

of ulceration there is found secondary invasion. But in addition to these organs, the Eberth germ has been reported by Chantemesse and Vidal¹⁰ in the lungs of typhoid patients with bronchitis, broncho-pneumonia and pneumonia. The same observers report the germ in the brain; Curschmann,¹¹ in the spinal cord; Zenker and Hoffmann,¹² in the voluntary muscles and in the marrow of the bones; and Reber,¹³ Neuhaus¹⁴ and Chantemesse and Vidal, in the placenta of typhoid patients. In twenty samples of blood taken from the finger, during life, of typhoid patients, Meisels¹⁵ reports the finding of this germ in nineteen. Neuhaus examined the blood taken from the eruptive spots in typhoid fever with success. Maragliano¹⁶ and others examined the blood taken from the spleen during life as a means of diagnosis. The Eberth germ has been found in drinking-water by Dreyfuss-Brisac and Vidal,¹⁷ Michael,¹⁸ Moers,¹⁹ Chantemesse, Loir,²⁰ Thoinot, De Blasi,²¹ Galbucci,²² Beumer,²³ and others. Granting that these observers have not been mistaken in the nature of the germs which they have found, we must admit that the Eberth germ is widely distributed. Banti²⁴ reports Eberth's germ in a case which he calls atypical typhoid fever, and in which the intestine was perfectly sound. This case is pronounced typhoid fever, notwithstanding the absence of any indication of the characteristic lesion of the disease, because the germ was found to be present. Whether or not this is justifiable is, I think, very questionable.

That the second of Koch's rules has been complied with, there is no doubt. Pure cultures of this germ are to be found in every bacteriological laboratory. It grows readily in our artificial media, and its (accredited) characteristics of growth are well known. The attempts which have been made to induce the disease in the lower animals by inoculation with this germ are numerous and interesting. I shall not attempt to review all of these, but will call your attention to some of the more important ones. The first to experiment with pure cultures was Gaffky. To five Java apes, he fed daily cultures without any results. Later these animals died of tuberculosis, and section showed no lesions resembling those of typhoid fever. Equally without result were two experiments upon apes; in one, the inoculation being made

directly into the blood, and in the other, in the tissues over the sternum. Gaffky also inoculated rabbits, guinea-pigs, rats, mice, pigeons, a chicken, and a calf, all without result. In these, the inoculations were made directly into the blood vessels or into the peritoneal cavity.

The experiments of E. Frankel and Simmonds²⁵ seemed at first to prove that the Eberth bacillus is pathogenic to some of the lower animals. These experimenters suspended the germ taken from potato cultures in sterilized water and injected this either directly into the blood or into the peritoneal cavity. Nineteen, out of thirty-two rabbits, and twenty-seven, out of thirty-one mice, succumbed under this treatment. These animals survived the injections from a few hours to four days, the majority dying on the first day. The symptoms observed consisted of lessened response to surroundings, lessened inclination to move, loss of appetite, and, in many, diarrhoeal discharges. Section showed enlargement of the spleen and mesenteric glands, and swelling of the intestinal follicles. In some there were observed enlargement of the axillary and inguinal glands, ecchymoses of serous membranes, inflammatory redness and hemorrhage in parts of the intestines, and parenchymatous swelling of the liver and kidneys. In no case was there suppuration at the point of inoculation. In the spleen, mesenteric glands, liver, kidneys, and Peyer's patches, the bacillus could be detected. However, the abundance of the bacilli did not correspond with the extent of the macroscopic changes. From these experiments, Frankel and Simmonds concluded that they had successfully transmitted typhoid fever to these animals.

Independently of the above, Di Vesta inoculated, with fatal results, rabbits and guinea-pigs. The lesions were not so marked as those found by the Hamburg investigators. Later, A. Frankel²⁶ inoculated guinea-pigs with the Eberth germ after the manner employed by Nicati and Rietsch in their experiments with the cholera bacillus, and which consists in introducing the germ directly into the duodenum, either with or without ligature of the bile duct. Of the fourteen animals thus treated, seven died. The anatomical changes observed were similar to those found by E. Frankel and Simmonds.

Seitz,²⁷ employing Koch's method for pro-