Feb. 19, 1991

Dear Deborah,

I appreciated your sending me recently some copies of two papers by Charles Nicolle and read them with great care; I have also re-read relevant portions of "Rats, Lice and History." Various circumstances have interfered with promptly summing up my findings which might be of interest to you, a delay which I regret, but I hope the analysis will still be helpful.

In the article "Experimental Research on Experimental Typhus Undertaken at the Pasteur Institute of Tunis during 1909" (published in 'Ann. Institut Pasteur of Paris,' volume 1, pp. 243-275), Nicolle states that:

a) He had negative results in preliminary attempts to directly infect M. cynomolagus and M. sennicus individuals with the blood of typhus patients;

b) He was successful in producing disease by inoculation of a chimpanzee with blood collected from another patient within a few hours after the appearance of erythema;

c) Using human body lice collected from normal patients and fed on the chimpanzee, he was able to transmit the disease to rhesus monkeys;

d) Blood from the lice lab was infectious for other individuals of this species. In Section IV of the paper (with Comte and Cuvillier), he discusses in some detail the transmission of typhus by the body lice, pointing out that human lice fed with equal voracity on man and monkeys, consuming blood rather than epidermal debris; lice must be fed daily if they are to be used for biting purposes; special methods must be employed to maintain lice in captivity. No mention is made here concerning head lice...
The second article is from "Le Bull. Inst. Pasteur" (Paris, 1920-21, pp. 49-52). It is a review on "The State of Our Experimental Knowledge of Experimental Typhus - an outline of the methods used and problems remaining to be resolved." Nicolle presents his views, with few technical details or references to prior literature. The following points strike me as noteworthy:

1. Typhus entericocides is a single disease, world-wide. Reciprocal vaccinations (cross-immunity tests in animals) have shown the identity of typhus of Parisians with that of North Africans, African typhus with that of Brill's disease, etc.

2. In "Rats, Rats History", Dr. Z. corrects this notion, saying (p. 173 in the Bentam Classics edition): "There are two distinct types of true typhus virus. The diseases they cause in man are identical and both are transmitted from one individual to another by human body and head lice.... they can be distinguished.... Before these distinctions had been recognized typhus had been regarded all over the world as a single disease perpetuated by man - horse - man transfer..... (p. 174) Most of the work we are discussing has been done since 1928, a good deal is hardly off the press, and some of it is not yet in print as these paragraphs are being written." Dr. Z. uses here and elsewhere the term "virus" as synonymous with "microbe."

3. In human typhus, transmission is often underplored than the louse is implicated - not fleas, not bed bugs, not biting flies nor mosquitoes or ticks. Only lousy people are affected. It is linked to fleas, skin, and soaps, goes with them and stays until they come to the household of the hospital where they find soap, water, and clean clothing. Endemic foci are linked with dirty people and the outbreaks of epidemics is linked seasonally with the humber of lice found on the fleas.

3. The louse does not become infectious until several days after a blood meal. Once seems to be proliferation of the typhus agent in the louse. At the time the
site becomes infective, the agent is in the gastro-intestinal tract since the louse deposits are infectious (for mosquitoes or guinea pigs). Hendyton transmission if the agent in the louse is not demonstrated, contrary to the situation in relapsing fever.

4. Other factor critical in typhus transmission - a) man, the sole reservoir in nature, behaves as a source during more than the great of the illness; b) the lice, of which the bite becomes virulent at least 7-8 days after it has fed on a diseased person. The virulence of louse deposits permits a second, indirect mode of contamination - association by scratching a skin soiled with louse deposits.

5. Children play an important role in the etiology of typhus, since in them the disease is generally mild, or inapparent.

6. "The body louse transmits typhus like the body louse." (Nicolls, p. 53)

7. Patients with their lice are no longer dangerous for others. In well-maintained hospitals, cases of typhus contagion were not observed except in the personnel at the entrance who could not defend themselves against the vermin on patients and their rags which they were obliged to contact; but, cases of laboratory contamination or accidents even among doctors have been recorded.

8. If instead of allowing them to bite one injects infectious lice under the skin of monkeys or guinea pigs, the results are constantly positive. Their non-natural route must be a more severe challenge. (Nicolls, p. 54)

In "Rats, Lice and History," (Bayham-Classon edition), Finster states:
"The body louse and the head louse carry the infection from one human being to another" (p. 165). He accepts and confirms Nicolls' claim (item 6, above), though I haven't yet located experimental data on his specific point. In speaking of the murine variety, H. Z. writes (p. 166): From the bite of infected fleas, the human being contracts typhus. This as the sporadic or endemic cease. If the victim is healthy, group infection may recur. If the lice on a louse-infested community, the consequences is an epidemic."
H.Z. conjectured (p.131) that ... 'from the several head varieties ... the body louse, when naked men began to wear clothing 'and he accepted (p.131). 'The relatively recent discovery by Bacot that the head lice of man would intermingle with the body lice and give fertile progeny.'

I hope you won't mind the above mention of matters beyond those specific issues on which you sought my thinking. I am convinced that since in the early 1930's concerned with Nicolls's view, expressed more than a decade previously, as to the capability of human head lice to transmit by place. Since both men believed strongly in the importance of the experimental method as the basis for scientific conclusions, I presume they were aware of actual trials on this point, although I don't know where the pertinent data are recorded. Let's hope one or other of us will have a revelation.

Sincerely,

M. F.S.