ON THE EXAMINATION OF THE FÆCES IN THE DIAGNOSIS OF PHTHISIS PULMONALIS.

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MANY methods have been devised as adjuncts to clinical observation in the diagnosis of pulmonary tuberculosis. Leaving aside the use of the Röntgen rays and the method of cyto-diagnosis which at one time had vogue in France, the procedures may be divided into two groups: (1) those which depend on the observation of the effects of various extracts of the tubercle bacillus upon the patient; and (2) those which depend on laboratory observations upon various materials (sputum, blood, fæces, etc.). Among those in the former group are the tuberculin test, the Von Pirquet, Moro's cutaneous and Calmette's ophthalmic reactions. Their uses are limited. It is the methods in the latter group that lend themselves more readily to general use.

In pulmonary tuberculosis the materials on which observations may be made are (*a*) sputum, (*b*) blood, (*c*) urine, (*d*) fæces.

Sputum.—It is universally recognized that the microscopical examination of stained films of the patient's sputum is of paramount importance, because of the high percentage of cases of active phthisis in which the bacilli are demonstrable in the sputum, the simplicity of the technique, and the facility with which the material may be collected and dealt with.

Rivalta's reaction in sputum, which depends on the coagulation of albumen in the presence of very dilute solutions of sodium carbonate and acetic acid, is said by Casali (1) to be a reliable diagnostic test for pulmonary tuberculosis.

Blood.—Lipmann (2) describes the treatment of blood with antiformin and centrifugalization. By this method he demonstrated tubercle bacilli in the blood in 53% of advanced cases and in 33% of second stage cases, but he was unable to discover the bacillus in the blood of early cases.

Rosenberger (3) claims to demonstrate tubercle bacilli in even the early stages of phthisis. Hunt, Ravenal and Smith have obtained similar results, but the examination of the blood for tubercle bacilli

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is a tedious process, and the results obtained do not seem to justify the labour involved. The same may be said of the method whereby the opsonic index of the blood-serum of the patient is estimated, of the agglutination method, where the patient's blood-serum is put up against an emulsion of tubercle bacilli, of Emery's and Bordet and Gengou's methods of fixation of complement as in the Wassermann reaction for syphilis, and of the Arneth count.

Urine.—Tubercle bacilli are not found in the urine in cases of pulmonary tuberculosis unless there is infection of the genito-urinary tract. Ehrlich's diazo-reaction is not invariably given by the urine in tuberculosis. As it occurs in several other diseases it is not of diagnostic importance.

Fæces.—Tubercle bacilli are present in the fæces in all cases of pulmonary tuberculosis in which a tubercle-infected sputum is present. This dogmatic statement may be made on theoretical considerations alone; but the practical point is: Of what value are the fæces as a material for examination for the tubercle bacillus in pulmonary tuberculosis, especially when sputa are unobtainable?

Perusal of the literature on the subject reveals a wide divergence of opinion.

Sergent and Durand (4), in their investigations of the stools for tubercle bacilli, established the important fact that in non-tuberculous patients no acid-fast bacilli were found in the fæces.

Bigger (5) states that it is practically useless to examine the fæces for tubercle bacilli by staining films, and asserts that the only reliable method of demonstrating their presence is to treat the fæcal material with 4% caustic soda and to inject the centrifuged deposit into a guinea-pig.

On the other hand, Todd and Sanford (6), discussing the stools as a material for examination in tuberculosis, write: "Success in the search (for the tubercle bacillus) will depend largely upon careful selection of the portion examined. A random search will almost surely fail. Whitish or greyish flakes of mucus or blood-stained or purulent particles should be spread upon slides or covers and stained by the method of Ziehl-Neelsen. . . . With young children, who swallow all their sputum, an examination of the stool for tubercle bacilli may be the means of diagnosing tuberculosis of the lung."

In mental hospital practice the majority of cases suspected of pulmonary tuberculosis cannot be taught to expectorate. This fact precludes the most valuable of all the laboratory investigations in pulmonary tuberculosis, *viz.*, examination of sputum for tubercle bacilli. The uncertainty of blood examinations, the uselessness of urine examinations, and the lack of unanimity regarding the value

of examination of the fæces, suggested that useful information might be obtained by examining the fæces (and the sputum when available) in all cases of suspected pulmonary tuberculosis at Leavesden Mental Hospital.

Various methods of examining the stools for *B. tuberculosis* came under review, and it was decided to examine specimens in two ways, employing in one a method of concentration and in the other the method of the direct smear.

Technique.—(*a*) Examination of direct smear from stool: A loopful of fæces is spread on a slide (emulsifying with a loopful of normal saline in the case of constipated stools), allowed to dry and fixed by heat.

(*b*) Examination by ligroin method: The fæces are emulsified with normal saline solution, filtered through gauze into a centrifuge tube, and 2 c.c. of a mixture of equal parts of acetic ether and ligroin added. The tube is then thoroughly agitated, and centrifuged for five minutes. The deposit is spread on a slide, allowed to dry and fixed by heat. This is a modification of the method introduced by Lange and Nitsche. (7) The slides are stained with warm carbol-fuchsin solution for 10 minutes, washed, decolorized in 25% sulphuric acid solution for 10 minutes (longer if required), washed, decolorized by washing in absolute alcohol, washed in water and lightly counterstained with an aqueous solution of methylene blue.

The material selected for examination was taken from 53 cases, in whom the clinical features suggested the advisability of excluding a possible diagnosis of tuberculosis. Positive findings were obtained in 22 of these cases, the remaining 31 giving negative results.

Low-grade imbeciles and idiots often present febrile symptoms lasting some days or weeks, and in such cases an exact diagnosis cannot at the time be made. In some the symptoms rapidly subside; in others unequivocal signs of pulmonary disease develop in the course of a few weeks, and the fact that in this series examination of the fæces gave negative results in 31 cases cannot be interpreted as indicating failure of the test to confirm the presence of a tuberculous infection.

It would probably be safe to conclude that a considerable proportion of the 31 negatives were from patients who did not suffer from tuberculosis, and that in certain others the pulmonary infection was so slight that destruction of lung-tissue with consequent liberation of tubercle bacilli had not begun.

In the remaining 22 cases tubercle bacilli were present in the sputum, the fæces, or both.

Table of Positive Results.

No.	Site of suspected lesion.*	Sputum.*	Fæces.		Remarks.*
			Direct.	Ligroin.	
1	L.	+	+	+	D.C.P.M.
2	L.	O	+	+	D.C.P.M.
3	L.	O	+	+	D.C.P.M.
4	L. & I.	+	+	+	D.C.P.M.
5	L.	+	+	+	Died. No P.M.
6	L.	O	+	+	Died. No P.M.
7	L.	+	+	+	
8	L	+	+	+	
9	L.	+	+	+	
10	L.	O	+	+	
11	L.	O	+	+	
12	L.	+	+	+	
13	L.	+	+	+	
14	L. & I.	O	+	+	
15	L.	+	—	—	
16	L.	+	+	+	
17	L.	+	+	+	
18	L.	O	+	+	
19	L.	+	+	+	
20	L.	+	+	+	
21	L.	+	+	+	
22	L.	O	—	+	

* L. = Lungs. I. = Intestines. O. = None obtainable.
D.C.P.M. = Diagnosis confirmed at *post-mortem*.

The cases with positive sputa numbered 14, and in 13 of these the bacillus was found in the fæces. In the remaining case, with tubercle bacilli in the sputum, examination of the fæces proved negative. On the other hand, no cases were obtained with a negative sputum and positive fæces.

In eight cases no sputum was available, and it was here that the examination of the fæces showed its value, for in each case tubercle bacilli were found in the fæces.

In one case no bacilli were detected, but at autopsy open pulmonary lesions were found.

Of 21 cases in which bacilli were found, using the ligroin method, 20 showed them on direct smear. The ligroin method seems, therefore, to have little advantage over the method of the direct smear. By comparing many fields it has been found that concentration by the ligroin-acetic ether method increases the frequency of the bacilli in the preparation as compared with the direct smear in the proportion 19 to 15.

From these considerations one may conclude, therefore, that it is of value to proceed at once with the examination of the fæces

by the method of the direct smear. In the event of a negative result the ligroin method should be tried. Positive results with either method are conclusive, and if tuberculosis of the gut can be excluded on clinical grounds, the finding of the tubercle bacillus in the fæces is an important factor in confirming a clinical diagnosis of pulmonary tuberculosis.

In conclusion I must acknowledge my indebtedness to staff nurse W. Ashworth for his painstaking preparation of many films and slides.

References.—(1) Casali, *Rif. Med.*, July 27, 1912.—(2) Lipmann, *Münch. med. Woch.*, October 26, 1908.—(3) Rosenberger, *Amer. Journ. Med. Sci.*, February, 1909.—(4) Sergent and Durand, *Médécine*, Paris, 1923, iv, p. 603. (5) Bigger, *Handbook of Bacteriology*, 1925.—(6) Todd and Sanford, *Clinical Diagnosis by Laboratory Methods*, 6th Ed., 1927.—(7) Lange and Nitsche, *Deutsche med. Woch.*, 1909, xxxv, p. 435.