

In chronic phthisis there will usually not be much difficulty. This case in time presents a clinical picture of ulcerative phthisis. The sputum should always be examined. It can often be found in the vomited portions of expectoration and the tubercle bacilli discovered. (The presence of these bacilli in the sputum is an infallible indication of tuberculosis.) In the acute forms it appears to be impossible to say whether the process is tuberculous or not; we may surmise, but there is no certainty early in the disease.

Osler's *Practice of Medicine* says: "In many instances the decision whether an existing bronchopneumonia is simple or tuberculous cannot be made as the circumstances under which the disease occurs, the mode of onset and the physical signs may be identical, and it is well to emphasize the fact that there are many cases of bronchopneumonia in children which time alone enables us to distinguish from tuberculosis."

BACTERIOLOGICAL NOTES.

MICROSCOPICAL DIAGNOSIS OF TUBERCULOSIS.

BY E. B. SHUTTLEWORTH.

The examination of tuberculous sputum is an operation which every physician has now to frequently perform. It is not always, however, that the necessary details have been practically acquired, and, from the enquiries made of the writer, he is led to believe that a few remarks on the subject may not be unacceptable to young or inexperienced practitioners.

The demonstration of tubercle bacilli in sputum, without having recourse to staining, is a matter of some difficulty, and, for diagnostic purposes, may be at once dismissed. Of the twenty or more methods which have been recommended for staining, it may be said that, in experienced hands, and with proper attention to all the prescribed conditions, they afford fairly good results, but as a matter of fact, being based on the same principle, they may be regarded as modifications of one general method.

It may be necessary to explain this. The bacilli of tuberculosis and leprosy, and the spores of micro-organisms generally, seem to have a thicker and more resistant cell-wall than other forms, or are in some way differently constituted

and are not readily penetrated by ordinary stains. If by heat, or some other agent, a stain can be made to enter, it is firmly held, and will withstand attempts at withdrawal, or bleaching, which are quite effective when applied to other organisms. In other words the tubercle bacillus is difficult to stain, and, when stained, is difficult to decolorize. This affords a means of differentiation which has proved exceedingly valuable. The requirements are: a stain sufficiently powerful to penetrate the bacilli; a bleacher by which the surrounding tissue, mucus, or accompanying organisms may be deprived of color; and, to make a handsome specimen, and perhaps assist in the differentiation, a second stain, to tincture the decolorized part, so that the bacilli may appear more distinctly by contrast with the back-ground. This test, is not, of course, absolutely necessary, though it is probably easier to distinguish colored objects, say red, on a blue background, than when the latter is quite colorless.

Among the best primary stains are fuchsin and methyl violet; the penetrating power is imparted by the addition of alkali, aniline oil, or carbolic acid; and, among the decolorizers may be ranked the mineral acids. Of the so-called contrast stains one may choose blue or green for red, and brown or green for violet. Of these materials the preference is with fuchsin and carbolic acid = Ziehl's carbol-fuchsin; hydrochloric acid and alcohol for a bleacher; and methylene blue for contrast.

Carbol-fuchsin solution can be easily made by dissolving ten grains of fuchsin in two fl. drachms of alcohol, and adding to this two fl. ounces of a saturated aqueous solution of carbolic acid. If this is not clear, a few drops more alcohol may be used. Another ready way to make the stain is to add to the aqueous carbolic acid solution as much of a saturated alcoholic solution of fuchsin as may be necessary to give a bronzed appearance to a drop of the mixture which has been allowed to remain for a few moments on a piece of glass. The decolorizer consists of a three per cent. alcoholic solution of hydrochloric acid. The contrast stain is a saturated aqueous solution of methylene blue.

Care should be exercised in the selection of sputum for examination. That expectorated early in the morning is best. A little may be poured on a piece of black glass (or clear glass on a black surface)