20th May, 1884; Died 11th January, 1885.

DECEMBER.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Slightly Acid	Slightly Acid	Acid
	Sp. Gravity	1004	1002	1004	1004
	Albumen - -	0	0	0	0
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	Excess	Excess	Excess	Trace

(Patient was admitted on the 29th May, when the following few short notes were taken of his case.)

He has general dropsy, and is not able to walk; his hands and feet are numb, and there is pain in his calves on pressure; extensors paralysed.

[*N.B.* This is the patient's third admission into hospital for this same disease, his first admission was two years ago.]

Notes of his Case.—*August 25th.* Patient has no œdema anywhere now, and is able to walk on crutches. *December 5th.* Patient complains only of numbness and painful sensations in his legs and hands, and of pain in his back, over the lumbar region. *7th.* Patient has had diarrhœa since yesterday, otherwise he is the same. *8th.* Complains of pain in his knee joint. *9th.* Complains of pain in his knee and ankle joint; has no appetite; tongue is clean, but broad, with teeth marks along the edges; corners of his mouth are sore. *10th.* He has been feverish since yesterday afternoon at four o'clock; feels cold, and has slight swelling of the feet. *12th.* Another attack of fever yesterday; could not sleep on account of pains in his hands and legs, and also part of the spine; refused to take his food this morning. *14th.* There is considerable œdema in his face, dorsum of the feet and over the tibia; otherwise the same. *15th.* Patient vomited yesterday afternoon for the first time. *19th.* Feverish attack again yesterday, more swelling in his face and feet. *20th.* Had an attack of diarrhœa yesterday, bowels moved six times, the stools natural. *23rd.* Fever continues, still complains of numbness and pain in his arms and legs, and pain in his back over the lumbar region; œdema the same; complains of thirst and vomits

frequently. 27th. Complains of more pain in his back over the lumbar regions, otherwise about the same. 31st. Pain in the back continues; there is pain and numbness in his arms up to the shoulder joint—in his legs, up to the hip joint: swelling is increasing in the dorsum of the feet and tibia; did not sleep last night owing to an attack of difficulty in breathing; complains of head-ache; had an attack of fever yesterday at noon; tongue clean; no appetite. *January 2nd*. Had an attack of difficulty in breathing during the day, otherwise the same. 3rd. Œdema increasing, it is now very considerable; there is great pain in his feet and legs on pressure; he says he feels very bad. 4th. Patient is inclined to vomit; swelling about the same; could not sleep last night from the pains all over him; he also complains of spasms in his legs, from the knee joint to the ankle joint; complains of headache and pains in his back. 9th. Was attacked with diarrhœa yesterday, three watery stools; feels more pain and numbness in his legs and arms; œdema about the same; complains of sleeplessness owing to pain in his back and the spasms; feels thirsty; vomiting continues. 10th. Diarrhœa continues; feels very thirsty; all other symptoms the same. 11th. Patient very low this morning; won't take his food; moans; cannot answer questions; his hands and feet are cold; pulse thready and very small. 9.30 *a.m.* Died quietly, without a struggle.

Post Mortem one hour after death; body œdematous; œdema over lumbar region, muscles pale; spinal column in the cervical region, and the first three dorsal vertebræ very much congested; congestion is present in the lumbar region also.

Head.—Dura mater normal. *Brain* surface is slightly congested; there is some fluid in the lateral ventricles.

Heart.—There are 2 ozs. of fluid in the pericardium; surface of the heart fatty; right side of heart full of clots; left side empty; valves normal.

Lungs.—Right lung slightly congested, weight 1 lb. 2 ozs.; left lung adherent posteriorly; small, milliary tubercles are scattered over it, weight 1 lb. 1 oz.

Abdomen.—There was a large quantity of fluid within the abdominal cavity (60 ounces).

Liver.—3 lb. 10 ozs., pale, yellow on the surface, soft and friable; on section presented a deep yellow hue; gall bladder full.

Spleen congested, 11 ounces.

Kidneys.—Right kidney, 4 ounces; left kidney, 4½ ounces.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	80	80			97.6	98		
2	84	80			97.8	98.2		
3	88	104			98.2	99.8		
4	92	88			99	100.2		
5	88	88			99.2	101.2		
6	106	96			98.8	100.2		
7	100	104			98.4	99.8		
8	92	96			98.4	99.8		
9	92	104			98.8	99.8		
10	92	104			98	100.2		
11	104	96			98.4	98.6		
12	88	96			98.6	99.8		
13	88	108			98.6	101.6		
14	88	96			98.4	100.8		
15	92	104			98.2	100.6		
16	96	92			98	97.8		
17	88	96			97.4	99.6		
18	84	92			97.8	99.2		
19	84	96			97.8	100.2		
20	96	96			98.2	100		
21	96	84			99	97.6		
22	84	92			98	100.4		
23	88	88			98	98.8		
24	76	92			97.6	98.6		
25	72	88			97.4	99.2		
26	76	92			98	100.2		
27	76	92			98	99.6		
28	76	92			97.8	99.6		
29	76	84			98.4	99.4		
30	88	92			98.6	99.6		
Dec. 1	88	84	16	16	98.6	99.2	1	23 OZS.
2	92	96	16	16	98.6	98.6	6	40 "
3	84	84	16	16	99	99.2	6	20 "
4	80	100	17	30	98.4	99.6	4 H	30 N
5	80	84	20	24	99.2	99.2	5 N	28 N
6	84	88	20	24	100.4	99.2	6 W	28 N
7	88	84	20	24	98.4	100.2	5 W	32 P
8	84	84	20	24	99	92.2	3 W	30 P
9	92	90	20	18	99.4	99.4	5 W	36 P
10	88	86	16	15	99.4	99	4 W	38 N
11	92	107	14	17	99.6	100.4	5 W	32 N
12	86	92	13	17	99.6	100.2	4 W	34 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 13	86	92	13	17	99	100·2	4 W	38 N
14	82	90	13	15	98·8	99·6	5 W	32 N
15	88	92	14	17	98·7	99·8	4 W	50 N
16	88	92	14	19	99·2	99·2	5 W	30 N
17	116	112	14	17	99·8	100·8	2 W	40 N
18	84	89	13	17	98·6	99·8	6 N	32 N
19	108	112	14	17	98·6	99·6	6 W	30 N
20	108	108	15	17	99·2	99·4	6 W	42 N
21	98	106	15	17	98·4	99·2	3 N	38 N
22	88	104	17	19	98·8	99·4	3 W	40 N
23	96	108	18	19	99	99·4	2 N	30 N
24	90	98	17	19	98·4	99·2	2 N	28 N
25	90	98	17	19	98·4	99·2	2 N	34 N
26	92	98	17	19	98·6	99·2	2 N	42 N
27	88	112	17	19	98·6	99·6	2 N	42 N
28	88	94	17	19	98·6	99·4	3 N	42 N
29	88	104	17	19	98·6	99·6	3 N	68 N
30	84	94	17	19	98·8	99·6	2 N	62 N
31	96	98	19	19	99·8	99·8	4 W	60 N
1885.								
Jan. 1	94	98	18	19	99	99·4	2 N	50 N
2	108	104	19	19	99	99·2	3 N	43 N
3	104	136	19	23	98·8	99·8	3 N	50 N
4	120	124	19	23	100·4	100·8	3 N	46 N
5	108	108	19	19	98·2	99	2 N	38 N
6	112	112	19	19	98·8	99·4	2 N	40 N
7	104	108	19	21	99·9	99·8	4 W	38 N
8	100	116	19	21	98·8	99·6	3 W	38 N
9	128	142	21	27	101·6	102	4 W	39 N
10	124	136	21	26	100·2	101·8	4 W	38 N
11	128		21		99			

CASE NO. 23.

TAN SYE HACK (MALE). *Taken ill at Johore; Duration of Disease, 10 days. Admitted 31st January, 1885; Died 19th February, 1885.*

Urine	{	Reaction - -	1st week.	2nd week.
		Sp. Gravity -	Acid	Acid
		Albumen - -	1008	1008
		Chlorides - -	0	0
		Phosphates -	Normal	Normal
			Trace	Trace

(The following short notes taken from February 3rd show the progress of his disease up to its fatal termination.)

February 3rd. Patient has considerable œdema of the face and legs; he complains of flatulence, and feels pains in his legs, and has difficulty in breathing; his bowels are regular; tongue flabby, red at edges; appetite good; can sleep at night. *10th.* Still complains of flatulence; his legs, face, and penis, are œdematous; there is slight œdema in his hands and abdomen; he feels also pain in his legs, and difficulty of breathing continues; his tongue is flabby and indented at the edges; bowels loose; appetite bad. No change of symptoms up to *16th*, when at ten o'clock he commenced to show signs of difficulty in breathing, which increased until 4 p.m., when the following notes were taken. Patient is in a very distressed state from difficulty in breathing; face sallow; body and face œdematous; the surface of the body cold; breath cold; no respiration; feels thirsty; pulse weak, thready, 120; has sensations in his ears; he retches occasionally, but brings up only mucus; he is obliged to sit up in bed owing to difficulty in breathing. *17th.* Has a cough, and difficulty in breathing has become less, but he complains of tightness and numbness in his chest; he has spasms, pain, and numbness in his hands, skin, and legs; he is cold, but he is decidedly easier and better than yesterday. *18th.* No change until 9 p.m., when he became collapsed, suffering from great shortness of breath, in which state he continued until 1 a.m., when he died.

Post Mortem.—Seven hours after death; rigor mortis present; body generally œdematous. On making an incision along the back to expose the spinal column, there was found serous effusion into the cellular tissues of the lumbar and sacral regions, on the sides of the spinous processes, of the whole lumbar region, the lower half of

the cervical and over the first four dorsal vertebræ, where there was much congestion. Corresponding congestions within the canal were also observed on opening the spinal column; one drachm of fluid within the dura mater spinalis.

Spinal Cord firm; dura mater slightly congested in patches.

Head.—Dura mater slightly congested, venous congestion on the surface of the brain; brain substance firm; half a-drachm of fluid in each lateral ventricle; some fluid in the thorax.

Heart.—2 ozs. of fluid in the pericardium; heart normal; valves normal; weight, 11 ozs.

Lungs congested.

Abdomen.—Much fluid in the abdominal cavity.

Liver.—3 lbs. 6 ozs., slightly congested; gall bladder full.

Spleen.—Weighed 12 ozs.; slightly congested.

Kidneys normal.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 1	82	82	17	18	100	99·8	2 N	80 N
2	82	82	18	18	99·8	99·6	0	60 N
3	82	82	18	20	100·8	99·2	0	59 N
4	82	82	18	20	99·8	99·6	6 W	45 N
5	82	80	18	18	100·8	99·8	1 H	58 N
6	82	80	18	20	99·4	99·6	1 H	56 N
7	82	80	18	20	99·6	99·4	7 W	56 N
8	82	82	18	20	99·8	99·6	7 W	52 N
9	80	82	18	20	99·6	99·8	6 W	60 N
10	82	80	20	18	99·2	99·6	2 W	56 N
11	80	80	18	18	99·4	99·4	1 N	55 N
12	80	80	18	18	99·6	99·4	1 N	50 N
13	80	80	18	18	99·6	99·6	7 W	50 N
14	80	80	18	19	99·6	99·8	6 W	62 N
15	80	82	18	18	C.N.	YR	7 W	60 N
16	80	82	19	18	99·8	99·8	6 W	58 N
17	100	104	22	24	99·6	99·8	4 W	54 N
18	106	108	24	26	99·8	99·6		

CASE No. 24.

GOH. SOON HOH (MALE), aged 51, Gambier Coolie. Taken ill at Johore; Duration of Disease, 1 month. Admitted 12th August, 1884; Died 18th January, 1885.

DECEMBER.

Urine	Reaction - -	1st week. Alkaline	2nd week. Acid	3rd week. Acid	4th week. Acid
	Sp. Gravity -	1020	1018	1014	1018
	Albumen - -	o	o	o	o
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	o	o	o	o

Notes taken on Admission.—He had dropsy a month ago, he has no dropsy now; hands and feet numb; pain in his calves on pressure; extensors paralysed; able to walk a little, but gait unsteady; has suffered from intermittent fever in Johore; has no albumen in his urine. Patient remained for several months in hospital, in much the same condition, until November 2nd, when diarrhoea set in, and continued until the time of his death.

Progress of his Case from 5th December.—Patient complains of pain in his abdomen; has no appetite; cannot sleep at night, owing to pains in his body generally. 6th. Has a tired feeling in his chest, otherwise the same. 7th. Much the same; tongue is glazed; epithelium absent; he has a wheezing cough; sputa purulent (phthisis): numbness in his hands and legs continues. 12th. Cough troubles him very much, and keeps him awake at night; temperature low—95 (taken per rectum, thermometer kept in for ten minutes; temperature was taken three separate times to prevent error, and retained on an average of five minutes each time, and registered the same temperature on each occasion). 15th. Temperature taken this morning at six o'clock, per rectum, 95.6; taken again at 9.15 o'clock, and retained for five minutes, 95.6 (see temperature chart). 18th. Patient much the same: temperature was very low in the morning, high in the evening; cough troublesome; tongue glazed. 22nd. Diarrhoea increased; tongue with a red fur in the centre and red edges; feels tightness in his chest and coughs a good deal; was feverish yesterday afternoon at two o'clock, when the temperature was 101.4. 24th. Complains of numbness and pain in his hands and legs, and spasms in his calves—otherwise the same. 26th. Diarrhoea is worse; feels tightness in his chest; spasms in the

tendons at the back of the knee joint ; otherwise the same. 27th. Complains of more pain, numbness, and weakness in his hands and legs. 30th. Increase of pain in the evening in his legs—from the knee joint to the ankle joint ; hands and legs feel numb ; has pain in the shoulder joint ; diarrhoea the same. Patient continued in much the same state up to the 16th January. On the 17th he was very low and weak ; diarrhoea continues ; tongue covered with thick fur ; cannot sleep at night owing to the difficulty in breathing ; pulse quick, thready ; refuses his food. Patient gradually sank, and died at 4 a.m. on the 18th.

Post Mortem three hours after death. Rigor mortis present. Body emaciated. Hands and legs œdematous.

Back.—No œdema along the spine. Slight congestion over the spinous processes of the lumbar vertebræ.

Spinal Cord removed easily. No adhesions to speak of over the bodies of the lumbar vertebræ (within canal), but a few spots of congestion seen. No excessive fluid within the dura mater. Surface of the cord presented a natural appearance.

Head.—Dura mater normal.

Brain.—Both hemispheres of the cerebrum adherent to the dura mater—about the centre—to the extent of about two inches long and one-sixth of an inch broad (apparently an old plastic adhesion). No surrounding congestion to denote recent inflammation. The adhesion had to be separated with a knife before the dura mater could be removed. About half-a-drachm of fluid in each lateral ventricle.

Chest.—16 ozs. of fluid in the thorax. Right pleura adherent to the chest wall. Small milliary tubercles disseminated throughout both lungs.

Heart.—No fluid in the pericardium. Heart small—6 ozs.

Abdomen.—74 ozs. of fluid in the abdominal cavity. No abnormal change in the peritoneum observed.

Liver.—1 lb. 12 ozs.—small, firm. Gall bladder full.

Spleen slightly enlarged and congested—12 ozs.

Kidneys.—Right, 3 ozs ; left, 4 ozs.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	88	120			99.4	104		
2	88	96			99.2	100.8		
3	88	104			100	101.4		
4	96	98			98.8	103		
5	100	120			100.2	103.2		
6	104	112			100.2	102.4		
7	116	112			100.4	103.6		
8	84	112			99.8	102.8		
9	116	140			100.7	103		
10	112	112			97.2	100.2		
11	108	124			98.6	103.4		
12	96	116			98	100.6		
13	96	112			98.6	100.8		
14	100	112			97.2	100.6		
15	108	104			98.2	99.8		
16	108	112			100.2	100.8		
17	104	124			99	102.8		
18	84	112			97.2	100.6		
19	84	108			97.4	98.2		
20	100	100			99.4	100.4		
21	92	100			98.2	98.6		
22	92	120			97.4	102.4		
23	88	116			97.4	102.2		
24	80	100			95	99.2		
25	80	100			95.6	100.2		
26	92	100			96.6	100.2		
27	96	116			96.4	101		
28	88	108			96	99.6		
29	84	112			96	101		
30	92	120			96.4	107.2		
Dec. 1	104	120	44	44	100.6	101.6	1	32
2	112	120	32	36	100.2	102.2	0	24
3	128	124	40	40	100.4	101.2	15 W	28
4	116	124	36	40	99.6	100.4	2 N	26 N
5	120	132	34	40	99.6	100.8	1 N	34 N
6	112	136	34	44	97.2	99.8	1 N	28 N
7	104	120	34	40	98.4	100.4	3 N	18 H.C
8	96	88	30	34	95.4	95.2	2 N	30 H.C
9	96	104	30	17	95.6	95.8	3 N	24 H.C

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 10	96	116	19	24	97.2	97.4	2 N	32 H.C
11	120	116	18	22	100.4	101.2	2 N	30 H.C
12	78	86	27	28	95.2	96.8	1 N	34 H.C
13	82	88	22	25	96	96.4	2 N	30 H.C
14	82	100	21	27	96.4	99.4	1 N	30 H.C
15	84	92	21	25	94.6	99.4	2 N	36 H.C
16	86	104	22	25	96.2	98.8	1 N	38 H.C
17	76	116	17	21	94.8	100.2	1 N	32 H.C
18	86	108	19	24	96.8	100.4	2 N	28 H.C
19	80	112	17	20	95.8	99.8	1 N	30 H.C
20	89	112	19	22	95.8	98.2	2 N	32 H.C
21	84	104	17	20	96	99.4	8 W	38 H.C
22	124	128	19	21	101.4	101.8	8 W	32 H.C
23	100	108	17	19	96.8	98.2	3 N	30 H.C
24	92	96	17	17	95.4	98	2 N	28 H.C
25	84	92	15	17	95	98.2	8 W	38 H.C
26	88	94	15	17	95.2	98.2	5 W	29 H.C
27	84	100	15	19	94.6	98.4	4 W	32 H.C
28	84	94	15	17	95.2	98.2	6 W	30 H.C
29	92	136	19	21	96.2	100.6	5 W	28 H.C
30	100	124	19	21	95.6	98.8	5 W	30 H.C
31	100	116	19	21	96.2	98.8	5 W	26 H.C
1885.								
Jan. 1	100	144	19	23	96.2	98.4	4 D	29 H.C
2	84	120	17	21	97.2	98.8	5 D	32 H.C
3	96	108	19	21	96.8	97.4	3 D	28 H.C
4	84	108	17	20	95.4	97.8	3 D	28 H.C
5	86	98	17	18	96	98.4	4 W	29 H.C
6	84	108	17	19	95.4	98.2	5 W	28 H.C
7	84	112	17	19	96.2	98.8	4 W	30 H.C
8	84	104	17	19	94.2	97.8	2 W	38 H.C
9	84	102	17	19	94	97.4	3 W	38 H.C
10	96	108	19	19	95.2	97.8	3 W	32 H.C
11	84	100	17	19	95.2	97.8	4 W	28 H.C
12	84	100	17	19	94.6	97.8	4 W	32 H.C
13	84	104	18	21	94.6	98.2	5 W	28 H.C
14	80	96	17	19	95	97.8	4 W	28 H.C
15	84	98	17	19	95	98.2	3 W	28 H.C
16	84	98	17	19	95.2	98	5 W	28 H.C
17	76	78	17	17	94.4	94.8		

CASE NO. 25.

ENG AH WAT (MALE) age 29, Gambier Coolie. Taken ill at Johore; Duration of Disease, 1 month. Admitted, October 20th, 1884; Died February 24th, 1885.

DECEMBER.

Urine	Reaction -	1st week	2nd week	3rd week	4th week
	Sp. Gravity-	Acid	Acid	Acid	Acid
	Albumen -	1010	1010	1010	1012
	Chlorides -	0	0	0	0
	Phosphates -	Normal	Normal	Normal	Normal

Patient was admitted to the Venereal Ward on the 13th August, with a primary sore on his penis. While under treatment there he developed symptoms of Bèri-Bèri as the following short notes, taken on the 20th October, will show:—Hands and feet numb, extensors paralysed, pain in the calves on pressure, not able to walk.

Progress of the case (taken subsequently).—December 5th. Patient complains of fever every evening, at about 6 p.m. Feels his arms and feet numb. Tongue covered with a white fur. 9th. Complains of numbness in the soles of his feet, and at the end of all his fingers on the left hand. There is some swelling over the dorsum of his feet, otherwise the same. 18th. Swelling has appeared in his face. Complains of some numbness in his legs, and feels very weak. 20th. States that he does not feel worse this morning, he has no pain in his back. Dorsum of the feet and tibia very œdematous. Arms, hands and body not so. Slight puffiness of face and lower eyelids, no spasms; he feels numbness in his legs and feet, which in the early morning feel very cold. January 1st. more pain and numbness in his legs, and œdema increasing, feels a tight feeling in his chest, also complains of diarrhœa. 5th. œdema more increasing, and no pain in his chest, but pain in his legs from knee joint to ankle joint. 10th. Diarrhœa and other symptoms about the same. 17th. Complains of pain, spasms, and numbness in his legs, from the knee to the ankle joint, especially in the calves; œdema and diarrhœa the same. 19th. œdema increasing. 23rd. Numbness, pain, and spasms increased; difficulty in breathing set in. Patient continued in much the same condition up to February 24th, when he died.

Post Mortem fifteen hours after death. Rigor Mortis absent. Body anæmic. There is general dropsy into all the tissues, legs and

feet œdematous. *Spine*—About half a drachm of serous fluid in the spinal canal. *Cord*—Very small quantity of fluid between the dura mater and arachnoid. Dura mater removed easily. No adhesion. Slight congestion on anterior and posterior aspects of the cord, more marked on the anterior aspect (probably due to Hypostasis) slight thickening of the cord on the left side posteriorly. Very small deposits of lymph here and there. *Brain*—Dura mater adherent to the skull in parts—small patches of lymph here and there on its surface. Otherwise healthy. Brain congested with increased number of red spots, some fluid between the dura mater and skull, and in both lateral ventricles, amounting to about an ounce in all. There was a small fibrous clot in the left ventricle.

Lungs.—Right, adherent to the chest wall; about four ounces of fluid in the right pleural cavity. Left lung free from adhesions. No fluid in left pleural cavity. Both lungs small. Structure healthy.

Heart.—Weight 17 drachms, small and firmly contracted. Aortic valves competent. Walls of left ventricle apparently hypertrophied. Tricuspid valves thickened.

Liver.—Weight 29 ozs. pale—contracted antero-posteriorly and cirrhused.

Kidneys.—Weight 6 ozs. Both capsules easily stripped.

Spleen.—Weight 5 ozs. Healthy.

Abdomen.—A considerable quantity of fluid in the abdominal cavity.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	88	92			99	100.4		
2	84	88			99.2	98.2		
3	92	96			98.4	100.2		
4	88	92			98	100.4		
5	102	92			99.6	99.4		
6	84	100			99	100.6		
7	84	104			98.6	101.2		
8	92	92			98.4	100.2		
9	76	92			98.4	99.6		
10	80	108			97.4	101.6		
11	80	80			98.6	99		
12	84							
13	88	92			98.4	99.2		
14	88	84			98	98.6		
15	84				98.2			
16	92	96			98.4	101.2		
17	96	96			98.8	100		
18	96	96			99	100.2		
19	96	104			99.2	102		
20	92	104			98.7	99.4		
21	92	92			98.8	100		
22	108	92			99.2	92		
23	100	108			99.8	100.4		
24	100	104			99.6	99.8		
25	92	108			98.8	101		
26	116	104			102	100.2		
27	124	104			101	99.8		
28	84	104			98	100.2		
29	120	120			101	100.4		
30	104	112			100.2	100		
Dec. 1	92	100	24	28	97.6	99.4	2	28
2	120	108	28	28	101.6	100	3	24
3	96	100	24	24	99.4	100.6	3	28
4	96	108	24	30	99.2	100.4	3 N	28 N
5	104	108	24	24	101.2	101.4	3 H	40 N
6	84	112	24	24	98.8	99.6	3 N	20 N
7	84	108	24	24	98.6	99.8	3 N	20 H.C
8	96	108	24	28	92.2	100.4	3 N	30 H.C
9	96	103	24	20	98.6	99.8	3 N	24 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M	E.		
1884.								
Dec. 10	88	88	21	22	98.2	99.2	2 N	30 H.C
11	86	102	24	28	98.6	99.4	3 N	30 H.C
12	84	86	20	23	98.6	98.6	3 N	32 N
13	80	84	20	22	97.6	98.6	3 N	30 N
14	80	84	17	19	97.8	98.6	3 N	32 N
15	84	96	17	19	97.4	98.8	3 N	36 H.C
16	74	86	15	18	98	98.2	3 N	34 H.C
17	77	88	15	18	97.6	99	3 N	40 H.C
18	74	86	15	19	98	98.4	3 N	40 H.C
19	82	94	15	18	98.4	99.4	3 N	40 H.C
20	82	90	15	18	97.6	98.2	3 N	44 H.C
21	86	98	17	19	98.4	99.2	3 N	38 H.C
22	84	98	17	19	98.2	99.2	3 N	34 H.C
23	88	94	17	19	98.8	99.6	3 N	38 H
24	86	92	17	19	98.8	99.6	2 N	38 N
25	78	84	17	19	98.8	98.8	2 N	40 N
26	88	94	17	19	98.2	99.4	3 N	38 N
27	88	98	17	19	98.8	99.2	3 N	40 N
28	88	94	17	19	98.6	99	3 N	42 N
29	88	98	17	19	98.8	99.4	3 N	42 N
30	88	108	17	19	98	99.4	2 N	38 N
31	88	104	17	19	98.2	99.2	2 N	46 N
1885.								
Jan. 1	88	94	17	18	98.6	99.2	3 W	40 N
2	88	94	17	18	99	99.4	3 W	42 N
3	96	108	18	19	99.2	99.6	3 W	42 N
4	96	98	18	19	99.4	99.8	4 W	38 N
5	98	98	18	18	99.8	99.8	4 W	38 N
6	98	94	18	18	99.4	99.4	4 W	42 N
7	94	98	18	19	99	99.8	4 W	38 H.C
8	94	100	18	19	99.4	99.8	4 W	38 H.C
9	96	100	18	19	99.4	99.8	4 W	38 H.C
10	98	102	18	19	99.6	99.8	3 W	26 H.C
11	98	100	18	19	99.2	99.8	3 W	32 H.C
12	96	108	18	19	98.8	99.6	4 W	30 H.C
13	92	112	18	19	99	99.8	4 W	32 H.C
14	96	104	18	19	98.4	98.8	4 W	38 H.C
15	96	108	18	19	98.6	99.4	4 W	38 H.C
16	100	104	18	19	99.2	99.8	3 W	28 H.C

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 17	100	108	19	19	99.6	99.8	4 W	48 N
18	100	120	19	21	98.6	99.8	3 W	50 N
19	104	104	19	21	98.6	99.6	4 W	50 N
20	94	104	21	21	99.4	99.6	4 W	40 H.C
21	104	104	20	21	98.4	99.6	4 W	40 H.C
22	92	104	21	21	100.2	100.8	4 W	40 N
23	92	100	19	21	99	99.8	4 W	50 N
24	92	96	19	19	99.2	99.4	5 W	50 N
25	92	98	19	19	99.2	99.8	5 W	66 N
26	92	104	19	19	99.2	99.8	5 W	62 N
27	92	94	19	19	99.2	99.6	5 W	66 N
28	88	94	17	19	98.6	99.6	5 W	58 N
29	96	104	17	19	99.6	99.8	5 W	66 N
30	96	112	18	19	99.4	99.8	5 W	64 N
31	100	104	19	19	99.8		6 W	60 N
Feb. 1	96	104	19	20			5 W	56 N
2	100	104	19	20			5 W	62 N
3	92	100	19	20			5 W	60 N
4	96	104	19	21			5 D	62 N
5	92	96	19	21			5 D	58 N
6	88	92	17	21			5 D	60 N
7	88	92	17	21			12 D	82 N
8	88	92	17	21			10 D	60 N
9	88	92	17	21			6 D	68 N
10	86	90	17	21			6 D	60 N
11	88	92	17	21			6 D	60 N
12	84	94	17	19			6 D	62 N
13	104	108	21	21			10 D	60 N
14	100	104	21	21			10 D	60 N
15	96	98	19	18		CN Y	10 D	52 N
16	96	98	19	19			8 D	50 N
17	94	98	19	19			10 D	54 N
18	92	96	19	19			8 D	46 N
19	88	92	17	19			10 D	50 N
20	92	94	19	19			10 D	50 N
21	92	98	19	19			10 D	56 N
22	90	96	19	19			10 D	54 N
23	92	96	19	19			10 D	58 N
24	68		17					

CASE NO. 26.

TAN AH LOW (MALE), age 25, Cook. Taken ill at Singapore.
 Duration of disease 16 days. Variety, Acute. Admitted
 December 24th, 1884. Died January, 14th, 1885.

Urine {	Reaction -	4th week. Acid
	Sp. Gravity	1018
	Albumen -	o
	Chlorides	Excess
	Phosphates-	o

History of Present Illness.—The patient states that he came to Singapore from China eighteen months ago, and worked as a cook in Chinese houses all the time. On the fifth Chinese month (June) he got a primary sore on his penis, followed a month afterwards by secondary symptoms. The primary sore healed up within a month of its appearance, and the secondary symptoms two months ago. He stopped work from the day that the sore appeared. He was able to walk about well after the syphilis disappeared, until sixteen days ago, when he felt that he was losing the power of his legs, and experienced twitchings of the tendons of the back of his legs, and a slight feeling of numbness and formication. He walked about with difficulty, and with the help of two sticks for two or three days after the first appearance of these symptoms, when he found, on attempting to walk, that he was unable to do so—on one occasion falling backwards on making the attempt. His hands also got weak and numb a day or two after the symptoms appeared in his legs, and he is now unable to hold his cup or chopsticks. He was under the treatment of a Chinese doctor for syphilis, and present disease, who prescribed for him decoctions and pills. As a cook he got six dollars a month wages, and all found. He says he was well fed. He sent half his earnings to China, and the other half he saved. He took his meals three times a day as follows:—

7.30 a.m. Congee and salt vegetables.

12 noon. Rice, pork, fresh vegetables, and fresh fish.

6 p.m. Rice, pork, fresh vegetables, and fresh fish.

His master had the same meals first, and all that was left afterwards, he got. He suffered from no disease either in China or here prior to the syphilis.

State on admission.—He is a moderately well-built man. He lies with his feet extended, and complains of twitchings in the tendons of his legs, and a cramped feeling in his flexors. He has been lying on his back for ten days, and complains of spasms in the back, which,

he says, prevent him from lying on his side. There is slight general œdema all over, especially in the dorsum of the feet and arms. His feet and hands are quite paralysed. He cannot extend his left hand. He is suffering from wrist-drop in the left hand.

Anæsthesia.—There is anæsthesia in his feet, extending up to the knee joint, and in his arms as far as the elbow joint. There is also a feeling of numbness, and a sense of fulness in the epigastrium. There is pain generally all over his body on pressure, especially over the dorsum of his feet, the calves of his legs, and the interosseous spaces, also between the ulna and radius—anteriorly. There is no pain in the hands. He has severe pain in his back.

Face and Head.—The face is puffy, expression distressed. *Lips* swollen and cracked. *Teeth* covered with sordes. *Gums* swollen, retracted, and slightly ulcerated on the edges. *Tongue* unusually red (very like a piece of raw beef.) *Fauces* inflamed. *Breath* foul. Complains much of thirst. Appetite good. *Bowels* costive—move with difficulty. He is able, with the greatest difficulty, to get up in bed. The pain in his back, in the attempt to do so, is very severe, and causes loss of breath. His *body* is covered with secondary eruptions, and the sore on his penis has not quite healed.

Heart.—Heart's action rapid—no cardiac murmurs, sounds dull, respiration laboured.

Progress of Case.—*December 27th.* Patient complains of difficulty of breathing. He did not sleep well last night. *28th.* Feels inclined to vomit—complains of tightness in his chest, otherwise the same. *29th.* The pain and numbness has increased all over his body—feels more stiffness in his hands and legs, still has great difficulty in breathing; the œdema is increasing. *30th.* Tightness in the chest, and difficulty of breathing the same. Did not sleep well last night. Pains in the body, in the lumbar regions and legs severe. Cannot straighten his legs. Tongue more red. *January 1st, 1885.* Tightness in the chest and difficulty in breathing much complained of. *3rd.* Complains more of the pain and difficulty of breathing. Body more swollen. Tongue dry and very red. *4th.* Complains of flatulence and tightness in the chest, and is inclined to vomit after taking his food. Feels very hot. *5th.* Patient still inclined to vomit. He now has no use of either arms. The hands hang flail-like, and the arms move inco-ordinately. Gums are dry and swollen, and he complains of general exhaustion in any position he lies in. When on his back he feels as if it would break. Pulse weak and compressible, his *gastrocnemii* have greatly wasted (disappeared), has

œdema of the dorsum of the feet and right leg, the dorsum of the hands and the fore-arm up to the elbow joint. His breathing is laboured—expiration forcible. 6th. Breathing easier. Complains of less tightness in his chest. Still feels inclined to vomit. 8th, 9th, 10th, and 11th. No particular change. 12th. Patient feels low, pulse small, lips and teeth encrusted with sordes, breathing abdominal and laboured. Patient is quite sensible; he refuses his food. 13th. Patient sinking—temperature 95·6. 14th. Died 3.30 a.m.

Post Mortem.—Performed three and a-half hours after death. On making an incision along the back large quantities of serum escaped. The tissues were all œdematous. There was much congestion in the cervical and lumbar regions, more so in the latter. In the lumbar region a large quantity of dark-coloured blood exuded. Every time it was sponged out fresh quantities accumulated. There was about half-a-drachm of fluid within the dura mater of the cord. The cord was removed.

P.S.—It was considered not advisable to proceed with the post-mortem examination, as the body was covered with secondary eruptions.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 26	112	106	26	26	98·4	98·6	1 N	42 N
27	112	116	24	26	98·2	98·8	1 N	38 N
28	112	120	24	26	98·4	99	1 N	42 N
29	116	122	24	28	98·8	99·6	1 N	46 N
30	116	120	24	24	98·4	99·2	1 N	38 N
31	116	120	24	24	97·8	99·8	1 N	42 N
1885.								
Jan. 1	112	116	23	25	96·6	98·2	2 N	42 N
2	112	120	23	25	99·4	99·8	1 N	38 N
3	112	116	23	25	99·2	99·2	2 N	40 N
4	104	114	20	24	97·2	99·2	2 N	32 N
5	114	124	23	24	97·4	99·8	2 N	30 H.C
6	116	112	23	23	97·4	98·2	1 N	38 H.C
7	112	124	23	23	97·4	99·2	1 N	32 H.C
8	122	120	23	23	97·4	99·2	1 N	32 H.C
9	112	120	21	23	97·4	99·2	6 W	38 H.C
10	112	120	21	23	97·6	99·4	2 N	28 H.C
11	112	124	21	23	97·8	99·8	1 N	38 H.C
12	108	116	21	23	97·8	99·8	1 N	
13		108	25	26	95·6	99·4		

General course of the disease in 36 Cases.

CASE NO. 27.

TAY SENG KAW (MALE), age 22, Fireman. Taken ill at Tanjong Pagar. Duration of Disease 2 months. Admitted December 14th, 1884. Cured 19th February, 1885.

JANUARY.

	1st week.	2nd week.	3rd week	4th week.
Urine { Reaction -	Alkaline	Slightly Acid	Slightly Acid	Acid
{ Sp. Gravity-	1010	1008	1010	1010
{ Albumen -	o	o	o	o
{ Chlorides -	Normal	Normal	Normal	Normal
{ Phosphates -	Trace	Trace	o	Trace

History.—Patient states that he worked as a fireman in Tanjong Pagar for six months. Two months ago he first felt a sensation of pins and needles in his feet; four or five days after which he felt they were getting numb, and in another fortnight he noticed a swelling over the tibiæ, dorsum of the feet, and twitching of the tendons of the legs, and at the same time weakness in them, as if his legs were giving way under him. The sensation of pins and needles, and numbness, now appeared in his hands, and he noticed a loss of power in holding anything firmly. He continued working for a month from the first appearance of these symptoms, but after that period he had to give up work on account of his inability to walk or stand without support, and an increasing unsteadiness, and weakness in his hands. He consulted a Chinese doctor, but getting no relief he came to the hospital, two months after the first appearance of the disease.

Previous History.—He was in receipt of six dollars a month, three of which he spent on his food, the other three he sent to China. The place that he lived and worked in was dry. He got two meals daily—one at nine o'clock and one at five o'clock, they consisted of:—

- 9 a.m. Rice, salt fish, fresh vegetables—prepared in lard.
- 5 p.m. Rice, salt fish and fresh vegetables „ „

He had fresh fish three times a month, during one meal only. Pork twice a month, during one meal only.

He came from China to Singapore six months ago, and has resided in Tanjong Pagar ever since he arrived. He had an attack of small-pox when he was eight years old, and also recollects having had two attacks of fever, which lasted each two days. He also suffered from dysentery two years ago while in China. Before leaving China he was badly fed, and lived principally on congee and sweet potatoes or yams, and salt fish. He had three congee and potato meals daily, but salt fish with two meals only. He ate rice only six times in the year—pork about twenty times, fresh fish thirty times. The place he lived in China was damp, being surrounded with paddy fields in which he worked.

Present Condition.—He is a spare but well-built man. He lies with his legs drawn up, because he says that they hurt him when straightened out. He can lie on either side. He has no pain in his back, and can lie on it.

Face, complexion, expression, eyes, nose, mouth, and lips, are normal. Teeth strong and undecayed. Lower row of incisors and canines irregular. Tongue clean, fauces slightly inflamed, gums swollen. Pulse 80. Respiration 20. Temperature 98.

There is no œdema anywhere; he feels numbness over the feet and legs, extending to the lower half of the thighs; also in his hands and the whole length of his arms. There is numbness over the epigastrium, and a sense of fulness in the pit of the stomach. He experiences twitchings of the tendons of his legs and arms, which wake him at night occasionally. There is apparently no paralysis, but he feels his legs to be weak and soft. The hands also are not strong, and he cannot hold anything firmly in them. He is unable to walk without being supported, when he does so, very slowly and with difficulty. His calves are numb, but when pressed are painful.

Heart.—First sound, dull; second, accentuated; no murmurs. Area of hepatic and splenic dulness, normal.

Progress of the Case.—*December 19th.* Patient complains of more pain and numbness in his hands and feet; sleeps well. No pain in the back. *20th.* Complains of spasms in his legs, and more pain and numbness than yesterday—less so in his arms. *21st.* Less pain in his legs and arms, otherwise the same. *23rd.* Says that he feels only numbness and weakness in the calves and arms. Has pain in his calves on pressure, otherwise the same. *24th.* Says that he feels pain and spasms from the knee joint to the ankle joint. *28th.* Could

not sleep last night owing to the pain and numbness in his legs and hands, and spasms in his calves. Had a feverish attack at six o'clock yesterday. 29th. Pains and spasms are worse—numbness about the same. He feels cold in the evening from the knee joint to the tips of the toes. 31st. Complains of pain in the knee, ankle, shoulder, and elbow joints, and a feeling of numbness in his arms from the shoulder joint to the tips of his fingers, and in the legs from the hip joint to the tips of the toes, and spasms in his legs and arms. He feels tight in his abdomen, and a numbness in his chest and abdomen. *January 1st, 1885.* Patient states that the pain and numbness in his hands and legs are the same. He could not sleep last night owing to the pain. Appetite good; tongue coated with a thick white fur; no thirst. 2nd and 3rd. No change. 4th. He states that he feels better this morning—no pain anywhere, only numbness and weakness in his hands and legs. 9th. Some pain and spasm last night in his legs, from the knee joint to the toes, and especially in the calves, in the arms from the elbow joint to the fingers. 19th. Pains and numbness the same, preventing him from sleeping. Tongue clean, appetite good. 21st. Has headache, and a feeling of cold in the hands and feet; pain and numbness in his arms and legs are about the same. Complains of pain in his back over the lumbar region; could not sleep last night owing to the pain in his arms. 24th. Pain, spasms and numbness still severe. Cold feeling continues in his legs. He has pain in his back; he has headache, and also complains of pain in his throat, preventing him from swallowing. Could not sleep well last night owing to the pain in his back. 27th. Much improved; no pain in his throat; no pain in his back. Slept well last night; appetite good, no thirst; able to walk a little by himself. 30th. The patient has continued to improve—has no pain now anywhere. *February 1st.* Patient says that he feels quite well; does not complain of pain or numbness anywhere, and is able to run. 9th. Patient is doing well—looks healthy. Does not complain of anything. He continued to improve until the 19th, when he was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 17	80	104	20	24	98	99.8	I H	38 N
18	66	86	15	17	98	99.6	I H	38 N
19	68	88	15	17	98	99.2	I H	42 N
20	66	84	15	17	98.4	99.4	I H	46 N
21	68	84	15	17	98.4	99.6	I H	38 N
22	66	86	14	17	98.4	99.8	I H	48 N
23	84	90	17	19	99	99.8	I N	38 P
24	84	90	17	19	99	99.8	I N	40 P
25	80	90	17	19	98.6	99.2	I N	50 P
26	88	90	17	19	99	99.2	I N	42 P
27	68	76	15	17	98.4	98.6	I N	42 P
28	72	80	15	17	98.4	98.6	I N	38 P
29	68	80	15	17	98	98.4	I N	28 P
30	52	96	14	19	97.8	99.2	I N	38 P
31	60	92	14	19	98.2	99.6	I N	50 P
1885.								
Jan. 1	60	80	15	17	98.4	98.8	I N	62 P
2	72	84	17	17	98.4	98.8	I N	68 N
3	74	88	17	17	96.8	98.8	I N	46 N
4	80	84	17	17	98.2	98.6	I N	42 N
5	94	98	18	19	98.8	99.4	I N	46 N
6	84	88	18	19	98.6	98.8	I N	40 N
7	74	76	17	18	98.6	99.2	I N	46 N
8	84	94	17	18	98.6	99.4	I N	42 N
9	74	84	17	17	98.6	98.8	I N	40 N
10	80	84	17	17	98.6	98.8	I N	38 N
11	80	84	17	17	98.4	98.8	I N	40 N
12	72	96	17	19	98.4	99.2	I H	40 N
13	80	94	17	19	98.6	99.6	I H	38 N
14	68	94	17	19	98.4	99.2	I H	42 N
15	100	104	21	23	99.4	99.8	I H	38 N
16	94	104	19	23	99	99.8	I H	38 N
17	84	108	17	21	98.4	99.8	I N	38 N
18	96	104	19	21	99	99.8	I N	42 N
19	80	96	17	19	98.6	99.6	I N	40 N
20	88	88	17	17	98.8	98.8	I N	40 N
21	80	88	17	17	98.4	98.8	I N	46 N
22	72	82	17	17	98.2	98.6	I N	48 N

CHART OF CLINICAL OBSERVATIONS — (continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 23	84	108	17	21	98·8	99·8	1 N	50 N
24	108	108	21	21	99·4	99·8	2 N	50 N
25	84	92	17	18	98·4	98·8	2 N	56 N
26	84	104	17	19	98·4	99·4	2 N	56 N
27	76	100	17	19	98·8	99·4	1 N	56 N
28	72	84	17	17	98	98·8	2 N	48 N
29	76	92	17	17	98·4	98·8	1 N	64 N
30	80	88	17	17	98·4	98·8	1 N	62 N
31	80	88	17	17	98·4	98·8	1 N	60 N
Feb. 1	80	88	17	17	98·4	98·8	1 N	64 N
2	76	82	17	17	99	99·4	1 N	68 N
3	96	100	18	19	98·4	99·2	1 N	68 N
4	88	96	17	19	98·4	99	1 N	64 N
5	88	94	17	17	98·4	99	1 N	68 N
6	80	88	17	17	98	98·6	1 N	62 N
7	84	84	17	17	98·2	98·4	1 N	63 N
8	84	88	17	17	98·4	98·8	1 N	58 N
9	76	82	17	17	98	98·4	1 N	64 N
10	80	86	17	17	98·2	98·8	1 N	70 N
11	80	88	17	17	98·2	98·8	1 N	64 N
12	76	84	17	17	97·8	98·4	1 N	68 N
13	80	84	17	17	98·2	98·6	1 N	76 N
14	76	82	17	17	97·8	98·4	1 N	76 N
15	76	82	17	17		CN ^Y	1 N	68 N
16	76	82	17	17	97·8	98·4	1 N	62 N
17	76	80	17	17	98	98	1 N	68 N
18	76	80	17	17	98	98·4		

CASE NO. 28.

LEE WAT KIA (MALE), *Gambier Coolie. Taken ill at Johore ;
Duration of Disease, 2 months. Admitted 15th December, 1884 ;
Cured 16th February, 1885.*

FEBRUARY.

Urine	Reaction - -	1st week.	2nd week.	3rd week.	4th week.
	Sp. Gravity	Acid	Acid	Acid	Acid
	Albumen -	1006	1008	1008	1006
	Chlorides -	o	o	o	o
	Phosphates -	Normal	Normal	Normal	Normal
		Trace	Trace	o	Trace

History.—Patient states that he was taken ill at Johore, where he has resided for twelve years, working as a coolie on a gambier plantation. He first experienced—two months ago—a sensation of lassitude and weakness, especially in his legs and hands, and in fact all over his body. He took chinese medicine : 6 or 7 days after, he noticed swelling about the knees and epigastrium which gradually extended over his chest and face, legs and feet, and generally very slightly over his body. Four days before he observed a swelling, he experienced twitchings of the tendons of the legs attended with pain in the back of the legs, and his feet got numb. Twenty days after these symptoms had shown themselves he noticed a slight loss of power in his hands and feet, and an inability to walk steadily, and he had to use a stick to enable him to raise himself up or to move about.

Previous History.—During the twelve years that he was in Johore he suffered from intermittent fever, and has had attacks on four different occasions. His first three attacks lasted a month each—the fever returning daily. The fourth attack lasted ten days, and occurred two years ago. He suffered from dysentery three years ago which lasted eight months. He has had no other disease that he can recollect except a severe attack of small-pox, in China, when seven years old. The ground he worked upon in Johore was dry, not swampy. He lived in a shed with about twenty other coolies—lived on the ground floor, but slept in a cot. The floor was made of earth beaten down (not damp). No other coolie in his batch got the disease, but in the Campong (district) several cases have occurred. The plantation that he worked in was first opened three years ago. There were very few cases of the disease in his district for the first two years. During this year (3rd year) he has known of about ten cases. The

patient thinks that the disease came on because he worked in a plantation where the jungle was only recently cleared. He was a chandoo (opium refuse) smoker for ten years, smoking fifteen cents worth daily. His wages were seven dollars a month, all found. His diet consisted of rice, fresh and salted vegetables, and salt fish; and fresh fish four times a month, with pork twice a month. He usually had four meals daily, as follows:—

5.30 a.m. Congee and salted vegetables.

9.30 a.m. Rice, fresh vegetables, and salted fish.

12.0 noon. Congee and salted vegetables.

6.0 p.m. Fresh vegetables and salt fish.

Condition on Admission.—The patient is a moderately well built man, height 5 ft. 4 in., small-pox marked. He is able to lie on any side with ease, but not on the back from a feeling of fulness in the epigastrium when in that position. Face and head normal. Complexion, sallow. Eyes, nose, and mouth normal; gums slightly swollen, retracted at the edges. Teeth irregular, several have decayed. Tongue flabby; broad; having teeth marks along the edges, surface pale and tremulous. Tip of the tongue, inclined to be drawn downwards, behind the teeth; especially noticed when he extends it. Fauces slightly congested. Breath very foul. Able to walk, but only when held up on both sides. Spleen enlarged; area of hepatic dulness diminished.

Progress of the Case.—*December 18th.* Patient complains of feeling a fulness in his epigastrium, and a feeling of tightness after food. No thirst, no difficulty in breathing. Face very puffy. Chest, legs, thighs, and abdomen œdematous. Does not sleep well at night owing to the tightness in his chest, which is numb. There is a swelling in the epigastrium which is due to an enlarged spleen, extending down below the umbilicus and across to the hepatic region. The calves of the legs are particularly swollen from œdema, especially the bellies of the gastrocnemii and over the tibia. Not much œdema over the dorsum of the feet. No œdema of hands and arms. Loss of power in grasping with the hands, but no paralysis. *21st.* Complains of flatulence. No difficulty in breathing, no pain in his back, feels weak in his hands and knee joints, no spasms in the calves of his legs, tongue slightly furred, sleeps well, no thirst, appetite good. *23rd.* Complains of cold and numbness in his legs and feet, otherwise the same. *28th.* Face, abdomen, and legs more œdematous. Flatulence continues, could not sleep well last night, owing to a tight sensation in his abdomen. Appetite

good. 31st. Other symptoms much the same, but patient complains more of pain and numbness in his arms, from the elbow joint to the tip of the fingers, and from the knee joint to the tip of the toes. He has also slight spasms in his calves. *January 2nd.* Complains of pain, numbness and spasms in his arms, as before. Feels tightness in his chest, but has no difficulty in breathing. Tongue furred. 5th. Patient feels better, complained in the evening of a feeling of slight pain and spasms from the ankle joint to the knee joint, and in the calves; otherwise the same. 6th. The swelling in the face, dorsum of the feet and tibiæ has disappeared, he feels a tightness in the abdomen, otherwise the same. 8th. More pain and spasm in his arms. Did not sleep well last night owing to the pain and spasms in his legs. He is able to walk a little with crutches. 13th. Symptoms continue; has a slight dysenteric attack which has come on to-day. 19th. Feeling of pain, coldness, numbness and spasm in his legs continues in the evening, but are much less in the morning. 27th. Patient is much improved. He is able to walk with assistance. 30th. Still complains of slight spasm in his calves, but no pain. Patient is now able to run. *February 1st.* Patient improving—no pains or spasms—only feels a slight numbness in his calves. 9th. Much improved. 12th. Patient states that he feels quite well. Does not complain of pain, spasm, or numbness anywhere, says he is cured. 16th. Discharged.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 16							1 H	
17	84	94	26	27	98.4	99.4	2 N	50 N
18	89	96	24	27	99	99.2	1 N	38 N
19	87	90	24	26	98.4	100.2	6 W	50 N
20	84	92	23	24	98	99.4	2 N	48 N
21	88	94	22	24	99.4	100.2	1 N	54 P
22	86	94	20	23	98.4	99.2	2 N	38 P
23	88	94	17	19	99.8	99.8	2 N	36 P
24	84	90	17	19	99.8	99.8	2 N	38 H.C
25	80	88	17	19	98.8	99.2	2 N	34 N
26	88	90	17	17	99.4	99.6	2 N	38 N
27	84	92	17	18	98.4	99.8	2 N	46 N
28	86	92	17	18	98.6	99.8	2 N	40 N
29	80	88	17	18	98.2	98	2 N	34 N
30	80	94	17	18	98.6	99.2	3 N	46 N
31	88	94	17	18	99.2	99.8	2 N	46 N
1885.								
Jan. 1	84	104	17	19	98.8	99.6	2 N	38 N
2	88	104	17	19	99.4	99.8	2 N	45 N
3	88	102	17	19	99.4	99.8	2 N	46 N
4	92	116	18	21	99.6	99.8	2 N	64 N
5	88	94	18	19	99.4	99.8	2 N	50 N
6	92	100	18	21	99.6	99.8	2 N	46 N
7	84	98	17	21	99.6	99.8	2 N	38 H.C
8	88	99	17	21	99.6	99.8	2 N	32 H.C
9	88	104	17	23	99.6	99.8	2 N	38 H.C
10	88	102	17	20	98.6	100.2	2 N	46 H.C
11	88	104	17	20	98.6	99.6	2 N	32 H.C
12	84	104	17	20	98.4	99.8	4 W	28 H.C
13	88	104	17	20	99.2	99.4	8 D	32 H.C
14	88	112	17	20	98.8	100.4	8 D	30 H.C
15	88	104	17	20	98.6	99.4	5 D	28 H.C
16	88	96	17	20	99.4	99.8	5 D	28 H.C
17	88	98	17	20	99.6	99.8	2 2	34 H.C
18	84	120	17	23	98.6	99.8	1 H	30 H.C
19	88	112	17	21	98.4	99.4	2 N	30 H.C
20	88	96	17	19	98.8	99.4	2 N	34 H.C

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 21	88	94	17	19	98.8	99.4	2 N	38 H.C
22	88	94	17	18	99.2	99.6	2 N	40 H.C
23	88	100	17	19	98.6	99.8	2 N	38 H.C
24	108	116	19	21	98.6	99.8	2 N	28 H.C
25	90	98	19	19	98.6	99.4	2 N	30 H.C
26	104	108	19	19	99.2	99.6	2 N	32 H.C
27	98	108	19	19	99.6	99.8	2 N	28 H.C
28	100	108	19	19	99.4	99.8	2 N	36 H.C
29	84	112	17	19	99.6	99.6	2 N	42 H.C
30	84	104	17	19	99.6	99.4	2 N	50 H.C
31	88	88	17	17	99.2	99.4	2 N	66 N
Feb. 1	96	102	19	21	99.6	99.8	2 N	50 H.C
2	96	100	19	21			2 N	44 H.C
3	88	96	17	19			2 N	42 H.C
4	92	96	19	19			2 N	40 H.C
5	96	98	19	19			2 N	50 H.C
6	92	96	19	19			2 N	42 H.C
7	100	104	21	21			2 N	40 H.C
8	94	102	19	21			1 N	40 H.C
9	92	98	19	19	99.2	99.6	1 N	38 H.C
10	92	96	19	19	98.8	99.4	2 N	42 H.C
11	96	98	19	19	98.8	99.4	2 N	50 H.C
12	96	98	19	19	98.6	99.2	1 N	42 H.C
13	96	98	19	19	98.4	99.2	1 N	60 H.C
14	100	100	19	19	99.4	99.4	1 N	37 H.C
15	96	98	18	19	CHNY		1 N	48 H.C
16	98	98	18	19	98	98.4	1 H	40 H.C
17	96	98	19	19	98.4	98.8	1 N	43 H.C
18	90	96	17	19	99.2	99.6	1 N	38 H.C
19	88	96	17	19	98.6	99.2	2 N	38 N
20	96	98	19	19	99.2	99.6	1 N	40 N
21	96	98	19	19	99.2	99.6	1 N	50 N
22	90	92	18	18	99	99.2	1 N	64 N
23	88	90	17	17	98.6	98.8	2 N	68 N
24	84	88	17	17	98.4	98.8	2 N	52 N
25	80	84	17	17	98.4	98.6	1 N	56 N
26	80	88	17	17	98.4	98.8	2 N	50 N
27	84	88	17	17	98.4	98.8	1 N	52 N
28	80	84	17	17	98.2	98.6	1 N	56 N

CASE NO. 29.

CHUA GEK HOON (MALE), age (?), Gambier Coolie. Taken ill at Rhio; Duration of disease 2 months. Admitted December 16th, 1884, Cured.

FEBRUARY.

Urine	Reaction -	1st week Acid	2nd week Acid	3rd week Acid	4th week Acid
	Sp. Gravity-	1008	1004	1006	1008
	Albumen -	0	0	0	0
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	Trace	Trace	Trace	Trace

History.—Patient states that he has been residing in Rhio one year and four months, during which time he worked on three different Gambier estates as a coolie. He enjoyed good health until two months ago when he got an attack of fever which lasted for two weeks, the attacks coming on every day for five hours each day. He had no rigors. After the fever left him he took a cold bath, and subsequent to this, several boils appeared on his legs and he got swelling of his feet. He stopped work two months ago, when he got the fever. When the boils and swelling of legs appeared he could not walk on account of the pain caused thereby, and after the boils disappeared the swelling also left him,—which was about 25 days ago, but he found he could not walk steadily as his legs were weak, and he felt as if his knees were giving way under him. He also experienced a sensation (as he describes it) of there being no muscle on the dorsum of his feet. He consulted a Chinese doctor twice, who administered two doses of a concoction, but getting no relief, and not being able to work he left Rhio on the 16th and obtained admission here the same evening. He was in receipt of 4 dols. 80 cents a month, all found. He considers he was well fed, his meals were as follows:—

- 6.0 a.m. Congee, fresh fish, and salted vegetables.
- 8.0 a.m. Rice, fresh fish and fresh vegetables.
- 12.0 noon, Congee and salted Chinese fruit.
- 6.0 p.m. Rice and fresh fish.

He had pork three times a month during three first meals, had no salt fish. (Part of his money he spent in gambling, the rest he sent to China.) He left China for Singapore two years ago and has lived here for 8 months rearing ducks. He has enjoyed here good health. He does not recollect of ever having suffered from any

disease before this. In China he was a paddy-grower, and was insufficiently fed. His meals consisting chiefly of congee, potatoes, and salted fish, and salted vegetables. He ate fresh fish five times and pork three times a month.

Condition on Admission.—He is a spare built man, height 5 ft. 2½ in. Lies on either side. Has no pain in his back and can lie on it.

Face.—Complexion, eyes, nose, mouth, lips, normal. Teeth, strong, regular and undecayed. Gums, slightly swollen. Tongue, broad dentated at the edges, and tremulous on the surface. Fauces, normal. There is no œdema anywhere. He feels as if his legs were weak and cannot support him. There is a slight feeling of numbness and a sensation as if ants were crawling on the dorsum of his feet. There is no pain in his calves, no twitchings of the tendons, no numbness or sensation of fulness in the epigastrium. Hands are strong, as usual, and he does not feel anything abnormal. He is able to walk but with very slow and unsteady gait, and when he walks he feels as if he was in danger of falling backwards every minute. He has no pain anywhere. His knees feel weak. Pulse 76. Respiration 17. Temperature 98.

Progress of the Case.—*December 19th.* Patient states that he feels to-day slight numbness in his legs, no pain in his calves. He is able to walk, but his knees are weak, appetite good. Tongue covered with a thin white fur, no thirst, no difficulty in breathing, no pain in his back. He feels stronger to-day and can walk without assistance but gait very unsteady. *21st.* Had an attack of fever yesterday evening after bathing, which has lasted until now, did not sleep well last night in consequence, no appetite, tongue covered with a thin white fur, and he complains of thirst. *22nd.* No fever, otherwise the same. *23rd.* Complains of weakness and spasms in his calves. *24th.* Complains of a stiff, cold, and weak feeling extending from the knees to the ankle joint; no spasm in his calves. *25th.* Complains of stiffness and pain in his toes. *27th.* Complains of feeling cold last night, preventing him from sleeping, no spasm in his calves, appetite good, no thirst, has numbness in his legs, tongue the same. *30th.* Complains only of stiffness in his calves, otherwise doing well. *January 11th.* Patient continued to improve until to-day when he felt feverish. No pain, numbness or spasm anywhere. *16th.* Patient states that he feels well. Temperature 101. Tongue, thin white fur with red edges, sleeps well, no thirst, no appetite. *19th.* Patient feverish, did not sleep well last night. Tongue coated, tip

and edges red. Papillæ prominent, no appetite. He walks steadier but with feet wide apart. No pain anywhere. Has an empty feeling in his stomach and complains of giddiness. Gums, very much swollen and bleed easily on pressure. 21st. Patient feels weakness in his hands and feet. Temperature 100. Sleeps badly. Otherwise the same. 23rd. Feels better and complains only of weakness in his arms and legs. 24th. Patient states he is quite well this morning. Does not complain of pain anywhere. 26th. Complains of tightness and pain in his calves, sleeps well, appetite good, no thirst. 29th. Complains of spasm and pain in his calves. February 4th. Patient doing well. Does not complain of pain or numbness anywhere. Feels only a weakness in his calves. 20th. Patient continued to improve until the 28th, when he was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 18	76	84	17	17	98	98.4	2 N	48 N
19	76	84	17	17	97.8	99.8	0	50 P
20	80	96	17	19	98.4	101.8	1 H	38 N
21	104	99	17	18	101	101.4	1 H	48 N
22	88	94	17	19	98.6	99.2	1 H	50 N
23	82	90	17	18	98.4	98.8	1 N	42 N
24	84	88	17	17	98.4	98.4	1 N	40 N
25	76	80	15	15	98	98.4	1 N	50 N
26	72	80	15	17	98	98.4	2 N	42 N
27	76	82	15	17	98.4	98.6	2 N	42 N
28	76	82	15	17	98.4	98.8	2 N	50 N
29	76	82	15	17	98.4	98.8	2 N	42 N
30	78	104	15	19	98.4	99.2	2 N	50 N
31	78	104	15	19	98.4	99.2	2 N	46 N
1885.								
Jan. 1	96	99	19	19	99.2	99.4	2 N	68 N
2	94	98	19	19	99.2	99.8	1 N	56 N
3	88	94	17	18	99	99.4	1 N	50 N
4	88	120	17	21	99	100.6	1 N	42 N
5	108	89	21	21	99.8	98.6	1 N	40 N
6	78	84	17	17	98.6	98.8	1 N	40 N
7	84	86	17	17	99	99.2	1 N	48 N
8	84	92	17	19	99.2	99.6	1 N	40 N
9	84	92	17	19	99.4	99.6	1 N	40 N
10	88	94	17	19	100	100.4	1 N	40 N
11	88	94	17	19	100.6	100.4	1 N	40 N
12	88	100	17	21	101.6	101.8	10 W	40 H.C
13	100	100	20	21	102.2	101.8	4 W	40 N
14	96	80	20	21	101.8	102.4	3 W	40 N
15	98	100	20	20	103	102.6	4 W	40 N
16	88	88	17	17	101	101.4	6 W	38 H.C
17	88	96	17	19	102.6	103.2	2 D	28 H.C
18	88	96	17	19	101.4	101.8	2 D	38 N
19	84	92	17	19	101.4	101.8	2 D	38 N
20	84	104	17	21	100.2	101.4	2 D	41 N
21	84	98	17	19	100	100.8	2 N	50 N
22	96	100	19	20	99.4	99.8	2 N	55 N
23	96	100	19	21	100.2	100.6	2 N	56 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 24	104	116	21	23	99.6	100.8	2 N	72 N
25	84	96	17	19	98.2	99.4	2 N	62 N
26	92	96	17	19	99.2	99.8	2 N	62 N
27	84	92	17	19	98.8	99.6	2 N	65 N
28	88	92	17	19	98.8	99.4	2 N	58 N
29	88	104	17	19	98.4	99.4	2 N	64 N
30	88	96	17	19	98.8	98.6	2 N	68 N
31	88	92	17	19	98.4	98.8	2 N	62 N
Feb. 1	94	104	19	21	99.4	100.2	2 N	60 N
2	92	102	19	19	99.4	99.8	2 N	62 N
3	108	102	19	19	98.6	99.8	2 N	66 N
4	96	102	19	19	98.2	99.2	2 N	56 N
5	96	98	19	19	98.2	98.4	2 N	62 N
6	92	96	19	19	97.6	98.2	2 N	68 N
7	100	108	21	21	98.4	98.8	3 N	72 N
8	100	108	21	21	98.6	99.4	2 N	68 N
9	104	108	21	21	98.4	99.4	2 N	68 N
10	100	105	21	21	98.4	99.2	2 N	50 N
11	92	98	19	19	98.6	99.6	2 N	50 N
12	92	98	19	19	98.2	99.2	2 N	60 N
13	92	98	19	19	98.8	99.6	2 N	48 N
14	92	98	19	19	98.8	99.4	2 N	48 N
15	92	96	18	19	CN V		2 N	54 N
16	92	96	19	19	98.8	99.2	2 N	50 N
17	88	96	17	19	98.4	98.8	2 N	48 N
18	90	96	17	19	98.6	99.4	2 N	46 N
19	88	92	17	19	98.4	98.8	2 N	50 N
20	88	98	17	19	98.4	99.4	2 N	60 N
21	96	98	19	19	98.8	98.8	2 N	50 N
22	92	98	19	19	98.8	98.8	2 N	48 N
23	92	96	19	19	98.8	99.4	2 N	54 N
24	88	92	17	19	98.4	98.8	1 N	46 N
25	84	88	17	17	98.4	98.8	2 N	52 N
26	84	88	17	17	98.4	98.8	2 N	48 N
27	88	92	17	18	98.4	98.8	1 N	56 N
28	84	88	17	17	98.4	98.8	2 N	50 N

CASE No. 30.

TAY TEK HENG (MALE), aged 23, Chinese Cake Maker. Taken ill at Bukit Timah (11 mile stones from Singapore;) Duration of Disease, 10 days. Admitted 28th January, 1885; Cured.

FEBRUARY.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1010	1008	1010	1008
	Albumen - -	0	0	0	0
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	0	0	0	0

History.—Patient states that he came from China eleven months ago, and was employed for seven months in a fruit garden in Teluk Blanga, after which he went to Johore, where he stayed two and a-half months doing no work. A month and a-half ago he got employment at Bukit Timah as assistant to a cake maker. He continued well until sixteen days ago, when he had to stop work on account of an attack of intermittent fever, which came on daily at 3 p.m., and left him at 6 p.m. The fever lasted five days, when he experienced great weakness in his legs, and he was not able to walk steadily, and he felt a sensation of pins and needles in his legs. The next day he was not able to get out of bed, stand or walk. He observed a little œdema on the dorsum of his feet three days after the symptoms appeared in his legs, and he felt loss of power in his hands, and twitchings in the flexor tendons of his arms and legs. He states that he had enough to eat. He had three meals daily:—

9 a.m. Rice, pork, eggs, fresh fish and fresh vegetables.

1 p.m. Rice or congee and salted vegetables.

5 p.m. Rice, salt vegetables and pork.

State on Admission.—He is a moderately well-built man. Lies on his back, but is not able to turn on his side with help. He lies with his legs extended.

Anæsthesia.—There is numbness in his legs from his toes to his hips—in the abdominal wall, lips, nose, and hands, up to the wrist joints, and over the lumbar region.

Hyperæsthesia.—There is pain on pressure in his calves, between the ulna and radius on the anterior aspect. He has also slight pain in the lumbar region. He is not able to get up from his bed, stand or walk; even when held up by two assistants he is not able to support himself on his legs—(there is complete loss of power in his

legs). He is not able to raise them from off the bed when lying on his cot. There is loss of power also in his hands, and he is not able to close or extend his hands freely ; he is not able to hold his cup or use his chopsticks.

There is no œdema. His face is flushed. There is no anæmia ; gums slightly spongy, and bleed a little on pressure. Tongue flabby—red in the centre and edges, with white fur patches in intervening spaces. Fauces slightly inflamed. There is a feeling of uneasiness in the epigastrium. Appetite indifferent ; bowels costive.

Areas of hepatic and splenic dulness, normal. Pulse, 96 ; respiration, 19 ; temperature, 101·6.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 1	100	92	19	19	102'2	101'4	1 N	42 H.C
2	100	108	19	19	101'6	102'4	0	46 H.C
3	96	100	19	19	101'6	101'4	0	40 H.C
4	96	98	19	20	102'6	100'2	0	38 H.C
5	100	99	19	24	102'2	102'6	0	40 H.C
6	98	96	19	20	100'2	102	0	38 H.C
7	99	96	24	22	100	101'8	2 N	40 H.C
8	99	96	24	22	101	100'8	1 N	40 H.C
9	99	96	24	24	101'2	100'8	0	40 H.C
10	99	96	24	22	101'4	100'8	0	40 H.C
11	99	99	24	24	101'4	101'2	0	42 H.C
12	92	90	24	24	100'2	101'2	2 N	42 H.C
13	92	92	24	24	101'2	101	3 W	40 H.C
14	92	92	24	24	108'8	100.2	1 W	42 H.C
15	90	92	24	24	CN Y		1 W	42 H.C
16	92	92	24	24	101	100'2	0	40 H.C
17	90	90	24	24	100'8	99'8	1 H	44 H.C
18	92	92	24	24	100'2	99'8	0	52 H.C
19	92	92	24	24	100'1	99'8	0	50 H.C
20	92	92	24	22	102	99'6	1 W	50 H.C
21	92	94	24	22	100	99'6	1 W	50 H.C
22	92	94	24	22	100	99'6	0	50 H.C
23	92	94	24	24	100	99'8	2 N	40 H.C
24	92	92	22	24	99'8	99'8	2 W	51 H.C
25	92	90	22	22	99'4	99'6	7 W	48 H.C
26	92	90	20	22	99'6	99'8	7 W	50 H.C
27	90	92	22	20	99'4	99'6	7 W	52 H.C
28	90	90	20	20	99'2	99'6	6 W	52 H.C
Mar. 1	90	92	22	20	99'4	99'6	6	48
2	90	90	22	20	99'2	99'6	6	50
3	92	90	22	20	99'4	99'6	6	48
4	92	90	19	19	99'4	98'8	6	50
5	92	92	20	20	99'6	99'6	2	80
6	92	92	20	20	99'6	99'4	4	68
7	92	90	20	20	99'6	99'4	5	85
8	92		18		99'6			
9	92		20		99'8			50
10	92	90	20	20	98'8	99'6	6	48

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Mar. 11	80	80	17	20	96·8	99·8	0	50
12	90	80	17	20	92·2	98·6	1	60
13	90	80	17	20	99·2	98·6	1	50
14	80	80	17	20	99·2	98·2	1	60
15	90	80	17	18	99·6	90·2	2	50
16	90	80	17	20	98·6	99·2	3	60
17	90	80	17	20	98·6	90·2	2	50
18	90	80	19	20	99·6	99·6	2	60
19	92	90	17	20	92·2	90·2	2	60
20	92	90	19	20	98·6	99·6	1	50
21	80	90	17	20	94·2	99·6	2	62
22	82	92	17	20	94·2	90·2	2	50
23	80	90	18	20	84·2	90·6	1	60
24	80	90	17	20	99·6	98·8	2	60
25	82	90	18	20	99·6	90·2	0	50
26	82		17	20	99·6			

CASE NO. 31.

GAN AH WAT (MALE) age 20, *Wood-cutter*. Taken ill at Benkalis ;
Duration of Disease, 13 days. Admitted, February 3rd, 1885 ;
Cured.

FEBRUARY.

		2nd week	3rd week	4th week
Urine	Reaction -	Acid	Acid	Acid
	Sp. Gravity -	1008	1008	1008
	Albumen -	0	0	0
	Chlorides -	Normal	Normal	Normal
	Phosphates -	Trace	Trace	Trace

History.—Patient states that he has worked in Benkalis (Rhio), as a wood-cutter for the last four months, on damp ground, and has had to wade through water knee deep for about a mile morning and evening while going and returning from the forests. He lived in a

hut on the ground, which was damp, sleeping on planks a foot off it. A fortnight ago he felt rather unwell, with pains and a feeling of lassitude all over his body. He was in receipt of three dollars fifty cents a month, all found. He had three meals daily, namely :—

6 a.m. Rice, salt fish, and salted vegetables.

12 noon. „ „ „ „

5 p.m. Congee, salt fish, and salted vegetables.

Previous History.—He had an attack of fever ten days after his first arrival in Benkalis, which lasted about ten days. He also had an attack of dysentery two months ago, which lasted the same time.

Condition on Admission.—He is a small-built man, able to lie on either side, but he is not able to keep his legs extended on account of the contraction of the tendons. There is numbness, from the toes to the hip joint, in the abdominal wall, the penis and scrotum; in the arms, from the fingers to the shoulder joint—no numbness about the face. There is pain, on pressure, in the calves, dorsum of the feet, muscles of the thighs and arms, especially between the radius and ulna and in the lumbar region. He is unable to stand or walk, and when held up by assistants he can hardly drag his legs forward. He is unable to extend his legs—the flexors are contracted), and when he attempts to raise his legs off the cot they are involuntarily forcibly flexed. There is apparent loss of power in his legs and in the hands. He has wrist-drop, and the fingers cannot be flexed or extended freely; he is unable to hold his cup or his chopsticks. Face puffy. There is œdema on the dorsum of the feet. No marked anæmia. Body covered with tinea and herpes. Gums spongy, and bleed on pressure. Tongue flabby—covered with white film, with red and dentated edges. Fauces inflamed; voice husky. A feeling of fulness in the epigastrium. Pulse, 104; respiration, 19; temperature, 98.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.*	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 5	100	124	19	21	97.8	98.6		40 N
6	104	124	19	21	98	98.6		40 N
7	104	124	19	21	98	98.4	1 N	40 N
8	104	121	19	21	98.2	98	2 N	40 N
9	100	121	19	21	98.4	99	1 N	40 N
10	101	124	19	21	99.4	99.6	1 N	40 N
11	100	121	19	21	99.6	99.2	1 N	40 N
12	100	121	19	21	99.4	99.2	1 N	40 N
13	104	121	19	20	99.4	99.6	5 W	40 N
14	104	104	19	20	99.4	99.8	5 W	52 N
15	102	100	19	19	CN V		3 W	46 N
16	104	100	21	19	99.8	99.4	1 W	52 N
17	104	100	21	18	99.2	99.6	1 W	50 N
18	102	100	22	24	99.4	99.8	1 W	46 N
19	104	112	24	24	99.8	99.8	1 W	42 N
20	102	100	24	22	99.6	99.4	1 W	40 N
21	104	100	24	22	99.8	99.8	1 W	40 N
22	104	100	24	22	99.6	99.4	1 W	40 N
23	104	104	24	20	99.6	99	2 W	36 N
24	102	100	22	22	99.4	99.2	6 W	40 N
25	99	100	22	24	99.6	99.6	4 W	42 N
26	98	99	20	22	99.4	99.8	2 W	50 N
27	98	98	20	24	99.6	99.8	2 W	51 N
28	98	98	22	24	99.6	99.6	3 W	60 N
Mar. 1	98	96	24	22	99.4	99.8	3 W	60
2	98	96	22	24	99.4	99.6	2 W	62
3	98	96	22	20	99.4	99.8	2 W	60
4	92	92	19	19	99.2	99.4	2 W	58
5	92	92	18	20	99.6	98.8	2 W	72
6	92	92	20	20	99.6	99.6	2 W	62
7	96	90	22	18	99.4	99.2	2 W	56
8	92	90	19	19	98.4	99.2	2 W	60
9	92	96	18	20	99.2	98.4	3 N	48
10	90	92	19	20	98.6	99.4	4 N	50
11	90	80	20	18	92	98.2	2 N	50
12	90	90	20	17	99.6	98.2	1 N	60
13	80	90	18	19	92.6	98.2	2 N	50
14	80	90	20	17	96	99.6	1 N	60

CHART OF CLINICAL OBSERVATIONS—(continued.)

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1885.								
Mar. 15	80	90	17	20	98.2	99.6	1 N	50
16	80	90	17	20	98.2	99.6	2 N	48
17	80	90	18	20	94.2	99.6	2 N	60
18	80	90	19	20	94.2	99.6	2 N	50
19	82	80	17	18	94.2	90.2	2 N	60
20	90	84	19	20	99.6	94.2	2 N	80
21	84	90	17	20	98.8	99.6	2 N	60
22	80	92	17	20	94.2	98.8	2 N	50
23	84	80	18	20	94.2	99.6	2 N	80
24	90		17		98.8			

CASE NO. 32.

LIP AH HOW (MALE), age 21, Carpenter. Taken ill at Singapore; Duration of Disease, 36 days. Admitted February 8th, 1886; Cured

February,

Urine	{	Reaction - -	3rd week.	4th week.
		Acid	Acid	
		Sp. Gravity - -	1008	1008
		Albumen - -	o	o
		Chlorides - -	Normal	Normal
Phosphates - -	Trace	Trace		

History.—Patient has been a resident in Singapore for five years during which time he has suffered from periodical attacks of fever at intervals of two or three months; each attack lasting about three days. His present illness dates from about two months ago, when he found that he was easily tired and could only walk with difficulty after his days work. This weakness of his lower extremities gradually increased, when after a month from the commencement of

his symptoms he found that his gait had become very unsteady. About fifteen days after this he felt his lower extremities, from the hips downwards, and the upper extremities, from the hands to the shoulder joint were benumbed. He had no uneasiness about the epigastrium. He received 10½ dollars as his wages, and has never been in want.

Condition on Admission.—He is unable to sit up or turn in his bed without great difficulty, and he experiences pain when doing so. There is more or less complete loss of power of the muscles of the legs, he being unable either to raise or bend them. (There is no anæmia.) There is numbness from the hips to the toes and loss of sensation at the heel, toes and upper parts of the soles of both feet. There is hyperæsthesia all over the body, more especially about the thighs and calves, and also in the upper extremities. The latter is more marked about the elbow and upper arm. The muscles of the upper arm are more or less powerless. He is unable to use the wrist, elbow or shoulder joints freely. He has lost much flesh. He has partially lost all power over the buccinator muscles, he being unable to inflate his mouth or to whistle. Extensors of the forearm and muscles of the calf are wasted. Gums, spongy and bleed on pressure. He is unable to leave his bed and passes his motions involuntarily, and has to be fed.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 9		88		17		98.8		46 N
10	84	92	17	18	97	97.6		40 H.C
11	92	96	18	18	97.2	98.2	2 W	68 H.C
12	92	96	18	18	97.4	98.6		40 H.C
13	88	96	17	18	97.4	98.6		40 H.C
14	84	90	17	18	97.6	98.2	1 N	40 H.C
15	84	94	17	18		CN Y	1 N	40 H.C
16	83	96	17	17	98	98.6	1 N	40 H.C
17	83	96	17	17	97.4	98	1 N	36 H.C
18	83	96	17	17	97.6	98.4	1 N	38 H.C
19	83	84	17	17	97.8	98.4		36 H.C
20	76	80	17	17	97.6	98.2	1 N	38 H.C
21	72	80	17	17	97.6	99.4	1 N	38 H.C
22	76	80	17	17	98.4	98.8		38 H.C
23	76	80	17	17	98.4	98.6	1 N	39 H.C
24	76	82	17	17	98.4	98.4	0	40 H.C
25	76	80	17	17	98.8	98.8	0	42 H.C
26	80	82	18	17	98.6	99	0	50 H.C
27	82	82	18	17	99.4	99.8	1 W	52 H.C
28	82	80	17	17	99.2	99.6	2 N	52 H.C
Mar. 1	80	82	17	17	99.2	94.4	3 W	50
2	82	80	17	17	99.4	98.8	2 N	52
3	82	80	17	17	99.2	99.4	1 N	50
4	62	80	17	17	99.2	99.4	0	60
5	82	90	17	20	99.4	99.6	1	58
6	90	92	18	20	99.4	99	0	60
7	92	90	20	18	99	98.6	0	62
8	92		20		99.2		1	
9	90	90	18	20	98.4	98.4	1	50
10	90	92	20	20	99.6	99.8	1	48
11	90	90	17	20	98.6	99.6	0	
12	80	90	18	17	98.2	99.6	0	50
13	80	80	20	17	98.2	98.2	1	60
14	90	80	20	17	99.6	98.2	1	60
15	90	80	20	18	90.2	99.6	0	58
16	90	80	20	19	98.2	99.6	1	60
17	90	80	20	18	98.2	99.6	1	60
18	92	80	20	20	90.2	99.6	2	60

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Mar. 19	90	92	17	20	94.2	98.6	1	60
20	94	90	18	17	99.2	98.8	0	60
21	80	90	20	18	99.6	99.2	0	80
22	84	90	20	18	99.6	98.8	0	60
23	84	90	20	19	96.2	98.8	0	60
24	92	90	20	20	99.6	98.8	0	50
25	80		18		99.6			

CASE NO. 33.

YAP AH CHOON (MALE), age 37, Sawyer, Taken ill at Salapong (Rhio); Duration of Disease, 3½ months. Admitted, 7th February, 1885; Cured.

MARCH

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1010	1008	1012	1010
	Albumen -	0	0	0	0
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	0	0	0	0

History.—Patient states that he left China eight years ago, and has worked as a sawyer the whole time in Salapong (District of Rhio). He suffered from attacks of intermittent fever three or four times every year. Three-and-a-half months ago he had general dropsy and a feeling of uneasiness in the epigastrium which came on ten days afterwards (? Beri-Beri). Two days after this feeling in the pit of the stomach he experienced numbness and weakness in his legs and ten days after this again in his hands with slight loss of power. These symptoms increased so that in four days after their first appearance he was unable to walk at all. The dropsy now com-

menced to disappear, completely leaving him in ten days. He worked in a forest all day, in the rain at times, and had to go through marshy ground to get to his work. He was in receipt of ten cents daily and food. He had five meals daily as follows:—

6 a.m. Rice, salt fish, and salt vegetables.

8 a.m. Congee and salt.

12 noon. Rice, salt fish, and salt vegetables.

3 p.m. Congee and salt.

6 p.m. Rice, salt fish, and salt vegetables.

Three times a month he got pork, duck, and fowl.

Condition on Admission.—He is a well built man, no œdema, no anæmia, and able to lie on either side. He is unable to extend his legs to their full length on account of contraction of the flexors.

Anæsthesia.—There is numbness from the toes to the hip, also in the abdominal wall, penis, and scrotum; and from the tips of his fingers to the elbow joint he feels numbness, and at times pain and a sensation of fulness in his epigastrium.

Hyperæsthesia.—There is pain in the toes and on the dorsum of the feet, muscles of the legs and thighs, hands, and arms, up to the elbow joint. The pain is more severe in the calves and between the radius and ulna on their anterior aspect. There is also some pain on pressure over the pectoralis. He is not able to stand. There is loss of power in the feet, with well marked contraction of the flexor tendons of the legs. Hands weak, and patient is unable to extend or close his fingers fully. There is loss of power at the wrist (wrist-drop). He is not able either to hold his cup or use his chopsticks.

Voice husky, gums slightly swollen and bleed on pressure, tongue slightly foul, fauces inflamed, appetite good. Pulse 88. Respiration 17. Temperature 99.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885. Feb. 9		88		17		98.6		68 N
10	84	88	17	17	98.6	98.8		56 N
11	84	88	17	17	98.8	98.8	2 W	68 N
12	88	88	17	17	98.8	98.8	2 W	68 N
13	88	92	17	18	99	99.6	2 W	68 N
14	88	92	17	18	99	99.6	1 N	60 N
15	88	96	17	18	C N Y		1 N	68 N
16	84	88	17	17	99	99.4	1 N	60 N
17	80	88	17	17	98.4	98.8	1 N	68 N
18	80	88	17	17	98.8	99.2	1 N	62 N
19	80	84	17	17	98.4	98.6	1 N	64 N
20	80	84	17	17	98.4	98.4	1 N	60 N
21	80	84	17	17	98.4	98.6	1 N	68 N
22	80	84	17	17	98.4	98.6	1 N	64 N
23	80	84	17	17	98.4	98.8	1 N	60 N
24	80	84	17	17	98.2	98.6	1 N	50 N
25	84	88	17	17	98.4	98.8	1 N	52 N
26	84	88	17	17	98.4	98.8	1 N	50 N
27	80	88	17	17	98.4	98.8	1 N	52 N
28	84	88	17	17	98.4	98.8	1 N	50 N
Mar. 1	84	88	17	17	98.4	98.8	1 N	46 N
2	80	86	17	17	98.2	98.6	1 N	42 N
3	84	88	17	17	98.4	98.8	1 N	50 N
4	108	112	21	21	98.4	98.8	1 N	46 N
5	96	104	19	21	98.6	99.4	1 N	50 N
6	98	104	19	21	98.8	99.4	2 N	56 N
7	96	100	19	19	98.6	98.8	3 N	50 N
8	92	96	19	19	98.4	98.6	2 N	48 N
9	92	96	19	19	98.4	98.8	2 N	50 N
10	92	96	19	19	98.6	98.8	2 N	46 N
11	92	96	19	19	98.4	98.8	1 N	49 N
12	96	96	19	19	98.6	98.8	2 N	52 N
13	92	96	19	19	98.4	98.8	1 N	46 N
14	96	96	19	19	98.6	98.8	1 N	49 N
15	92	96	19	19	98.4	98.8	1 N	50 N
16	92	96	19	19	98.4	98.8	1 N	46 N
17	88	92	17	17	98.4	98.8	1 N	49 N
18	84	88	17	17	98.4	98.8	1 N	50 N
19	80	86	17	17	98.2	98.6	1 N	44 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Mar. 20	84	88	17	17	98·4	98·8	I N	49 N
21	80	84	17	17	98	98·4	I N	50 N
22	84	86	17	17	98·4	98·6	I N	44 N
23	80	88	17	17	98·2	98·6	I N	49 N
24	80	84	17	17	98·4	98·6	I N	49 N
25	84	86	17	17	98·4	98·4	I N	44 N
26	84	88	17	17	98·4	98·6	I N	49 N
27	84	86	17	17	98·4	98·8	I N	50 N
28	80	84	17	17	98	98·4	I N	44 N
29	84	88	77	17	98·4	98·8	I N	49 N
30	82	86	17	17	98	98·6	I N	48 N
31	84	88	17	17	98·4	98·4	I N	50 N
Apr. 1	84	88	17	17	98·4	98·8	I N	49 N
2	80	84	17	17	98	98·4	I N	44 N
3	84	88	17	17	98·4	98·8	I N	50 N
4	84	86	17	17	98·4	98·6	I N	46 N
5	84	88	17	17	98·4	98·8	I N	49 N
6	80	84	17	17	98	98·4	I N	48 N
7	84	88	17	17	98·4	98·8	I N	50 N
8	84	86	17	17	98·4	98·6	I N	44 N
9	80	84	17	17	98	98·4	I N	49 N
10	84	88	17	17	98·4	98·8	I N	44 N
11	84	88	17	17	98·4	98·8	I N	46 N
12	80	84	17	17	98	98·4	I N	49 N
13	84	88	17	17	98·4	98·8	I N	48 N
14	80		17		98			

CASE 34.

CHOW LENG GEONG (MALE), age 22, *Gambier Coolie*.
*Taken ill at Johore. Admitted 31st December; Duration of
 Disease, 25 days. Cured.*

JANUARY

		1st week	2nd week	3rd week	4th week
Urin	Reaction - -	Acid	Slightly acid	Slightly acid	Slightly acid
	Sp. Gravity -	1008	1012	1012	1012
	Albumen - -	o	o	o	o
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	o	o	o	o

History.—Patient states that he has resided in Johore for two years, on a gambier estate, as a coolie in charge of the furnace. He had an attack of intermittent fever eight months after his first arrival in Johore, which lasted four days. He was free from fever and enjoyed good health until 44 days ago, when he had an attack of fever which lasted twenty-eight days, which confined him to his bed. After the fever left him he tried to get up, but found that his legs were very weak and he was unable to walk without assistance. (This was 16 days ago). His legs grew weaker daily until ten days since when he experienced numbness, first in the calves of his legs, then gradually extending up to the knees and thighs, and downwards to the dorsum of his feet. Numbness also appeared at the same time in his hands. Two days after the numbness appeared in his hands he suffered from slight loss of power in his fingers which he first noticed when attempting to stitch his jacket. He then found that he was unable to hold his needle. After this last attack of fever he had a little œdema on the dorsum of the feet (he says that the swelling there pitted on pressure). The œdema disappeared in two or three days. He thinks he was well fed. His wages were 9½ dollars, all found. His meals were as follows:—

- 6.0 a.m. Congee and salt vegetables.
- 8.0 a.m. Rice, salt fish, and salt vegetables.
- 11.0 a.m. Rice and salt fish.
- 1.0 p.m. Congee and salt vegetables.
- 3.30 p.m. Rice and salt fish.
- 6.0 p.m. Rice and salt fish, and fresh vegetables.

He had pork during one meal once a month. Fresh fish, very seldom.

Condition on Admission.—He is a small built man, height 5 ft. 4 in. Able to lie on either side but not on his back for long, on

account of the pain which he experiences then in the lumbar and sacral regions. Extremities cold. There is numbness in his fingers and hands extending up his arms as far as the elbow joint, also from his toes up his legs and thighs to a line drawn across the abdomen at a point over the ensiform cartilage. The whole of the abdominal wall is numb. There is apparent loss of power in his legs, patient being unable to stand or walk without assistance. He says that he cannot walk because his legs are weak, and the flexors are tense, going into spasms when he attempts to do so. There is not much loss of power in his hands, he is able to close his fist, use his chopsticks, or hold his cup. He is able to move his legs, and extend them but the attempt causes pain in the calves. He is unable to draw his feet forward dorsally which he attributes to tightness of the tendons on the dorsum of the feet. He lies with his legs drawn up because pressure of the cot on his calves causes him pain (he says that when his legs are kept in an extended position, the tendons at the back of the legs are in danger of snapping). There is pain on pressure in the calves, and slightly also on the front of the legs, on either side of the tibiæ. There is also pain in the muscles of the thigh; no pain in the dorsum of the feet; there is pain on pressure between the radius and the ulna in their whole length and in the muscles of the upper arm. There is no pain in the epigastrium but a feeling of uneasiness there when he exerts himself, which also causes him loss of breath, on the least exertion.

There is no marked anæmia, and no œdema anywhere. Gums, swollen and slightly spongy, and bleed on pressure. Tongue foul, coated with a white fur in the centre, and pale red along the edges, with prominent papillae. Fauces inflamed slightly. The patient complains of pain in his throat on deglutition.

Progress of the Case.—*January 3rd.* Patient complains of the pain in his throat and of tightness in his chest, and of the numbness in his abdomen. He feels a sensation of coldness from 1 o'clock to 3 o'clock, and a pain and numbness in the buttocks. Tongue flabby, appetite good, bowels regular. No sleep, owing to the pain and numbness in his buttocks. *9th.* Patient complains of pain in his eyes and throat, and of tightness and numbness in his chest, also of flatulence and numbness. He feels pain in his loins, and feels pain and numbness and spasmodic contraction in his calves. He can walk however, with assistance. *20th.* Patient gradually improving. *23rd.* Complains of spasms and numbness in his legs, otherwise the same. He continued to improve until the *26th*, when he was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885. Jan. 2		112		18		101.2	2 N	28 N
3	80	94	20	18	100	99.8	2 N	38 N
4	76	80	20	18	99.4	99.6	2 N	42 N
5	72	72	20	18	99	99.4	2 N	45 N
6	72	72	20	18	99.2	99.6	2 N	60 N
7	84	72	18	18	99.8	99.4	2 N	60 N
8	72	72	18	18	99	99.2	2 N	58 N
9	72	72	20	18	99.8	99.4	2 N	48 N
10	72	72	20	18	99.6	99.4	2 N	48 N
11	72	72	18	18	99.4	99.2	2 N	81 N
12	72	72	18	18	99.2	99.4	2 N	87 N
13	80	72	18	18	99.6	99.4	3 N	86 N
14	81	80	18	18	99.2	29.6	3 N	82 N
15	82	80	18	18	99.6	99.4	2 N	80 N
16	80	82	20	18	99.6	99.4	3 N	85 N
17	80	82	20	18	99.6	99.2	3 N	80 N
18	80	82	20	18	99.4	99.4	3 N	78 N
19	80	80	22	18	99.2	99.2	3 N	76 N
23	82	82	20	18	99.4	99.6	4 N	68 N
21	82	80	20	18	99.2	99.4	3 N	85 N
22	82	82	20	18	99.8	99.6	2 N	89 N
23	80	80	22	19	100	99.8	3 N	91 N
24	82	82	20	19	100	99.6	3 N	90 N
25	82	82	22	19	100	99.8	4 N	90 N
26	82	82	20	19	99.2	99.4	4 N	90 N
27	82	82	20	19	100	99.6	3 N	90 N
28	80	80	20	18	99.6	99.8	3 N	78 N
29	82	82	19	18	99.4	99.6	4 N	76 N
30	80	80	20	18	99.6	99.8	4 N	80 N
31	80	82	19	18	99.4	99.6	4 N	82 N
Feb. 1	82	82	18	18	99.2	99.4	3 N	60 N
2	82	82	18	18	99.8	99.6	3 N	60 N
3	82	82	18	19	100	99.8	3 N	60 N
4	82	82	19	18	99.8	99.8	3 N	58 N
5	80	80	19	19	99.4	99.6	2 N	50 N
6	82	80	18	19	99.2	99.4	2 N	56 N
7	80	80	18	19	99.2	99.6	2 N	50 N
8	80	82	18	18	99.4	99.8	3 N	50 N
9	80	82	19	19	99.6	99.6	2 N	50 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1895.								
Feb. 10	80	82	19	19	99.8	99.6	2 N	50 N
11	80	82	19	19	99.8	99.6	3 N	50 N
12	80	82	19	18	99.8	99.4	4 N	50 N
13	80	82	19	19	99.6	99.6	4 N	50 N
14	82	82	19	19	99.8	99.4	2 N	52 N
15	80	82	19	18	CN V		2 N	50 N
16	82	80	19	18	99.6	99.4	2 N	50 N
17	82	80	19	18	99.6	99.6	3 N	52 N
18	80	82	17	18	99.2	99.4	2 N	50 N
19	82	80	17	18	98.4	99.8	2 N	52 N
20	80	82	17	19	99.4	99.6	2 N	50 N
21	82	82	19	20	99.6	99.6	2 N	50 N
22	80	82	20	24	99.6	99.8	2 N	50 N
23	80	80	20	20	99.6	99.4	1 N	46 N
24	82	82	18	20	98.4	99.2	2 N	50 N
25	82	80	18	22	98.4	99.4	2 N	52 N
26	82	80	18	20	98.6	99.4	2 N	55 N
27	82	80	20	20	98.4	99.6	2 N	58 D
28	82	80	18	20	98.6	99.6	2 N	50 N

CASE No. 35.

LIM KENG BIN (MALE), age 31, Gambier Coolie. Duration of disease, 25 days. Admitted, January 2nd. Cured.

JANUARY.

		1st week.	2nd week.	3rd week	4th week.
Urine	Reaction -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1010	1010	1010	1010
	Albumen -	o	o	o	o
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	Trace	Trace	Trace	Trace

History.—Patient states that he went to Johore as a sinkay eight years ago, and has resided there ever since, working in several Gambier plantations as a coolie. In his second year in Johore he

had two attacks of intermittent fever ; the first lasted a month and a half, and the second five days. During the third year he had an attack also which lasted six days. He has not suffered from fever since. Fifteen months ago he had a similar attack to the one he is suffering from now, which lasted two and a half months. He took chinese medicine and got well. He was strong and able to work about two months after the first attack, and continued well up to twenty-five days ago. The first attack was not so severe as this one, but came on in a similar way ; he was able to walk, he only felt then numbness with pain in several spots in his legs, especially the knee joints and the calves, but he had tightness of the tendons in the back of his legs. He was quite well until 26 days ago, and went to work as usual ; returning in the evening, he took his meals and went to bed well. On getting out of bed the next morning he found that his legs were weak and numb. He stopped working, thinking that a little rest would put him right, but in the evening on attempting to walk he felt pain in the muscles on the inner side of his thighs, and contraction of the tendons on the back of the leg. These symptoms increased so that after ten days he was unable to walk at all. Twelve days after the first appearance of this attack, his hands which were all right till then, became weak and numb. He had no dropsy nor had he any during his first attack. He thinks that he was well fed. He was getting eight dollars a month wages, and all found. He sent a portion of his earnings to China, the rest he spent in gambling. His meals were as follows :

5.0 a.m. Congee and salted vegetables.

8.30 a.m. Rice, salt fish and salt vegetables.

12.0 noon. Congee and salted vegetables.

6.0 p.m. Rice, salt fish and fresh vegetables.

Pork, fowl, and duck, once a month only, during one meal only ; no fresh fish.

He had an attack of small-pox in China at the age of seven.

State on Admission.—He is a spare built man able to lie on either side. He is not able to keep his legs extended for any length of time on account of the pain caused in his tendons. He feels pain in his back between the dorsal and sacral regions, which is increased when he attempts to turn or lie on his back for any length of time. Extremities cold.

There is considerable numbness in his fingers, hands and arms up to the elbow joint, and in a less degree to the shoulder joint. There is numbness in his lips, front of the chest, abdomen, penis, and

scrotum, from the tips of the toes to the knee joint, it is very numb and feels as if the skin is dead there. From the knee joints to the hips it is also numb, but in a less degree. Patient is unable to stand or walk. There is only partial loss of power in his legs for he is able to lift them off his cot, and perform the lateral movements. He can also move his toes, but is unable to flex his feet, and says that the attempt to do so gives him great pain in his calves. The tendo Achillis is contracted. There is apparently no loss of power in the upper extremities. There is pain on pressure in the calves, and the muscles of the thighs, and between the ulna and radius, and he, at times, experiences slight pain in the epigastrium. There is no anæmia or œdema anywhere. Gums swollen, retracted and bleed slightly on pressure. Teeth irregular. Tongue of an unusually red colour, glassy on the surface with well marked fissures. Fauces inflamed. Pulse 84. Respiration 17. Temperature 98.6.

Progress of the Case.—*January 12.* Patient complains of cough, and of numbness in his lips, hands, abdomen and fingers, also of pain and numbness in his legs, tibiæ, calves, dorsum of the feet, and loins, over the lumbar vertebræ. Appetite good. Bowels constipated. Does not sleep well at night owing to the pain and numbness. Cannot walk at all. Tongue, clean. *20th.* Complains of feeling very hot. Temperature 102.4, otherwise the same. *26th.* No fever, symptoms the same. *February 1st.* Pain and numbness the same. Patient complained of tightness in his chest last night. *22nd.* Patient being well, but still complains of pain and numbness in his hands, legs, and chest; otherwise the same. *26th.* Patient rapidly improving.

Patient was eventually discharged cured, but the further notes of the case are not at hand.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Jan. 2	80	80		17		99.4		46 N
3	85	84	17	17	99.6	98.8		38 N
4	76	84	17	17	97.8	98.4	2 N	40 N
5	88	88	17	17	98.4	98.6		40 N
6	74	80	17	17	98	98.4	1 N	40 N
7	64	68	17	17	98	98.6	2 N	38 N
8	80	80	17	17	98.4	99.4	1 N	46 N
9	80	120	17	9	98.4	99.8		42 N
10	124	128	21	21	104.8	104.8	1 N	40 N
11	88	92	17	17	97.8	98.4	1 N	38 N
12	74	94	17	17	97.2	99.8		42 N
13	80	92	17	17	97.8	99.2	1 N	42 N
14	82	82	17	17	98.4	99.4		72 N
15	80	82	17	17	98.4	99.2	1 N	72 N
16	72	80	18	17	98.8	99.2	1 N	68 N
17	72	80	18	18	98.6	99.4	1 N	72 N
18	76	80	18	18	98.6	99.4	1 N	62 N
19	78	82	17	18	98.4	99.4	1 N	58 N
20	80	80	17	19	98.6	99.6	1 N	62 N
21	80	82	17	18	99	99.4	1 N	58 N
22	80	82	17	19	99.2	99.8		62 N
23	82	80	17	18	102.4	100	1 N	71 N
24	82	80	17	17	101.8	100	1 N	68 N
25	80	80	17	17	101.4	100	1 N	65 N
26	80	80	17	17	98.6	100		60 N
27	80	80	17	17	98.4	100	1 N	60 N
28	80	82	17	17	99	99.8	1 N	64 N
29	82	80	17	17	99.2	99.6	1 N	72 N
30	80	82	17	17	99.4	99.8	1 N	70 N
31	80	80	17	17	99.2	99.4	1 N	72 N
Feb. 1	82	82	17	17	99.4	99.2	1 N	80 N
2	82	82	18	17	99.2	99.4	1 N	80 N
3	82	82	18	18	99.2	99.2	1 N	80 N
4	82	82	18	18	98.8	99.2	1 N	82 N
5	82	80	18	18	99.4	99	1 N	80 N
6	82	82	18	18	99.2	99.2	1 N	82 N
7	80	82	17	18	99.4	99.4	1 N	80 N
8	80	82	17	18	99.6	99.2	1 N	80 N
9	80	82	17	18	99.4	89.8	1 N	80 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E	M	E		
1885.								
Feb. 10	80	82	18	18	99.6	99.6	1 N	80 N
11	80	82	18	18	99.8	99.6	1 N	80 N
12	80	82	18	19	99.8	99.6	1 N	80 N
13	80	80	18	19	99.8	99.4	1 N	80 N
14	80	82	12	19	99.6	99.2	1 N	82 N
15	82	82	20	19			2 N	80 N
16	80	80	19	20	99.8	99.6	1 N	80 N
17	82	82	19	20	99.8	99.4	1 N	82 N
18	80	80	18	20	99.2	99.8	1 N	80 N
19	82	80	19	18	99.4	99.6	2 N	82 N
20	82	80	19	19	99.2	99.4	1 N	82 N
21	82	80	19	19	99.6	99.6	1 N	84 N
22	82	80	19	24	99.6	99.6	1 N	80 N
23	82	80	24	20	99.8	99.4	1 N	81 N
24	80	82	18	20	98.4	99.2	2 N	84 N
25	82	80	18	22	98.4	99.4	1 N	85 N
26	82	80	18	18	98.6	99.2	1 N	80 N
27	80	82	18	18	98.4	99.4	1 N	82 N
28	82	80	18	18	98.6	99.4	1 N	80 N

CASE No. 36.

TAH AH WAK (MALE), age 35, Gambier Coolie. Taken ill at Johore. Duration of disease $3\frac{1}{2}$ months. Admitted January 6th, 1885. Cured March 3rd, 1885

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity	1014	1012	1014	1012
	Albumen - -	o	o	o	o
	Chlorides - -	Normal	Normal	Normal	Normal
	Phosphates -	o	Trace	Trace	o

History.—Patient states that he was a resident in Penang for two years where he worked in a vegetable garden. Five months ago he left Penang and went to Johore where he worked on a gambier estate as a coolie. Three and a half months ago he felt numbness

first in his calves, and three days afterwards a tightness. These feelings increased until 15 days after their first appearance, when he found he was unable to walk without assistance. He had no swelling anywhere. He does not recollect having suffered from any disease prior to the present. He was well fed. He had four meals daily :

6 a.m. Congee and salt vegetables.

8 a.m. Rice, salt fish and fresh vegetables.

3 p.m. Congee, salt vegetables.

6 p.m. Rice, salt fish and fresh vegetables.

Fresh fish once a month ; pork, sometimes once a month, sometimes none.

State on Admission.—He is a tall well built man. Able to lie on either side and able to keep his legs extended. He has no twitching of the tendons, but when he is made to walk he says he feels a tightness in the tendons at the back of the legs, and in his legs from the knees downwards.

Anæsthesia.—He feels more or less numb all over his legs from the toes to the hips. No numbness elsewhere.

Hyperæsthesia.—There is pain on pressure in the calves and the muscles of the thighs, no pain in the dorsum of the feet nor anywhere else.

He is unable to stand or walk without assistance, but is able to lift his legs off the cot while lying on his back, and to flex and extend his legs at the knee joint, but he is unable to flex the ankle joint (ankle drop). His feet are extended and apparently powerless. His hands are strong, he grips firmly, and feels nothing abnormal there. There is no anæmia nor œdema anywhere. Gums slightly spongy, bleed on pressure, and are retracted. Tongue covered with a white film on the centre, with a purplish hue along the edges where it is marked with the teeth. Papillæ prominent. Fauces slightly inflamed. Pulse 80. Respiration 17. Temperature 98.8.

Progress of the Case.—*January 16th.* The numbness has extended up to the umbilicus. *17th.* Complains of stiffness in the tendons at the back of his legs, and numbness from the hip to the ankle joint. Sleeps well, appetite good, no thirst. *21st.* Complains of feeling pain, spasm, and numbness in his calves. *22nd to 8th February,* no change. *9th.* Patient feels much better. He has no spasms in his legs. Numbness and pain in his calves diminished. No numbness in his abdomen, otherwise the same. *13th.* Patient has no pain in his calves, only numbness. *17th.* Numbness in his legs lessening. *March 2nd.* Patient has continued to improve. All the symptoms diminishing. *3rd.* Discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885. Jan. 8		112		22		101.6	1 H	42 N
9	99	99	19	20	98.8	98.8	1 H	38 N
10	88	94	18	19	98.4	98.8	1 H	40 N
11	78	94	17	19	98.2	98.8	1 H	38 N
12	78	82	17	18	98.2	98.6	2 N	40 N
13	74	88	17	18	99	99.4	2 N	44 N
14	74	100	17	19	98.4	99.4	2 N	40 N
15	80	88	17	18	98.8	99.4	2 N	40 N
16	80	88	17	18	99	99.6	2 N	45 N
17	80	96	17	19	99.4	99.8	2 N	38 N
18	80	88	17	18	99.4	99.8	2 N	38 N
19	80	88	17	18	98.4	99.2	2 N	44 N
20	74	78	17	18	98.4	98.6	2 N	38 N
2F	71	78	17	18	98.4	98.6	2 N	40 N
22	72	78	17	17	98.6	98.8	2 N	50 N
23	68	76	17	17	98.4	98.8	2 N	46 N
24	72	76	17	17	98.6	98.8	2 N	48 N
25	68	76	17	17	98	98.8	2 N	60 N
26	68	76	17	17	98.2	98.6	2 N	60 N
27	72	76	17	17	98.8	98.8	2 N	60 N
28	72	76	17	17	98.8	98.8	2 N	58 N
29	84	88	17	17	98.6	99	2 N	64 N
30	76	84	17	17	99.9	99.4	2 N	56 N
31	72	84	17	17	98.6	99.2	1 N	62 N
Feb. 1	72	80	17	17	98.4	98.8	2 N	60 N
2	72	80	17	17	99.2	99.6	2 N	64 N
3	76	82	17	17	98.6	98.8	2 N	68 N
4	76	88	17	17	99	99.6	1 N	62 N
5	72	82	17	17	98.8	98.8	2 N	56 N
6	68	76	17	17	98.6	98.8	2 N	64 N
7	68	72	17	17	98.4	98.8	2 N	80 N
8	68	72	17	17	98.2	98.8	1 N	76 N
9	68	72	17	17	98.2	98.8	2 N	74 N
10	68	72	17	17	98.2	98.6	2 N	68 N
11	72	76	17	17	98.4	98.8	2 N	60 N
12	64	74	17	17	98.4	98.8	1 N	68 N
13	72	76	17	17	98.4	98.8	2 N	70 N
14	84	88	17	17	99.2	99.4	1 N	60 N
15	82	88	17	17			1 N	72 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Feb. 16	80	84	17	17	98.4	98.8	2 N	62 N
17	88	88	17	17	99	99.2	2 N	64 N
18	76	80	17	17	98.4	98.8	2 N	68 N
19	82	88	17	17	98.8	98.8	2 N	60 N
20	68	72	17	17	99	99.4	1 N	66 N
21	76	80	17	17	99.2	99.6	2 N	64 N
22	80	84	17	17	98.4	98.8	2 N	60 N
23	80	80	17	17	98.4	98.8	2 N	68 N
24	80	84	17	17	98.4	98.6	1 N	52 N
25	80	84	17	17	98.4	98.6	2 N	48 N
26	80	86	17	17	98.6	98.8	2 N	49 N
27	84	88	17	17	98.6	98.8	2 N	56 N
28	88	92	17	17	98.6	98.8	2 N	52 N

CASE No. 37.

LEE SOON HYE (MALE) age 29, Chinese Clerk. Taken ill at Singapore; Duration of Disease, 1 month. Admitted January 16th, 1885.

FEBRUARY.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1010	1008	1008	1010
	Albumen - -	0	0	0	0
	Chlorides - -	Normal	Normal	Normal	Normal
	Phosphates -	0	0	0	0

History.—Patient states that he left China three years ago, when he came to Singapore, where he stayed four months, after which he went to Malacca, remaining there two and a-half years. He worked as a clerk to a sugar manufacturer, five miles inland, at a place called Guba. He was in receipt of eight dollars a month, all found. He returned to Singapore four months ago, and has been out of employ-

ment ever since, living in a joss-house (church), and assisted by his friends. Three months ago he got a bubo on the left side; a month ago, after taking a cold bath, he had rigors, and the same day he experienced twitchings of the tendons of his legs, and numbness in his ankles and hands. From this time he gradually lost power in his legs, and experienced difficulty in walking without assistance. Nine days ago he observed a swelling on the dorsum of the feet, and the inability to walk without support increased with it, and he now also felt pain in his loins. He had three meals daily, as follows:—

8 a.m. Rice, fresh fish, fresh vegetables.

12 noon. Congee, salt vegetables.

6 p.m. Rice, fresh fish, fresh vegetables.

He had at times a little pork cooked with vegetables.

Previous History.—While at Malacca, a year ago, he had a little swelling in his feet, and his face looked pale and puffy. The swelling, however, disappeared within ten days, after taking some decoction of garlic, and some Chinese cake, called “mee.”

State on Admission.—He is a medium-sized man, spare built, able to lie on either side; if he lies on his back for long, it aches.

Anæsthesia.—There is numbness in his feet from the toes to the ankle, and in his hands from the tips of his fingers to the wrist joint—no numbness elsewhere.

Hyperæsthesia.—There is pain on pressure in his toes, dorsum of the feet, calves of his legs, and inner side of the thighs; also over the tendo Achillis, which is contracted. There is pain also between the radius and ulna, and he has pain in his back if he lies on it, or sits up long.

Patient is able to get out of bed and stand a little, but is unable to move or walk further than a few steps without assistance, and then his gait is very unsteady and shaky. He is able to lift his legs off the cot, and flex his knees; there is some loss of power also in his hands. He is able to hold his cup and use his chopsticks, but he is unable to extend or flex his hands or fingers.

Face puffy and sallow; dorsum of the feet are swollen. There is general œdema of the body; there is anæmia in his loins. Patient is slightly anæmic. Gums spongy, purplish, retracted, and bleed slightly on pressure. Tongue flabby, covered with a white film in the centre, marked at the edges, and tremulous on the dorsum. Fauces inflamed and uvula elongated. Appetite, good; bowels regular; respiration, 17; pulse, 88; temperature, 98·8.

For *Progress of the case*, see Clinical Chart and rough notes.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 19								38 N
20	92	98	19	21	98.4	98.8	2 N	30 N
21	92	96	19	21	88.4	98.8	2 N	53 N
22	92	96	19	17	99	99.6	2 N	40 N
23	88	98	17	19	98.8	99.4	2 N	46 N
24	88	98	18	19	98.8	99.4	2 N	52 N
25	96	98	17	19	99	99.2	10 W	50 N
26	96	98	18	19	99.4	99.2	10 W	50 N
27	96	98	18	19	98.8	99.6	30 W	50 N
28	94	96	18	19	99.2	99.8	24 D	60 N
29	96	98	19	20	99.4	99.6	10 D	62 N
30	98	96	19	20	99.2	99.8	24 D	56 N
31	98	94	19	20	99.4	99.6	13 D	62 N
Feb. 1	96	96	20	20	99.4	99	20 D	40 N
2	96	96	18	20	99.2	99.2	17 D	40 N
3	96	96	18	20	99.2	99.2	15 D	40 N
4	96	96	18	19	99.6	99.4	15 D	42 N
5	92	96	18	18	99.8	99.6	10 D	50 N
6	90	92	18	18	99.4	99.8	10 D	52 N
7	90	92	18	18	99.2	99.8	10 D	50 N
8	90	92	18	18	99.2	99.8	10 D	50 N
9	90	92	18	19	99.4	99.4	10 D	50 N
10	90	92	18	19	99.8	96.4	10 W	50 N
11	90	92	18	19	99.8	99.6	10 W	50 N
12	90	92	18	19	99.8	99.6	8 W	50 N
13	90	92	18	19	99.8	99.6	6 W	50 N
14	90	90	18	19	99.8	99.2	5 W	62 N
15	92	92	18	20			4 W	62 N
16	90	90	18	20	99.8	99.6	5 W	60 N
17	92	90	18	20	99.8	99.4	5 W	58 N
18	92	90	18	24	99.2	99.8	6 W	56 N
19	90	92	18	20	99.6	99.6	2 W	56 N
20	92	92	19	20	99.4	99.6	3 W	50 N
21	92	92	20	22	99.4	99.6	3 W	50 N
22	92	90	24	20	99.8	99.6	4 W	50 N
23	92	92	24	22	99.6	99.8	3 W	46 N
24	92	90	22	20	99.2	99.4	2 W	50 N
25	90	92	20	22	99.2	99.8	2 W	52 N
26	92	90	20	20	99.4	99.9	2 W	60 N
27	92	92	20	20	98.6	99.6	2 W	60 N
28	92	92	20	20	98.4	99.8	2 W	60 N

CASE No. 38.

NG AH MONG (MALE), age 21, Coolie, Tapioca Estate. Taken ill at Trafalgar Estate; Duration of Disease, 2½ months. Admitted, January 28th, 1885; Cured February 28th, 1885.

Urine	Reaction - -	1st week.	2nd week.	3rd week.	4th week.
	Sp. Gravity -	Acid	Acid	Acid	Acid
	Albumen - -	1012	1010	1012	1012
	Chlorides - -	o	o	o	o
	Phosphates -	Normal	Normal	Normal	Normal

History.—Patient states that he resided for three years in Penang, planting sugar-canes, prior to coming to Singapore three months ago, where he has been employed as a coolie on a tapioca estate at Sirangoon. He worked there forty days, when one evening, on rising from a sitting posture, he felt tightness in the tendons at the back of his legs, and soon after experienced numbness in the calves. About three or four days after this, he observed that his legs were weak, and that he could not walk steadily, having to use a stick; he also experienced numbness and loss of power in his hands. Eight days after these symptoms first appeared, the dorsum of his feet became swollen, but the œdema disappeared a week after. He was always well fed, and had five meals daily:—

- 5 a.m. Rice and salt fish.
 - 8 a.m. Congee and salt vegetables.
 - 11 a.m. Rice and fresh fish, and sometimes fresh vegetables.
 - 3 p.m. Congee and salted vegetables.
 - 5 p.m. Rice and fresh fish.
- No pork; duck three times a month.

Previous History.—Unimportant.

State on Admission.—He is a moderately-sized man, spare built, able to lie on either side. He is unable to keep his legs extended for long on account of tightness at the back. He also at times experiences twitchings in the tendons there.

Anæsthesia.—There is numbness in his legs from the toes to the knee-joint, and in his hands from the tip of the fingers to the wrist joint; no numbness elsewhere.

Hyperæsthesia.—There is pain on pressure in the calves of his legs, and between the ulna and radius, close to the wrist; nowhere else. No pain in the back. Patient is able to stand or walk with the

characteristic Bèri-Bèri gait, without support. He is very shaky and unsteady, and he is afraid of losing his balance and falling. He is able to lift his legs off the cot, and extend or flex his toes. He is unable to flex his feet dorsally, on account of the contraction of the tendo Achillis. There is apparently no loss of power in his hands. The patient is able to grip firmly, hold his cup, and use his chopsticks, but there is visibly some contraction in the tendons of the hands. He is unable to extend his fingers fully, and keep them straight. Flexing the hands gives him pain at the wrist joint.

Face.—Sallow, puffy. No marked anæmia. There is slight œdema over the tibiæ. Gums slightly spongy, ulcerated at the edges, retracted, bleed slightly on pressure. Tongue clean. Fauces inflamed. Appetite good; bowels regular; pulse 96; respiration 17; temperature 98·6.

Progress of the Case.—*January 23rd.* Patient complains of numbness in his legs, from the knee joint to the tips of the toes, and in the arms from the elbow-joint to the tips of the fingers. He feels pain in his calves and in his fore-arm, between the two bones, on pressure, near the wrist-joint. He is able now to stand or walk. There is slight œdema of the face and over the tibiæ. He did not sleep well last night on account of the numbness and pain in his calves; no thirst. *24th.* Feels better. The numbness is more in the evening than in the morning. No numbness in his arms since yesterday. Able to sleep. *27th.* Patient rapidly improving; he has less numbness in his arms; sleeps well. *30th.* Much improved; does not complain of numbness anywhere. *February 1st.* Patient doing well; much improved; does not complain of pain or numbness anywhere. *9th.* Patient looks healthy and is fat. He does not complain of anything. *28th.* Discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E.	M	E.		
1885.								
Jan. 12		78		17		98.6	3 N	46 N
13	80	84	17	17	98.8	98.8	1 N	50 N
14	76	104	17	23	98.4	99.8	1 N	42 N
15	80	92	17	19	98.4	98.8	2 N	50 N
16	80	92	17	19	98.4	98.8	2 N	46 N
17	76	90	17	19	99	99.8	2 N	46 N
18	72	92	17	19	98.6	99.4	2 N	56 N
19	72	88	17	17	98.2	98.6	2 N	50 N
20	80	84	17	17	98.6	98.8	2 N	40 N
21	84	96	17	19	98.6	99.6	2 N	56 N
22	96	98	17	19	98.6	99.4	2 N	46 N
23	84	88	17	17	98.2	98.6	3 N	48 N
24	72	92	17	19	98.4	98.8	2 N	56 N
25	72	88	17	17	98.6	99.2	2 N	60 N
26	76	88	17	17	98.6	99.6	3 N	62 N
27	88	88	17	17	98.6	98.8	2 N	56 N
28	84	84	17	17	98.2	98.8	2 N	60 N
29	72	96	17	19	98.6	99.6	2 N	58 N
30	92	96	19	19	99	99.6	2 N	64 N
31	88	96	17	19	98.6	99.4	2 N	56 N
Feb. 1	80	84	17	17	98.2	98.4	1 N	68 N
2	84	88	17	17	99	99.6	2 N	62 N
3	84	88	17	17	98.4	98.8	1 N	60 N
4	84	88	17	17	98.6	98.8	1 N	68 N
5	76	86	17	17	98.2	98.8	2 N	70 N
6	76	82	17	17	98.4	98.8	1 N	58 N
7	76	82	17	17	98.2	98.8	1 N	60 N
8	76	82	17	17	98.4	98.8	2 N	65 N
9	88	94	17	18	98.2	99.8	2 N	68 N
10	88	92	17	18	98.8	99.4	2 N	68 N
11	96	100	19	19	98.6	99.8	2 N	64 N
12	84	88	17	17	98.2	98.6	1 N	60 N
13	84	88	17	17	98.2	98.6	1 N	64 N
14	90	94	18	19	98.4	98.6	1 H	40 N
15	94	88	19	18			1 H	52 N
16	90	98	17	19	98.4	98.8	1 H	50 N
17	80	88	17	17	98.4	98.8	2 N	62 N
18	80	84	17	17	98.4	98.8	1 N	68 N
19	76	80	17	17	98.4	98.8	1 N	64 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E.	M	E.		
1885.								
Feb. 20	76	80	17	17	98.6	98.8	1 N	68 N
21	80	84	17	17	98.4	98.8	1 N	64 N
22	84	88	17	17	98.4	98.8	1 N	68 N
23	84	88	17	17	98.4	98.8	2 N	64 N
24	80	84	17	17	98.4	98.6	1 N	50 N
25	80	84	17	17	98.2	98.6	1 N	48 N
26	84	88	17	17	98.2	98.8	1 N	48 N
27	84	88	17	17	98.4	98.6	1 N	56 N
28	80	84	17	17	98.2	98.6	1 N	50 N

CASE NO. 39.

TAY AH SONG (MALE), age 32, Gambier Coolie. Taken ill at Johore; Duration of Disease, 1½ months. Admitted January 19th, 1885; Cured February 28th, 1885.

FEBRUARY.

		1st week.	2nd week.	3rd week.	4th week.
Uriné	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity - -	1006	1008	1008	1008
	Albumen - -	o	o	o	o
	Chlorides - -	Excess	Excess	Excess	Excess
	Phosphates - -	o	o	Trace	Trace

History.—Patient states that he came from China two years ago as a sinkay. He went to Johore, where he was employed as a coolie on a Gambier plantation for a year, after which he went to Serangoon, and was employed on a tapioca estate. Two months ago he again went to Johore as a Gambier coolie. Twenty days after arriving there he got an attack of fever which lasted five days, not preceded by rigors. After it left him he felt numbness in his feet, weakness in his legs, from the knees downwards. These symptoms increased in

severity daily, so that in fifteen days he was quite unable to walk. Twenty-five days after the first appearance of the disease he experienced a tightness in the tendons of his hands, and two days afterwards numbness also. He was well fed. His meals were :—

- 5 a.m. Congee and salt vegetables.
- 8 a.m. Rice, salt fish, and fresh vegetables.
- 12 noon. Congee and salt vegetables.
- 6 p.m. Rice, salt fish, fresh vegetables.

He had pork twice a month, and duck twice a month at one meal only.

State on Admission.—Patient is a spare-built man, able to lie on either side, and to keep his legs extended, but when his legs are separated the heels are drawn backwards.

Anæsthesia.—There is numbness from the toes to the knee-joint, and from the tips of the fingers to the elbow-joint. No numbness elsewhere.

Hyperæsthesia.—There is pain on pressure in the calves and between the ulna and radius, from the wrist to the elbow. No pain in the loins, no feeling of uneasiness in the pit of the stomach. He is unable to walk or stand by himself. If held he can be made to move with some difficulty, with the characteristic Bèri-Bèri gait. When lying he is able to lift his legs off the cot. He flexes his legs on the thighs, and his thighs on his abdomen. There is loss of power at the ankle (ankle drop). There is also loss of power in his hands, he being unable to hold his cup or use his chopsticks.

Face slightly puffy. No anæmia. Gums slightly spongy, and bleed on pressure. Tongue glazed, in patches, red nearly all over the surface; tremulous on the dorsum. Fauces inflamed. Pulse 92; respiration 19; temperature 99.

Progress of the Case.—*January 30th.* The numbness and the pains are the same; no thirst. *31st.* Patient had an attack of fever this morning (see Chart). *February 1st.* Complains of some pain in his hands, from the tips of his fingers. The pain and numbness in his legs about the same. He is suffering from an abscess at the anus. Tongue clean. Did not sleep the whole night owing to the pain in his hands. No appetite; feeling of cold. *3rd.* Patient complains of feeling very hot, and of rheumatic pains in his arms from the shoulder-joint, which prevents him from sleeping; no appetite; no thirst; tongue clean. *4th.* Complains of more pain in his right arm, which he is not able to lift; still feels hot; did not sleep the whole night; appetite good; tongue clean. *7th.* Patient much better, less

pain in his hands. Slept well last night. Tongue clean. 10th. Patient complains of pain in the ring-finger of the left hand, which is swollen (rheumatic?), and prevents him from sleeping. Pain and numbness in his legs about the same. 11th. Patient still complains of pain in right arm and left ring-finger. 15th. Much better; less pain in arm and finger; slept well. 20th. Complains of more pain in his right arm, and of spasm from the shoulder-joint to the tip of the fingers. Could not sleep owing to severe pain in his arm. 23rd. Still complains of spasm and pain in his right arm. 26th. No change. 28th. Pain in right arm.

No further notes were taken of this case. He was eventually discharged cured, but the date is not certain.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 20							1 H	40 N
21	84	96	17	19	96·8	98·8	1 H	38 N
22	96	98	19	19	98	98·8	1 N	46 N
23	92	100	19	21	98·2	99·6	1 N	56 N
24	92	112	19	23	98·2	99·8	1 N	50 N
25	84	92	17	19	98·2	99·2	1 N	60 N
26	88	116	17	19	98·6	99·8	2 N	64 N
27	92	98	19	19	98·8	99·4	2 N	68 N
28	96	104	19	19	99·2	99·8	2 N	62 N
29	92	124	19	21	99	99·8	1 N	62 N
30	100	108	19	21	99·4	99·8	1 N	62 N
31	100	104	19	21	100·2	100·6		62 N
Feb. 1	96	104	19	21			1 N	60 N
2	96	100	19	21			2 N	68 N
3	96	100	19	21			1 N	68 N
4	92	98	19	19			1 N	62 N
5	90	98	19	19			1 N	62 N
6	92	98	19	19			1 N	56 N
7	88	96	17	19			1 N	62 N
8	80	88	17	17			1 N	52 N
9	96	104	19	19			1 N	64 N
10	100	108	19	19			2 N	68 N
11	92	98	18	19			1 N	60 N
12	96	98	19	19			1 N	68 N
13	96	98	19	19			1 N	60 N
14	96	98	19	19			1 N	60 N
15	98	98	18	19			1 N	68 N
16	100	104	21	21			2 N	60 N
17	108	112	21	21			1 N	64 N
18	92	96	19	19			2 N	68 N
19	96	98	19	19			1 N	64 N
20	88	92	17	19			1 N	60 N
21	88	92	17	19			1 N	68 N
22	88	90	17	19			1 N	64 N
23	84	88	17	17			1 N	68 N
24	88	88	17	17			1 N	54 N
25	84	88	17	17			1 N	46 N
26	84	88	17	17			1 N	50 N
27	80	84	17	17			1 N	48 N
28	80	88	17	17			1 N	50 N

CASE NO. 40.

TAY AH CHUY (MALE) age 31, *Wood-cutter. Taken ill at Johore; Duration of Disease, 2½ months. Admitted, January 19th, 1885; Cured February 10th, 1885.*

FEBRUARY.

Urine	{	Reaction - -	1st week.
		Sp. Gravity -	Acid
		Albumen - -	1008
		Chlorides - -	0
		Phosphates -	Normal
			0

History.—Patient states that he has resided in Johore for four years, where he has been employed in felling trees and clearing jungle. Two years ago he got an attack of intermittent fever, which lasted one month. Since then he has been free from fever until two-and-a-half months ago, when he had another attack, which lasted twenty days, the fever coming on every day at eight o'clock, and lasting five to six hours. After this he experienced swelling on the dorsum of the feet, and his legs felt very weak. This weakness gradually increased, until after a fortnight he was unable to walk without assistance. He was in receipt of ten dollars a month, all found. He had four meals daily:—

- 5 a.m. Congee and salt vegetables.
- 8 a.m. Rice, fresh vegetables, and salt fish.
- 12 noon. Congee, salt vegetables.
- 6 p.m. Rice, salt fish, and fresh vegetables.
- Once a month he had pork, duck, and fowl.

State on 30th January.—He is a well-built man, able to lie on either side, and to keep his legs extended. There is no numbness anywhere, but a feeling of weakness in his legs, from the knees downwards, and also in his hands. There is pain on pressure all over his legs, from the dorsum of the feet to the knee-joint. The calves are very painful. No pain in the hands or elsewhere. There is no feeling of uneasiness in the epigastrium; no pain in the back. Patient is able to walk by himself a little, but his gait is unsteady, and characteristic of Bèri-Bèri. He states that his hands are not as strong as they were before, but he is able to use his chopsticks and hold his cup. There is œdema on the dorsum of the feet and over

the tibiæ, and over the abdominal wall. Face puffy, no marked anæmia. Teeth decayed. Gums lightly spongy, and bleed on pressure, retracted. Tongue clean. Fauces inflamed. Appetite good. Bowels regular. Conjunctivæ tinged slightly yellow. Areas of hepatic and splenic dulness increased. Pulse 64; respiration 17; temperature 98·4.

Progress.—*February 2nd.* Patient states that he feels better. Œdema in the dorsum of the feet and hands has decreased. Less pain in his legs and hands. Tongue clean. Appetite good. Sleeps well. *3rd.* Improving. *4th.* Œdema of face, hands, and legs has disappeared. Does not complain of pain or numbness anywhere. He looks healthy; is able to run. Tongue clean. Appetite good. Sleeps well. *9th.* Patient doing well; does not complain of pain or numbness anywhere; looks healthy. *10th.* Discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 20							2 N	38 H.C
21	68	74	15	17	95·6	96·8	4 W	32 H.C
22	76	80	17	17	97	97·6	3 W	38 H.C
23	80	88	17	17	98·2	98·8	2 N	32 H.C
24	68	76	17	17	97	98·4	1 N	64 N
25	68	76	17	17	97	98·4	2 N	62 N
26	68	76	17	17	97	98·4	1 N	60 N
27	64	72	17	17	97·6	98·2	2 N	64 N
28	64	80	17	17	97·8	98·6	1 N	58 N
29	64	80	17	17	97·8	90·4	1 N	62 N
30	64	80	17	17	98·4	98·6	1 N	60 N
31	66	80	17	17	98·4	98·6	1 N	62 N
Feb. 1	64	64	15	17	98·4	98·8	2 N	64 N
2	64	64	15	17	97·6	98·4	1 N	68 N
3	64	64	15	17	97·4	98·4	2 N	68 N
4	64	84	17	17	98·2	98·6	2 N	66 N
5	68	68	15	17	97·4	98·2	1 N	68 N
6	68	68	15	17	97·4	98·2	1 N	72 N
7	68	68	15	17	98	98·8	1 N	66 N
8	68	68	15	17	97·8	98·6	2 N	68 N
9	84	84	17	17	98·6	98·8		

CASE NO. 41.

TEO AH CHEE (MALE), age 30, Gambier Coolie. Taken ill at Batu Pahat, Johore; Duration of Disease, 2 months. Admitted December 29th, 1884; Cured March 4th, 1885.

JANUARY.

Urine	Reaction -	1st week Alkaline	2nd week Acid	3rd week Slightly Acid	4th week Acid
	Sp. Gravity-	1006	1008	1010	1010
	Albumen -	0	0	0	0
	Chlorides -	Excess	Excess	Excess	Normal
	Phosphates -	Trace	Trace	Trace	Trace

History.—Patient states that he has worked on six different Gambier estates in Batu Pahat during the last six years. The first symptom of the disease that he observed, and which made him stop work, was a feeling of weakness in his legs two months ago. At the same time he also observed that his hands were not strong. He moved about and thought that it was weakness, and that with some rest and good food he would get better, but twenty days after he experienced twitchings of the flexor tendons of the legs and hands, and slight numbness in his hands and feet. He was now unable to walk without the help of a stick. These symptoms increased in severity until ten days ago, when he found that his walk was more unsteady, and that he was less able to grip objects on account of the increased feeling of the numbness in the fingers and of spasmodic contraction of the flexors. He also observed at this time some swelling on the dorsum of the feet.

Diet.—He says he was well fed. Outside, his meals were as follows —

- 6 a.m. Congee, salt fish, salt vegetables and pickle.
- 8 a.m. Rice, salt fish, fresh vegetables (prepared in lard).
- 12 noon Congee, salt fish, pickle, salted vegetables.
- 6 p.m. Rice, salt fish, fresh vegetables (prepared in lard).

He had pork at one meal, twice a month only. No fresh fish.

Previous History.—He had three attacks of intermittent fever in Johore during the period he was there. The first attack lasted ten days, the second and third a month each. The three attacks came on after an interval of a year or more. He lost his right eye five years ago from inflammation.

State on Admission.—Patient is a well-built man, able to lie on either side. Unable to keep his legs extended on account of

twitching of the flexors. He has no pain in his back. There is a feeling of numbness there.

Face.—Puffy, slightly anæmic. Corners of the mouth cracked. Gums spongy, discoloured, retracted, ulcerated, and bleed slightly on pressure. Teeth regular; some decayed. Tongue flabby, pale, covered with a white film, and tremulous. Fauces congested.

There is slight general dropsy, more marked on the dorsum of the feet and legs, abdomen, and loins. Numbness in the hands as far as the wrist, also in the legs from the tips of the toes to the hip-joint. Slight feeling of fulness in the epigastrium. There is pain on pressure over the feet and legs, especially in the calves, dorsum of the hands, and anterior aspect of the fore-arms, between ulna and radius. There is twitching of the tendons of the flexors of the legs and fingers. He is not able to walk without being held up by the arms of an assistant. He is not able himself to hold anything. He can neither close nor open his fingers.

Heart.—Sounds dull, muffled; no murmurs.

Progress of the Case.—*January 3rd.* There is some swelling in the legs and feet. He complains of a feeling of fulness in the epigastrium, and pain and numbness in his hands and legs, also in the back. Tongue flabby. Cannot sleep owing to the numbness and pain in his calves. Appetite good. *11th.* Patient improving. Able to walk a little by himself. *13th.* Feels better; swelling in the feet decreasing, tongue clean, appetite good. *20th.* Much better, swelling in the legs and dorsum of the feet disappeared. Has still some pain and spasm in his calves; tongue clean, sleeps well, no thirst. He has more strength in his hands. He can hold his chopsticks and can extend his hands now without difficulty. He can also walk alone slowly. *22nd.* He complains of more pain to-day in his calves, which prevented him from sleeping last night. *23rd.* He has pain in the tendons at the back of the knee-joint when he bends it. He also complains still of the spasm in his calves. *26th.* Much the same. *28th.* The spasms in the tendons of his legs prevent him from sleeping. *29th.* Pains better; no spasms. *31st.* Again complains of spasms in his legs, otherwise the same. *February 9th.* Looks well, but says that he has pain and spasm continually in his calves. *14th.* Feels a little better. Does not feel spasms now, and the pain is less. *20th.* Again complains of spasms; the pain and numbness in his calves are less. *24th.* The spasms have left him; only feels slight pain and numbness. He is doing well, much improved. *March 4th.* Patient continued to improve, and was discharged to-day.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 30		88		17		98.6	1 N	38 N
31	68	88	15	17	98.4	98.8	1 N	38 N
1885.								
Jan. 1	68	88	15	17	98.4	98.8	1 N	38 N
2	70	88	15	17	98.4	98.8	2 N	38 N
3	66	72	15	17	98.4	98.8		38 N
4	60	66	15	17	98.4	98.6	1 N	46 N
5	64	68	15	17	98.4	98.8	0	38 N
6	54	62	15	17	98.6	98.8	1 N	38 N
7	54	66	15	17	98.6	99	1 N	38 N
8	56	66	15	17	98.6	99.8	1 N	42 N
9	54	66	15	17	98.2	99.8	1 N	82 N
10	56	66	15	17	98.4	99.8	1 N	76 N
11	54	58	15	15	98.2	98.6	2 N	56 N
12	50	60	13	15	97.8	98.2	2 N	48 N
13	52	68	13	15	98.4	98.8	1 N	86 N
14	60	64	15	55	98.6	98.8	3 N	68 N
15	60	68	15	17	99.8	99.6		86 N
16	56	72	15	16	98.8	99.6	1 N	86 N
17	72	100	17	21	98.8	99.8	2 N	82 N
18	72	84	17	17	98.8	99.4	1 N	48 N
19	72	84	17	17	98.8	99.4	1 N	50 N
20	80	88	17	17	96.6	98.8	2 N	42 N
21	92	96	19	21	99.8	98.8	1 N	40 N
22	78	80	17	17	98.2	98.6	1 N	62 N
23	84	88	17	17	98.4	98.6	1 N	56 N
24	76	88	17	17	98	98.8	1 N	50 N
25	64	76	17	17	97.8	98.4	1 N	68 N
26	76	78	17	11	98.4	98.6	1 N	62 N
27	72	76	17	17	98.2	98.6	1 N	68 N
28	72	76	17	17	98.2	98.6	1 N	59 N
29	76	80	17	17	98.4	98.6	1 N	64 N
30	72	80	17	17	98.2	98.6	1 N	62 N
31	68	80	17	17	97.8	98.6	1 N	64 N
Feb. 1	76	92	17	19	88.2	99.2	1 N	68 N
2	80	86	17	17	88.4	98.8	1 N	62 N
3	84	88	17	17	88.4	98.8	2 N	68 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 4	76	80	17	17	98.2	98.6	1 N	68 N
5	72	80	17	17	98.4	98.8	2 N	52 N
6	72	82	17	17	98	98.8	2 N	40 N
7	72	84	17	17	98.4	98.8	2 N	46 N
8	76	80	17	17	97.8	98.8	2 N	30 P
9	72	80	17	17	98.2	98.4	2 N	48 P
10	76	86	17	17	99.2	98.6	2 N	50 P
11	120	124	21	21	99.4	99.6	2 N	39 P
12	76	84	17	17	98	98.9	2 N	48 N
13	76	80	17	17	98	98.4	2 N	50 N
14	76	84	17	17	98	98.8	2 N	56 N
15	76	84	17	17	CN Y		2 N	46 N
16	76	80	17	17	98	99	1 N	50 N
17	84	88	17	17	98.4	98.8	2 N	46 N
18	86	88	19	17	98.6	98.8	2 N	64 N
19	80	88	18	17	98.4	98.8	2 N	60 N
20	84	88	17	17	98.6	98.8	2 N	50 N
21	80	84	17	17	98	98.4	2 N	54 N
22	80	84	17	17	98	98.4	2 N	48 N
23	80	88	17	17	98.2	98.8	2 N	52 N
24	80	84	17	17	98.4	98.8	2 N	50 N
25	82	88	17	17	98.2	98.8	2 N	52 N
26	84	88	17	17	98.4	98.8	2 N	56 N
27	80	84	17	17	98.2	98.6	2 N	52 N
28	84	88	17	17	98.4	98.8	2 N	50 N

CASE No. 42.

TAN AH SUAN (MALE), aged 26, *Dyer*. *Duration of Disease*, 22 days. *Admitted* 14th February, 1885. *Result*, Cured.

MARCH.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1006	1008	1010	1008
	Albumen - -	o	o	o	o
	Chlorides -	Trace	Normal	Normal	Normal
	Phosphates -	o	o	Trace	o

History.—Patient states that he has been in Singapore for six years. Three years after his first arrival from China he suffered from primary syphilis. He kept good health since then until about forty days ago, when the symptoms of the present illness came on with a headache in the evening. The following morning, after a bath, he noticed that his hands became numb. He stopped work after this for fourteen days, hoping to get better. He found then, that he could not walk in the least; his feet began to swell, the swelling disappearing the next day. This was followed by a pricking pain in his ankles and knees, also in both calves. These symptoms extended to his hands and arms within two days after their appearance in the calves. He then felt a shortness of breath and tightness about the chest, and numbness in his upper lip; no uneasiness about his stomach. All these symptoms gradually increased until his admission. He has always lived well—four meals in the 24 hours, consisting of:—

3 a.m.	Congee and salted vegetables.
8.30 a.m.	Pork, fish, vegetables, and rice.
12 noon.	„ „ „ „
5 p.m.	„ „ „ „

State on February 26th. Patient states that he has lost flesh. He is fairly well developed. He is able to sit up and turn in his bed. He is unable to use his flexors or extensors, or bend his knees, or support them when raised; power over the toes also lost. He is unable to flex or extend his wrist, or pronate the fore-arm.

Anæsthesia.—There is loss of sensation from the knees downwards; all other parts sensitive. Extensor muscles of the fore arm wasted.

Hyperæsthesia.—Calves, arms, and fore-arms are painful on pressure. There is numbness of the lips, no anæmia, tongue coated but clean on the tip and edges; gums swollen and bleed on pressure.

Progress of the Case.—*March 1st.*—Patient complains of pain, numbness, and spasm in the legs from the hips to the tips of the toes, and in the arms from the shoulder-joint to the tips of the fingers. He feels tightness in his abdomen. He is not able to walk at all, or stand. He has pain in his back. There is very great pain in his calves, and between the radius and ulna on pressure. Tongue covered with a thick white fur in the centre and edges red. Appetite good. Did not sleep well last night owing to the pain. *9th.* Still complains of pain and numbness all over, and of spasm in his legs, and tightness in his chest and epigastrium; sleeps well, tongue the same. *14th.* Feels a little better. Less pain and numbness in the legs and hands. *18th.* Patient improving; less pain and numbness in the arms and legs; appetite good; sleeps well. *30th.* Patient complains now only of numbness over the dorsum of the feet. Has some pain in his legs. *April 5th.* Still has some pain in his calves and numbness over the dorsum of the feet; no other change. *10th.* Patient is much better, no pain anywhere. Patient continued to improve, and was, eventually, discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 16	84	88	17	17	98.9	98.6	2 N	64 N
17	84	88	17	17	97.6	98.4	2 N	46 N
18	82	86	17	17	98	98.4	2 N	64 N
19	84	88	17	17	98.4	98.8	4 W	50 N
20	84	88	17	17	98.4	98.8	3 W	46 P
21	84	84	17	17	97.8	98	1 N	48 P
22	84	84	17	17	98.2	98	2 N	50 P
23	84	88	17	19	98.2	98.8	1 N	56 P
24	100	108	19	19	98	98.8	1 N	50 P
25	104	108	19	19	98.6	98.8	1 N	46 P
26	92	96	19	19	98.4	98.8	2 N	52 P
27	88	92	17	19	98.4	98.8	2 N	56 P
28	88	92	17	17	98.8	99.2	2 N	50 P
Mar. 1	84	88	17	17	98.4	98.8	2 N	49 N
2	80	84	17	17	98	98.4	1 N	42 N
3	88	88	17	17	98.4	98.8	3 N	50 N
4	94	98	19	17	98.6	99.4	2 N	46 N
5	88	92	17	17	98.4	98.8	2 N	50 N
6	86	92	17	17	98.4	98.8	3 N	48 N
7	88	92	17	17	98.4	98.8	2 N	52 N
8	84	88	17	17	98.4	98.8	1 N	46 N
9	86	92	17	17	98.4	98.8	2 N	50 N
10	96	100	19	19	98.8	99.6	2 N	48 N
11	84	88	17	17	98.4	98.6	3 N	46 N
12	92	96	17	19	98.6	99.2	3 N	49 N
13	96	98	17	19	98.6	98.8	3 N	46 N
14	92	96	17	19	98.4	98.8	2 N	49 N
15	92	96	17	19	98.4	98.8	2 N	46 N
16	90	94	17	17	98.4	98.8	3 N	50 N
17	92	96	17	19	98.4	68.8	3 N	49 N
18	90	92	17	17	98.6	98.8	2 N	53 N
19	88	92	17	17	98.4	98.8	3 N	46 N
20	84	88	17	17	98.4	98.8	1 N	49 N
21	80	86	17	17	98.2	98.8	2 N	52 N
22	84	88	17	17	98.4	98.8	2 N	46 N
23	84	88	17	17	98.4	98.6	2 N	48 N
24	80	84	17	17	98.4	98.6	2 N	44 N
25	84	86	17	17	98.4	98.6	2 N	50 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1885.								
Mar. 26	84	86	17	17	98.4	98.6	2 N	48 N
27	84	88	17	17	98.4	98.8	2 N	44 N
28	80	84	17	17	98.2	98.6	2 N	48 N
29	80	86	17	17	98	98.6	2 N	46 N
30	84	86	17	17	98.4	98.6	2 N	49 N
31	80	88	17	17	98	98.4	2 N	46 N

CASE NO. 43.

TUNG SIM POO (MALE), age 26, Gambier Coolie. Taken ill at Johore. Duration of Disease, 3 months. Admitted 24th January, 1885. Cured.

FEBRUARY.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1010	1012	1010	1012
	Albumen -	0	0	0	0
	Chlorides -	Normal	Normal	Trace	Trace
	Phosphates -	Trace	0	0	0

History.—Patient states that he came from China six months ago. He worked in a Gambier plantation for three months, when he had to stop on account of an attack of intermittent fever, which lasted a fortnight, and left him very weak. He lost his appetite, and ate little but congee. Subsequently, he got swelling in his legs and face, which gradually disappeared nineteen days ago. He was treated in the Johore Hospital, and states that he was able to walk when he went into hospital, and also when he left it, without assistance, but his legs felt very weak. After three days, finding he was getting

weaker in his legs, he came to hospital. His daily meals on the estate consisted of:—

- 5.0 a.m. Congee and salt fish.
- 10.0 a.m. Rice, fresh vegetables, and salt fish.
- 3.0 p.m. Congee and salt fish.
- 6.0 p.m. Rice, fresh vegetables, and salt fish.

Once a month he had pork, duck, and fowl, during one month only.

State on Admission.—Patient was a tall and apparently well-built man; he is now emaciated, but is able to lie on either side. There is numbness in his feet, from the toes to the ankle-joint; nowhere else.

Hyperæsthesia.—There is pain on pressure all over his feet and legs, up to hips; calves very tender. There is no pain in the arms or back. There is a feeling of fulness in the epigastrium, with twitchings of the flexor tendons of the legs. He is unable to stand or walk. When held up by two assistants he moves along with an unsteady gait. There is loss of power in the feet, which he is unable to flex at the ankle-joint (ankle-drop), and they remain extended as he lies in bed. There is apparently no loss of power in his hands. Patient states that they are as strong as ever. There is marked anæmia, also slight œdema on the dorsum of the feet, and over the tibiæ. Gums firm, tongue flabby, covered with white film in the centre, with pale edges. Fauces inflamed, appetite moderate, bowels regular.

Pulse, 92; respiration, 19; temperature, 99.

Progress of the Case.—*February 9th.* Patient complains of pain and numbness in his feet, from the ankle-joint, and pain on pressure all over his legs. Very painful in the calves. No pain in the arms, hands, or back. Has pain in the abdomen (he is an opium smoker). He is unable to stand or walk. Slight œdema over the dorsum of the feet; nowhere else. *20th.* Patient feels better. He is able to walk a little with crutches. No pain in his abdomen. Less pain and numbness in his feet. *13th.* Complains of tightness in the stomach, otherwise the same. *16th.* Patient much improved. He is able to walk without assistance. Less pain and numbness in his legs. *17th.* Patient again complains of more numbness in his legs, and pain in the epigastrium. *20th.* Patient states that the pain and numbness in his legs are about the same. Less pain in the epigastrium. *26th.* Patient feels much better. Less pain and numbness in his legs; no pain in the epigastrium. Appetite good; sleeps well; tongue clean.

Patient continued to improve, and was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Jan. 24		132		19		102.6		50 H.C
25	92	116	18	21	99.2	101.8	1 N	50 H.C
26	100	124	21	21	101.2	102.4	1 H	50 H.C
27	96	116	18	21	99.6	101.8	1 H	52 H.C
28	112	116	18	21	101.8	102.4	1 N	40 H.C
29	96	108	18	20	98.6	99.6	1 N	50 H.C
30	112	116	18	20	102.2	102.6	2 N	60 H.C
31	92	104	18	20	97.6	98.8		60 H.C
Feb. 1	108	108	19	19	101.4	101.6	1 N	48 H.C
2	92	102	19	19	98.2	99.2	1 N	50 H.C
3	92	100	19	19	98.8	99.6	1 N	50 H.C
4	92	100	19	19	99.6	99.8	1 N	42 H.C
5	94	104	19	19	99.6	99.8	1 N	38 H.C
6	98	102	19	19	101.2	101.6	1 N	38 H.C
7	92	106	19	19	99	99.8	1 N	40 H.C
8	96	104	19	19	99.2	99.8	1 N	68 N
9	88	94	17	19	98.6	99.2	1 N	68 N
10	96	99	19	19	99.6	99.6	1 N	68 N
11	80	94	17	19	98.2	98.8	3 W	62 N
12	80	84	17	17	98.6	98.8		60 N
13	84	88	17	17	98.4	98.8	3 N	68 N
14	92	98	18	19	99.2	96.6	1 N	58 N
15	92	98	19	18	CN Y		1 N	40 N
16	90	96	18	19	99	99.4	1 N	54 N
17	80	88	17	17	88.2	98.4	1 N	48 N
18	80	84	17	17	88.4	98.6	2 N	50 N
19	80	88	17	17	88.4	98.8	1 N	48 N
20	84	88	17	17	88.6	98.8	2 N	66 N
21	84	84	17	17	88.4	98.6	2 N	44 N
22	84	88	17	17	88.4	98.8	1 N	58 N
23	84	88	17	17	88.4	98.8	2 N	46 N
24	80	84	17	17	88	98.4	1 N	50 N
25	80	84	17	17	88	98.6	2 N	48 N
26	80	84	17	19	88.4	98.6	2 N	50 N
27	84	88	17	17	88.4	98.6	2 N	56 N
28	80	84	17	17	88	98.4	2 N	50 N

CASE No. 44.

LIM AH KAPE (MALE), age 38, Carpenter. Taken ill at South Bridge Road, Singapore. Duration of Disease, 5 days. Admitted December 13th, 1885. Cured.

JANUARY.

Urine	Reaction- -	1st week	2nd week	3rd week	4th week.
	Sp. Gravity-	Slightly Acid	Slightly Acid	Slightly Acid	Slightly Acid
	Albumen -	1008	1012	1012	1012
	Chlorides -	0	0	0	0
	Phosphates -	Normal	Normal	Normal	Normal
		Trace	Trace	Trace	Trace

History.—The patient stopped work five months ago on account of his sight growing dim, and has done no work since. One month ago he observed some swelling on the dorsum of the feet and ankles, which gradually extended up his legs. He felt no other symptoms until five days ago, when he commenced feeling his hands and feet growing numb, and pain on the back of his legs, and inability to walk steadily. He does not know the cause of his illness.

State on Admission.—He has slight œdema of the feet and legs. There is numbness in the feet and hands, and pain in the calves on pressure. He is able to walk, but his gait is unsteady.

Progress of the Case.—December 16th. Patient complains of numbness in his lips, abdomen, hands and fingers, and he feels pain and numbness in his calves, and numbness on the tibiæ and dorsum of the feet. His eyesight is dim; tongue clean; appetite bad; bowels regular; sleeps well. He can walk a little without any assistance, but gait very unsteady. 20th. Patient feels easier. Pain and numbness less in his calves and over tibiæ. Can walk a little with assistance. 23rd. Complains of feeling swollen in the abdomen (flatulence). 24th. Numbness in his lips, chest, backs of his hands and fingers continue. Numbness of the body more or less general. There is some œdema over the tibiæ, both calves, and dorsum of the feet. Eyesight still dim; tongue flabby; appetite good; bowels regular. January 5th. He vomited last night. Has diarrhœa; bowels moved twice. 8th. About the same, but suffered from spasms and contractions in his legs last night. 21st. He is suffering from a slight attack of dysentery. Spasmodic contraction of the legs continues. February 2nd. Complains of numbness in his lips, and numbness and tightness in his chest, and flatulence. Has numbness and stiffness in his hands, and pain, numbness, and spasms in his legs. Bowels regular. 19th. Feels better, able to walk without assistance, and otherwise much improved. March 19th. Patient continued to improve up to the time of his leaving hospital.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Dec. 15		90		17		99.4	2 N	16 H.C
16	90	90	12	17	98.4	99.2	2 N	18 H.C
17	90	92	18	17	98.4	99	2 N	28 H.C
18	90	90	17	17	98.8	99.2	2 N	32 N
19	90	90	17	17	98.6	99.6	2 N	36 N
20	84	90	17	17	99	99.4	2 N	40 N
21	90	90	17	17	98.2	99.2	3 N	36 N
22	72	90	16	17	98	99.4	2 N	55 N
23	84	90	18	17	98.4	99.6	2 N	48 N
24	84	90	17	17	98.8	99.6	2 N	56 N
25	84	90	17	17	98.4	99.4	2 N	58 N
26	72	84	18	17	98.4	99.4	4 N	68 N
27	84	84	17	17	98.4	99.6	2 N	65 N
28	90	84	17	17	98.4	99.4	2 N	58 N
29	90	84	17	17	98.4	99.2	4 W	65 N
30	84	84	16	17	99.4	99.6	3 W	62 N
31	72	74	17	17	99	100.2	3 W	60 N
1886.								
Jan. 1	60	72	16	17	99.2	99.4	3 N	72 N
2	64	72	17	17	99.2	99.2	3 N	80 N
3	72	72	16	17	99.4	99.2	4 N	84 N
4	64	72	17	17	98.6	99.2	2 N	68 N
5	72	72	17	17	99.2	99.6	2 N	48 N
6	72	72	17	17	99	99.4	2 N	52 N
7	72	72	16	17	99.4	99.8	3 N	80 N
8	72	72	16	17	99	99.4	3 N	80 N
9	64	72	17	17	98.8	99.4	3 N	82 N
10	64	72	17	17	99.4	99.2	3 N	80 N
11	68	72	17	17	99	99.2	3 N	78 N
12	68	72	17	17	99.2	99.2	4 N	80 N
13	72	72	17	17	99.6	99.4	2 N	78 N
14	72	72	17	17	100	99.8	2 N	68 N
15	72	72	17	17	99	99.4	3 W	65 N
16	76	72	17	17	99.2	99.6	4 W	62 H.C
17	76	72	17	17	99.9	99.2	4 W	60 N
18	76	72	17	17	100	99.2	4 W	62 N
19	76	72	16	17	99.8	99.4	4 W	82 H.C
20	72	72	17	17	99.6	99.8	5 W	68 H.C
21	72	72	17	17	99.6	99.4	5 W	72 H.C

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1886.								
Jan. 22	72	72	17	17	99.4	99.6	6 W	86 H.C
23	72	76	18	17	99.4	99.8	6 W	78 H.C
24	72	72	17	17	99.6	99.6	6 W	79 H.C
25	76	72	16	17	99.4	99.6	6 W	75 N
26	76	72	17	17	99.6	99.4	7 W	78 N
27	72	72	17	17	100	99.8	6 W	75 N
28	72	72	17	17	99.6	99.8	6 W	71 N
29	72	76	17	17	99.4	99.6	6 W	71 N
30	72	72	17	17	99.2	99.8	7 W	76 N
31	72	76	17	17	99.4	99.6	6 W	78 N
Feb. 1	72	72	17	17	99.2	99.6	6 W	60 H.C
2	72	72	17	17	99.8	99.6	6 W	60 H.C
3	72	72	17	18	99.6	99.6	6 W	60 H.C
4	72	70	18	18	100.4	99.8	6 W	62 H.C
5	72	72	17	17	100	99.8	2 N	56 H.C
6	72	72	17	17	99.6	99.6	6 W	56 H.C
7	72	72	17	18	99.2	99.6	6 W	55 H.C
8	72	72	17	18	99.4	99.4	6 W	50 H.C
9	72	72	17	18	99.8	99.6	5 W	50 H.C
10	72	72	17	18	99.8	99.6	6 W	50 H.C
11	72	72	18	19	99.8	99.4	5 N	50 H.C
12	72	72	17	19	99.8	99.6	6 N	50 H.C
13	72	72	17	19	99.4	99.4	5 W	50 H.C
14	72	72	17	19	99.6	99.4	5 W	51 H.C
15	72	72	17	19	CN Y		6 W	50 H.C
16	72	72	19	19	99.6	99.4	6 W	50 H.C
17	72	70	19	19	99.8	99.2	5 W	52 H.C
18	72	70	18	17	99.6	99.2	2 N	56 H.C
19	72	72	17	18	99.2	99.6	7 W	55 H.C
20	72	72	19	18	99.4	99.6	6 W	50 H.C
21	72	72	19	19	99.6	99.6	7 W	50 H.C
22	72	72	19	19	99.8	99.6	6 W	52 H.C
23	72	72	19	19	99.8	99.6	2 N	50 H.C
24	72	72	18	19	98.4	99.4	6 W	54 H.C
25	72	74	17	18	99.2	99.6	7 W	54 H.C
26	74	72	17	17	98.6	99.8	6 W	58 H.C
27	72	70	17	17	98.4	99.6	5 W	56 H.C
28	72	72	17	17	98.4	99.4	6 W	48 H.C

CASE NO. 45.

TAN AH CHIANG (MALE), age 34, *Trader. Taken ill at Singapore. Duration of Disease, 3½ months. Admitted 9th December, 1884. Cured 28th, 1885.*

JANUARY.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction -	Slightly Acid	Slightly Acid	Slightly Acid	Slightly Acid
	Sp. Gravity -	1010	1010	1012	1010
	Albumen -	o	o	o	o
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	o	o	o	o

History.—He last was at work three-and a-half months ago, when he had to stop on account of an attack of fever, which lasted twenty days. Six days after the attack of fever he felt numbness, first in the nape of his neck, popliteal spaces, and hypogastric; a day after that in the dorsum of the feet and epigastrium, and on the third day on dorsum of the left hand and fingers, and outer aspect of arm. On the fourth day he felt numbness in his legs and calves, and twitchings of the tendons of the legs, especially at nights. He was unable to walk without being supported.

State on Admission.—The calves are painful on pressure, and there is numbness in the umbilical region, and a feeling of constriction across the chest; he is not able to walk without assistance. He also states that twenty days prior to being attacked with fever he got a chancre on his scrotum, and a bubo on the right side.

Progress of the Case.—*December 12th.* Patient complains of numbness in his chest, hypogastrium, left hand, and front of legs, and pain in his calves. There is a slight swelling in the feet on the dorsum. Tongue flabby; appetite good; bowels regular; sleeps well. *14th.* Swelling reduced; pain and numbness less in his chest and legs. *19th.* Complains of tightness in his chest, and of numbness, pain, and spasmodic contraction in his calves, which comes on at 9 p.m., lasting till 12 p.m. He has pain also in the lumbar region. *24th.* Complains of weakness, pain, numbness, and spasmodic contraction in his legs. *30th.* Much the same. *January 5th.* Same feelings continue. *14th.* Weakness and numbness in his legs, and tightness and numbness in his chest are the same. He complains of flatulence, and of numbness over the bladder, and some pain in the rectum. Appetite bad; bowels regular; sleeps well. *19th.* No improvement. He is suffering from a perineal abscess.

For further particulars refer to rough notes. Patient gradually improved from this day up to *February 28th*, when he was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Dec. 11		92		17		99.2	1 H	16 N
12	86	90	17	17	98.8	99.4	2 H	20 N
13	96	90	17	17	98.6	99.6	2 N	18 N
14	84	108	18	22	99	99.8	2 N	68 N
15	90	102	17	20	99.2	99.6	2 N	80 N
16	84	90	17	17	99.4	99.2	2 N	82 N
17	84	90	17	17	99.6	99.4	2 N	72 N
18	84	90	17	17	99.4	99.6	2 N	84 N
19	84	90	17	17	99.2	99.6	2 N	80 N
20	78	84	17	17	99.2	99.8	2 N	80 N
21	84	84	17	17	99.4	99.6	2 N	68 N
22	84	84	17	17	99.4	99.4	2 N	86 N
23	96	84	18	17	99.2	99.8	2 N	85 N
24	90	84	17	17	99	99.4	2 N	68 N
25	84	84	17	17	99.2	99.2	2 N	60 N
26	84	84	17	17	98.6	99	2 N	56 N
27	84	84	17	17	99	99.2	2 N	68 N
28	72	72	17	17	99.2	99.4	2 N	68 N
29	76	84	17	17	99.2	99.8	2 N	65 N
30	76	80	18	18	99.4	99.4	2 N	78 N
31	80	84	17	20	99.4	100.4	2 N	68 N
1886.								
Jan. 1	84	84	18	18	99.4	99.8	2 N	68 N
2	76	72	19	18	99.4	99.4	2 N	72 N
3	80	80	18	18	100	98.8	2 N	86 N
4	84	84	18	18	99.2	99.6	2 N	84 N
5	84	84	19	18	99.2	99.4	2 N	56 N
6	80	80	18	18	99	99.2	2 N	80 N
7	84	84	18	18	99.6	99.6	2 N	80 N
8	80	80	18	18	89.4	99.4	3 N	80 N
9	90	84	19	18	99.6	99.4	4 N	75 N
10	80	84	18	18	99.6	99.6	4 D	85 N
11	80	80	19	18	99.2	99.4	6 D	82 N
12	80	80	18	19	99.8	99.4	7 D	72 N
13	84	80	18	18	99.6	99.6	1 N	76 N
14	84	80	19	18	100	99.8	0	58 N
15	80	80	19	18	100.2	99.8	1 N	60 N
16	72	82	20	18	100.2	98.8	0	62 H.C
17	72	80	20	18	100.2	98.8	0	60 H.C
18	72	80	20	18	100.2	99.8	0	62 H.C
19	78	80	20	18	100	99.4	4 W	56 H.C

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1886.								
Jan. 20	76	72	22	19	98.8	99.6	2 N	62 H.C
21	72	80	20	18	99	99	1 N	68 H.C
22	72	76	20	18	99	99	1 N	72 H.C
23	74	76	20	18			2 N	74 N
24	72	72	19	18			1 N	82 N
25	72	72	18	18			1 N	80 N
26	72	72	18	18			1 N	80 N
27	72	72	18	18			1 N	80 N
28	72	72	18	18			1 N	82 N
29	72	76	18	18			1 N	78 N
30	72	72	20	18			1 N	76 N
31	72	72	18	18			1 N	80 N
Feb. 1	72	72	18	18			1 H	70 H.C
2	72	72	18	18			1 H	65 H.C
3	72	72	18	18			1 H	60 H.C
4	72	72	18	18			1 H	63 H.C
5	72	72	18	18			1 H	60 H.C
6	70	72	18	19			1 H	58 H.C
7	72	72	19	19			1 H	55 H.C
8	72	72	18	19			1 H	50 H.C
9	72	72	18	19			1 H.C	50 H.C
10	72	72	18	19			1 H	50 H.C
11	72	72	18	19			1 H	50 H.C
12	72	72	18	19			1 H	50 P
13	72	72	18	19			2 H	50 P
14	72	72	19	18			2 N	52 P
15	70	72	20	19			2 N	50 P
16	72	72	19	20		CN Y	2 N	50 P
17	72	72	19	20			2 N	52 P
18	70	70	18	24			2 N	53 P
19	72	72	18	24			2 N	50 P
20	72	72	18	24			2 N	50 P
21	72	72	18	24			2 N	50 P
22	72	72	18	24			3 N	50 P
23	72	72	18	22			2 N	39 P
24	70	72	18	22	98.4	99.2	2 N	40 P
25	72	70	18	20	98.4	99.4	2 N	42 P
26	72	72	18	18	98.6	99.6	2 N	50 P
27	72	70	18	18	98.4	99.6	2 N	56 P
28	72	72	18	18	98.6	99.4	2 N	58 P

CASE No. 46.

NGIEW HOCK CHOO (MALE), age 29, Coolie. Taken ill November 15th, 1884. Duration of Disease, 2 months. Admitted November 15th, 1884. Cured February 28th, 1885.

FEBRUARY.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity -	1008	1008	1008	1010
	Albumen . -	o	o	o	o
	Chlorides - -	Normal	Normal	Trace	Trace
	Phosphates -	Trace	o	o	o

History.—Patient has suffered from intermittent fever for three months in Johore. He slept in a shed with twenty others on a ground floor, on a cot. His comrades did not get the disease. He was employed as a grass-cutter.

State on Admission.—There is slight general œdema. Hands and feet numb. Extensors paralysed; pain in the calves on pressure. Not able to walk.

Progress of the Case.—December 5th. Pain and numbness in the chest, arms, and legs, and pain in the abdomen is the same, but the swelling has much decreased. He feels a bitter taste in his mouth. Did not sleep well last night owing to the pain. 10th. Complains of pain from his knees to the dorsum of both legs, and especially in his calves when he lies down. 13th. Had a feverish attack yesterday evening at 6 p.m. Has more pain and numbness in his legs and back. He feels tight in his chest. Did not sleep well on account of the pain. 15th. Improving slightly; pain and numbness less. 20th. Still improving; less pain in his calves and legs. No pain in his chest or back; appetite good. 30th. Complains of more pain in his legs from hip to ankle, and stiffness in his tendons; otherwise the same. January 21st. Has pain in his back over the lumbar region. Feels weak, and numbness and pain from the knees to the ankle. Tongue clean; appetite good; no thirst; sleeps well. February 7th. Patient doing well; feels only weak in his knees, and weakness and numbness in his feet from the ankle-joint. 14th. Patient still complains of having pain and numbness in his calves; he looks well. 24th. He has now only slight pain in his back, over the lumbar region, nowhere else. No numbness anywhere. Discharged cured on 28th.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1884.								
Nov. 17	76	76	24	24	98.4	98.6		
18	80	84	24	24	98.6	99	3	
19	76	120	20	24	97.6	103.6	2	
20	96	112	24	24	98.8	99.4	7	
21	92	96	24	28	98.4	100.8	7	
22	92	100	24	28	98.8	103.2	6	
23	80	88	24	26	98.6	97.2	3	
24	84	92	24	28	98	101	3	
25	88	92	24	24	99.2	100.4	1	
26	88	92	20	24	99.8	99.4	3	
27	100	92	16	20	99.2	97.8	3	
28	80	72	16	16	97.2	96.8	3	
29	80	76	20	22	97.4	97.8		
30	76	80	20	24	96.6	97.6		
Dec. 1	80	84	20	24	99	99.2	0	9
2	88	99	24	24	97.8	98.8	0	27
3	88	92	24	24	98.4	99.8	1 H	40
4	92	104	24	24	98.6	99.8	1 H	34 P
5	92	108	24	24	99.2	99.8	1 N	28 N
6	88	92	24	24	99.2	99.4	0	50 N
7	84	88	24	24	99.8	99.8	0	50 P
8	84	84	24	24	99	99	1 N	38 P
9	84	90	24	17	99	99.2	1 N	70 N
10	84	84	17	17	99	99.2	1 N	56 N
11	82	88	17	17	98.8	99.4	1 N	58 P
12	84	92	19	22	99.4	100.2	1 N	52 N
13	89	88	21	22	100.2	101.2	1 N	52 N
14	92	98	21	21	99	100.2	0	70 P
15	82	92	17	19	98.6	99.6	1 N	54 N
16	86	89	19	21	99	99.2	0	48 N
17	84	89	19	21	99.4	99.8	1 N	38 N
18	82	87	18	22	98.6	99.8	1 N	42 N
19	80	90	18	21	98.4	99.2	1 N	48 N
20	82	92	18	21	98.2	98.4	1 N	44 P
21	80	92	17	20	98.6	98.8	2 N	38 P
22	80	90	17	20	98.8	98.8	2 N	40 P
23	80	88	17	19	98.6	98.8	3 N	50 N
24	80	88	17	19	99.4	99.8	2 N	38 N
25	94	94	18	19	99.8	99.8	2 N	42 N
26	92	94	18	19	99.2	99.8	2 N	48 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1884.								
Dec. 27	92	98	18	19	99.2	99.8	2 N	50 N
28	86	92	18	17	99.2	99.6	2 N	50 N
29	92	100	19	19	99.2	99.8	2 N	38 N
30	92	104	19	19	99.2	99.8	2 N	50 N
31	100	116	19	19	99.6	100.2	2 N	49 N
1885.								
Jan. 1	92	96	19	20	99	99.4	1 N	48 N
2	88	94	17	20	99	99.2	2 N	50 N
3	94	104	19	21	99.8	99.8	1 N	50 N
4	90	96	18	21	99.4	99.8	2 N	84 N
5	88	94	17	21	99.8	99.8	2 N	50 N
6	88	94	17	20	99.4	99.8	1 N	42 N
7	84	89	17	21	98.6	99.2	1 N	48 N
8	84	108	17	18	99.6	100.2	2 N	48 N
9	88	96	17	18	99.6	100.4	2 N	48 N
10	88	94	17	19	99.6	99.8	1 N	56 N
11	88	98	17	21	98.8	99.8	1 N	48 N
12	96	108	17	21	99.8	100.4	1 N	50 N
13	92	100	17	21	98.8	99.4	1 N	56 N
14	84	96	17	20	99	99.8	1 N	56 N
15	78	84	17	17	99	99.8	1 N	52 N
16	80	92	17	17	99	99.4	2 N	48 N
17	84	92	17	18	99.4	99.8	2 N	48 N
18	80	96	17	18	99.2	99.8	2 N	38 N
19	88	96	17	19	98.8	99.4	2 N	40 N
20	88	96	17	19	99	99.6	2 N	46 N
21	84	94	17	19	98.6	99.4	2 N	48 N
22	96	98	19	19	99.4	99.6	2 N	56 N
23	92	94	19	19	98.8	99.4	2 N	54 N
24	92	96	19	19	99.4	99.8	1 N	60 N
25	96	96	19	19	99.4	99.4	1 N	56 N
26	88	94	17	19	99.2	99.8	1 N	56 N
27	88	92	17	17	98.8	99.4	2 N	58 N
28	96	98	19	18	99.2	99.6	1 N	52 N
29	96	96	19	19	99.2	99.6	2 N	64 N
30	96	96	19	19	99	99.4	1 N	68 N
31	88	96	17	19	99.2	99.4	2 N	52 N
Feb. 1	80	84	17	17	99.2	98.6	2 N	62 N
2	76	80	17	17	99.2	99.6	1 N	68 N
3	76	80	17	17	99.4	99.6	1 N	60 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Feb. 4	84	88	17	17	99.8	99.8	2 N	60 N
5	80	86	17	17	98.8	99.4	2 N	58 N
6	88	88	17	17	99	99.2	1 N	72 N
7	84	92	17	19	98.8	99.6	1 N	76 N
8	84	88	17	17	98.4	98.8	2 N	70 N
9	88	92	17	19	99.2	99.8	2 N	76 N
10	88	96	17	19	98.4	99.2	1 N	68 N
11	88	94	17	18	98.6	99.2	2 N	68 N
12	88	94	17	18	98.6	99.2	2 N	65 N
13	88	94	17	18	99.4	99.8	2 N	68 N
14	80	84	17	17	99.4	99.4	2 N	60 N
15	80	84	17	17	CN V		2 N	48 N
16	80	84	17	17	99.4	99.8	1 N	56 N
17	92	96	18	19	99.8	99.8	1 N	60 N
18	84	88	17	17	98.6	99.8	1 N	58 N
19	88	92	17	18	98.8	99.2	1 N	60 N
20	88	92	17	18	98.6	99.2	1 N	56 N
21	92	96	19	19	99.2	99.6	1 N	50 N
22	90	94	19	19	99	99.6	1 N	68 N
23	88	94	17	19	98.6	99.2	1 N	56 N
24	84	88	17	17	98.2	98.6	1 N	50 N
25	80	84	17	17	98	98.4	1 N	48 N
26	86	88	17	17	98.4	98.8	1 N	50 N
27	84	88	17	17	98.4	98.8	1 N	56 N
28	84	88	17	17	98.4	98.8	1 N	50 N

CASE NO. 47.

PING AH HUNG (MALE), age 35, *Whitewasher's Coolie*. Taken ill at Singapore. Duration of Disease 1 month. Admitted November 11th, 1884. Cured January 2nd, 1885.

DECEMBER.

		1st week.	2nd week.	3rd week.	4th week.
Urine	Reaction - -	Acid	Acid	Acid	Acid
	Sp. Gravity	1010	1012	1008	1012
	Albumen -	0	0	0	0
	Chlorides -	Normal	Normal	Normal	Normal
	Phosphates -	0	Trace	Trace	0

Notes on Admission.—Patient has œdema of legs, feet numb, pain in the calves on pressure, no numbness in the hands. There is slight numbness in the abdominal walls. He is able to walk on crutches. Extensors of the feet are paralysed. He attributes his disease to syphilis.

Progress of the Case.—December 5th. œdema about the same. Has some tightness in the abdomen, with pain and numbness in his legs and hands; sleeps well; no thirst; appetite good; tongue clean. 10th. Has some œdema in his legs and feet, which is greater in the evening. 11th. There is tightness in the tendons when he stretches them. There is considerable œdema also of both feet, over the dorsum of the legs and over the tibiæ. 15th. Patient improving. Swelling less. Abdominal tight feeling diminished. Pain in the tendons at the back of the ankle-joint when he walks. 17th. Patient much improved; swelling disappeared; has only a little numbness in his legs. 18th. Patient looks well, and feels only slight pain and numbness in his legs. Some numbness in his chest. 24th. Patient continued to improve since last reported. He has now no pain or numbness anywhere; only feels some tightness in his calves. March 7th, was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 13		108		24		99.8	2	
14	104	96	24	20	98.2	99	3	
15	96	96	22	20	98	98.8	3	
16	92	96	24	24	97.4	98.8	2	
17	88	96	20	24	97.2	98.4	2	
18	92	100	20	20	96.8	98.7	2	
19	80	100	20	24	96	98	3	
20	80	112	20	24	97.2	98.4	2	
21	80	104	20	24	96.6	98.4	1	
22	88	92	24	24	98	97.6	3	
23	88	96	20	24	97.4	98.8	3	
24	76	92	20	24	97.4	98.6	3	
25	76	88	24	24	97.6	98.6	3	
26	84	84	24	24	97	98.4	3	
27	72	80	23	24	97.2	98.2	3	
28	80	84	23	24	97.4	98.6	2	
29	80	80	23	24	98	98.6	2	
30	76	76	23	20	97.8	98		
31	80	80	23	20	98	98.2		
Dec. 1	72	76	20	20	97.4	98	2	10
2	76	84	20	24	98.2	98.6	2	40
3	72	76	18	24	98.6	99.2	3	34
4	72	76	20	24	98.4	99.2	3 N	50 N
5	84	76	17	24	98.8	98.6	3 N	50 N
6	72	76	20	24	98.2	99	2 N	50 P
7	92	92	20	24	100.2	99.6	3 N	50 N
8	72	80	20	24	99	99.4	2 N	50 N
9	94	78	20	17	98.6	99.2	2 N	48 N
10	72	72	17	17	98.4	99.2	2 N	50 N
11	72	78	15	17	98	99.4	2 N	50 N
12	94	82	15	17	98.8	98.8	3 N	56 P
13	94	89	15	19	98.4	100.2	3 N	52 P
14	76	84	15	18	98.2	99.4	3 N	52 P
15	80	86	17	18	98.4	99.8	2 N	80 P
16	87	94	17	20	99.2	99.6	2 N	64 P
17	88	92	17	20	98.6	99.2	2 N	42 N
18	82	88	17	19	98.6	99	3 N	60 N
19	86	90	17	19	98.6	99.8	2 N	56 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E	M	E		
1884.								
Dec. 20	90	94	17	19	99	99.2	2 N	78 N
21	90	94	17	19	99	99.4	2 N	89 N
22	92	94	19	19	99.4	99.4	3 N	91 N
23	94	98	19	19	99.4	99.8	4 N	90 N
24	98	99	19	19	99.6	99.8	2 N	90 N
25	104	99	19	19	100.4	99.6	2 N	78 N
26	100	104	19	19	99.2	99.8	3 N	80 N
27	100	104	19	19	99.2	99.2	3 N	68 P
28	96	100	17	19	99.2	99.4	2 N	70 P
29	100	104	19	21	98.4	99.4	2 N	60 P
30	100	104	19	21	98.6	99.4	2 N	72 P
31	100	108	19	21	99	99.8	2 N	49 N
1885.								
Jan. 1	100	108	19	21	99.2	99.8	2 N	56 N
2	104	108	19	21	99.2	99.8	3 N	78 N
3	104	104	19	19	99.2	99.4	2 N	38 N
4	100	108	19	21	98.4	99.6	2 N	50 N
5	104	106	19	21	98.6	99.8	2 N	50 N
6	102	108	19	21	98.8	99.8	2 N	50 N
7	104	108	19	21	100.4	100.8	2 N	50 N
8	100	108	19	21	99.2	99.2	3 N	50 N
9	104	108	19	21	99.4	99.8	2 N	50 N
10	104	108	19	21	99.4	99.8	2 N	38 N
11	104	108	19	21	99.8	99.4	2 N	46 N
12	104	108	19	21	99.2	99.6	3 N	48 N
13	104	102	19	21	99.2	99.8	2 N	34 N
14	98	104	19	21	98.6	98.4	3 N	38 N
15	100	104	19	21	99.2	99.8	3 N	38 N
16	104	108	19	21	99.4	99.8	3 N	38 N
17	100	108	19	21	99	99.8	3 N	40 N
18	96	104	19	21	98.8	99.6	2 N	40 N
19	96	96	19	21	99	99.2	2 N	40 N
20	100	108	21	21	99.6	99.8	2 N	56 N
21	100	104	21	21	99.6	100.4	3 N	50 N
22	100	104	21	21	98.6	99.8	2 N	50 N
23	104	104	21	21	99.2	99.6	2 N	56 N
24	104	108	21	21	99.2	99.8	2 N	64 N
25	100	108	21	21	99.2	99.8	2 N	65 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Jan. 26	96	102	21	21	98.6	99.8	2 N	62 N
27	96	104	21	21	98.6	99.8	3 N	58 N
28	96	100	21	21	98.6	99.2	3 N	54 N
29	104	106	21	21	98.8	99.6	2 N	60 N
30	100	104	21	21	98.6	99.4	2 N	64 N
31	100	102	21	21	98.6	99.2	2 N	68 N
Feb. 1	100	104	21	21	98.6	99.2	2 N	68 N
2	100	104	21	21	98.8	99.4	3 N	62 N
3	104	108	21	21	99.2	99.6	2 N	66 N
4	108	108	21	21	99.6	99.8	2 N	68 N
5	100	108	21	21	98.8	99.6	2 N	72 N
6	100	104	21	21	99.2	99.6	2 N	66 N
7	96	100	19	21	98.6	99.2	2 N	68 N
8	92	96	19	19	98.4	98.8	2 N	72 N
9	92	98	19	19	98.6	99.4	2 N	76 N
10	92	98	19	19	98.6	99.4	2 N	80 N
11	96	98	19	19	99.2	99.6	2 N	68 N
12	92	98	19	19	99.2	99.6	2 N	68 N
13	96	98	19	19	99.4	99.8	2 N	68 N
14	96	98	19	19	99.4	99.8	2 N	60 N
15	92	96	18	19	CN Y		2 N	68 N
16	96	98	19	19	99.4	99.8	1 N	60 N
17	96	98	19	19	99.2	99.8	2 N	52 N
18	92	96	19	19	99	99.6	2 N	64 N
19	98	92	17	19	98.6	98.8	2 N	60 N
20	84	88	17	17	98.6	98.8	1 N	50 N
21	96	98	19	19	99	99.2	2 N	50 N
22	90	94	19	19	99	99.4	1 N	64 N
23	92	96	19	19	99.2	99.6	1 N	52 N
24	88	92	17	19	98.4	98.8	1 N	50 N
25	88	92	17	19	98.4	98.8	1 N	54 N
26	84	88	17	17	98.4	98.8	2 N	50 N
27	88	92	17	19	98.6	98.8	2 N	48 N
28	84	88	17	17	98.4	98.8	2 N	50 N

CASE NO. 48.

TAN AH KIT (MALE), age 27, Coolie. Taken ill at Trafalgar Estate. Duration of Disease, $1\frac{1}{2}$ months. Admitted November 10th, 1884. Cured March 2nd, 1885.

DECEMBER.

Urine	Reaction -	1st week.	2nd week.	3rd week.	4th week.
	Sp. Gravity-	Acid	Acid	Acid	Acid
	Albumen -	1008	1008	1010	1012
	Chlorides -	o	o	o	o
	Phosphates -	Normal	Normal	Normal	Normal

Notes on Admission.—Has had general dropsy at the commencement of the disease, which disappeared fifteen days ago. He has no dropsy now. Hands and feet are numb; extensors paralysed. Has pain in the calves on pressure, and a feeling of fulness in the pit of the stomach, and numbness in the abdominal walls and lips. He is not able to walk.

He suffered from intermittent fever ten days prior to the dropsy. He slept in a bungalow with thirty-nine others, on the ground floor. Four of his comrades suffered also from Bèri Bèri. These four went to China.

Progress of the Case.—*November 17th.* Patient is better generally; is able to walk a little. *December 5th.* Patient states that he feels pain and numbness all over his body, and cannot sleep. *12th.* Complains of pain, tightness, and numbness in his chest and abdomen. Feels pain and numbness in his hands and legs; tongue clean; appetite good. Could not sleep owing to the tightness and numbness in his chest and abdomen. *19th.* Complains of pain over the lumbar region; otherwise the same. *February 2nd.* There is pain in his chest and loins; numbness and flatulence in his abdomen; slight pain and numbness in his legs. Bowels regular; appetite good; sleeps well. Patient made daily improvements, and was discharged cured on *March 2nd.*

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E.	M	E.		
1884.								
Nov. 11	84	120		32		100.2		
12	84	116	28	32	98	99.6	1	
13	84	92	30	32	98	99.8	1	
14	84	88	20	28	98	98.4	1	
15	80	88	24	24	97.6	99.4	1	
16	76	104	24	26	97.2	100.2	2	
17	76	88	24	20	97.4	97.8	2	
18	76	92	20	24	97.4	97.2	2	
19	80	104	24	26	97.6	99.2	1	
20	92	100	24	24	97.6	98.2	1	
21	92	96	24	24	98.4	99	2	
22	84	108	24	28	97.6	100.4	2	
23	80	108	24	24	97.8	99	3	
24	80	84	24	24	97.2	98	3	
25	88	96	24	24	98	98.8	3	
26	80	88	24	24	98	98.4	3	
27	80	88	24	24	98	98.4	3	
28	90	90	24	24	98.8	98.4	3	
29	84	96	24	24	98.4	99	3	
30	84	98	24	24	97.8	99.4	2	
Dec. 1	90	90	24	24	99.2	98.8	3 N	28
2	90	96	24	24	98.8	100	3 N	64
3	90	98	24	24	99.6	100.2	4 N	48 N
4	84	96	24	24	99.4	100	3 N	36 N
5	96	96	24	24	99.2	100.2	3 N	38 N
6	90	96	24	24	99.2	99.8	3 N	36 N
7	88	96	24	24	99.2	99.4	3 N	34 N
8	84	90	24	24	99	99.2	3 N	29 N
9	78	96	24	18	98.6	98.8	3 N	56 N
10	72	96	20	20	98.4	99	3 N	40 N
11	84	96	20	20	98.8	99.2	3 N	50 N
12	72	90	20	20	98.4	99.4	3 N	58 N
13	84	90	24	20	98.4	99.2	3 N	54 N
14	78	90	20	20	98.4	99	3 N	48 N
15	72	84	24	20	98	99.4	2 N	52 P
16	84	84	24	20	99.2	99.6	2 N	60 P
17	84	84	24	20	99	99.4	2 N	58 P
18	72	84	24	20	99	99.4	2 N	60 P
19	72	84	22	20	99	99.4	2 N	56 P

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E.	M	E.		
1884.								
Dec. 20	72	84	22	24	98.2	99.6	2 N	52 P
21	72	84	22	24	99	99.4	2 N	48 P
22	72	84	24	24	98.8	99.2	2 N	52 P
23	72	84	24	24	98.8	99.4	2 N	48 P
24	72	84	24	24	99	99.2	3 N	36 P
25	84	82	24	24	99	99.2	3 N	35 P
26	84	84	24	24	98.6	99.4	3 N	42 P
27	82	84	24	24	99	99.6	3 N	48 P
28	72	84	24	24	99.6	99.4	3 N	51 P
29	84	82	24	24	98.4	99.6	3 W	56 P
30	72	82	20	20	99.8	99.5	3 W	52 P
31	76	84	24	24	99.2	100.4	3 W	54 P
1885.								
Jan. 1	80	80	24	24	98.4	99.4	3 N	50 N
2	72	72	24	24	98.8	99.2	3 N	48 N
3	72	72	24	24	99.6	99.6	3 N	50 N
4	72	72	24	24	99.2	99.4	3 N	45 N
5	80	72	24	24	99.6	99.8	3 N	50 N
6	72	72	24	24	99	99.4	3 N	72 N
7	72	72	24	24	99.4	99.2	3 N	70 N
8	72	72	24	24	99.2	99.4	3 N	70 N
9	72	72	24	24	99	99.2	3 N	48 N
10	72	72	24	24	98.6	99.4	3 N	52 N
11	72	72	24	24	98.6	99.2	3 N	51 N
12	72	72	24	24	99	99.4	3 N	48 N
13	78	72	24	24	99.2	99.2	3 N	50 N
14	84	82	24	24	99	99.4	3 N	50 N
15	80	72	24	24	99.2	99.2	2 N	45 N
16	84	80	24	24	99.6	99.4	2 N	46 N
17	80	80	20	24	99.4	99.6	2 N	50 N
18	80	80	24	22	99	99.2	3 N	61 N
19	80	84	24	24	99.2	99.4	3 N	59 N
20	76	80	22	24	99.2	99.2	2 N	62 N
21	76	82	22	24	99.2	99.4	2 N	63 N
22	76	82	22	22	99.2	99.6	3 N	62 N
23	80	80	22	22	99.6	99.4	3 N	72 N
24	82	80	24	24	99.8	99.2	3 N	69 N
25	80	80	24	24	99.6	99.4	3 N	60 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1885.								
Jan. 26	80	80	24	24	99.4	99.2	3 N	60 N
27	80	80	22	24	99.6	99.4	3 N	60 N
28	80	82	22	24	99.6	99.6	3 N	56 N
29	82	80	24	24	99.4	99.4	3 N	62 N
30	82	82	24	24	99.2	99.6	2 N	70 N
31	80	80	22	24	99.6	99.4	2 N	72 N
1885.								
Feb. 1	82	82	22	20	98.8	99.4	2 N	60 P
2	82	82	22	20	99.6	99.4	2 N	60 P
3	82	82	22	22	99.6	99.2	3 N	60 P
4	82	80	22	20	98.6	99.6	3 N	62 P
5	82	82	22	22	98.4	99.4	4 N	60 P
6	80	80	20	24	98.4	99.6	3 N	62 P
7	80	80	22	24	98.4	99.2	3 N	60 P
8	80	80	24	24	99	99.6	3 N	60 P
9	80	80	24	24	99.4	99.8	3 N	60 P
10	80	82	24	24	99.8	99.8	2 N	60 P
11	82	82	24	22	99.8	99.8	2 N	60 P
12	82	82	24	22	99.8	99.8	2 N	60 P
13	82	82	24	22	99.4	99.8	2 N	60 P
14	82	82	24	22	99.4	99.8	2 N	62 P
15	82	80	22	24	CN Y		2 N	60 P
16	82	80	24	24	99.6	99.4	2 N	60 P
17	82	82	24	24	99.6	99.2	2 N	62 P
18	80	82	24	24	99.8	99.4	2 N	60 P
19	82	82	24	24	99.2	99.6	2 N	60 P
20	82	82	24	24	99.4	99.4	2 N	60 P
21	82	82	24	24	99.6	99.4	2 N	60 P
22	82	84	24	22	99.6	99.6	2 N	60 P
23	82	82	24	20	99.8	99.2	2 N	62 P
24	84	82	22	20	98.6	99.4	2 N	65 P
25	82	82	20	20	98.6	99.2	2 N	68 P
26	84	82	20	20	98.4	99	2 N	62 P
27	82	80	18	20	98.4	99.2	2 N	60 P
28	82	82	18	20	98.4	99.4	2 N	62 P

CASE NO. 49.

TAN AH KUAN (MALE), age 30, Coolie. Taken ill at Siran-
goon. Duration of Disease, 8 months. Admitted November 9th,
1884.

Notes on Admission.—Patient had general dropsy at the commencement of the disease, which disappeared six months after. He has no dropsy now; hands and feet numb, extensors paralysed, pain in the calves on pressure, not able to walk, has no fever.

Previous History.—He slept in a shed with eleven others on the ground floor, on a cot; none of his comrades suffered from the disease.

Progress of the Case.—November 17th. Able to walk a little; feels better generally. 20th. Complains of pain in the pit of the stomach. December 7th. Feels tightness in the abdomen, œdema has increased, and he feels pain and numbness in his knee-joints, fingers, and hands. 8th. Patient complains of headache, tightness in the abdomen, with pain and numbness on the front part of his legs. He has numbness of the fingers, backs of the hands, and knee-joints. 12th. Has pain in the back part of his hands, and feels numbness in his right leg and front part of his left leg; has flatulence, appetite good. 19th. Patient complains of pain in the back part of his right hand, and pain and numbness in his knees, ankles, and dorsum of his feet. Feels spasmodic contraction of the tendons of his legs during the day and night. 20th. Patient had a feverish attack at one o'clock, lasting till four o'clock. Has pain in the back part of his hands, and in his knees, ankles, and feet, and spasmodic contraction in his legs. 29th. Patient improving. 31st. He is able to run. January 16th. Patient can walk fast but with the characteristic gait. There is still pain along the back of the right fore-arm, extending to the elbow-joint, between the bones. Can pronate and supinate, can flex and extend the fingers, but they are stiff. Has slight pain on the dorsum of the hand.

From this time patient continued to make rapid improvement, and was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1884.								
Nov. 10		80				98.8		
11	76	80	24		97.2	99	2	
12	76	84	28		97	99	1	
13	72	80	28	32	96	98	2	
14	76	84	24	28	97	98.2	2	
15	76	84	24	26	96.4	98.8	2	
16	72	80	20	24	96.6	99.2	3	
17	72	80	20	24	96.4	98.2	1	
18	72	84	20	24	96.2	98.4		
19	72	92	20	24	97.4	98.4		
20	80	92	20	24	97.4	98.6	2	
21	80	84	20	24	97.7	97.2	2	
22	76	88	24	24	98	98.4	2	
23	72	88	24	24	97.2	98.4	2	
24	72	84	24	24	97.2	98.4	3	
25	72	80	24	24	97.8	98.4	3	
26	72	80	24	24	98	98.4	3	
27	72	76	24	24	98	98.6	2	
28	84	84	24	24	98.8	98.4	1	
29	84	84	24	24	97.8	98.4	1	
30	72	76	24	24	97.8	98.2	1	
Dec. 1	72	82	24	24	97.4	98.4	3	38
2	72	72	24	24	98.6	98	1 N	16 N
3	72	92	24	24	98.4	99.4	1 H	40 N
4	72	78	24	24	98.6	99.2	1 H	20 N
5	78	78	24	24	98.4	98.6		18 N
6	78	72	24	24	99	99	1 H	40 N
7	72	78	24	24	99.8	99.6	1 H	56 N
8	72	78	24	24	98.8	98.8	2 H	40 N
9	78	76	24	18	98.4	99.4	2 H	32 N
10	72	78	22	18	99.2	99.8	1 H	35 N
11	72	76	22	18	99	99.2	2 N	60 N
12	72	76	18	20	98.4	99.6	2 N	58 N
13	78	78	17	20	99	99.8	2 N	60 N
14	78	78	20	20	98.4	99.4	2 N	56 N
15	72	84	20	20	99	99.2	2 N	59 N
16	84	84	17	20	99	99.2	1 N	40 HC

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Dec. 17	84	84	20	20	99.2	99.8	1 N	42 P
18	72	84	20	20	98.4	99.4	1 N	40 H.C
19	72	84	20	20	98.8	99.8	1 N	41 H.C
20	78	84	24	20	99.2	99.6	2 N	48 H.C
21	78	84	20	20	98.6	99.8	2 N	50 H.C
22	78	78	20	20	99	99.4		20 H.C
23	84	84	20	20	99	99.4	1 N	36 H.C
24	78	84	20	20	99	99.4	1 N	58 N
25	78	78	20	20	99.2	99.6	1 N	50 N
26	80	78	24	24	99.6	99.8	2 N	54 N
27	80	78	20	20	99.6	99.4	1 N	50 N
28	80	80	20	20	99.4	99.4	2 N	52 N
29	80	78	20	20	98.4	99.4	2 N	50 N
30	72	72	20	20	99	99.4	2 N	54 N
31	80	84	24	24	99.2	100.6	3 N	60 N
1885.								
Jan. 1	76	76	18	18	98.4	99.2	2 N	56 N
2	76	72	20	20	99.6	99.4	2 N	65 N
3	72	72	24	20	99.4	99.4	2 N	70 N
4	80	80	20	20	99.4	99.6	2 N	68 N
5	78	78	20	20	99	99.4	2 N	56 N
6	80	80	20	20	98.8	99.2	2 N	52 N
7	78	80	22	20	99.6	99.6	2 N	50 N
8	78	80	22	22	99.2	99.4	2 N	48 N
9	80	78	24	22	99.2	99.6	1 N	35 N
10	84	78	22	22	98.6	99.4	2 N	34 N
11	80	80	24	22	99.4	99.6	2 N	40 N
12	80	82	24	24	99.4	100	2 N	42 N
13	78	80	24	24	99	100	4 N	40 N
14	80	82	22	24	99	99.8	4 N	51 N
15	80	80	22	24	99.2	99.4		54 N
16	78	80	22	24	99	99	1 N	56 N
17	78	80	24	24	99	99.2	2 N	48 N
18	78	82	24	24	99.6	99.4	2 N	52 N
19	76	80	20	22	99.4	99.2	1 N	62 N
20	78	82	20	22	99	99.6		59 N
21	78	80	20	22	99.2	99.4	2 N	62 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 22	78	82	20	22	99.2	99.6	2 N	59 N
23	80	80	22	22	99.6	99.4	3 N	62 N
24	82	80	20	22	99.6	99.4	2 N	56 N
25	80	80	22	22	99	99.4		50 N
26	80	80	22	22	100	99.8	2 N	50 N
27	80	80	22	22	99.8	99.6	2 N	50 N
28	80	82	20	22	99.8	99.8	2 N	64 N
29	82	82	20	22	99.2	99.8	3 N	58 N
30	80	82	22	22	99	99.6	2 N	62 N
31	80	80	20	24	99.2	99.8	2 N	72 N
Feb. 1	82	82	19	19	99.4	99.8	7 W	60 N
2	82	82	19	19	99.8	99.4	3 W	60 N
3	82	82	19	19	99.8	99.4	10 W	60 N
4	82	80	18	19	99.6	99.6	4 W	62 N
5	80	82	18	18	99.6	99.4	2 N	58 N
6	82	82	18	18	98.4	99.2	3 N	60 N
7	82	80	19	19	98.4	99.2	3 N	60 N
8	82	82	19	19	99	99.4	3 N	60 N
9	82	82	19	19	99.2	99.4	2 N	60 N
10	82	82	19	19	99.8	99.6	2 N	60 N
11	82	82	19	19	99.8	99.6	3 N	60 N
12	82	80	19	19	99.8	99.4	3 N	60 N
13	82	80	19	19	99.6	99.6	3 N	60 N
14	82	82	19	19	99.8	99.4	3 N	62 N
15	82	80	20	19	CN Y		3 N	60 N
16	82	80	19	19	96.6	99.4	1 N	60 N
17	82	80	20	18	99.6	99.6	1 N	62 N
18	80	82	20	18	99.2	99.8	1 N	58 N
19	82	80	19	18	99.4	99.8	2 N	46 N
20	82	82	18	19	99.6	99.6	2 N	45 N
21	80	82	19	19	99.4	99.6	3 N	50 N
22	80	82	20	24	99.6	99.4	2 N	50 N
23	80	82	20	20	99.6	99.6	2 N	46 N
24	82	80	22	20	98.8	99.2	2 N	50 N
25	82	82	19	20	38.4	99.6	3 N	51 N
26	82	82	19	20	99.6	99.8	3 N	60 N
27	82	80	18	20	99.4	99.6	3 N	62 N
28	82	80	18	20	98.6	99.6	3 N	60 N

CASE NO. 50.

TEO AH MIN (MALE), age 35, *Gambier Coolie*. Taken ill at *Johore*. Duration of Disease, 1 month. Admitted 31st. October, 1884.

State on Admission.—Patient has general dropsy. Hands and feet numb; extensors paralysed; pain in the calves on pressure; not able to walk at all. Has suffered from intermittent fever in *Johore* for a year, where he has resided for seven years.

Progress of the Case.—*December 5th*. Patient's swelling has increased much since the 2nd. Has a troublesome cough at night. Had an attack of fever at 4 p.m. Has pain in his chest and legs. *9th*. Cough and fever better; complains of a hard tight feeling in the pit of the stomach. *11th*. There is more swelling of the face and abdomen. Numbness in his hands and legs about the same; bowels constipated; urine scanty. *15th*. The swelling is still present in his abdomen and legs, more so at night than during the day. *20th*. He complains of more pain at night, also complains of a pain in his back, over the lumbar region; has slight difficulty in breathing. *22nd*. Complains of flatulence. The swelling on the dorsum of the feet has disappeared. There is only slight oedema over the tibiæ and abdomen; no pain in his back. *23rd*. Complains of spasm, pain, and numbness in his legs, and numbness in his hands. He has headache; is feverish; appetite good; no thirst. *January 24th*. Patient has continued in much the same state up to the present. *27th*. Patient much better; has no pain anywhere, only feels weakness and numbness in his calves. Tongue clean; appetite good. *February 7th*. Doing well. Has lost the tight feeling in the abdomen. *26th*. Continues to improve; numbness disappeared entirely, except from the legs, where it is very slight. *28th*. He was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	92	86			97.6	99.4		
2	96	104			97.8	99		
3	112	104			98.2	98		
4	92	88			97.8	97.4		
5	84	88			97.4	98.4		
6	84	92			97.6	97.8		
7	76	100			97.2	97.8		
8	92	92			97.2	99.2		
9	80	96			97.2	98.2		
10	92	92			97.4	98.4		
11	84	96			86.4	98.4		
12	88	96			96.8	98		
13	84	96			97	98.2		
14	72	84			96.4	98		
15	76	88			97.2	97.8		
16	80	96			96.4	98.8		
17	84	88			97.2	98.2		
18	80	88			96.6	98.2		
19	80	92			97	98		
20	80	100			97.2	98.2		
21	84	100			97.4	98.6		
22	88	96			97.4	98.6		
23	84	96			97.6	98.6		
24	72	88			97.4	98		
25	80	88			98	99		
26	80	88			98	98.4		
27	76	84			98	98.6		
28	72	80			98.4	99		
29	72	92			98	99		
30	72	96			97.2	98.8		
Dec. 1	72	80	24	24	98	99	1	16
2	80	88	24	24	99	99.4	1	20
3	80	88	24	24	99.6	100.2		28
4	80	80	28	28	98.4	99.6	1 H	34 H.C
5	88	96	28	28	100.2	104.2		44 H.C
6	80	92	26	28	98.6	100.2	2 W	50 N
7	88	104	24	26	100.2	102.6	1 H	62 H.C
8	84	84	24	24	98.4	99	1 H	42 H.C
9	80	66	24	24	98.2	99.4	2 N	38 H.C
10	66	66	20	24	98.6	99.6	1 N	35 H.C

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of Stools in 24 hours.	Quantity of urine in 24 hours.
	M	E.	M	E	M	E		
1884.								
Dec. 11	64	66	19	18	98.2	99.4	1 N	46 H.C
12	66	72	18	23	98.4	99.6	2 N	50 H.C
13	60	72	16	23	97.2	99.2	1 N	38 H.C
14	58	64	18	19	97	99.2		57 N
15	54	68	17	20	98	99.4	2 N	50 N
16	56	66	19	22	98.4	98.4	1 N	48 N
17	56	66	18	21	98.2	98.4	2 N	50 N
18	56	66	18	22	98.4	98.4	1 N	50 N
19	56	68	17	20	99	99.6	2 N	50 N
20	82	86	17	19	98.6	99.2	1 N	42 N
21	68	76	15	17	99.2	99.4	1 N	42 N
22	68	74	15	17	99.2	99.4	1 N	48 N
23	98	98	19	19	100.6	100.6		50 N
24	80	86	18	19	100.2	100.2	1 N	42 N
25	78	88	17	19	100	100	1 N	54 P
26	78	82	17	19	98.8	98.8	1 N	38 P
27	78	82	17	19	99.8	99.8	1 N	56 P
28	74	80	17	19	99.8	99.8	1 N	52 P
29	72	80	18	19	99.2	99.2	1 N	56 P
30	64	78	15	17	97.4	98.6	2 N	38 N
31	68	96	15	19	98.4	98.4	2 N	38 N
1885.								
Jan. 1	66	74	15	17	98.6	98.8	2 N	50 P
2	68	74	15	17	98.4	98.8	2 N	50 P
3	76	78	15	17	98.6	98.8	2 N	50 P
4	76	84	15	17	98.4	98.8	2 N	50 P
5	78	84	15	17	99.6	98.8	2 N	48 N
6	72	74	15	17	98.4	98.6	2 N	48 N
7	66	76	15	17	98.6	98.8	2 N	48 N
8	80	66	17	17	99.2	99.8	2 N	46 N
9	60	76	17	17	98.4	98.8	2 N	42 N
10	72	76	17	17	99.4	99.8	1 N	46 N
11	68	72	17	17	98	98.4	1 N	48 N
12	66	74	17	17	98	98.4	1 N	42 H.C
13	60	86	17	17	98.6	98.8	1 N	48 N
14	66	76	17	17	99	99.4	1 N	42 N
15	60	72	15	17	98.8	99.4	1 N	38 H.C
16	68	80	15	17	99.6	99.8	1 N	40 N
17	68	78	15	17	99.2	99.8	1 N	56 N
18	72	78	15	17	99.6	99.8	1 N	56 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 19	66	72	15	17	98·8	99·4	1 N	50 N
20	66	72	15	17	98·8	99·4	1 N	50 N
21	66	72	15	17	98·8	98·4	1 N	50 N
22	68	72	15	17	99·2	99·6	1 N	64 N
23	80	84	17	17	98·4	99·6	1 N	56 N
24	88	88	17	17	99	99·4	1 N	56 N
25	72	78	17	17	98·6	99	1 N	64 N
26	72	78	17	17	99·2	99·2	1 N	64 N
27	84	84	17	17	99·4	99·4	1 N	68 N
28	72	80	17	17	99·8	99·8	1 N	68 N
29	80	84	17	17	99·6	99·8	1 N	58 N
30	72	80	17	17	99·2	99·6	1 N	62 N
31	76	80	17	17	99·4	99·6	1 N	65 N
Feb. 1	80	94	17	18	98·6	99·6	1 N	68 N
2	76	90	17	18	98·4	99·2	1 N	68 N
3	76	62	17	18	98·4	99·8	1 N	68 N
4	92	92	17	18	99·8	99·8	2 N	60 N
5	76	84	17	18	98·2	98·8	1 N	64 N
6	76	86	17	18	100·4	100·8	1 N	60 N
7	72	84	17	17	98·8	99·4	1 N	70 N
8	76	80	17	17	98·4	98·8	1 N	60 N
9	92	98	17	17	99·2	99·6	1 N	50 N
10	96	84	17	17	98·6	98·8	1 N	68 N
11	72	80	17	17	98·6	98·8	1 N	68 N
12	68	72	17	17	98·6	98·8	1 N	60 N
13	68	72	17	17	98·4	98·8	1 N	48 N
14	68	72	17	17	98·4	98·8	1 N	60 N
15	68	72	17	17	CNY		1 N	68 N
16	68	72	17	17	98·4	98·8	1 N	62 N
17	68	70	17	17	98·6	98·8	1 N	62 N
18	68	72	17	17	98·6	98·8	1 N	63 N
19	68	72	17	17	98·4	98·8	1 N	68 N
20	72	76	17	17	98·4	98·6	1 N	58 N
21	72	76	17	17	98·8	98·8	1 N	48 N
22	72	76	17	17	98·4	98·8	1 N	50 N
23	76	80	17	17	98·6	98·8	1 N	56 N
24	72	80	17	17	98·2	98·8	1 N	50 N
25	76	80	17	17	98·6	98·8	1 N	52 N
26	80	84	17	17	98·6	98·8	1 N	50 N
27	84	88	17	17	98·4	98·8	1 N	54 N
28	80	84	17	17	98·2	98·6	1 N	50 N

CASE NO. 51.

KHOO TENG HONG (MALE), age 31, Coolie—burial-ground.
Taken ill August, 1884. Duration of Disease, 2 months.
Admitted October 27th, 1884.

Notes on Admission.—Patient had general dropsy ; no dropsy now ; hands and feet numb ; extensors paralysed ; pain in the calves on pressure ; not able to walk ; has suffered from intermittent fever.

Progress of the Case.—*November 7th.* Patient has hiccough and depression of the epigastrium. There is tertiary syphilitic eruption on the nates and thighs. *December 5th.* Patient has pain in the legs, especially the knee-joints, and swelling over the dorsum of the feet ; the joints of the big toes feel hot and painful. *8th.* Has pain in his back over the lumbar region, and in his legs from the knee-joints to the tip of his toes, and in his hands from the wrist ; did not sleep well last night owing to the pains ; feels hot all over the body in the evenings (fever). *12th.* Complains of more pain and numbness in his hands and legs ; free from fever since yesterday. *15th.* Fever returns daily with pain in the knee-joint and in the back ; the knee-joint is swollen from effusion (rheumatic ?) *20th.* Much the same. *30th.* Patient has no pain in the back, only feels weak ; sleeps well ; appetite good. *January 5th.* Rheumatic condition of the knee-joint is continued ; it is swollen and painful. *29th.* Swelling much decreased. Patient continued in much the same state until *March 6th*, when he was discharged cured.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1884.								
Nov. 1	88	88			98	99.6		
2	84	116			98.2	99		
3	80	104			97.2	99		
4	84	102			97.6	98.4		
5	92	104			98	100.2		
6	104	100			99	100		
7	96	104			98.4	100.4		
8	104	104			98.2	99		
9	96	100			98	99.2		
10	100	92			98.2	99.4		
11	92	104			97.4	99.8		
12	96	104			97.6	98.4		
13	92	100			97.4	99.4		
14	84	100			97	98.4		
15	88	104			97.2	100.2		
16	80	104			97.2	100.6		
17	80	100			97.2	99.6		
18	72	84			96.4	98.8		
19	76	100			96.8	99.6		
20	76	100			97.7	100		
21	72	88			97.4	98.6		
22	92	96			98	99.2		
23	80	100			97.6	99.4		
24	84	108			97.8	99.4		
25	104	88			98.4	99		
26	84	96			98.4	99.6		
27	88	96			98.6	99.6		
28	88	92			97.8	99		
29	84	96			98.4	99.6		
30	80	92			97.4	99.6		
Dec. 1	76	88	24	24	98.2	99.2	4	12
2	88	84	24	24	98.6	98.2	4	38
3	92	96	24	24	98.6	100.4	3	28
4	88	96	20	24	99	101.4		34 N
5	96	108	24	24	99.2	101.4	2 N	30 N
6	96	108	24	24	98.6	101.6	2 H	30 N
7	104	108	24	24	99.2	100.2	2 H	34 N
8	96	112	24	24	98.4	100.4	2 H	38 H.C
9	92	92	24	18	98.4	98.6	2 H	34 N
10	86	101	17	24	98.4	99.2	2 H	38 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Dec. 11	86	98	18	22	98.6	99.4	2 H	44 N
12	94	99	18	22	99.4	100.2	3 H	38 N
13	92	98	20	21	98.6	100.8	1 H	50 N
14	100	104	18	24	99.2	100.8	1 N	38 N
15	104	116	19	24	99.4	102	5 B	48 N
16	104	104	18	23	99	100.2	1 N	54 N
17	94	99	18	22	98.6	99.8	4 N	50 N
18	102	99	18	21	98.6	99.8	3 N	42 N
19	82	104	15	22	98	100	2 N	38 N
20	94	108	17	23	98.4	99.2	2 N	34 N
21	96	106	19	22	98	99.2	1 N	38 N
22	92	104	18	20	98.2	99	1 N	38 N
23	98	100	19	21	98.4	99	2 N	40 H.C
24	88	96	17	19	98.4	99	3 N	48 N
25	116	122	19	24	98.8	99.8	4 W	50 H.C
26	114	120	18	22	99.2	99.8	3 W	38 N
27	100	108	18	19	98.4	99.2	3 N	50 N
28	96	98	18	19	98.6	99.2	2 N	48 N
29	96	108	17	19	98.2	99.4	1 N	38 P
30	100	116	19	22	98.4	99.4	2 N	38 P
31	100	116	19	22	98.2	99.4	2 N	38 N
Jan. 1	100	100	19	19	97.6	98.2	4 N	29 H.C
2	100	100	19	19	98.8	99.2	4 N	32 H.C
3	98	104	19	22	97.8	98.8	2 N	38 P
4	104	114	19	23	97.4	98.8	2 N	38 P
5	84	90	19	18	97.2	98.8	1 N	42 P
6	98	104	19	21	98.2	99.4	2 N	50 N
7	100	106	20	22	98.6	99.4	2 N	50 N
8	94	100	19	22	98	99.8	1 N	38 N
9	94	100	19	22	99.4	99.8	1 N	32 N
10	94	100	19	22	98.6	99.6	2 N	38 N
11	88	100	19	21	97.6	99.2	2 N	40 N
12	94	100	19	21	98.4	99.8	1 H	38 N
13	88	112	18	23	97.4	99.4	1 H	38 N
14	88	96	17	21	97.4	98.8	1 N	38 N
15	100	104	21	21	97.8	99.4	2 N	38 N
16	96	108	19	21	97.4	99.8	4 W	38 N
17	100	104	21	21	97.6	98.8	3 W	48 N
18	96	108	19	21	97.4	98.8	2 N	38 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 19	100	100	21	21	97.6	98.8	1 N	44 N
20	96	112	21	21	97.4	99.4	2 N	38 N
21	96	114	21	21	98.4	99.6	1 N	56 N
22	100	112	21	21	99.4	99.8	3 N	54 N
23	100	112	21	21	97.8	98.8	2 N	48 N
24	104	108	21	21	97.2	99.2	2 N	64 N
25	100	104	21	21	98.4	99.6	2 N	62 N
26	96	102	21	21	98	98.8	2 N	62 N
27	96	98	21	21	98.2	98.8	2 N	66 N
28	92	96	21	21	97.4	98.8	1 N	58 N
29	92	100	19	21	97.6	98.8	1 N	62 N
30	96	100	19	21	97.8	98.6	2 N	66 N
31	92	96	19	21	97.8	98.6	2 N	68 N
Feb. 1	92	120	19	21	97.8	99.6	2 N	58 N
2	92	106	19	21	98.2	99.4	2 N	64 N
3	104	108	19	20	98.4	99.2	2 N	62 N
4	92	98	19	20	98.4	99.4	1 N	68 N
5	96	100	19	20	98.6	99.2	1 N	72 N
6	88	92	19	20	88	99.6	2 N	70 N
7	96	100	19	20	98.4	99.2	2 N	64 N
8	88	96	19	19	98.4	99	2 N	58 N
9	92	98	19	20	98.6	99.4	2 N	48 N
10	104	108	20	21	99.2	99.6	2 N	50 N
11	104	108	20	21	98.6	99.4	2 N	60 N
12	96	98	19	19	98	98.6	2 N	48 N
13	94	98	19	19	98.4	98.8	2 N	54 N
14	94	98	19	19	98.8	99.4	2 N	50 N
15	94	98	19	18	CN V		2 N	50 N
16	90	96	19	19	98.6	99.2	2 N	56 N
17	84	96	17	17	98.2	98.6	2 N	54 N
18	88	88	17	18	98.8	99.2	2 N	48 N
19	88	92	17	19	98.6	99.2	2 N	34 N
20	92	92	18	19	98	98.4	3 N	60 N
21	96	96	19	19	98.2	98.6	3 N	54 N
22	90	98	18	19	98.4	98.6	2 N	56 N
23	90	98	18	19	98.4	98.8	2 N	60 N
24	92	96	18	19	99.4	98.8	1 N	56 N
25	88	92	17	19	99.4	98.8	3 N	48 N
26	84	88	17	17	99.4	98.8	3 N	52 N
27	80	86	17	17	98.4	98.6	2 N	56 N
28	84	88	17	17	98.4	98.8	1 N	50 N

CASE NO. 52.

CHUA AH CHOY (MALE), age 20, *Gambier Coolie*. Taken ill at *Johore*. Duration of Disease, 4 months Admitted October 24th, 1884.

Notes on Admission.—Has had general dropsy; no dropsy now; hands and feet numb; extensors paralysed; pain in the calves on pressure; able to walk a little, but gait unsteady; no albumen; has suffered from intermittent fever prior to the present illness.

Progress of the Case.—December 5th. Patient complains of weakness and numbness in his arms and legs; extensors paralysed; does not sleep well at night. 12th. Patient complains of more pain and numbness in his legs and hands; has slight œdema on the dorsum of his feet; fingers cannot be straightened. 22nd. He complains of pain and weakness in his fingers, which he cannot straighten; also of pain, spasm, and numbness in his arms and feet. Tongue furred; appetite good; sleeps well; no thirst; feels hot generally. January 14th. He states that the pain in his left leg and dorsum of the feet are about the same; tongue covered with a thin white fur; edges red. 21st. Patient states that he feels pain and numbness in his left leg, which is less so than in his right; still feels hot. February 4th. Patient much improved; has much less numbness in the legs. 20th. Feels now only pain in the dorsum of the feet when he walks. The numbness in the arms and legs is about the same. No further notes of the case taken, as he continued to improve until his discharge.

CHART OF CLINICAL OBSERVATIONS.

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1884.								
Nov. 1	124	112			101	101.2		
2	112	120			99.6	99.8		
3	104	104			98	98.8		
4	96	100			98	98.8		
5	96	116			98	98.4		
6	88	100			97.6	99.2		
7	104	100			97.6	98.6		
8	92	108			97.8	98.8		
9	93	108			97	99.4		
10	100	104			97.6	99.2		
11	92	124			98	99.8		
12	92	112			98	99.4		
13	88	106			98	99.6		
14	84	92			97.6	99.2		
15	84	100			97.6	100		
16	84	104			97.6	99.8		
17	84	104			97.6	99.8		
18	84	100			97.2	99.8		
19	84	116			97.8	99.4		
20	96	112			98.2	99.2		
21	96	128			98.4	98.6		
22	112	112			98.4	99.6		
23	96	112			98	98.4		
24	88	108			97.4	99		
25	88	104			97.8	99.2		
26	92	120			98	99.2		
27	100	108			98.2	99.2		
28	104	96			97.6	98.4		
29	104	116			97.8	99.2		
30	100	104			97.8	98.6		
Dec. 1	92	92	20	20	98.4	99	3	14
2	92	112	20	24	99	100.2	2	36
3	92	108	24	24	99	100.4	3	22
4	80	96	20	24	99	99.6	3 N	28 N
5	100	108	28	28	99.2	100.2	2 H	40 P
6	92	112	28	28	98.8	99.6	2 H	50 P
7	92	96	28	28	98.6	99.4	4 H	48 N
8	92	96	28	28	99	99.2	3 N	50 N
9	88	96	28	19	98.6	99	2 N	42 P
10	80	85	22	22	99.6	99.6	2 N	48 P

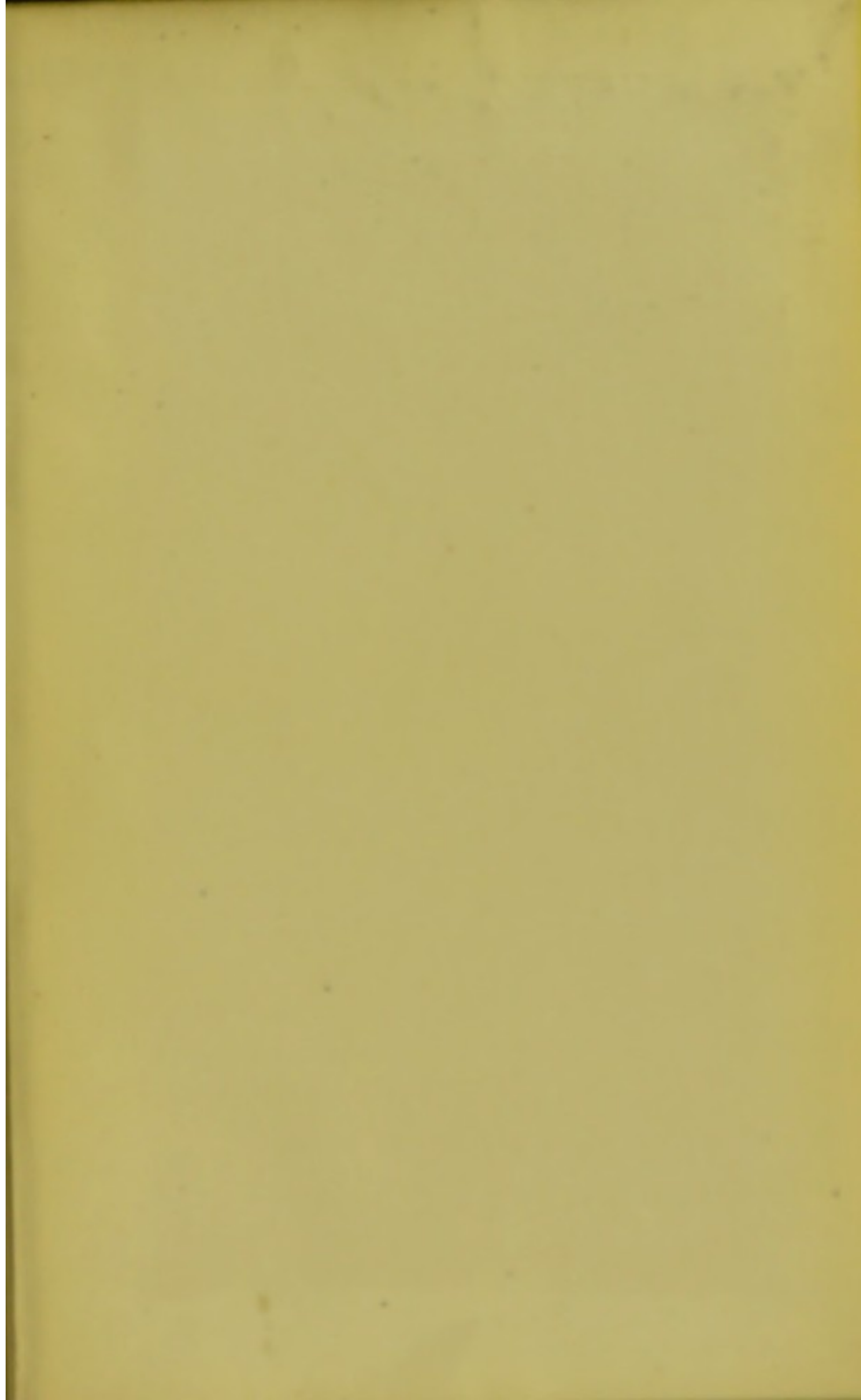
CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours.
	M	E	M	E	M	E		
1884.								
Dec. 11	86	88	21	22	98·6	99·2	3 N	50 P
12	89	98	22	22	98·6	99·2	3 N	50 P
13	96	98	24	24	99·2	99·6	3 N	42 P
14	96	99	24	24	98·8	99·4	2 N	50 P
15	89	98	21	23	98·8	99·4	3 N	50 P
16	92	96	22	24	98·8	99·4	3 N	52 P
17	94	98	22	24	98·8	99·4	4 N	50 P
18	89	94	20	22	98·6	99	2 N	48 D
19	144	134	20	23	98·2	99·6	2 N	34 N
20	92	68	19	22	98·8	98·8	2 N	48 N
21	92	98	17	20	98·6	99·2	3 N	50 N
22	84	86	17	17	98·6	98·8	4 N	50 N
23	84	86	17	17	98·6	98·8	3 N	54 N
24	108	112	19	23	99·6	98·8	3 N	50 N
25	108	120	19	22	98·6	98·8	2 N	50 N
26	108	116	19	22	99·2	99·8	1 N	48 N
27	112	116	19	22	99·4	99·8	2 N	50 N
28	96	98	18	19	98·8	99·2	3 N	50 P
29	96	96	18	19	98·6	99·2	4 N	50 N
30	106	108	19	19	98·6	99·4	3 N	42 N
31	88	108	17	19	98·8	99·8	1 N	34 N
1885.								
Jan. 1	88	92	17	18	98·4	99·2	2 N	50 N
2	92	92	18	18	99·2	99·2	4 N	38 N
3	94	88	18	18	98·8	99	3 N	50 P
4	88	98	18	19	99	99·8	4 N	38 P
5	88	94	19	19	99·2	99·6	4 N	42 P
6	96	98	19	19	96·2	99·6	4 N	48 N
7	96	99	19	21	99·2	99·8	3 N	48 N
8	100	104	19	21	99·4	99·8	4 N	40 N
9	94	98	19	19	99·2	99·6	4 N	50 N
10	96	98	19	19	99·4	99·8	2 N	38 N
11	80	98	19	19	98·8	99·8	3 N	40 N
12	96	104	19	21	99·2	99·8	3 N	50 N
13	92	106	19	21	99·2	99·8	2 N	46 N
14	84	96	17	21	98·8	99·4	1 N	50 N
15	96	98	19	19	99	99·6	3 N	42 N
16	62	108	19	21	98·6	99·8	3 N	38 N
17	88	88	17	17	99·2	99·2	2 N	38 N
18	82	104	17	19	99·6	99·8	3 N	38 N

CHART OF CLINICAL OBSERVATIONS—(continued).

Dates.	Pulse.		Respiration.		Temperature.		No. of stools in 24 hours.	Quantity of urine in 24 hours
	M.	E.	M.	E.	M.	E.		
1885.								
Jan. 19	80	116	17	17	98.6	98.8	2 N	52 N
20	92	96	17	19	98.2	98.6	3 N	40 N
21	88	94	17	19	99	99.6	3 N	46 N
22	88	92	17	19	99	99.6	3 N	56 N
23	88	108	17	19	99	99.8	3 N	48 N
24	92	98	19	19	99.2	99.6	2 N	50 N
25	92	96	19	19	99.2	99.6	3 N	62 N
26	88	96	17	19	98.8	99.6	2 N	60 N
27	80	88	17	17	98.8	99.2	2 N	64 N
28	84	88	17	17	98.6	98.8	2 N	58 N
29	84	88	17	17	98.8	99.2	3 N	56 N
30	84	88	17	17	98.4	98.8	2 N	62 N
31	96	96	19	19	98.8	98.8	2 N	68 N
Feb 1	96	96	19	19	98.6	98.8	3 N	66 N
2	88	92	17	18	98.4	98.8	1 N	62 N
3	92	99	18	19	99	96.6	3 N	62 N
4	92	98	19	19	98.8	94.4	2 N	60 N
5	88	92	17	17	98.6	99	2 N	62 N
6	84	90	17	18	98.6	92.2	1 N	58 N
7	88	94	17	19	98.6	94.4	2 N	64 N
8	88	92	17	19	98.4	98.8	1 N	68 N
9	96	102	19	19	98.2	98.8	2 N	52 N
10	98	104	19	19	98.4	96.6	2 N	48 N
11	88	92	17	18	99	96.6	2 N	56 N
12	84	90	17	18	98.8	94.4	2 N	60 N
13	88	92	17	18	99.4	98.8	2 N	44 N
14	92	96	18	19	99.2	96.6	2 N	48 N
15	92	96	18	19	CN V		2 N	50 N
16	88	84	17	19	98.6	99.4	1 N	52 N
17	90	96	18	18	98.8	99.2	2 N	46 N
18	96	98	17	19	98.6	99.4	2 N	66 N
19	84	88	17	17	96.4	98.8	2 N	60 N
20	84	88	17	17	99	99.4	2 N	58 N
21	84	88	17	17	98.6	98.8	2 N	46 N
22	84	88	17	17	98.4	98.8	2 N	54 N
23	84	88	17	17	98.4	98.8	2 N	60 N
24	80	84	17	17	98.2	98.6	2 N	56 N
25	84	88	17	17	98.4	98.8	2 N	50 N
26	88	90	17	18	98.6	98.8	2 N	48 N
27	84	88	17	17	98.4	98.8	2 N	54 N
28	80	88	18	17	98	98.4	2 N	56 N

Printed at the Operative Jewish Converts' Institution, Palestine Place,
Cambridge Heath, London.







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