

however, was working with a mixture of rat-fleas which probably included all the three species common in India.

Taylor and Chitre (1923) working in Bombay obtained equally successful results both with *X. astia* and *X. cheopis* during the colder months of January and February, while they failed to do the same with *X. astia* in the comparatively hotter month of March. Hirst (1926) working with *X. astia* failed to obtain successful transmission of plague in rodents in his experiments at room temperature, but was able to do so in one case at a reduced temperature in a saturated atmosphere.

As far as Nalgonda is concerned it is always in free communication with the neighbouring infected places and epidemic centres and has also a dense population of highly susceptible rodents. In spite of these facts, its freedom from plague can only be attributed to its flea-population which consists entirely of *X. astia*. This alone again would not have prevented its having at least occasional mild epidemics of short duration had it not been for its hot and dry climatic conditions which make fleas of this species quite inefficient as vectors of plague.

#### Summary

A plague-infected place (Hyderabad) and a plague-free place (Nalgonda) quite close to and in free communication with one another have been compared with regard to their rat population and flea infestation.

*Rattus rattus* has been found to be the prevailing species of rat in both these places.

While more than 94 per cent of fleas found in Hyderabad belong to the species *X. cheopis*, the entire rat-flea population of Nalgonda consists of the species *X. astia*.

The climate of Nalgonda is generally hot and dry.

The rats of Nalgonda have been found to be highly susceptible to plague infection.

Rats from Hyderabad, though more resistant to plague infection than Nalgonda rats, have not attained the same amount of resistance as the *Rattus rattus* of other plague infected places, such as Bombay.

It is suggested that the climatic conditions in Nalgonda make *X. astia*, an already inefficient vector of plague, doubly so and hence the freedom of Nalgonda from plague, in spite of its close proximity to plague infected centres.

My thanks are due to Col. Norman Walker, C.I.E., I.M.S. (retd.), late Director of Medical and Public Health Department, H. E. H. the Nizam's Dominions, and to Dr. C. F. Chenoy, the special plague officer at that time, for giving me all facilities for making the rat-flea survey of Nalgonda. Dr H. Hyder Ali Khan and Dr. M. Farooq, the present director and the deputy director, respectively, of the Hyderabad Medical and Public Health Department, were kind enough to give all departmental help for the

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## VAN EXPERIMENT IN COOLIE LINE SANITATION

EFFECT ON HOOKWORM INCIDENCE

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### Introduction

THE principal causes of invaliding among tea estate coolies in Assam are malaria, pulmonary diseases including influenza, injuries, water sores (ground itch) and anæmia. In the fourth of these causes, invasion by hookworm larvæ is almost certainly the pathogenic factor and massive hookworm infections are probably associated with other factors in the production of anæmia. Fortunately for the sanitarian, both malaria and hookworm disease are caused by parasites which can, even if with difficulty, be prevented from coming into contact with their human hosts. In the case of hookworm disease, this prevention will be most complete if matters are so arranged that egg-containing faeces are removed from the possibility of contact with human feet. This removal must, usually, be by mechanical means. By a fortunate chance, a very usual method of spread of the bowel diseases is through the

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collection and transmission of rats from Nalgonda and Hyderabad.

Dr. R. B. Lal, the Officiating Director, the All-India Institute of Hygiene and Public Health, Calcutta, was kind enough to make arrangements with the authorities of the Haffkine Institute, Bombay, for allowing me to carry out the animal inoculation tests there and also giving me advice and help during the work. Finally, my thanks are due to Lieut.-Col. S. S. Sokhey, I.M.S., Director of the Haffkine Institute, Bombay, who kindly gave me all facilities and advice for my experimental work at the Institute.

### REFERENCES

- \* Advisory Committee on Plague in India (1911). *Journ. Hyg.*, Vol. XI, Plague Supplement, p. 157.
- Goyle, A. N. (1928). *Indian Journ. Med. Res.*, Vol. XV, p. 837.
- \* Hirst, L. F. (1926). *Ceylon Journ. Sci., Sec. D.*, Vol. I, p. 155.
- Philip, W. M., and Hirst, L. F. (1917). *Journ. Hyg.*, Vol. XV, p. 527.
- Sokhey, S. S. (1936). *Rep. Haffkine Inst., Bombay, 1932-35*, p. 60. Supdt., Govt. Printing and Stationery, Bombay.
- Sokhey, S. S., and Maurice, H. (1935). *Bull. Office Internat. Hyg. Pub.*, Vol. XXVII, p. 1534.
- Taylor, J., and Chitre, G. D. (1923). *Indian Journ. Med. Res.*, Vol. XI, p. 621.
- Walker, J. N., Chenoy, C. F., and Rao, S. R. (1931). *Ibid.*, Vol. XIX, p. 657.

agency of flies which have settled on infected faeces. Thus, any method of disposal of faeces which removes infective matter out of harm's way will be an effective means of controlling bowel diseases also.

In February 1938, an isolated coolie line of average size was completely equipped with bore-hole latrines at the rate of one latrine per family. The preliminary investigations and the constructional work were described in a previous paper (Hare, 1938) and a later report (Hare, 1939) recounted the experience gained during the rains of 1938 and the effect that sanitation had had on the general health of the population. The present report is a review of twelve months' working of the experiment which, from the point of view of the management, has proved so successful that several hundreds of these latrines are now in existence on this and neighbouring estates.

#### Hookworm incidence

The incidence of hookworm infection in a control line which has no sanitation was found to be as in tables I and II, taken from the second paper on this experiment (*loc. cit.*). The incidence in the Balimara line previous to the installation was not known but was judged to be approximately equal to that shown in table IV, also taken from the second communication. Reasons for this statement are given in that paper. Using the same technique as before, stool surveys were again carried out on the control line and the Balimara line in March 1939 and the results are recorded in tables III and V.

TABLE I

*Stool survey of 112 persons, being the total population of the control line, carried out in March 1938*

Infection	Number infected	Percentage incidence
All helminths .. ..	103	91.9
Hookworm .. ..	97	86.6
Ascaris .. ..	54	48.2
Trichuris .. ..	61	54.4

TABLE II

*Stool survey of 113 persons, being the total population of the control line, carried out in November 1938*

Infection	Number infected	Percentage incidence
All helminths .. ..	107	94.7
Hookworm .. ..	94	83.2
Ascaris .. ..	77	68.1
Trichuris .. ..	59	52.2

TABLE III

*Stool survey of 111 persons, being the total population of the control line, carried out in March 1939*

Infection	Number infected	Percentage incidence
All helminths .. ..	104	96.0
Hookworm .. ..	94	84.7
Ascaris .. ..	62	55.9
Trichuris .. ..	56	50.0

TABLE IV

*Stool survey of 126 persons, being the total population of the Balimara line, carried out in November 1938*

Infection	Number infected	Percentage incidence
All helminths .. ..	121	96.0
Hookworm .. ..	103	81.7
Ascaris .. ..	95	75.4
Trichuris .. ..	88	69.8

TABLE V

*Stool survey of 120 persons, being the total available population of the Balimara line, carried out in March 1939*

Infection	Number infected	Percentage incidence
All helminths .. ..	110	91.7
Hookworm .. ..	88	73.3
Ascaris .. ..	85	70.8
Trichuris .. ..	73	60.8

*Note.*—The actual population of the line at the time of the survey was 130 but stools could not be obtained from ten of them owing to advanced pregnancy, recent delivery or absence from the estate, either visiting friends or recruiting new labour.

The expected absolute cure-rate of hookworm infection from a single dose of tetrachlorethylene was found by Hare and Dutta (1939) to be 48.3 per cent. If, therefore, no reinfection had occurred in the meanwhile, the expected hookworm incidence in the control line in March 1939 should have been 51.7 per cent of 83.2 per cent, that is 43.0 per cent, instead of which, it was 84.7 per cent, almost double the expected figure. Reinfection was, therefore, taking place continuously in the control line, in spite of the adverse conditions represented by the dry cold winter. In the Balimara line the expected hookworm incidence in March 1939 can be calculated as 51.7 per cent of 81.7 per cent, that is 42.2 per cent. In fact, it was 73.3 per cent, an increase of about two-thirds. Reinfection is, therefore, still taking place, but not at such a rapid rate

as in the control line. Moreover, in the course of carrying out the survey, one was struck by the fact that, judging by the number of ova seen, the infections in the Balimara line population were much lighter than those in the people living in the control line.

My impression is that, over a period of years, the provision of latrines will reduce the incidence of hookworm infection to an innocuous level, but that such a result cannot be hoped for quickly. Since the reinfection that does occur almost certainly occurs in the fields and from the earthen floors and surroundings of the houses, and not from the latrines themselves, it is reasonable to expect that these infective larvæ will gradually die out. Moreover, the same circumstances would obtain whatever type of latrine was installed so that the bore-hole type does not suffer from inefficiency and has the great merit of cheapness.

#### *Incidence of dysentery*

In the second report (*loc. cit.*) on this experiment the numbers of cases of dysentery occurring during nine months in the Balimara line and in the remaining lines of the Dirial estate were recorded. These figures can now be revised to cover twelve months and are set out in table VI.

TABLE VI  
*Dysentery on Dirial Tea Estate*

Line	Period of observation	Number of cases	Percentage incidence
Balimara	June 1936 to May 1937	9	6.9
Other lines		38	3.7
Balimara	June 1937 to Feb. 1938	3	2.3 (3.1)
Other lines		27	2.6 (3.5)
Balimara	March 1938 to Feb. 1939	5	3.5 (2.1)
Other lines		50	5.1

Tube wells were sunk in 'other lines' in May 1936 but not in the Balimara line until May 1937. The result of the good water supply was to bring the incidence of dysentery in the latter line down to that of the remainder of the estate. I have inserted in brackets, against the incidence figures for the June 1937-February 1938 period, the calculated incidence for a twelve month period. I have also inserted, in brackets, against the Balimara line incidence for 1938-39, the figure 2.1. This would be the percentage incidence if two cases were ignored. As I mentioned in my second report, there is reason to believe that two cases were infected quite away from the estate. In any event, the difference in the incidence rates is quite marked and shows that the installation of latrines, combined with

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### REMARKS ON THE ÆTIOLOGY AND SYMPTOMS OF *YOUNG-DAH-HTE* WITH A REPORT ON FOUR CASES AND ITS MEDICO-LEGAL SIGNIFICANCE

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A TYPE of neurosis is found in Burma known as *young-dah-hte*, the literal translation of which is 'to be ticklish and nervous'. The condition is characterized by paroxysms of apparently purposive actions which occur independently of the will as a result of a given stimulus.

I have noticed two distinct types of sufferers:—

*Type I.*—Individuals who react to sudden stimuli by imitating words, gestures and actions of those in the immediate neighbourhood. They may or may not utter an obscene epithet at the same time.

*Type II.*—Those in whom a sudden tactile or auditory stimulus produces a severe response. They jump and recoil as though they had received a great fright, uttering at the same time an obscene or unintelligible epithet. These individuals are extremely ticklish and nervous and continued stimuli cause them to get into a very distressed condition.

*Prevalence.*—In urban areas there are stated to be about one or two persons in each village who exhibit this condition and whose rôle is

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the provision of a pure water supply, is capable of bringing about a satisfactory reduction in the incidence of dysentery and, presumably, of other bowel diseases also.

#### *Conclusions*

Reading this experiment, as a whole, I think it can be fairly claimed that:—

1. In suitable soils the bore-hole latrine, properly constructed and with a well-designed superstructure, is a cheap and effective method of sanitation with a reasonable length of working life.

2. The adoption of the principle of one latrine per family is more likely to meet with the co-operation of the coolie class than the provision of communal latrines.

3. The provision of effective sanitation, combined with a pure water supply, will bring about a reduction in the incidence of bowel disease and hookworm infection and invasion and, therefore, a reduction in the incidence of water-sores and, possibly, anæmia.

#### REFERENCES

- Hare, K. P. (1938). *Indian Med. Gaz.*, Vol. LXXIII, p. 609.  
Hare, K. P. (1939). *Ibid.*, Vol. LXXIV, p. 340.  
Hare, K. P., and Dutta, S. C. (1939). *Ibid.*, Vol. LXXIV, p. 198.