The Boston Medical and Surgical Journal

TABLE OF CONTENTS

February 7, 1918

ADDRESS	
LABORATORY METHODS IN TUBERCULOSIS. <i>By G. Benjamin White, Ph.D., Otisville, N. Y.</i>	175
ORIGINAL ARTICLES	
THE PROBLEM OF PHYSICAL SELECTION APPLIED TO LARGE NUMBERS OF APPLICANTS. <i>By Andrew F. Downing, M.D., Cambridge, Mass.</i>	177
RE-EDUCATING GERMAN WAR CRIPPLES AT DÜSSELDORF. <i>By Douglas C. McMurtie, New York</i>	182
PHYSICAL SELECTION IN ITS RELATION TO HEART AND LUNG CONDITIONS. <i>By M. J. Cronin, M.D., Boston</i>	187
A STUDY OF THE KIDNEY FUNCTION IN SENILITY. <i>By W. C. Rappleye, A.B., Foxboro, Mass.</i>	191
CLINICAL DEPARTMENT	
A PSYCHOPATHIC CONSTITUTION RESEMBLING SO-CALLED MORAL INSANITY, AND ITS INTERPRETATION. <i>By J. Victor Haberman, A.B., M.D., S.M.D. (Berlin), New York</i>	194
BOOK REVIEWS	
Radium Therapy in Cancer. <i>By Henry H. Janeway, M.D.</i> ..	197
Diseases of the Chest and Principles of Physical Diagnosis. <i>By George William Norris, M.D., and Henry R. M. Landis, M.D.</i>	197
Manual for Institution Libraries. <i>By Carrie E. Scott</i>	197
United States Naval Medical Bulletin, January, 1918	197
The New System of Gynecology. Edited by Thomas Watts Eden, M.D., and Cuthbert Lockyer, M.D.	198
Clinical Surgical Diagnosis for Students and Practitioners. <i>By Prof. F. de Quervain</i>	198
EDITORIALS	
MOBILIZING THE PROFESSION FOR WAR	199
THE NEEDS OF THE MEDICAL SERVICE	199
WAR RISK INSURANCE	200
MEDICAL NOTES	200
THE MASSACHUSETTS MEDICAL SOCIETY	
OFFICERS OF THE SOCIETY AND OF THE DISTRICT MEDICAL SOCIETIES	208
CORRESPONDENCE	
VESALIUS AND LOUVAIN. <i>Isador H. Coriat, M.D.</i>	210
OBSTETRICS AND THE MEDICAL PROFESSION. <i>Charles Malone, M.D.</i>	210
MISCELLANY	
A PLAN FOR THE CONSCRIPTION OF PHYSICIANS	203
ENGLISH PIONEERS IN NAVAL MEDICINE	206
OCCUPATIONAL DISEASES	207
THE MASSACHUSETTS VENEREAL DISEASE PROGRAM. <i>By Eugene R. Kelley, M.D.</i>	208

Address.

LABORATORY METHODS IN TUBERCULOSIS.*

BY BENJAMIN WHITE, PH.D., OTISVILLE, N.Y.,
Assistant Director, Bacteriological Laboratories, Department of Health, City of New York.

IN spite of the development of laboratory methods during the past ten years, the diagnostician has received little new aid from the laboratory worker in the detection and treatment of tuberculous infections. The one thing most to be desired has been, and still is, some means for differentiating between tuberculous infection and tuberculous disease, or, in other words, a method for determining the presence or absence of activity in a tuberculous lesion. The results of considerable research activity are encouraging, but the fulfilment of this desire still lies in the future.

The bacteriologist has contributed nothing of first importance, but by refining older procedures of finding tubercle bacilli in the excretions and body fluids he has made it possible to detect a greater percentage of positive cases in the examination of such material. The serologist's contributions are promising, but at present are more of academic interest than of practical value.

The diagnostic aid, therefore, which the laboratory can at present furnish must come from the older and well-tried methods; and in order that the laboratory worker may be spared the

* Delivered before the Framingham Medical Club and the Community Health and Tuberculosis Demonstration, Dec. 6, 1917.

error and confusion resulting from the many technical modifications recommended in various textbooks, the following brief review has been prepared:

I. Staining.

1. The Ziehl-Neelsen method is still the most dependable and most widely applicable of staining procedures for tubercle bacilli. The carbolfuchsin solution should be made from basic fuchsin, which can also be obtained in this country under the name of "aniline red." Of the various decolorizing methods advised, 3% hydrochloric acid in 55% alcohol is sufficiently strong and eliminates the danger of over-decolorization.

2. Hermann's stain frequently gives positive results when the Ziehl method fails, and, in addition, may be used by those workers who are color-blind to red.

II. Detection of Tubercle Bacilli.

It should be borne in mind that dead tubercle bacilli stain as well as live forms. Therefore, all glass receptacles used in collecting sputum, urine or other specimens should be previously cleansed with concentrated nitric or sulphuric acid, or in hot sulphuric acid-bichromate solution. Only clean new slides should be used. In order to prevent possible infection to workers, or to preserve specimens which cannot be immediately examined, the sputum may be sterilized by heating in an Arnold sterilizer, or even at 120° C. for 20 minutes in the autoclave. The staining properties of the tubercle bacillus are not appreciably affected.

1. *Sputum.* The direct examination of sputum is adequately described in the textbooks. It is advisable to make smears on slides instead of on cover glasses, because the former give a larger field for search and are less fragile. Where more convenient, the slides may be stained by immersion over-night in carbolfuchsin in the cold instead of by heating for five minutes.

2. *Concentration of Sputum.* All methods recommended are merely modifications of a neglected method of Biedert, published in the eighties. Antiformin is perhaps the most widely used concentrating (or better, dissolving and homogenizing) agent. Where not purchasable, it may be prepared as follows:

Sol. A. Sodium carbonate 15 gms.
Chlorinated lime 8 gms.
Distilled water 100 cc.
Sol. B. Sodium hydrate 15 gms.
Distilled water 100 cc.

Take equal parts of A and B (Rosenau).

- a. To 20 cc. sputum add 65 cc. sterile distilled water and 15 cc. antiformin.
- b. Shake frequently for 1-2 hours until sputum is homogenized, and allow to sediment.
- c. Discard supernatant, pipette sediment into centrifuge tube and centrifugalize.
- d. Discard supernatant, add 0.8% salt solution, mix and centrifugalize. Repeat washing.
- e. Spread sediment on slide, air dry, fix and stain.

The Ellermann-Erlandsen method gives good results and is of particular service when lack of time causes interruption in carrying out the examination. Recently Petroff has recommended a 4% sodium hydrate solution for homogenizing sputum. In the original Biedert method, 0.2% sodium hydrate was used. A 4% solution is more active and apparently does not interfere with the stainability of the tubercle bacillus.

3. *Blood.* The startling announcement in 1908 that tubercle bacilli could be demonstrated in the blood of individuals suffering with incipient tuberculosis raised high hopes of its value as a diagnostic aid, and inspired new investigations. It has since been shown that the bacilli frequently found in the preparations were undoubtedly saprophytic acid-fasts originating in the distilled water employed. While there is no doubt that tubercle bacilli may appear in the blood stream in miliary tuberculosis, and in the agonal stage of pulmonary disease, their presence, as a rule, is so infrequent that a search for tubercle bacilli in the blood for clinical purposes is not recommended.

III. Cultivation.

As is well known, tubercle bacilli, when freshly isolated from sputum, feces or animal organs, grow sparsely, if at all, on ordinary nutrient media, but may be propagated on the various egg media. Petroff has advocated the use of a meat infusion egg medium, to which

gentian violet is added for the purpose of inhibiting the growth of secondary or contaminating bacteria. Brilliant green may be substituted to advantage for the gentian violet, and has the advantage of exerting a more marked restraint on the Gram-negative organisms. Recent experiments by one of the author's assistants would seem to show that the inhibiting action of either dye is, at the best, a slight one, and that pure cultures may be obtained as frequently when the dye is omitted from the formula. Griffith has recently recommended that sputum be shaken for a short time with an equal volume of 10% antiformin, and the resulting sediment planted without the neutralization of the alkali. This simple method has been tried out with success.

IV. Animal Inoculation.

Animal inoculation is still the most reliable and the ultimate test in proving the presence of tubercle bacilli in suspected material. Its disadvantage is the delay incident to the development of the tuberculous infection in the test animal, but if more than one animal is inoculated one may be sacrificed at the end of two or three weeks and early evidence of infection thus obtained. The suspected material may be sedimented or centrifuged if necessary, or treated with antiformin when other bacteria are present. The fluid or emulsified sediment is then injected subcutaneously into the groin.

V. Secondary Organisms.

Bacteria other than the tubercle bacillus may, at times, be responsible for an aggravation of symptoms in the tuberculous, and may also be the cause of lung infections requiring nice discrimination in order to distinguish them from the tuberculous process. In such cases great care must be exercised in the collection and in the washing of the sputum, because the material examined should represent a morbid product of the infected area itself, free from contaminating mouth organisms. An excellent method is described by Avery and Lyall. The continued absence of tubercle bacilli from sputum of patients exhibiting abnormal symptoms or pulmonary physical signs should lead to a thorough study of the bacterial flora present and to a re-examination of the patient in the various postures described by Garvin. By these means bronchiectasis and sub-pulmonic abscesses may be diagnosed. In syphilis and malignant disease of the lungs the bacterial flora tells little of the true condition. There the continued failure to find tubercle bacilli in the presence of abundant physical signs would naturally suggest the employment of the Wassermann reaction and of the x-ray.

VI. Serological Methods.

The content of agglutinins, precipitins, lysins and opsinins in the serum of the tuberculous is either too small or else the antibodies themselves are too elusive to enable us to use the usual sero-

logical methods for diagnosis. These immune substances, with proper technic, can be demonstrated, but when it is remembered that the immune mechanism in tuberculosis is to a large degree cellular, it is not surprising that its humoral manifestation is slight.

The Bordet-Gengou phenomenon has been utilized with a variety of modifications for the purpose of demonstrating a complement-fixing antibody in the serum of the tuberculous, and thus determining the presence and activity of a tuberculous lesion. The literature has been reviewed by Craig, to whose article may be added those by Petroff and Miller. There is no doubt that the method of complement-fixation, when properly carried out, yields positive results in the majority of tuberculous individuals tested. It is far from being the valuable diagnostic aid that the Wassermann test is, it tells little of the extent of the lesion, and it fails in the prime requirement of enabling one to distinguish between a healed or inactive lesion, and an open or active disease process.

It is eagerly to be hoped that this method may be so perfected that it will take its place beside the classic Wassermann reaction as one of the laboratory's greatest contributions to clinical medicine.

Original Articles.

THE PROBLEM OF PHYSICAL SELECTION APPLIED TO LARGE NUMBERS OF APPLICANTS.*

By ANDREW F. DOWNING, M.D., CAMBRIDGE, MASS.,

Physical Examiner, Massachusetts Civil Service Commission; Assistant Physician to Out Patients, Boston Consumptives' Hospital; Late Examiner for Tuberculosis and Cardiovascular Diseases, U. S. Army, Dept. of the North-east.

WITH our declaration of war against Germany and the subsequent passage of the selective draft bill, a difficult problem of physical selection was presented to the medical profession of this country. I speak of it as difficult for several reasons. In the first place, it is not an easy or a pleasant task, even though it be a patriotic one, to assume the burden of sending your patient or your patient's boy, your neighbor or your neighbor's boy, your friend or your friend's boy, into the dangers and horrors of modern warfare. Secondly, the possibility of encountering that type of malingering which skilfully feigns a physical disability, or just as skilfully exaggerates some slight defect, makes the work potential with many trying problems which require time and calm judgment for their solution. The insurance examiner, or the examiner for positions in the public service has to be on his guard only against that type of malingering

which endeavors to conceal physical defects. I am speaking from an experience of eleven years of continuous service as a physical examiner of applicants for public positions, especially for positions in fire and police departments, during which time I have gained some knowledge of the latter type.

I have seen a padded wig worn to increase the height; soap made plastic, and chewing gum, worked in under a thick head of hair; and also, for the same purpose, coin-size pieces of thick orthopedic felt fastened to the heels with adhesive plaster and skilfully concealed from view. Very often I have escaped a deluge of stomach contents, consisting of water, milk and bananas, vomited by an applicant under weight just as he was about to step upon the scales. The arrival of the psychological moment apparently produced emesis. Occasionally, I have incurred the displeasure of an applicant whose varicose veins refused to go into seclusion after a course of soaking in alum water and a few days' rest in bed before the examination, with the legs bandaged from toe to hip. It is interesting to see the confusion of the applicant who has spent days learning the eye test card by heart, when he is asked to read backward the very lines that he has learned, or only the letters pointed to by my assistant, or an altogether different set of letters.

But such malingering is easy to detect, and neither time nor thought is required to make a decision. The problem is more complex when you are dealing with counterfeited defects, because time and keenness of judgment are necessary to reach a just and accurate conclusion. My work is in a field where competition is sharp and where men want jobs; that of the draft physician is in a field where competition is not sharp and where men do not want jobs. In his field, physical defects have in many cases become luxuries, possessions to be jealously guarded; and thus, whereas my archives contain only letters protesting my rejections, the archives of the draft physician contain only those protesting his selections.

There is a story told of an old gentleman who, while walking along the esplanade with a friend, was much disconcerted by the passing show of women, young and not young, fair and otherwise, whose short skirts displayed an over-generous amount of shapely or unsightly calves. Turning in disgust to his friend he remarked, "Thank God, I flourished in the days when legs were a luxury!" Like him, too, I am thankful that I began to flourish as an examiner in the days when legs, good sound legs, were a luxury. The draft physician has begun to flourish in these modern short-skirted days, when, forgetful of the old fighting spirit of our fathers, too many of us were beginning to acquire a spiritual as well as a physical obesity which generously passes over to the other fellow our share of the job of war, and transmutes into luxuries

* Read before the Charlestown Medical Society, November 19, 1917, also before the Watertown Medical Society, Jan. 9, 1918.