appearance of the first symptoms of obstruction the temperature rose.

Operation.

On examination of the abdomen, which was still distended and tender on pressure generally, a small area of distinctly greater tenderness was discovered in the left iliac region; it was distinctly dull on percussion. This suspicious area was closely watched during the next three or four days, during which time it became visibly larger till it formed a somewhat oval patch measuring about three inches in its long diameter. It was excessively tender on palpation, pitted slightly on pressure, and the patient now referred most of his pain to this region. Synchronous with this all the symptoms of acute obstruction returned. The vomiting became persistent, the vomited matter being almost black in colour. Distressing hiccough supervened which nothing seemed to relieve. The abdomen was rigid and much distended, and waves of peristalsis could be seen through the abdominal wall, evidently indicative of an obstruction fairly low down. The patient complained of pain accompanying each act of micturition. Examination of the urine, however, revealed nothing of significance. On rectal examination there was great tenderness, especially in the neighbourhood of the prostate, which, however, was not enlarged. The rectum was empty and much ballooned; the temperature was 100° and the pulse about 120, very small, and almost thready in character. A consultation was held, and it was decided to open the abdomen immediately in the left iliac region. An incision was accordingly made in the long axis of the dull area, and by carefully working deeper an abscess was opened into and about a teacupful of fetid pus evacuated, such as one finds in purulent appendicitis. As adhesions had apparently formed shutting off the cavity it was deemed inadvisable to attempt to explore further. The cavity was therefore washed out and a large drainage tube inserted. Advantage was also taken of the anaesthesia to make a more thorough examination of the rectum, but nothing pathological could be discovered.

The vomiting and hiccough persisted at intervals during the next few days, the latter being particularly distressing. The patient could get very little sleep, and was slightly delirious part of the time. He continued to suffer a good deal from sharp spasms of abdominal pain, and there was still visible peristalsis. A fresh complication supervened in the shape of a septic pericarditis, and the outlook for the patient seemed very grave. The bowels became more and more loose, till there was persistent diarrhoea. The evacuations were very light, almost clay-coloured, and very offensive. The abdomen still remained distended and nearly immobile, and there was great tenderness, especially in the neighbourhood of the wound.

Then gradually the severity of the symptoms began to abate. Vomiting and hiccough disappeared, and he was able to get better sleep. He continued, however, for some time to have frequent sharp spasms of pain, but these gradually disappeared also. The motions then became occasionally formed, and gradually the diarrhoea ceased, giving place to copious, fully-formed stools, which in time assumed a normal aspect. The wound was kept open for some time, and then allowed to heal up.

The case presented some difficulty at first. The signs and symptoms resembled so closely those characteristics of an attack of appendicitis that, if they had occurred in the right iliac fossa instead of the left, a diagnosis of appendicitis would undoubtedly have been made, and an operation undertaken at an early stage for the removal of the offending organ.

As it was, the fact that the appendix might be to blame was not lost sight of, and this at first was one of the possibilities one had in mind. In fact when occurring on the right side pericolitis has frequently been mistaken for appendicitis and it seems extremely difficult to distinguish between the two conditions. Before definitely localizing symptoms in the form of abscess formation became evident, one had also to take into account the possibility of the presence of malignant disease. In support of this there was the loss of weight, obstinate constipation for some time before, the cachectic appearance of the patient, together with definite signs of obstruction probably somewhere in the region of the sigmoid as evidenced by the nature of the peristalsis and the ballooned and empty condition of the rectum. Against this we had to set the greater amount of pain than is usually expected in malignant disease. The extreme tenderness, the fever, and ultimately the rapidly increasing area of dullness with superficial oedema, helped to discount the theory of malignant stricture.

The conclusion finally arrived at, therefore, was that we were dealing with a case of pericolitis, probably of the sigmoid flexure and ending in abscess formation. In favour of this theory there was first of all the history of chronic constipation, a preceding factor found in so many of the recorded cases of pericolitis, and apparently a factor of some importance. Indeed, according to Rolleston,[1] chronic constipation is given as the commonest cause of pericolitis. Further, the position of the lesion corresponded with what is generally regarded as the commonest site of pericolitis, the sigmoid flexure. The definite symptoms in these cases would appear to come on fairly suddenly, and in this case the onset of acute symptoms was sudden.

As regards the pathology of the case, it was, perhaps, unfortunate, from one point of view, that the exact condition of the walls of the bowel could not be determined, especially as various theories have been advanced to account for the condition. What probably took place was that a local inflammation of the tissues in immediate relation to the sigmoid flexure occurred, cause unknown—perhaps the result of a discontinuity in the mucous membrane, perhaps the result of simple constipation, with infection of a sacculus. The peritoneum became involved with all the usual signs of peritonitis and obstruction. Instead of this inflammatory condition becoming resolved, as frequently happens, it progressed fairly rapidly to abscess formation—not so fast, however, not to allow of adhesions forming—and in this particular case, following this, we have pericarditis resulting from septic absorption.

It is interesting to note how, after the first few days following the operation, the patient began to make a steady, uninterrupted recovery, with the gradual disappearance of all signs of abdominal trouble. He is now in excellent health and has regained his normal weight. There are no evidences of thickening or adhesions anywhere in the left iliac region, and he has a daily natural action of the bowels.

REFERENCE.

[1] *Trans. Med. Soc.*, London, 1905, vol. xxviii.

THE PART PLAYED BY PEDICULUS CORPORIS IN THE TRANSMISSION OF RELAPSING FEVER.

BY F. PERCIVAL MACKIE, F.R.C.S., CAPTAIN, I.M.S.,

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ON August 16th, 1907, I was dispatched by the Director of the Laboratory (Lieutenant-Colonel W. B. Bannerman, I.M.S.) to investigate an outbreak of relapsing fever which had broken out about a month previously in the Nasik Mission Settlement. I remained there exactly a month, by which time the epidemic had practically subsided. The results of my investigation, though in some respects incomplete, may be considerd of sufficient interest to warrant publication, especially as, owing to stress of other work and the absence of relapsing fever in Bombay, many months may elapse before I shall get an opportunity of extending my inquiries.

GENERAL OBSERVATIONS.

The Mission Settlement contains a population of about 284 persons, including 170 boys and 114 girls. It is under the charge of the Rev. A. and Mrs. Manwaring, to whom and to Miss Landon, M.B., I am greatly indebted for their ever ready kind assistance and information. The surroundings and general sanitary conditions of the Settlement were excellent, and it was evident that these factors had nothing to do with the outbreak. The boys and girls occupied separate buildings scattered in a large compound, and their conditions of life were otherwise identical. The boys occupied the newer, and the girls the older and somewhat dilapidated, bungalows. As a result of this the girls' quarters were infested with bugs, whilst the more recently constructed boys' wards were almost entirely free from these pests.

I was a constant visitor to all these buildings, and was very much struck by the enormous number of bugs procurable from the girls' wards and the absence of them from the boys'. Still more striking was it that the boys were infested with body lice, whilst the girls at first were entirely free. The same rewards and inducements were held out for the production of all kinds of parasites, but all the lice came from the boys', and all the bugs from the girls' wards. *Pediculi capitis* were obtained in small

numbers daily from the girls' heads, and in somewhat fewer numbers from the boys'. A few mosquitos and fleas were caught, but there were no ticks.

The incidence of the disease amongst the two sexes is striking. Twenty-five out of the 170 boys were sent away on the first appearance of the epidemic, so that only 145 remained exposed, and out of these 137 were struck down, nearly all in the first month. Out of 114 girls about 35 contracted the disease, but only very slowly, so that the outbreak amongst them was spread over about three months. It is noteworthy that of the first 15 girls attacked every one had apparently contracted the disease in the boys' wards in which she had assisted as nurse or attendant. Again, practically every casual visitor and attendant from outside who spent any considerable time in the boys' wards went down with the disease.

This dangerous infectivity was strikingly absent from the girls' wards. There the attendants did not contract the fever, and even when the infection appeared to get a hold in the building itself the cases occurred at long intervals, and the disease spread with difficulty.

When I reached Nasik the explosion amongst the boys was over, and only a few outsiders and visitors contracted it on the boys' side; the girls, however, were succumbing to the disease one by one.

The number of lice continued high amongst all the boys, and particularly on those who were ill. Until I had been at Nasik for two weeks I had only succeeded in getting 29 body lice from the female building, but every day large numbers were sent from the boys. Latterly lice became less rare amongst the girls, and from 6 to 10 could be found daily.

My attention was thus attracted toward the question of louse infection. At the end of the first fortnight 112 body lice from the boys' wards had been subjected to careful dissection, and of these 27 (24.10 per cent.) were found to contain spirilla in greater or less numbers. Only 29 had been obtained from the girls, and of these 1 only (3.44 per cent.) was infected. At the end of my month's investigations the figures were:

	Number Examined.	Number Infected.	Percentage Infected.
Lice from boys	240	34	14.16
Lice from girls	108	3	2.77
Artificially-fed lice* ..	52	7	13.46
Total	400	44	11.0

* I cannot say how many of these actually took in blood.

Twenty lice were obtained from a neighbouring village which was stated to be infected with relapsing fever, but none of them contained spirilla.

ANATOMY OF PEDICULUS.

Before giving the results of dissection a few introductory remarks on the anatomy of the louse (*Pediculus corporis*) will be pertinent. This is the more necessary as I know of no writings bearing on the subject. This fact at first militated against accurate dissection, and introduced a fallacy upon which it is necessary to lay stress. This fallacy is due to the fact that during dissection the thin-walled stomach almost invariably protrudes at the first nick of the needle, and ruptures, flooding the whole dissection with its contents. When I say that the stomach is the principal seat of spirilla infection it is obvious that other organs may have become accidentally infected, and, though I have strenuously attempted to exclude this factor, the results of dissection of certain organs—for example, the ovary—must be read in the light of this warning statement.

Pediculus Corporis.

I have not so far had the opportunity of making sections of the mouth parts, so that no extended description can be given of these difficult structures, nor yet the exact relations of the pharyngeal and salivary structures to one another. I saw no evidence of protrusible proboscis, but there appears to be a chitinous biting mouth.

The pharynx is short and dilatable, and leads into the oesophagus, which after a short course in the upper thorax is lost in the thoracic fat-body until it opens into the stomach. A leash of tubular structure surrounds or accompanies the upper course of this tube, but I was not able to satisfy myself as to its nature or function. The salivary glands are minute paired bodies buried deep in the thoracic fat-body in close vicinity to the cornua of the stomach. Each is shaped like a "wishing-bone," the salivary duct emerging from the junction of the two limbs and running a long course mouth-wards. The stomach is a large distensile and thin-walled organ with two prominent cornua reaching as far as the origin of the second pair of the legs and backward to fill the anterior third of the abdomen. When the stomach contains blood it forms a prominent object, especially from the ventral aspect, it is then deep black, active peristaltic waves continuously flowing over it extending right down to the cloacal extremity. The process of digestion takes about three or four days, and the black faeces can be seen travelling backwards. Two pairs of Malpighian tubes emerge from the intestine a short distance behind the pylorus. The intestine is a short, highly contractile tube opening out somewhat into the rectum and cloaca.

The ovary is a fimbriated body filling up almost the whole abdomen. Each fimbria is composed of a string of ova in varying degrees of development. There are generally four or five ripe ova (corresponding to the number of fimbria), which are large and contain dark granules and are about to be extruded. They are situated at the cloacal extremity of each fimbria. There are small paired spermathecae. The testes are shaped like twin acorns on a long stem, a pair on either side; the two vasa deferentia lead into thick bicornuate vesiculae seminales, which are full of spermatozoa, which also occupy each calyx of the testis, matured and about to make the passage of the vas. The spermatozoa are large spiral filaments with barbed heads, and I hasten to add that they cannot be mistaken for the spirilla of relapsing fever. The fat-body is a soft greyish organ occupying the margins of the abdomen, and forming a packing in which the thoracic organs are buried.

The external appearances are markedly different in the adults of the two sexes, but only the most obvious need be referred to. The adult female is much larger and broader across the abdomen than the male, and her posterior extremity more blunt than that of the male. On the ventral surface of the female body just anterior to the cloaca are two chitinous spurs converging and directed slightly backwards. More anteriorly still there is another curious chitinous structure formed of two short stout bars converging and fusing into a truncated projection. The male is furnished with a sharp chitinous penis which is extroverted in an upward and backward direction, that is to say, the penis is extruded like the tail of a scorpion. There is a strongly ribbed chitinous plate forming the sheath of the penis, and extending along the middle of the dorsal surface of the abdomen. The method of copulation has been watched, and explains the function of these curious secondary sexual organs, but it is outside the limits of the present paper to describe the process. The eggs are glistening white, and are glued on to the hairs or fibres of cloth, generally in a sheltered position.

Pediculus Capitis.

Attention was also paid to the head louse, and marked differences were found between the two species, both in their external features and in their life-history.

The internal anatomy of the head louse was not studied. I may here say that I do not think that the head louse plays any part in the transmission of relapsing fever. I do not believe that it even sucks blood, but that it feeds on the sebaceous and scurfy residue in the scalp. I came to this conclusion after having examined one hundred and more head lice all recently taken from the heads of both boys and girls, and I never found blood in the stomach, but always a greasy non-staining material in small quantities.

They differ also in the following ways:

P. Corporis.	*P. Capitis.*
Large and nearly always of a dirty white colour with dark or black margin.	Smaller and of a smoky dark colour pricked out strongly with black.
Nil.	Some show a black thoracic shield on the ventral surface.
The stomach very evident from the ventral surface as a black bicornuate pulsating organ.	Stomach not distended or visible from the outside.
Legs longer and white.	Legs short, curved and edged with jet black.
Female much larger than male.	Less disparity between the sexes.
Lays glistening white eggs.	Eggs smoky brown.
Lives for four or five days or more in captivity and is more active and hardy.	Dies in twenty-four hours in captivity and is sluggish.

All these points have a direct bearing on the life-history and habits of the insects and show how much more suited the *P. corporis* is for acting as a carrier of disease than is the head louse. Thus, if a piece of fresh blanket be brushed over the surface of another piece on which are placed body lice, some will at once transfer themselves from one to the other, and this is probably the way in which the disease spreads from one person to another and from one place to another, in clothes or bedding.

THE RESULTS OF DISSECTION OF PEDICULUS CORPORIS.

The exact details of dissection methods are not called for. Suffice it to say that in most cases complete separation of the important organs was attempted, and each was smeared separately on a slide and subjected to prolonged examination after staining by Leishman's method.

Compared with the bug, flea, or mosquito, the louse is a very difficult insect to dissect; this is partly due to the fact that it possesses a cuticle of indiarubber-like toughness, and the segments do not split and come away as they do in chitinous insects. The cephalic and thoracic organs I found almost impossible of isolation, and hence in many cases these portions were teased and smeared *in toto*. The large majority of the lice used for dissection were taken from the bedding or close vicinity of boys or girls actually suffering from the fever. The first 250 lice or so were fully dissected and all the organs specially smeared and the question of infection subsequently determined. It was found, however, that the state of the stomach contents was always a safe criterion of infection, and subsequently the full dissection was only carried out where preliminary examination of the stomach gave positive results.

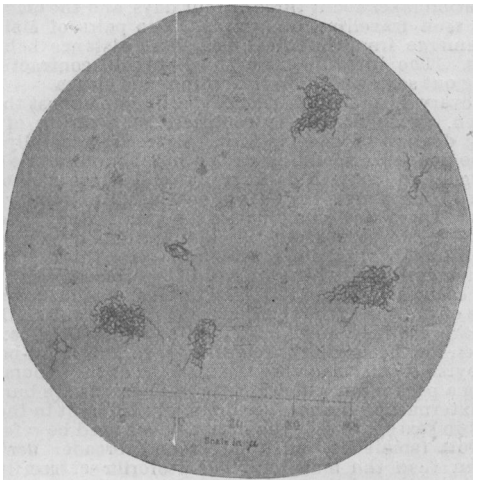

Fig. 1.—The stomach contents of an infected louse.

The stomach is the organ principally infected, and great increase takes place in the number of the spirilla soon after a meal. I was not able to work out accurately the different stages in chronological sequence, but I believe that the maximum period of development is reached in about three days or less. In some stomachs which contained very recent blood the spirilla were seen in small numbers only, and this I believe to be the stage previous to commencing multiplication. Later the spirilla may be seen in every field in twos and threes and in small leashes, and appear to be undergoing active transverse division. Subsequently the spirilla undergo enormous multiplication, and are finally to be found in tangled masses of scores of individuals in almost every field of an oil immersion lens. Such a specimen is depicted in Fig. 1, and almost every field of this particular specimen shows one or more of such tangled leashes. The last stage in the stomach appears to be one of simple granular degeneration, and there is nothing to suggest spore formation or any intermediate stage. The spirilla have not been found in the stomach wall itself, but only in the contents.

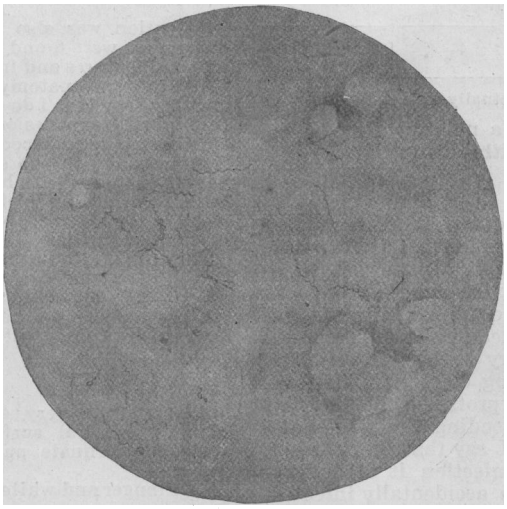

Fig. 2.—Smear from the ovary of an infected louse. (The spirilla had almost disappeared from the stomach of this louse.) Small circle, (*a*) short forms of spirilla (composite field) from the same ovary; (*b*) two spirilla from circulating blood of human patient.

It is noteworthy that spirilla are fewest when the blood is fresh and gradually increase as the blood disappears, so that the heaviest infections are found in stomachs where digestion is almost complete. The spirilla are slightly shorter than in the human blood, and are always more regularly spiral and stain somewhat less readily. When fresh specimens were examined they showed the spirilla to be in the same state of high activity as in recently-drawn human blood. Crithidia were frequently seen in varying stages of development. But neither trypanosomes nor bacteria were met with in living lice.

The ovary was infected in most instances where it was examined (twenty times out of twenty-nine), but it is certain that many of these instances were of accidental infection during dissection. It is equally certain, however, that in one or two instances the infection in the ovary was heavier than that in the stomach, and Fig. 2 is an instance of this. The stomach contents from this louse contained a very few spirilla, not more than one to a field. It is also certain that spirilla were found in the ovaries in one or two cases where these were withdrawn from the abdomen without rupture of the stomach, and in one such case only one large leash of several score of individuals was seen, reminding one of the pictures in Koch's paper on the development of African spirilla in the ovaries of ticks. This was seen once only, for generally the spirilla in the ovary were discrete, and contrasted with the multiplication masses which characterize stomach infections.

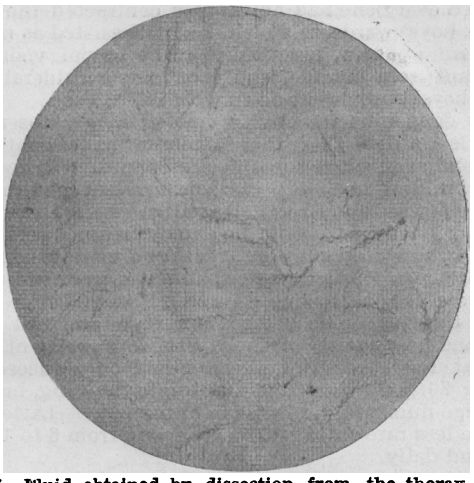

Fig. 3.—Fluid obtained by dissection from the thorax of an infected louse.

I think that short forms are commoner in the ovary than in any other organ. They consist of only two, or even one, curve, and a few selected ones are depicted at (*a*) in the small circle in Fig. 2. They may be only 2 μ long as compared with 8 to 12 μ in the louse stomach, and 10 to 16 μ in their average length in the human blood. An ordinary spirillum and a short specimen from the blood of one of the girls are seen in the lower division of the small circle in Fig. 2.

Out of 36 infected lice where the sex was noted, 31 were females and only 5 were males. This is partly, but I think not entirely, attributable to conscious selection on my part of the bigger females, because I always found that the gravid females were more likely to be infected than the small individuals of either sex. I examined about a hundred or less nits laid by females from the infected boys' wards, but I never found any egg infected. These ova were in various stages of pupation.

Spirilla were occasionally found in small numbers in the intestine in the Malpighian tubes and in the testis (3 out of 5 cases), but not under conditions where fouling from the stomach contents could be entirely excluded.

Briefly, I am certain that the infection exists in the upper alimentary tract, and that the secretion expressed

from the mouth contains abundant spirilla, but I cannot say whether this secretion is derived from the salivary glands, from the pharynx itself, or from some of the diverticula which are connected with the pharynx or oesophagus.

This phenomenon of infection of the mouth secretion was observed in almost every case where it was looked for. If light pressure is made with a needle on the head a small quantity of cloudy fluid is expressed, and when this was examined it showed 9 times out of 13 the presence of spirilla in greater or less number. Once a few spirilla were seen in this secretion when none were found in the stomach. Once or twice larger numbers were found here than in the stomach, and once well-stained healthy-looking organisms were found here when the stomach contained spirilla, which were scarcely recognizable as such by reason of marked degeneration. A noteworthy point is that, however tangled the masses of spirilla in the stomach, they were always quite discrete in the mouth secretion.

The thorax was teased *in toto* 10 times, and in 7 of these spirilla were found, generally in considerable numbers. When the thoracic fat-body was separated together with the salivary gland embedded in it (16 times), on 6 occasions spirilla were demonstrated, in several cases in very large numbers as in Fig. 3. It is possible, however, that in some of these cases a portion of the oesophagus or diverticula therefrom was included. In the case of two infected lice where the salivary bodies were successfully isolated and washed neither contained spirilla.

Monkey Experiments.

Two of these animals were used for louse transmission and one for bug transmission. Neither of the experiments succeeded:

The monkeys were fitted with tight-fitting jerseys after the skin had been shaved, and beneath the jerseys relays of lice from the infected ward were placed at intervals of a day or two. The hands of the monkeys were restrained during the night. I was never able to satisfy myself that the lice bit the monkeys, and as the percentage of infected lice was low when the experiments were carried out I do not think that the failure proves much. Besides the monkey (*Macacus sinicus*) is much less susceptible to relapsing fever than man is. Lieutenant-Colonel Bannerman suggested that I should inject the stomach contents of lice artificially into monkeys, but the degree of louse infection fell towards the end of the epidemic, and I was unable to do the experiment.

Dissection of Other Insects.

I examined a few fleas and mosquitos from the beds or vicinity of infected patients, but found none containing spirilla. The question of bug infection requires more extended notice. I had already had considerable experience of the bug in its supposed part of carrier in this disease, and the results of about eighteen months' work are summarized in a paper on Bombay spirilla fever in the *Lancet* of September, 1907. I was prepared to find spirilla in the alimentary tract of bugs, and was not disappointed. The observations on Nasik bugs were in accordance with my previous experience, and the subject was not pursued. They were found in the stomach contents of bugs in the presence of fresh blood only, and in very small numbers. Scarcely more numerous were they than in the human blood, if allowance is made for concentration of the blood by the absorption of the fluid portions during digestion. There was never any sign of multiplication, and no organ was found to contain spirilla except the recently-filled stomach.

It may be argued that the bug may have been responsible for the slowly advancing epidemic in the girls' wards, but if the bug is really a carrier, then there should have been an explosion similar to that in the boys' wards.

I think, however—and this accords with my not inconsiderable previous experience—that the bug played no part in the epidemic, and that the few body lice in the girls' wards were sufficient to keep up the slow transmission.

Summary.

1. An epidemic of relapsing fever broke out in a mixed settlement of boys and girls living under similar conditions.
2. A very high percentage of the boys fell victims to the disease in the course of a few weeks.
3. A much smaller percentage of girls fell ill and at infrequent intervals extending over three months.
4. The most notable factor in which the boys differed from the girls was that they were infested with body lice, from which parasite the girls were almost free.
5. A well-marked percentage of the lice taken from the infected ward contained living and multiplying spirilla.
6. The stomach of the louse was the chief seat of multiplication, and this was carried on in the face of active digestion and after the disappearance of all other cellular elements. Other organs became secondarily infected. The secretion expressed from the mouth of infected lice contained numbers of living spirilla, and they also existed in greater or less numbers in the upper alimentary tract. The ovary was frequently infected, but spirilla were not found in deposited ova.
7. With the increase of the epidemic amongst the girls, body lice became more in evidence.
8. With the subsidence of the epidemic amongst the boys the percentage of infected lice fell.
9. An attempt to infect a monkey by means of lice failed.

I think that the above facts are sufficient to throw grave suspicion on the body louse as a transmitter of relapsing fever. Many epidemiological facts point to this mode of transmission as being a likely one, and the life-history and habits of body lice as outlined above show how well these parasites fulfil the necessary conditions for spreading the disease.

Thus relapsing fever has always been associated with poverty-stricken, overcrowded, and half-starved communities, and it is under just such conditions that lousiness is at its worst. Again, in mixed communities, as in Bombay, the disease attacks the poor, dirty, and low caste living in squalid tenements, to the exclusion of those of cleanly habits and better conditions of life.

Relapsing fever is a "personal" and not a "place" disease, and amongst stricken communities the infection spreads from person to person very rapidly after only a few days' exposure, and mere contiguity without contact is not sufficient to carry on the infection.

It is probable that the infected secretion of the louse's mouth is the medium responsible for transmission during the height of an epidemic, but whether the ovarian infection plays any part in the linking together of epidemics or in the carrying over of the disease during the off season it is at present impossible to say, but the failure to find spirilla in nits is rather against this theory.

The photographs are from drawings made by Dr. Tarkud, M.B, of Bombay. They are faithful to the minutest detail of the fields they represent, and are in no sense composite (except sector (*a*) in Fig. 2). The spirilla of the circumferential limits of each field were, for optical reasons, omitted by the draughtsman.

A POSSIBLE EXPLANATION OF LATE RETURN CASES IN SCARLET FEVER.

By WILLIAM HABGOOD, M.D.Brux., D.P.H.Lond.

Every medical officer responsible for the discharge of scarlet fever patients from isolation hospitals is beset with the difficulty of knowing when they are free from infection. The time having not yet arrived when he can, as in the case of diphtheria, call in the aid of the bacteriologist, he has to be guided by ordinary clinical examination. Formerly desquamation was the guide; when that was completed the case was discharged. Of recent years it has been recognized that where return cases of scarlet fever occur the discharged patient will be found to have some purulent or muco-purulent discharge.

While admitting the impossibility of being sure that all inflammation has ceased in the upper respiratory tract, I am inclined to believe, from observation at different hospitals in the last two years, that cases are sent out free from any nasal discharge and not infectious, but do again become infectious by the occurrence of an ordinary attack of nasal catarrh, which causes some remaining quiescent scarlet fever germs to renew their activity.

An analogy may be found in the case of one who sits in a warm room with a current of cold air playing on his neck. He may get an attack of acute nasal catarrh, and he may become infectious to others. The germs that cause the catarrh were already in his nose, but dormant and able to become active only when an interference with the nasal circulation was set up by the cold air driving on to the warm skin.