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On the Foetal Infection by *L. Icterohaemorrhagiae* in a Rat

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ON THE FŒTAL INFECTION BY
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It is established that rat is the carrier of pathogenic leptospiræ, but no definite observations have been made as to how the infection is maintained in the rat population. Since leptospiræ are excreted in urine of the infected rat, it has been suggested that the infection occurs through the ingestion of food contaminated with such urine. Possibly also leptospiræ may gain entrance into the body through the infected material coming in contact with the skin with open wounds. The observations to be described in this paper suggest still another possible mode of transmission, e.g. transmission of infection from the mother to the offspring through the placenta.

In the literature there is no mention of placental transmission of infection from mother to offspring in the rat though there are a few experimental observations on such transmission in the guinea-pig. In the case of guinea-pig Costa and Troisier (1916) were the first to report the penetration of leptospiræ through placenta as shown by the transmission of the disease by inoculation of the amniotic fluid. To this Buchanan (1927) put forth objections on the ground that the presence of infected blood in such circumstances is rather difficult to exclude. Takagi (1927) detected spirochætes in the placentas of guinea-pigs infected with Weil's disease but the organisms could not be found in the fœtuses. It was observed that the spirochætes had been taken up by the ciliated cells and other tissues on the outside of the embryo which seem to protect the fœtus from invasion from the maternal body. The transmission of leptospiræ from mother to fœtus was established by Saenz (1929). This worker inoculated a pregnant guinea-pig with leptospiræ and five days later removed both the placenta and the fœtus. The guinea-pig inoculated with the emulsion of the fœtus died seven days later, whilst the second animal inoculated with the placenta died of the same infection after thirteen days. Another pregnant guinea-pig was infected six days before the birth of two young ones in

both of which leptospiræ were detected. More recently, Das Gupta (1939) undertook a series of experiments on the guinea-pig during various stages of pregnancy and advanced definite evidence of transmission of leptospiral infection from mother to the foetus. Further, the presence of the organism was demonstrated in the sections of the foetal liver. These observations, therefore, confirmed Saenz's findings.

During the course of investigation on the incidence of leptospiral infection in the rat population of the city of Bombay a rat of the species *Rattus norvegicus* in a fairly advanced state of pregnancy was trapped. On examination under dark-ground illumination the kidney emulsion of this animal showed the presence of leptospiræ. This chance presence of infection in a pregnant animal permitted of the following investigation :—

The uterus of the rat was removed aseptically and six well-developed live foetuses were recovered. In the removal of the foetuses care was taken to avoid contamination with maternal fluids. Similarly, in order to eliminate any possible contamination from external sources, each foetus was immersed in a bowl of strong lysol solution for five minutes and then washed in several changes of sterile saline. The kidneys of each foetus were removed under aseptic precautions but owing to the paucity of young guinea-pigs saline emulsions of the kidneys of three foetuses were pooled together. Two cubic centimetres from each of the two mixtures thus made were injected intraperitoneally into separate guinea-pigs. On examining the mixtures under dark-ground illumination before inoculation leptospiræ were seen in only one of them. Two c.c. of emulsion of kidneys of the mother rat were also similarly inoculated into a young guinea-pig of about 180 grammes in weight. On the third day after inoculation the peritoneal fluid of the guinea-pig showed few leptospiræ under dark-ground illumination and on the seventh day after inoculation this animal died. On post-mortem examination jaundice and typical flecks of hæmorrhage all over the lungs, the two pathognomic signs of the infection in guinea-pigs, were noticed. The emulsion of the liver showed numerous leptospiræ and a second guinea-pig was inoculated with this emulsion. From this second animal the strain was finally isolated. The culture of the heart's blood of this animal yielded a luxuriant growth in Vervoort's medium.

The two guinea-pigs which received the pooled emulsions of the kidneys of the foetuses died respectively on the eighth and tenth day after inoculation. Post-mortem examinations presented the characteristic signs of leptospiral infection. A pure growth of leptospiræ was obtained from the culture of the heart's blood of both these animals. The three strains thus isolated from mother and the offspring were found to be serologically identical. The above observation is, therefore, a clear indication of natural infection of rats through placenta.

The question arises whether the embryonic rat infected in the uterus through placenta would survive after birth. On this point, however, we have no direct evidence. From the fact that the foetuses were all alive even at such an advanced stage of pregnancy it is very likely that they could have been born alive and would have developed to maturity. They would thus have acted as reservoirs of infection. This is further supported by the fact that there is no experimental evidence in

favour of *L. icterohæmorrhagiæ* being pathogenic to rats. Definite experimental studies in rats are, however, needed to clarify the point.

SUMMARY.

Intra-uterine infection of the foetuses of a rat through the placenta is recorded.

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