

in clumps in the spaces between the fibrin, and are usually most numerous in the superficial part of the membrane. The bacteria stain very well by Gram's method. The membrane in fowls, however, consists almost entirely of pus cells, some granular masses, debris of epithelial cells (especially the swollen nuclei of these), and bacteria; and the micro-organisms which stain by Gram's method are seldom found in it.

This year we have succeeded in isolating certain bacteria from diseased birds, and producing the typical disease in healthy birds by the injection of these bacteria.

Our final results and successes were obtained by using pigeons in order to increase the virulence of the causal organisms. Chronic diseases, of which we have an excellent example in fowl diphtheria, are notoriously hard to reproduce by the inoculation of healthy animals, because in most cases of sickness there must be not only the causal organism, but a lowering of the vital forces; and, to get over the difficulty, we used pigeons which are easily infected, to increase the virulence of the causal organisms and thereby assist in the infection of hens. In this way we produced roup in hens at pleasure by inoculation with the roup bacillus taken from roupy pigeons. The roup bacillus tends to penetrate the deeper layers of the mucous membranes or sub-mucous tissues. Hence cultures made from swabs taken from false membranes very rarely contain the roup bacillus, because the bacilli are retained in the depths of the tissue.

The roup bacillus (which we have named *Bacillus cacosmus*) is especially difficult to isolate in cases in which the bird has had the disease for a length of time, as the tumors and false membranes contain very many other kinds of bacteria in large numbers. In our experiments, even when roup was produced in healthy fowls by the inoculation of pure cultures of the "roup bacillus," the mucous discharge from the very beginning contained many different kinds of bacteria. The roup germs seem capable of remaining in a sort of dormant condition in the depths of the tissues for a very long time,—so long that the fowls sometimes appear convalescent; but suddenly, when the constitution is weakened by a cold or other causes, the roup germs become active, and the diphtheria symptoms reappear.

We have found that roup, with all its varying symptoms, can be produced also by the inoculation of healthy hens with the well-known *Bacillus pyocyaneus*, or green pus germ, which we have frequently isolated from roupy birds. Hence, it would seem that roup is simply a complex suppurative process, but different from ordinary forms of suppuration. The pus in fowls ap-