THE HUMAN LOUSE IN TRANSMISSION OF *T. DUTTONI* IN NATURE

BY

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Hitherto there has been no evidence that the human louse can act as a vector of *Treponema duttoni* in nature. Even in the laboratory Nicolle and Anderson (1927) were unable to infect lice with a Congo strain of the parasite. Recently, however, Heisch and Garnham (1948) have shown that under laboratory conditions several strains of East African *T. duttoni* can infect and undergo metacyclic development in lice, and that the infection can be transmitted by inoculation.

The present paper reports the discovery of natural infections in lice of spirochaetes indistinguishable from *T. duttoni*. The only other worker to have experimented along these lines is Blanchard (1914), who in the Congo inoculated mice with lice collected from patients infected by *T. duttoni*, but with negative results.

Lice were collected from the clothes of patients infected with *T. duttoni* at Kisumu and other places in Kenya Colony where the disease is endemic; after being kept for varying periods they were emulsified with saline and inoculated into rats and mice. Lice were collected from seven patients, and four of the batches proved infective.

Case 1.—Ten lice (L19) were collected on Aug. 26, 1946, from the clothing of a Kikuyu woman with *T. duttoni* in her blood. The following day one louse was smeared on a slide and stained; no spirochaetes were seen. On the 28th seven lice remained; these were emulsified and inoculated into Mouse 673, but infection did not result.

Case 2.—At Meru six lice (L26) from the clothing of a child aged 1 year with relapsing fever were emulsified and inoculated into Mouse 1460, but no infection resulted.

Case 3.—Sixteen lice (L26) from the trousers of a sophisticated Tanganyikan African suffering from relapsing fever, and with quite numerous spirochaetes in his blood, were emulsified and inoculated into Mouse 1593; there was no infection.

Case 4.—Eight lice (L30a) were collected at Kisumu from the clothes of a patient with spirochaetes in his blood. Six hours later they were emulsified and inoculated into Rats 2574 and 2548, both of which became infected.

Case 5.—Two lice (LKu8) were removed from the head of a child of the Jaluo tribe at Kisumu with spirochaetes in his blood. After five hours they were emulsified and inoculated into Rat Ku19, which subsequently became infected.

Case 6.—Forty-eight lice (LKu9) were collected from an adult male of the Jaluo tribe at Kisumu with relapsing fever spirochaetes in his blood. Twenty-five of these were inoculated into a rat after forty-eight hours and the remaining 23 were inoculated into Rat Ku24 after seventy-two hours. Both these animals became infected.

Case 7.—Sixteen lice (LKu10) from the clothes of a Jaluo male aged 18 with spirochaetes in his blood were emulsified and inoculated after twenty-seven hours into Rat Ku25, which subsequently became infected.

Discussion

The recovery of spirochaetes from four out of seven batches of lice collected from patients infected with *T. duttoni* is further evidence that the louse is able to act as a vector of this organism in nature. It might be objected that the infections caused in mice and rats were examples of mechanical transmission, but this seems unlikely, as the lice were kept for periods up to three days before inoculation. The criticism might also be made that the strains recovered were in reality not *T. duttoni* but some other

species of spirochaete. However, the strains proved to be *T. duttoni*, because they were capable of infecting *Ornithodoros moubata*, they caused typical infections in laboratory animals, and they were markedly neurotropic (residual brain infections in rats and mice).

It is strange that epidemics of louse-borne *T. duttoni* have rarely if ever been known to occur. This may be due to the existence of an immunity in the populations of endemic areas or because the louse is a less efficient vector of *T. duttoni* than of *T. recurrentis*.

Summary

Of seven batches of lice collected in Kenya Colony from patients infected with *T. duttoni* four were found to be infective when inoculated into rats and mice.

The spirochaetal strains recovered proved to be *T. duttoni* and not any other species of spirochaete.

Although it is probable that the louse can act as a vector of *T. duttoni* in nature, it is not known how often or with what degree of facility this occurs.

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MENINGOCOCCAL CONJUNCTIVITIS

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An intracellular Gram-negative diplococcus in the exudate of a purulent conjunctivitis is often assumed to be a gonococcus, but full bacteriological investigation sometimes shows it to be a meningococcus. There are numerous references in the literature to the presence of meningococci in the conjunctiva, but the methods of identification employed in the earlier cases, at least, are not now acceptable.

Case Report

A boy aged 3½ years attended the casualty department with a gross purulent conjunctivitis of the left eye of one day's duration. The cornea was clear and the interior of the eye normal. The condition was completely cured within eight days by local treatment with 30% sulphacetamide ("albicid") hourly, penicillin in saline (2,000 units per ml.) every half-hour, atropine, and the provision of coloured glasses. The right eye was healthy.

Bacteriology.—When first seen films from the left eye showed pus cells with numerous intracellular and extracellular Gram-negative diplococci, and cultures yielded a copious growth of these and a scanty one of *Staphylococcus aureus*. The Gram-negative cocci were strict aerobes, grew only on media containing blood or serum, and fermented glucose and maltose but not lactose or saccharose. Their colonies were denser and more luxuriant than those of gonococci, and suspensions of them were agglutinated to titre by the Standard Laboratory's (Griffith) Group II meningococcal antiserum and to 1 in 25 by Griffith's Group I antiserum. The organism was therefore identified as *Neisseria meningitidis* (Griffith's Group II). The right eye did not yield the neisseria. The nasopharynxes of the patient, his parents, and five sisters were all examined for neisseriae without success.

Discussion

During or immediately preceding cerebrospinal meningitis, meningococci have often been found in the conjunctiva. In some instances the eyes were apparently healthy (Randolph, 1893; McKee, 1908, 1909), but others showed a purulent conjunctivitis (Koplik, 1904). This type of conjunctivitis has become progressively rarer with treatment by specific antiserum and later by sulphonamides, so that it is now practically never observed (Lewis, 1931; Tillet and Brown, 1935). McKee (1908) discussed the probabilities of whether the conjunctiva acted as a portal of entry for the neisseriae or became invaded secondarily.

The occurrence of the conjunctivitis immediately before the onset of meningitis (Koplik, 1904) and its appearance in nurses attending patients with meningitis (Smith, 1905; Reese, 1936) support the first contention. There is no inherent reason why the conjunctiva should not, like the nasopharynx, harbour and even be infected by air-borne meningococci, but obviously the chance is less, inasmuch as a current of air containing the organisms is not drawn by each respiration over the conjunctiva. Meningitis resulting from meningococci which have gained access to the body via the conjunctiva, if it occurs at all, must be very rare compared with the usual sequence of events described by Wilson and Miles (1946), beginning with entry of the meningococci into the nasopharynx and their spread to the meninges either direct or by the blood stream.

Conjunctivitis due to *N. meningitidis*, unassociated as in this case with meningitis in either the host or any of his known immediate contacts, has often been recorded, and Stuart and McWalter (1948) give more than a dozen references. They themselves described six cases, from which they isolated five strains. Four of these were investigated serologically and, in contrast to the case here recorded, all belonged to Group I. It is a matter for speculation whether in the absence of treatment these patients would subsequently have developed meningitis. At present meningitis is usually due to Group I, and most of the strains found in the nasopharynges of persons who have not been in contact with cases of meningitis belong to Group II (Mackie and McCartney, 1948).

In the interests of public health as well as of the patient himself, rapid identification of the organism in neisserial conjunctivitis is of obvious importance. Difficulties due to absence of facilities for immediate culture may be overcome by the use of the thioglycollate method of transport (Stuart, 1946). As Stuart and McWalter suggest, meningococcal conjunctivitis is more frequent than commonly imagined, is often erroneously diagnosed as gonococcal, and may be as severe clinically as gonococcal ophthalmia. Although both conditions respond to sulphonamides, the sociological "follow-up" required is entirely different.

Summary

A case of purulent conjunctivitis due to *N. meningitidis* Group II is recorded and discussed. Contacts were examined for neisseriae without success.

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Medical Memoranda

Pulmonary Tuberculosis Complicated by Amoebic Hepatitis

The following case history may be of general interest because of its differential diagnostic problem, which is somewhat unusual, and its moral, which is becoming increasingly common.

CASE HISTORY

The patient, a married woman aged 36, has been suffering from pulmonary tuberculosis for at least ten years. A left-sided artificial pneumothorax was induced some two years ago, and she recently came for treatment of a fresh spread in the right lung. She had had appendicectomy twenty years ago.

For the last eight years she has been complaining of sharp, dragging pains in the right iliac fossa and lately also in the right epigastric region; the pains were independent of food, were worse when she stood up, and had grown in intensity during the last few years. There was moderate flatulence, but the bowels were regular and the stools macroscopically normal. She gave a vague history of three or four sharp attacks of diarrhoea in the course of the last nine years. The first attack, lasting four or five days, was in 1939; the others, lasting two or three days, occurred between 1939 and 1944. She thinks that on two occasions she passed some blood and mucus.

The patient has never been in tropical countries, and, apart from occasional pre-war trips to Paris and the South of France, her only foreign journey was a summer cruise in Dalmatian waters in 1937. The abdominal symptoms had been variously diagnosed as those of duodenal ulcer and abdominal tuberculosis. They have not responded to treatment.

On examination the caecum was ballooned, doughy and tender, and could be elicited by pressure on the colon as far as the splenic flexure. No mass or rolled-up omentum could be palpated. A small area of localized tenderness, which had been unknown to the patient, could be detected in the right lobe of the liver, about 1 in. (2.5 cm.) to the right of the xiphoid process. This tenderness was more pronounced in the intercostal space above than on the palpable liver-edge. On screening, the right diaphragm was observed to be slightly elevated and its movement was somewhat diminished. Sigmoidoscopy disclosed a congested oedematous rectal mucosa, several submucous haemorrhages on the haustra, and a few small round healed ulcers at 4 in. (10 cm.).

Investigation revealed slight hypochromic anaemia; W.B.C. 3,600, with normal distribution; van den Bergh quantitative test, 0.8 mg. per 100 ml.; nicotinic acid tolerance (Erdei, 1947, 1948), 450 mg.; galactose tolerance and thymol turbidity normal; cephalin-cholesterol test, weakly positive. On examination of the faeces two typical *Entamoeba histolytica* cysts could be demonstrated in the sixth specimen.

A course of ten injections of emetine, with concurrent penicillin and diodoquin and consecutive emetine bismuth iodide and carbarson, was given. After the second emetine injection the liver became very tender, but all tenderness disappeared after the sixth injection, thus justifying the diagnosis of chronic amoebiasis with hepatitis.

Further attacks of diarrhoea occurred some time after the improvement from the anti-amoebic treatment. First *Giardia lamblia* was demonstrated; afterwards, when the diarrhoea became worse and sigmoidoscopy revealed superficial ulceration of the rectal mucosa, *Shigella flexneri* (Newcastle-Manchester strain) was grown from a sigmoidoscopy swab. Several stool cultures proved to be negative. Sulphasuxidine treatment was given, and the patient is now free of the complaint, and her motions do not exceed two daily.

COMMENT

In the above case abdominal tuberculosis figured much too prominently in the differential diagnosis, and the correct diagnosis was arrived at only because it was realized that chronic amoebiasis is an increasingly common condition which must be considered when dealing with a very wide range of abdominal and general conditions. This case also demonstrates the value of a rapid liver-function test such as that of nicotinic acid tolerance.

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