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BY

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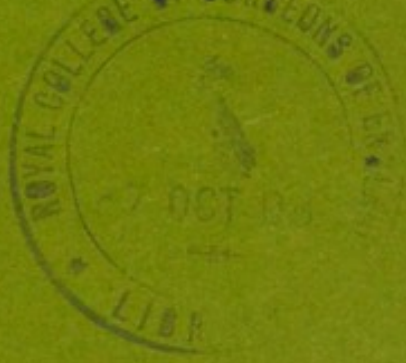


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# On the Present Methods of Combating the Plague.

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## I.

I shall begin my review by briefly enumerating the measures suggested for stamping out the plague or preventing its importation. These measures deal either with man, with inanimate objects, or with the lower animals. The first category of measures comprises:—

(1) Discovery and notification of persons attacked with the disease.

(2) Isolation of the attacked.

(3) Certain precautions with regard to the disposal of the dead.

(4) Segregation of those who have come in contact with the sick or dead.

(5) Institution of cordons round infected areas.

(6) A less drastic and less thorough plan than the last mentioned, viz., placing in quarantine arrivals from infected places, detaining the sick and suspected, and letting the rest free after a time of observation; or

(7) A still less rigorous measure, which is merely to examine travellers, isolate the sick and suspected, and let the others free under a system of surveillance.

The following may, I think, be said in regard to this group of measures:—

The part played by man in the causation of plague seems, on the whole, subordinate to that of other agents. Thus, when the plague first broke out in Bombay, in the summer of 1896, it remained for a considerable time confined to a quarter called Mandvi. The mass of people there are day labourers, working outside their quarter. Though they spent the day in close communion with many other people, cases continued

to occur among the Mandvi labourers alone and in their families, and only subsequently and gradually appeared in other quarters. Since that year Bombay has had eleven consecutive outbreaks. Every year the epidemic lasts for some months and becomes relatively quiescent for the rest of the time, but the recrudescence begins approximately in the same locality and the same events are more or less uniformly repeated.

Subsequent to the appearance of plague in Bombay a township called Kirkee, near Poona, became infected, and the disease broke out among the native followers of the Royal Artillery. The men and their families lived on a spot somewhat away from the rest of the people, but spent the day at work in the batteries. Throughout the epidemic the batteries remained free from disease, while the followers suffered heavily; and they suffered practically in the same proportion as their womenfolk and children, who did not leave their homes. Similar facts were observed on the Colaba peninsula in Bombay, among men who, in the daytime, were at work in the Army and Navy Co-operative Stores and at the Gun Carriage Factory, and spent the night with their families. The other people in the Army and Navy Stores and at the Carriage Factory remained free, but the Colaba men suffered equally with their families.

Further, on many occasions it has been observed that plague first started in a town by attacking persons who had not been away and among whom no history of contact with people from an infected place could be discovered; and, vice versa, in every country invaded by the disease, there are districts, towns, or villages in which, though the people are in constant communication with infected places, and cases of plague are constantly imported into them, the disease gets no footing and the locality remains exempt from invasion.

The proposition illustrated by these facts, viz., that man does not play a predominant part in the conveyance of plague, is supported also by other observations. In 1897 a plague hospital was established in the vast premises of the old Government House at Parel, in Bombay, and a number of patients soon gathered there. In order to minimise the objections to hospital treatment families were allowed, if they so wished, to accompany their patients, stay at the hospital, and attend on them. The officers in charge soon noticed that when a family took advantage of this permission to dwell in the midst of numerous plague patients, its members were safe from disease; but when they remained in their own home, although the only case of plague had been removed, other cases often followed. In the same way, very rarely has it been seen that any

of the permanent attendants in plague hospitals have taken the disease. Pneumonic cases alone have proved dangerous in this respect.

The observations above quoted warrant, I believe, the following propositions, now more or less generally recognised, viz., that (1) plague is what has been termed, in a general sense, a disease of locality; (2) that it is contracted principally at night; and (3) that the part which man plays as direct agent in its propagation is a more or less subordinate one. This being so, the measures taken with regard to man, even when carried to perfection, can influence the propagation of plague only to the same proportionately limited extent. In the vast majority of cases events have conformed with this conclusion, in that precautions taken against the importation or the spread of plague by man have failed to secure the desired end. It must, however, be stated that these precautions can rarely, if ever, be carried to perfection. Their application is fraught with great difficulties, and is often impracticable. This is due to the impossibility of enlisting the self-sacrificing co-operation of individuals, to the first cases being rarely recognised, to the reluctance of those falling ill to deliver themselves into the hands of strangers and officials, to the measures of prevention hurting trade and numerous private interests, and to the consequent wholesale evasion of prescribed rules. The time, therefore, arrives when the measures directed against man are relaxed or dropped, and efforts are chiefly applied to inanimate objects.

II.

This part of the programme seems lighter of accomplishment. The list of measures, within an area infected, comprises, in this case, destruction or disinfection of houses, furniture, clothing, bedding, carriages, goods, warehouses, grain and other stores, garbage, drains and streets. Outside the infected area the measures consist in the refusal to admit carts, trains and ships with goods from infected places; or in the refusal to admit only certain goods; or in mere inspection of trains, carts and ships, and some procedure by which these, and the goods they convey, as well as the belongings of travellers, are sought to be rendered harmless. All these measures are intended for the avoidance or destruction of plague germs which may possibly exist in the objects concerned.

Plague bacilli have, however, been very carefully looked for, but so far have not been discovered in the earth, on the walls or floors of houses, or on any inanimate object, unless they were quite obviously and recently soiled by the products of a plague patient. I am not, moreover, aware of a single instance in which the extension of this disease

by means of goods of an inanimate nature has been conclusively demonstrated, though linen, clothing, handkerchiefs, and other personal belongings of a sufferer from pneumonic plague, if soiled with his sputum or nasal discharge, must be dangerous for a certain, possibly long, period of time. Further, the microbe of plague is not a resistent organism. From the first it was seen that under ordinary circumstances it was easily killed by disinfectants, and that exceptional conditions are required for that microbe to resist and preserve its vitality. Under these circumstances the following conclusion might seem justifiable: If inanimate objects are important carriers of plague, disinfection should generally be an effective check to its spread, and on this presumption the above measures were devised.

According to numerous observations, however, made by health authorities, a house, its furniture, all the belongings of the inmates, and the inmates themselves may be washed and disinfected repeatedly, and yet cases of plague may occur subsequent to each disinfection, if people are allowed to stay in that house. Though general statements to this effect have been made by earnest observers, I am not aware of a precise demonstration of a case in which disinfection arrested the development of an epidemic of plague.

The above theoretical considerations must be supplemented by the following remarks of a practical nature: The expense and the difficulties of destroying or thoroughly disinfecting houses, goods, and other property over a vast area are very great, and the agency for properly carrying out such measures is not available or is not forthcoming.

The enormous bulk of merchandise conveyed nowadays by rail and ship admits of no process which would answer to elementary requirements of disinfection; and the opposition and hostility of vast numbers of people, whose interests are interfered with by these measures, can only be estimated when the task is actually undertaken.

## III.

I come to the measures relating to the lower animals. These are:—

(1) Destruction or keeping away of rats by poisoning, trapping, tar and sulphuric acid mixture, or through the agency of the domestic cat.

(2) Improvements in towns and villages, with a view of reducing or keeping out the rat population, viz., structural alterations of dwellings, warehouses and grain stores, demolition of insanitary buildings, introduction or improvement of conservancy arrangements, prompt disposal of garbage, periodical inspection of stores, paving and draining of streets, and certain other measures.

(3) Destruction and dispersion of fleas by petroleum or other insecticides.

(4) Fumigation of houses as a temporary protection against rats and fleas.

(5) Obligation on ships from infected regions to anchor away from the shore; or,

(6) Provision of mechanical arrangements for preventing the landing of rats along mooring cables and gangways; and

(7) Fumigation of ships arriving with plague patients or plague rats on board.

The measures have, therefore, for their object, and, I believe, rightly so, the rat and the flea, described by Rothschild under the name of *Pulex cheopis;* but epizootics of plague break out also among squirrels, tarbagans, guinea-pigs, monkeys, mice, kangaroos in Australia, and some other animals, which contribute to keeping the disease alive.

Measures for the destruction of rats were applied in India at the beginning of the epidemic, viz., in 1896, by Professor W. J. Simpson, then Health Officer of Calcutta, and have been carried on also in the subsequent outbreaks in many places. A new impulse has been given to them by the labours of the recent Plague Commission in Bombay. But nowhere, possibly, has the effect of these measures been more carefully gone into than in Sydney, under the direction of Dr. Ashburton Thompson. The campaign against rats and fleas is the most rational and the best founded of all the procedures suggested for stamping out the plague, for outside the human body in animals alone have plague microbes been actually seen so far in nature. It is, however, essential to estimate the extent to which this is a promising direction. Various factors, such as increase of the human population, destruction or planting of forests, occupation of waste lands, building of canals, introduction of new animals and plants, and a variety of other circumstances bring about, in the course of time, important changes in the flora and fauna around us. I might quote, as relatively modern instances, the disappearance of wolves from Great Britain, or the practical extinction of the bison, or of the black rat, from these islands and the continent of Europe, and a few others. These changes have taken place gradually, and in such long periods of time, that the exact causes which have brought them about are unknown.

Up to quite recently it would have been impossible to name a single instance of a result of this kind having been effected in a short time by steps of an administrative character, or even by the resolve of a whole population. From time immemorial man has had to put up with the

presence in his proximity of animals and plants interfering with, and devastating, his crops—locusts, field mice, spermophiles, campagnols, phylloxera, mildew, rabbits in Australia, and so on. The power of adaptation and reproduction with which nature has endowed many of these animals and plants generally triumphs over the deliberate efforts of man when the surrounding circumstances are favourable to their multiplication. Still the problem is not wholly impossible.

The recent successful instances, to which I have alluded, are the campaigns against mosquitoes in Ismailia, in Klang and Port Swettenham, in the Panama Canal zone, and in a certain number of other places at which it has been found possible to alter, in a short time, the surrounding conditions so as to render the propagation of these insects impossible. These examples are a grand and splendid lesson to the world, but a lesson which, it must be acknowledged, is, in many cases, difficult, and in others, impossible of imitation.

The observations made by the Chief Medical Officer of New South Wales are of interest in this connection. I have in view his carefully organised campaign against rats in Sydney, with the object of protecting from plague a white population of a high standard of intelligence and education. During that campaign Dr. Ashburton Thompson found that the gross returns of rats and mice caught and destroyed, week by week, were nearly uniform, and that there was thus no evidence that the slaughter produced such an impression on the general horde as would have rendered collection progressively more difficult. The opinion he came to was that extermination of rats in any large area by poisoning and trapping was practically impossible, and that the plan of spreading among them an artificial epizootic by means of Dr. Danysz's rat virus failed on account of that virus rapidly losing its virulence. Regarding this latter point, one cannot forget that India has now had, in the plague bacillus, eleven years' experience of a most devastating virus for these animals, and as yet there is no sign that this involuntary experiment has rid the country of their presence.

The observations coming from Japan, where determined efforts have been made to destroy rats, are as little encouraging. The facts published in June of last year were to the effect that in Tokyo alone 4,800,000 of these animals had been killed, but the slaughter seemed only to have prepared more favourable conditions for the multiplication of the survivors.

Dr. Ashburton Thompson's experience, in regard to facilities given by householders in Sydney for the detection of plague rats, was identical

with that gained in India. He found that the people were reluctant to admit to their premises rat-catchers and other strangers bent on that task, and that the information supplied by the inhabitants, as well as that gathered by the professional men specially appointed for the purpose, was so scant as to be barely sufficient to indicate the presence of infection in a locality, but not to gauge its severity. Though, therefore, the measures against rats, either by extermination or by change in the construction of cities and villages, are a most important item in an anti-plague campaign, the question whether any noticeable impression can be made on the epidemic by these measures within the length of a generation, or even in a longer period, is a matter of great uncertainty. Even the destruction of rats on ships alone, if imposed as a general measure, would cause a dislocation of traffic and an outcry formidable to face. The result is that every day plague is imported, though fortunately it does not spread, into one part or other of the maritime countries of the world.

IV.

The above analysis of the facts connected with the problem of stamping out the plague leaves little room for surprise when it is seen that, although in many places reached by the plague, the latter, as I have just mentioned, does not take root and dies out, in others, where it finds a congenial field for its propagation, the attempts at eradicating it prove unavailing. Thus often ends in disappointment what may be termed the *first stage* of the struggle against that disease, namely the efforts of stamping or keeping it out. This result becomes apparent to the population, who are the sufferers, long before the medical or sanitary authority makes up its mind to acknowledge defeat; and when they first become aware of it the people fly in a stampede in all directions. For, although bare figures of the plague death-rate impress different people differently, there can be no doubt as to a plague actuality being a terrifying event. It takes time to get used and, so to say, reconciled to it. European countries must still have some recollection of their own experience of the matter. The people therefore flee and seek shelter in other towns. But their means of livelihood are left behind in the old place: nowhere is employment and sustenance ready for new and sudden arrivals. After a period of suffering and hardships the fugitives return in search of work to the old place, and resign themselves to the inevitable.

I have referred, however, to the fact that when plague first occurs in a given quarter of a city it remains confined to that quarter for

a certain time. There is thus no necessity for going far afield. In the Himalayas and the plains of India the villagers, whenever possible, go out a mile or two from their houses and live under trees or in open fields. Often, however, the disease breaks out in the mountains in severe winter, and in the plains during the season of rains. To remain then in the open or in rapidly put-up shelters, with a scanty provision of clothing and bedding, with the difficulties in preparing food, protecting property, caring for and sheltering the small children and the aged, becomes an untold hardship. In towns, on the other hand, unoccupied land is scarce. The people, in fair weather, go into such open spaces and public squares as are available. A water supply, conservancy arrangements, police administration, fire prevention, patrolling of abandoned houses and property, depôts for boxes and bundles, and a number of other arrangements become necessary. With this, the deprivation of ordinary comforts of a settled home is felt so keenly that only families in whose midst cases of plague have already occurred avail themselves of these facilities. The others remain at their homes and furnish material for the continuance of the epidemic. The plan of abandoning the affected locality, for shorter or longer periods, may perhaps be termed a *second stage* in a campaign against the plague.

To whatever extent that plan is feasible, to that extent the effect of it is beneficial. It is the limited range of it and the innumerable complications which it brings in its train that finally lead the administration and the people to resort to what always seemed to me the *ultimate method* of combating the bubonic plague in the areas in which it becomes endemic, viz., that of conferring on the population immunity from the disease by means of an artificial treatment.

## V.

I imagine that in this Section of the Royal Society of Medicine it would be out of place to enter into the bacteriological aspect of the anti-plague inoculation, to examine the various views from which the subject might be approached and solved, and the advantages and difficulties of each. For the purposes of the present deliberations it may, perhaps, be sufficient to enumerate the salient points of the matter, as ascertained in India in the last ten years. These are:—

(1) That in a native of that country, who is more susceptible to the disease than Africans, Europeans and some other races, the inoculation now in force in India reduces the liability to attack to less than one-third of what it is in a non-inoculated Indian.

(2) That in the one-third of cases which still occur, the recovery rate is at least double that in the non-inoculated attacked, the ultimate result being a reduction of the plague mortality by some 85 per cent. of what it is in non-inoculated Indians.

(3) That in an inoculated European an attack of plague, if it subsequently occurs, has so far always ended in recovery.

(4) That the inoculation is applicable to persons already infected and incubating the plague, and prevents the appearance of symptoms, or else mitigates the attack, a fact which disclosed a basis for the bacteriotherapeutic treatment of disease.

(5) That in natives of India the degree of immunity conferred by this inoculation, though gradually vanishing, seems to last during several outbreaks of plague; and that

(6) In Europeans the effect has not yet been seen to disappear in the space of time, since 1897, that this inoculation has been under study.

I now proceed to matters which concern the epidemiological aspect of the question, viz., the place which experience has indicated should be assigned to this plan of defence in plague-stricken provinces.

His Majesty's letter on the plague, addressed to the Governor-General of India on August 13 last, and Lord Minto's communication to the heads of local governments and administrations, have brought about a renewal of efforts to bring down the plague mortality. Lord Minto's letter points out that many expensive and harassing operations carried on in the past may be safely abandoned, and expresses the hope that, with the assistance of the people themselves, some distinct advance will now be made towards bringing the ravages of the pestilence under control. Consequently, in most places fresh campaigns have been undertaken and organised in the light of the teaching gained during the past decade.

The Province which has had most of this unhappy experience is the Bombay Presidency, where the disease appeared first, viz., in 1896. The result of this experience may, I think, be gauged from the following official utterances: On October 7 last, the Hon. Mr. Muir Mackenzie, then Acting Governor of that Presidency, in a speech addressed to the Municipal Corporation of Satara, summarised the mutual position of the two principal measures on which the Bombay Government have learned to rely in the struggle against the plague. "Evacuation," he said, "is no doubt effective *quantum valeat*. But think of its drawbacks. I doubt if it would have been possible at all during the torrential rains of July and early August. If managed, think

of the miserable discomfort, the risk of chills and fever; and, at its best, what a dislocation of business, what a disturbance of home, what expense, what discomfort, is entailed by evacuation. Evacuation will not cure the stoppage of business, the closing of schools of which you complain. But if inoculation were general none of you need stir—your business would continue, your schools would be full, everything would be as before. I can fancy that in the old days small-pox may have entailed the same miseries as plague does now—fleeing the town, the runaways carrying infection; deserting the home only to catch the disease on daring to re-enter it. Now people, being vaccinated, are hardly disturbed when small-pox breaks out. Let it be the same with plague. Be inoculated at the first sign, and so obviate disturbance of the domestic and educational and business avocations of yourselves and your children."

Sir George Sydenham Clarke took over office as Governor of Bombay a few weeks ago, and on November 12 addressed to the vernacular newspapers a letter of which some telegraphic information has reached this country. He emphasised the heavy responsibility which rested upon the papers of using their influence with the natives to prevent the spread of the scourge. He acknowledged that if the people were unwilling to destroy the rats which were the vehicles of the disease, their feelings must be respected, and he therefore urged that recourse should be had to universal inoculation, which, he stated, was the easiest and most certain method of prevention.

The experience gained in the Punjab (the other great Province of India ravaged by the plague) has been stated in a memorandum which the local government addressed to the Government of India on June 30, 1902, after five years of the application of various anti-plague measures. According to this statement *segregation of patients and "contacts,"* under the conditions which are essential to the success of that measure, is entirely out of the question, and intercourse between infected and uninfected places is in most cases quite unrestricted; *evacuation* is not a procedure which can be of assistance in checking the extension of plague from one locality to another; *disinfection* cannot be relied upon as a practical measure for the arrest of the epidemic; and there remains only *inoculation* with the plague prophylactic, and its benefits, the government declares, are so generally understood in the Punjab that a large proportion of the population of the infected districts can, without much difficulty, be induced to submit to the operation.

The part of India now exposed more dangerously than all the others is the United Provinces of Agra and Oudh. These provinces have at

present, as head of the administration, the able civilian who, in 1898-1900, accompanied and took part in the investigations of the Indian Plague Commission, and had an opportunity of making himself closely acquainted with the working and the results of the various plans tested for combating the plague. In publishing, in the beginning of September last, His Majesty's and the Governor-General's letters on the plague, Sir John Hewett, the Lieutenant-Governor, issued a detailed plan, approved by the Government of India, of organising a special service to carry on inoculation when plague reappeared. The poor, who cannot afford to lose their earnings during the day or two of rest desirable after inoculation, are to be given assistance up to a sum of one rupee per person. Government servants are to have inoculation leave for the necessary period. Railway companies, and other employers of labour, are requested to give similar facilities to their employés.

The resolution issued by the Government on the subject ends by saying that the Lieutenant-Governor "*earnestly appeals to everyone interested in preventing the manhood of the country from being sapped and its vitality destroyed by the scourge of plague, and particularly to the leaders of native society and non-official Europeans who employ labour on a considerable scale, to aid in the endeavour to induce the people to protect themselves by inoculation.*" Subsequent to this resolution the Government of the United Provinces issued orders offering also facilities for those who wish to vacate their houses, and giving detailed and well thought-out directions for the destruction of rats.

Mr. President and Gentlemen, I have endeavoured to place before you the present position of the various measures suggested and tried so far in combating the plague as an epidemic. I have not entered upon the subject of curative treatment of plague, because this would perhaps be outside the scope of this Section, and because the result of that treatment leaves much, if not everything, to be desired.