

undoubtedly to be associated with the diphtheritic process, viz.—the chains of micrococci and the single bacillus first observed by Klebs. The former of these were always found in the cases where a distinct loss of substance had taken place, not only on the surface, but also pushing their way into the tissues beneath, and so to the lymph glands and the internal organs.

Having thus established the fact that these two varieties are commonly associated with the local changes in diphtheria, Dr. Loeffler proceeded to verify and expand his observations by means of cultivation and infection of animals. With the cultivated specimens of the chain-forming micrococcus, the results of infection were for the most part negative, and the author arrived at the conclusion that their presence must be regarded as only an occasional accompaniment of the disease, and not as an active element in its production. With the cultivations of the bacillus, however, the results were more decided. By successive cultivations he effectually isolated them and obtained them, free from other bacteria, in a fluid, consisting of a mixture of three-parts of calf or sheep's blood serum, and one part of neutralised veal-broth, to which was added 1 per cent. of peptone, 1 per cent. of grape sugar, and one half per cent. of common salt. The bacilli were motionless, staining rapidly and deeply in methyl blue. Some were straight and slightly bent, their average length being about equal to that of the tubercle bacillus, though somewhat wider transversely. A dark deeply-strained spot at one end of the rod was observed by Klebs, and thought to represent a spore. Dr. Loeffler, however, who also observed it, failed to find any sufficient evidence of this. The results obtained by infection experiments were remarkable. Although mice and rats appeared to be unaffected by the bacilli, he found that guinea-pigs were very

powerfully attacked; distinct false membranes were, in many cases, formed about the seat of puncture, profound disturbance of the internal organs being induced by the poison. Inflammatory œdema of the subcutaneous tissue, local hæmorrhage and general serious effusion were found in the majority of cases. No bacilli, however, could be detected in any other part than the immediate seat of inoculation. These experiments place the fact beyond doubt that the fatal affection of the internal organs is due, not to the local action of the bacilli circulating within them, but to the influence of some poison, probably set up by the bacilli at the primary point of infection.

Upon rabbits the effects of inoculation although present, were less marked. In pigeons, a very distinct membrane was produced about the seat of puncture, whether in the breast or in the trachea itself. The bacilli introduced through the mouth into the unwounded larynx produced no effect whatever. Similar results were obtained with like experiments on fowls. Some curious phenomena were observed in the cases of two pigeons and one fowl, in which an apparent diphtheritic paralysis had been induced. In two cases there were found abundant deposits of uric acid (which, by the action of methyl blue, were stained a bright red), and these had evidently set up an arthritis of several joints, whilst in the third a myxomatous tumour was found pressing on the spinal cord. Dr. Loeffler's paper is concluded by some observations upon diphtheria in pigeons and in calves. The main practical point which comes to the front as the result of his investigations is this, that the diphtheritic process is essentially local in its early stages, and that the poison which exercises its disastrous influence upon the body generally, is developed at the original seat of attack. Hence the paramount necessity of isolation and of disinfection of all discharges