

has led to scientific misconceptions. Throughout the recent literature we find the terms "pure culture" and "mixed infection" used haphazard. These terms lack scientific definiteness. No one knows exactly what "mixed infection" is, and there is reason to doubt if a "pure infection" ever occurs. Nothing can be more self-evident than that the question of mixed or pure infection cannot be solved by one culture-medium alone, especially if that medium is especially devised to favor the growth of others. To use Loeffler's culture-serum for diagnostic purposes is highly satisfactory; to use it as a basis of scientific differentiation is clearly irrational.

Silberschmidt examined 91 cases of diphtheria with Loeffler's serum, bouillon, and glycerol-agar, and all but one showed the presence of streptococci or staphylococci. Those who work with glycerol-agar alone will sometimes fail to detect the Loeffler bacillus when it is present in the throat; and those who work with Loeffler's serum alone will fail to find other germs that could be demonstrated by other means.

Bernheim has shown that if streptococci and Klebs-Loeffler bacilli are inoculated in the same tube, the streptococci are retarded in development. Bernheim, by the use of glucose-bouillon and Loeffler's serum, demonstrated that none of his cases presented "pure infection."

In a recent examination of over 120 throat cases, I failed to find any that might be considered a "pure infection."

The term "mixed infection" is far from standing for anything definite. If every case in which streptococci or staphylococci are present at the site of infection is a case of mixed infection, then cases of pure diphtheria are rare indeed. The predominance of one germ over another cannot be made the basis of scientific discrimination, especially if only one culture-medium is used. In follicular tonsillitis, staphylococci and streptococci are present. In a case of "mixed diphtheria" we should expect in addition to the symptoms due to the Klebs-Loeffler bacillus, those due to the streptococcus and the staphylococcus but this is notoriously untrue, as the symptoms (fever, headache, backache) of follicular tonsillitis are usually more severe than those of diphtheria.

What is "mixed infection," and how can we tell that the cocci present in a diphtheric throat are playing any rôle in the disease? Certainly, to talk of the comparative value of the antitoxine in cases of pure and in those of mixed infection, is thoroughly irrational, as we do not know what is pure infection and what is mixed infection. A prognosis cannot be made from the bacteriologic examination, as some cases die in which staphylococci predominate, others in

which Klebs-Loeffler bacilli predominate. It may be interesting to note here that Bernheim has shown that if animals are inoculated with the filtrate of cultures of diphtheria-bacilli and streptococci, the disease runs a more violent and rapid course; if, however, a filtrate of cultures of staphylococci is used in large quantity, the disease is milder than in cases of pure diphtheria.

The question of deciding the infectiousness of convalescent patients is not so easy as was supposed. When a pharyngeal culture fails to reveal the presence of virulent Klebs-Loeffler bacilli, the patient is usually dismissed as no longer dangerous. Tezenas du Montcel showed that when there is a nasal discharge, the pharyngeal culture may repeatedly prove negative, and still virulent bacilli may persist in the nose from one to eight weeks. Sevestre et Méry examined 18 cases from day to day in 1893. In one case, non-virulent bacilli persisted in the pharynx several days; one month later, the bacilli were found to have regained virulence, and a sister of the patient was seized with the disease. In two other cases virulent bacilli were found fifteen days after recovery, although intermediate cultures revealed non-virulent bacilli. In two other cases pharyngeal cultures were negative, though nasal cultures showed virulent bacilli, in one case up to the forty-ninth day. These researches prove that non-virulent bacilli may regain their virulence, and that an existing nasal discharge should not be overlooked in declaring convalescents contagion-free.

The relation of albuminuria and nephritis to diphtheria is another subject that requires clearing up. All writers have noticed the great frequency of albuminuria in diphtheria, and most of them have used albuminuria and nephritis as interchangeable terms. Nothing has been made more clear by recent study than that in a large proportion of cases the albuminuria of diphtheria does not depend on nephritis. We are not justified in diagnosing nephritis unless we find epithelium, casts, or blood in the urine. Anyone who takes the trouble to examine diphtheric urine microscopically, will be surprised to find how often albuminuria may exist without the presence of renal elements in the urine. Fischer reports 141 cases of albuminuria without casts. I have myself frequently examined the albuminous urine of diphtherics without finding evidence of nephritis. Schroeder reports 44 cases of albuminuria, only 6 of which presented evidence of nephritis. *The Stadt Physikat of Trieste* reports 105 cases of diphtheria; 75 of these had albuminuria, but only one-half of these had casts in the urine. This rather startling clinical evidence is made more striking by *post-mortem* observations. Goodall reports 30