

ORIGINAL PAPERS.

THE CHEMICAL COMPOSITION OF TUBERCULOUS EFFUSIONS.

By OSKAR C. GRUNER,

M.D.,

Clinical Pathologist, Leeds General Infirmary; Author of
"Studies in Puncture Fluids."

JUST as the cytological characters of tuberculous effusions are frequently so distinctive that they may be employed as a basis for clinical diagnosis, so there are certain facts about the chemical characters of this class of effusion which are deserving of notice from the point of view of clinical diagnosis or prognosis.

In order to present an account of the chemical composition of these tuberculous fluids within the space at disposal, it will be necessary to merely enumerate the various points, without entering, at present, into as full a commentary on the facts as is desirable.

1. The *Specific Gravity* of an exudation is (as is well known) usually above 1020, and tuberculous effusions in the later stages agree with exudates in this respect. However, exceptions have frequently been met with, especially in early stages of effusion, when the specific gravity varies from 1014 to 1017.

2. The *Total Proteid* is best ascertained by direct weighing. The precautions necessary in preparing a complete coagulation of the proteid have been described elsewhere.¹ The results are fairly decisive, and Engländer's researches may be referred to, since he has made very extensive observations (1908). It was found that tuberculous effusions contain a *minimum* of 3 per cent. of proteid, and that the older the condition, the higher the percentage of proteid present. In basing a diagnosis of tubercle on the fact that the proteid percentage is greater than 3, one must decide, on clinical grounds, that there is no possibility of carcinomatosis. The most reliable results, in my experience, obtain in the case of peritoneal effusions; whereas in pleural effusions one is apt to have a low percentage of proteid even in tuberculous cases (early stage). The error is, however, avoided by following a golden rule: Examine the

¹ See the author's work on "Studies in Puncture Fluids," pp. 12, 20. London: H. K. Lewis. 1908.

fluid on at least two successive dates, and contrast the chemical characters. This, of course, applies to doubtful cases.

3. *Globulin* is usually only present in small amount, especially so in the case of peritoneal tubercle.

4. *Albumoses*.—These vary in different cases; deutoalbumose β is frequently present, but as a rule the presence of the various albumoses is in favour either of cirrhosis of the liver or of carcinoma. *Peptones* are always absent.

5. *Leucin*, *tyrosin*, and other *amido-acids* must not be expected. They are invariably absent as long as possible autolytic processes are excluded.

6. *Urea* is frequently present in trace, but *purins* are usually absent.

7. *Mucins* are more frequently found in pleural (tuberculous) than in peritoneal effusions.

8. *Cholesterin* was found in one case of longer standing. *Lecithin* has not been found in any of the specimens examined.

9. *Colour Reactions*.—The Molisch and tryptophane reactions have been systematically applied to a long series of fluids of all kinds, and some important conclusions may now be offered. The deductions to be made depend, however, on the particular method of carrying out the tests, and a description of this must be reserved for a future occasion. One may meanwhile remark that pleural tuberculous effusions almost without exception give a "negative" Molisch reaction and an instant, and intense, tryptophane reaction.

10. *Rivalta's Test* is a simple one. A 100 c.c. measure is filled with distilled water, two drops of glacial acetic acid added, and well mixed with the water. A single drop of the fluid to be tested is allowed to fall on the acidulated water by means of a glass rod, and a positive result is indicated by a trailing white cloud which increases as the drop descends. This reaction must be present before one can affirm an effusion to be tuberculous, though it is not specific for tubercle. A negative result means no tubercle.

11. *Müller's Test* consists in adding a single drop of the fluid to a little Millon's reagent in a watchglass. If tuberculous, the drop of fluid will become a firm pellicle, which does not readily break up with a platinum wire, and does not stain the reagent. Experience has shown that in many cases the test answers, although it was originally designed for the examination of *pūs*. There are four conditions to be allowed for: (1) There must be no fibrin; (2) there must be no blood or synovia; (3) a time-limit must not be given; (4) no other organism than tubercle must be present. The explanation of the reaction lies in the fact that tuberculous fluids contain no peptonizing ferment which will destroy the proteid of the fluid. The deposit from these fluids consists mainly of the non-proteolytic ferment-bearing lymphocytes.

12. *The Müller-Kolaczek's Biological Reaction* is based on absence of proteolytic ferment from these fluids. Without entering into the details of the test we may point out that proteolysis can occur in purely tuberculous pus—(1) if iodoform has been used for treatment ; (2) if there is a mixed infection ; or (3) both conditions obtain ; (4) anti-ferment action has to be remembered as a possible contingency. The last point is under investigation.

13. *Drug Tests*.—It has been found by Landolfi that administration of sodium iodide causes no reappearance of the drug in the effusion in cases of tubercle.

14. *Inorganic Constituents*.—The concentration of *chlorides* varies from 0.024 to 0.087, the higher value being met with in a case of long standing. The content in chlorides is decidedly higher in peritoneal tubercle than in pleural. *Phosphates* are usually present in only very small amount.

15. The total concentration of *Electrolytes* varies from 0.179 to 0.343, with an average of 0.236 for peritoneal fluids, and 0.299 for pleural. The detailed significance of these observations is considerable, and has been dealt with elsewhere. It is, however, worth calling attention to the fact that in *early* stages of tubercle the "salt" ratio may remain below unity.

16. The *Osmotic Concentration* is usually rather higher than normal. It varies between 0.297 and 0.313, when it approaches that of blood.

The above condensed notes will, it is hoped, be of service to those who propose making excursions into this new and promising field of research.

SANITARY TENEMENTS FOR TUBERCULOUS FAMILIES.

By HENRY L. SHIVELY,

M.D.,

Physician in Charge, Presbyterian Hospital Tuberculosis Clinic, and Visiting
Physician to St. Joseph's Hospital for Consumptives, New York.

It has long been felt by thoughtful physicians, who come much in contact with tuberculous disease in the poorer classes of society, that for any lasting benefit to accrue to them the problem must be more vigorously attacked in the home itself. Valuable as are sanatoria in the treatment of tuberculosis, their greatest usefulness will probably always consist in the care of the well-to-do patient, who can put hygienic measures into practice, and continue after leaving the sana-