

ASCARIS LUMBRICOIDES IN THE SINGAPORE GARRISON.

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THE almost daily arrival at the laboratory of specimens of *Ascaris lumbricoides* for identification suggested a heavy infestation of the troops of the Singapore garrison. In view of the now well-recognized facts that this nematode is not only a cause of occasional severe illness, but is frequently associated with chronic ill-health, it was decided to undertake the examination and, if necessary, treatment of all troops stationed in Singapore and the surrounding islands.

Arrangements were accordingly made for specimens to be sent to the laboratory from all units and also, as a routine, from all patients admitted to hospital. In the former case the examination was completed for companies before treatment was undertaken. In the latter, however, positive cases were placed under treatment at once. The result of this procedure is shown by a reduction in the percentage of men harbouring *A. lumbricoides* from 79·56 per cent in the first company examined to 65·35 per cent in the last company examined five months later. At the same time, the removal of the main source of infection no doubt also helped towards this result.

The mass treatment of troops in barracks was reflected in the figures for hospital cases, as the following table shows :—

TABLE I.

| Investigation commenced | | Number of specimens examined | Percentage positive |
|-------------------------|-------|------------------------------|---------------------|
| August, 1925 | | 134 | 66·6 |
| September | | 189 | 48·5 |
| October | | 80 | 52·5 |
| November | | 73 | 23·2 |
| December | | 28 | 25·0 |
| January, 1926 | | 88 | 17·04 |
| February | | 23 | 0 |

These figures include re-examination of cases treated in hospital, but they form only a very small part.

Procedure.—About ten to twenty specimens were sent to the laboratory each day in cigarette tins. These specimens were examined by the smear and flotation methods, using a saturated salt solution in the latter case. An effort was made to make the smear preparations more or less constant in thickness, and in reporting results the average number of eggs per field was stated. It was hoped that by doing this it would be possible to ascertain roughly the relation between the number of ova passed and the number of parasites harboured by each individual. This proved to be impracticable, owing to the difficulty of counting the number of specimens per head when treating large numbers of men in barracks. It was noticed, however, that cases which required more than one treatment

showed a reduction in the number of ova per field at each examination after treatment.

The result of the examinations, which are tabulated below, show that in one infantry battalion 84·71 per cent of the men harboured intestinal worms, 74·45 per cent having *A. lumbricoides*, either alone or in company with other worms.

The highest company count recorded was 87·69 per cent and the lowest 74·01 per cent for all worms, and 79·54 per cent, and 65·35 per cent for *A. lumbricoides* alone.

Amongst the remainder of the garrison the counts were not so high.

TABLE II.—INCIDENCE OF *A. lumbricoides* INFESTATION BY STATIONS.

| Station | Unit | Number of specimens examined | Percentage positive for <i>A. lumbricoides</i> | Percentage positive for all worms |
|------------------|------------------|------------------------------|--|-----------------------------------|
| Tanglin | British Infantry | 770 | 74·45 | 84·71 |
| " | R.A.M.C. | 15 | 6·66 | 20·00 |
| Fort Canning .. | Details | 27 | 18·51 | 33·33 |
| Pulau Brani .. | " | 60 | 10·00 | 16·66 |
| Blakan Mati } | British | 139 | 31·53 | 38·16 |
| | Indian | 105 | 6·66 | 12·38 |
| <i>Women.</i> | | | | |
| Tanglin | — | 14 | 50·00 | 57·15 |
| <i>Children.</i> | | | | |
| Tanglin | — | 44 | 59·09 | 63·63 |

Appended below is a list of the parasites which were found during the course of the investigation. In reading this it must be remembered that ascaris was the main object of our search, and that protozoa were only looked for when indicated.

The hospital figures include a small number of re-examinations after treatment in hospital, and also men who had received treatment in barracks.

TABLE III.

| Parasites | Hospital cases | Out-patients |
|---|----------------|--------------|
| <i>A. lumbricoides</i> alone | 194 | 334 |
| <i>A. lumbricoides</i> , <i>T. trichiura</i> | 69 | 282 |
| <i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>A. duodenale</i> | 1 | 1 |
| <i>A. lumbricoides</i> , <i>Strongyloides</i> larvæ | 1 | — |
| <i>A. lumbricoides</i> , <i>A. duodenale</i> | 1 | — |
| <i>A. lumbricoides</i> , <i>O. vermicularis</i> | 1 | — |
| <i>A. lumbricoides</i> , <i>T. trichiura</i> , <i>O. vermicularis</i> | — | 3 |
| <i>A. duodenale</i> | 4 | — |
| <i>A. duodenale</i> , <i>T. trichiura</i> | 1 | — |
| <i>T. trichiura</i> | 84 | 69 |
| <i>T. trichiura</i> , <i>Strongyloides</i> larvæ | 1 | — |
| <i>O. vermicularis</i> | 1 | 3 |
| <i>E. coli</i> | 2 | — |
| <i>E. histolytica</i> | 6 | — |
| Trichomonas | 1 | 1 |
| Tricercomonas | 1 | — |

Treatment.—As stated above, this was carried out in barracks by companies. The men were struck off all duty on the day of treatment and the following day. The second day's "excused duty" was not, in actual practice, a necessity on medical grounds, as little or no inconvenience was caused by the treatment.

The following procedure was adopted and gave good results :—

| | | |
|-------------------------------|----|--|
| Day prior to treatment—6 p.m. | .. | Pill No. 13 (or similar pills), 2 |
| Day of treatment—6 a.m. | .. | Cup of tea |
| 7 a.m. | .. | Ol. chenopodium, 10 minims |
| 9 a.m. | .. | " " |
| 11 a.m. | .. | " " |
| 1 p.m. | .. | Mag. sulph., 1 dram " |
| 3 p.m. | .. | Dinner |

No solid food was allowed before or during treatment, and the consumption of water was curtailed as much as possible. Milk was available if required, and was issued at 10 a.m. and noon.

The oil of chenopodium was given in gelatine capsules, and doses up to 15 minims were given on occasions without any apparent ill effect. The administration of ol. chenopodium 10 minims, in an emulsion with aq. menth pip. 1 ounce, was tried in some of the cases treated in hospital, but did not seem to give such good results as in capsules. The immediate effect of treatment was all that could be desired; practically all the men treated were able to produce numerous worms for inspection the following morning. The largest number produced by any one man was thirty-seven, and he was quite certain that he had not collected them all; however, as he was doing his full duty and apparently in perfect health, his was no mean effort!

It was found during the treatment of the hospital cases that one treatment was not, as a rule, sufficient to clear out all the worms. A second treatment was therefore given to all men about one month after their first treatment.

Perusal of Table I shows that treatment in barracks was largely successful in ridding the men of their parasites.

Causation.—(1) As soon as the high infection-rate was realized a search was made for the cause, and the *main* cause was not far to seek.

The troops had, as part of their diet, almost every day uncooked vegetables, principally lettuce and spring onions. In addition to this a certain amount of re-infection, no doubt, took place, particularly amongst the children, but as flies and dust are unusual in Singapore, the main source of infection must have been the vegetables.

When one realizes how these vegetables are grown the figures are not surprising. The main supply of fresh vegetables is from local market gardens, which are owned and managed by Chinese. These Chinese use as manure human and pig night-soil, which has been kept in barrels for about three weeks to "ripen." In addition to this it is a common practice to spray the lettuce with this liquefied fæces, to keep it fresh while it is being conveyed to market.

Both these practices are forbidden by law, but even so it is a very difficult matter to stop them.

The storage of the fæces for three weeks is of very great interest, for two reasons: (1) The fact that other more delicate ova and cysts are probably unable to survive. (2) It gives the ascaris ova time to become mature.

In connexion with this outbreak it is interesting to see almost similar conditions mentioned in the Ministry of Health Report, No. 37, on *A. lumbricoides*.

The figures for ascaris all over Malaya are very high, and the results of eating uncooked vegetables are well shown in the foregoing investigation.

During the course of the investigation numerous cases showing the possibilities of *A. lumbricoides* as a cause of unusual symptoms, or of no symptoms, came to light.

(1) The case already quoted of a soldier doing full duty harbouring at least thirty-seven worms with no apparent ill-effects.

(2) Baby B., aged 14 months, vomited two large ascaris—no symptoms or apparent ill-effects.

(3) Baby T., aged 20 months, very poorly developed physically and mentally, frequently off colour, though never seriously ill—treated for ascaris and put on seven pounds in next two months.

(4) Baby X., aged 15 months, seen by M.O. at 5 p.m., with a history of vomiting while at a children's party, and then being "very bad." The mother stated that it had been in hospital three weeks previously for one week suffering from diarrhoea, with blood and mucus. When seen the child was collapsed with a subnormal temperature and very poor pulse. No physical signs. It was treated for its immediate condition, and quickly came round and fell into a peaceful sleep. It was ordered syrup of figs. Next morning the child vomited three ascaris.

I am indebted to Sir David Galloway for the following notes on the two worst cases seen by him during the course of over thirty years' experience in Singapore:—

(1) "A Spanish boy, aged 7, who came from Manila (it was during the Spanish occupation of the Philippines). The diagnosis sent with him was tuberculosis of the lungs and abdomen, and his appearance certainly lent colour to such a diagnosis. There was a constant temperature of 102° F., frequent cough, intense anæmia, shrunken limbs and protuberant abdomen. The lungs were full of sounds, scattered equally all over, and the abdomen had the doughy feel which one associated with tuberculous disease.

"Sputum was negative and the lung condition was not that of tuberculosis. Curiously enough, he never passed a worm during the few days when the diagnosis was in doubt, but he vomited one shortly after his arrival, which gave an indication for treatment.

"I do not know how many he passed, but his aunt, in whose care he was, described them as being passed by the 'potful.'"

(2) "The second case was that of an Arab girl. On account of some political trouble the family had to remove themselves from Palembang, and they came here, in all about sixty persons.

"Every member of the family was heavily ascaris infested, but the palm seemed to be awarded to the girl in question. She was 17 years of age and had never menstruated, and was therefore not married.

“Physically she was a skeleton and the abdomen was enormous. The temperature was constantly high, respirations hurried, and there was œdema of the feet and hands. Albuminuria was present. There never was any doubt as to the nature of the illness, as worms were being constantly evacuated *per anum* and *per oram*. I was able to awake some interest in this case in some of the other members of the family, and they counted the worms which were evacuated during the first four days of treatment, after which the familial interest seemed to wane and the count was dropped. The number enumerated was 800, and worms were passed in small numbers for at least a week after the enumeration ceased.

“The interest in the case lay in watching the superadded symptoms, due to the toxæmia, gradually one by one disappear, and it is enough to say that within twelve months she had developed into a normal woman. Menstruation became established ten months after the ‘great evacuation,’ and the albuminuria disappeared about the same time.”

NOTES ON THE USE OF OIL FUEL FOR COOKING PURPOSES AND THE SYSTEM IN USE IN THE INDIAN STATION HOSPITAL; DEOLALI.¹

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OIL fuel has been used in the hospital kitchen at Deolali since May, 1918, and during this time no firewood has been issued. The oil is that used for bunkering steamers and for railway and other engines; it is a heavy oil, and when lighted burns with a dead yellow flame and gives off a large quantity of thick, black smoke. It has many advantages over wood and these are enumerated later.

A plan of the kitchen (scale two inches to one foot) is shown on page 55.

There are two reservoirs (four-gallon petrol drums) with stopcocks, one contains oil and the other water. Both oil and water are run into a funnel in a small stream and so get mixed. This mixture is carried by the pipe to the ovens. The reservoirs are mounted side by side on a cemented pedestal at a height of one foot three inches from the floor. The idea of mixing water with the oil is to produce partial atomization of the oil and thus to lessen the smoke production, which is considerable if only the oil is used.

¹ At Aldershot field kitchens modified to burn oil have been issued for trial to regiments without previous experience of the method. Very good results were obtained when the kitchens were stationary; but on the move the results were not satisfactory, owing to the jolting on the high roads and the excessive production of smoke. The M.G.A. considers that if an oil cooker is to be used it should burn paraffin and be made on the principle of an oil stove. There might also be possibilities in the Primus stove system, where oil is burnt under pressure.—ED.