favorable prognosis. It should be stated, however, at this point, that the diphtheria of pigeons appears to be unlike that of the human species.

But now we come to a serious question. From the time that Lœffler first called attention to his bacillus to the present moment, all prominent bacteriologists have found bacilli in various situa tions that were morphologically similar to the Lœffler bacillus, but non-pathogenic. The Paris observers, Roux and Yersin, found this bacillus 15 times in 45 children, that did not have diphtheria, 33%. Among 59 healthy children in a village school, they also found them 26 times in 44 examinations, 59%; in five out of seven cases of measles, 71%.

In 1891 Abbott examined 53 patients with ordinary catarrhal affections of the upper air passages. In 49 he found ordinary bacteria, chiefly the pyogenic micrococci. In four, or 7.5%, he found the non-pathogenic bacillus. But Park in 159 cases appears to have found it only once.

However, the existence of a non-pathogenic bacillus is now generally admitted, but, as will have been noted, American workers have found it so infrequently, that (here at least) it has not been a very disturbing factor in the diagnoses. Now if, as I have said, we should expect to find it in from 75 to 95%, we should also expect it to be absent sometimes, if the report of Tecenas de Montcel* is confirmed, for in 50 cases of true diphtheria he found the bacillus disappeared in 6 or 12%, after the second or third examination.

I cannot here take up a further discussion of the non-pathogenic bacillus, except to say, that in respect to cultures in suitable media, it has a similar growth to the Lœffler bacillus, though the latter develops in 12 hours in the incubator, while the non-pathogenic form takes from 24 to 72 hours. Other differences have been given, but the general impression is, that the differences between the two are in *degree* rather than in *kind*. On the other hand inoculations of the cultures of non-pathogenic bacilli produce no result, unless there is an admixture with other pathogenic microzymes.

Inoculations should be practiced, however, on susceptible animals, of which kittens, puppies and chickens stand in the first rank—and the trachea, duly irritated, should be the point of election. For we have good reason to believe that these lower animals have the same sort of diphtheria as the human species, and that the disease can be contracted from them directly.

But now we are to take up a still more practical phase of the matter. About the time that Lœffler published his earliest views on the bacillus of diphtheria, Dr. Theobald Smith† in conjunction with Dr. Salmon, of Washington, following somewhat in the line of work inaugurated by Gautier, of France, and Selmi, of Bologna, found in the hog cholera virus, not only a special microphyte, but also a peculiar substance elaborated by it, and capable of producing the disease. I had myself anticipated (in my own mind) this discovery, by an experiment conducted as early as 1876 (Mch. 28). In conjunction with Drs. Frank P. Foster, W. F. Cushman, and Wm. H. Lawrence, I had assisted in the inoculation of a heifer with pure vaccine lymph, intimately intermixed with salcylic acid, in the strength of 1 to 250, a strength sufficient to destroy the activity of all bacteria in the mixture. But, notwithstanding this, five pocks appeared in April 4, while on the other hand two out of four of the controlling experiments made with pure lymph on the same animal were failures.‡ Hence in this case the poison could not have resided in any ordinary bacterium.

Now Hankin,§ in 1889, while engaged in the study of anthrax had obtained an albuminoid substance which, inoculated upon susceptible animals, protected them from disease. And in the diphtheritic virus there appears to be an analagous substance, which quickly decomposes and is destroyed at a temperature of about 50 C. It is also insoluble in alcohol. If concentrated and dropped into absolute alcohol, to which a little acetic acid has been added, there will be thrown down a greyish-white flakey deposit, which is soluble in water, but is precipitated again by alcohol. After this precipitate has been dried in a vacuum at 70 C. it forms a snow-white amorphous mass. This substance is now classed as a toxal-bumin. It appears to be derived from the bacteria, though some hold to the idea (without reason, I think,) that it comes

*Tecenas de Montcel, *Prov. Med.*, 21, 1893.

†Smith, Proceedings of the Biol. Soc. of Wash., Vol. III, 1884-6.

‡Curtis & Satterthwaite, Loc. Cit.

§Hankin, *Brit. Med. Jl.*, I. p. 810; *Centralbl. f. Bakt.*, 6, 1889.