

ly indicated a severe type of the disease; smaller bacilli, a mild form; while smaller bacilli in conjunction with certain streptococci, or chain-bacteria, might indicate a very virulent type.

A recent New York worker* of large experience in bacteriological work, who has furnished us with the latest information on this point, says that out of 159 cases examined, he found the Loeffler bacillus in 54, or 34%. From these three sources, then, we get an approximate idea of the present value of the bed-side test, as viewed from the standpoint of the bacteriologist. He would be apt to find the bacillus in from 34% to 78% of the cases clinically named as diphtheritic. This view tallies with that held by my friend, Dr. R. H. Fitz,† of the Harvard Medical School, and it is evidently a safe and conservative ground to occupy at present.

At the same time my friends, Drs. M. P. Jacobi,† Welch,† of Baltimore, and Theobald Smith,† of Washington, write me that they expect to find the Loeffler bacillus in at least 75% of true diphtheria, while Dr. L. Emmett Holt tells me that he believes "the bacillus will be found in 95% of the cases of true diphtheria," and adds, "in my own hospital cases, it has been found almost invariably at the first examination."

So that a goodly proportion of our ablest men confidently expect to find the Loeffler bacillus in from 75 to 95% of their cases.

But in view of what will appear hereafter, and the recently observed fact that the bacillus will sometimes suddenly disappear out of a membrane, a variation in frequency even between 34 and 95% is quite intelligible; nor does it in any way weaken the position taken by Loeffler that it is, primarily, the cause of true diphtheria; though it greatly lessens its value as a diagnostic criterion in any one case. Some points in the life history of the bacillus are now to be noted. At a temperature of 37 C. it will retain its virulence for 7 weeks; in dried membranes it will live for 9 to 14 weeks: it may be potent even if taken from the throat 3 weeks after the cessation of the fever; at 18 to 20 C.; it will grow in some media; at 20 C. in milk. In agar it will survive 7 months; in glycerine it

has lived 331 days (Loeffler), and, according to Abel,‡ much longer.

And now as to a newer phase of the bacillus matter: It was at first held that the Loeffler bacillus did not penetrate the tissues except, perhaps, in the immediate vicinity of the membrane. During the year that has just passed, this view has been overthrown. It is true, Davier§ had noted bacilli in the lungs in 1885, and Martin,|| had seen them in a case of bronchial pneumonia of diphtheritic origin, but Frosch¶ last year found them in internal organs 10 times in 15 examinations.

Now American workers* have established this point conclusively, Abbott and Ghriskey finding the characteristic bacilli in leucocytes aggregated together in and about the mesentery of guinea pigs killed by inoculation over the belly and testicles with pure cultures; Flexner* has been able to confirm *Davier and *Martin's statements; and Howard even found the Loeffler bacilli in and about the mitral and aortic valves of a man who died of heart failure, in connection with ulcerative endocarditis, as I have already stated.

Before concluding this part of our topic which relates to the etiological relation between bacteria and diphtheria, it will be proper to allude to the problematic connection between certain other microzymes and diphtheria. And these are the so-called pyogenic strepto-cocci and staphylo-cocci. Both of these forms are found in the mouths of healthy people, but they appear to be unusually common in the anginas of measles and scarlet fever. Now there is an idea that the contemporaneous association of one or the other of these microzymes with attenuated Loeffler bacilli will produce a virulent form of the disease, that the bacillus alone could not evoke; and the Italian observer Concetti† has gone even so far as to say that though he could produce genuine diphtheria in pigeons, at least, by the inoculation of the Loeffler bacillus, he could do the same by inoculating the pneumo-coccus, strepto-coccus and staphylo-coccus; though, on the whole, the latter gave a more

‡Abel, *Centralb. f. Bakteriolog.*, 23, 1893.

§Davier, *Thèse de Paris*, 1885.

||Martin, *Loc. Cit.*

¶Frosch, *Zeitschr. für Hygien.*, III., p. 49, 1893.

*John Hopkins' Bull., 30, 1093.

†Concetti, *Centralbl. f. Bakt.*, 19, 1893.

*Park, *Med. Rec.* July, 1892.

†As communicated to me by letter.