which the pressure is above 145 mm. in persons under 40 years of age, and in those above that age in whom the tension is above 160 mm. Out of 100 cases, 36 had high tension; of these, 25 had symptoms of anginal pain and 11 were without pain. When the high tension is not accompanied by dilatation or other signs of cardiac failure the prognosis is more favourable than when signs of degeneration are present.

10. Dilatation.

In 61 cases the heart was dilated, and in 22 of these a murmur was present; in one case the murmur certainly had no prognostic significance, as it was the only cardiac symptom present.

11. The Urine.

Albumin was present in the urine in three cases and sugar in one.

12. Prognosis.

In 17 of the 100 cases prognosis as regards life was good, provided the patients did not exceed the limits of the amount of strain put upon the heart. Of these cases, 4 were due to affections of the nervous system, and were all amenable to treatment, and 8 suffered from cardiac pain, but this either disappeared on treatment or was so infrequent as to cause little anxiety. In two cases the cardiac symptoms were of no importance.

Treatment.

The first essential is rest; its degree must be left to the judgement of the physician, (a) whether the patient is to go to bed for some weeks, or (b) whether he is allowed to be up and about, and is to have his exercise graduated according to the amount of work the heart is able to do. All the cases mentioned in this paper are comprised in the latter class. In estimating the capacity of the patient for exercise it is always necessary to inquire how far he can walk without bringing on pain or producing shortness of breath, palpitation, or exhaustion. After a few days' treatment it is often found that the patient is able to walk further without distressing symptoms, and has lost the sensation of lassitude.

The second essential is the careful regulation of the diet, especially if gastric catarrh be present. Frequently immediate relief to distressing cardiac symptoms is afforded by a few simple directions as to diet. The main principles I adopt are as follows:

1. The teeth are to be in good condition.
2. The avoidance of indigestible foods, such as pork, veal, and other hard meats and warmed-up dishes. All underground roots, including potatoes; also sloppy food, such as bread and milk, broth and soup, strong tea, coffee, alcohol.
3. Each meal is to consist of a very few articles, and over-eating is to be avoided. The food is to be well masticated, and eaten dry.
4. Hot water is to be taken after the meal; when flatulence is present, a soda mint tablet may be taken with advantage.
5. A pill containing a grain of calomel is to be taken once or twice a week.

Among the working classes indulgence in strong tea has in many cases caused more damage to the gastric mucous membrane, and thus eventually shortened life, than indulgence in alcohol.

At Llangammarch Wells these patients had spa treatment in addition to rest from their various occupations and anxieties, and change of air and scene; they had the benefit also of balneological treatment, consisting of the internal administration of the mineral water, of baths, and of massage, which I have fully described elsewhere.*

Many of the patients are seen year after year, and the progress made by some of them is noted below.

CASE I.

A man, aged 60, consulted me in July, 1916, having had symptoms of cardiac failure a month previously. He complained of pain over the precordium, which occasionally radiated down the left arm. He also suffered from giddiness, palpitation, and shortness of breath. There was evidence of gastric catarrh, the heart was dilated and the sounds feeble. The pulse was regular, the rate 76 and the tension 150 mm. He had been

addicted to alcohol. I recommended a strict diet, the mineral water, and abdominal massage, and advised him as to the amount of exercise he was to take. He soon began to improve, and lost most of the distressing symptoms and was able to walk much better. The improvement was maintained when he was last seen during the summer of 1919.

CASE II.

A man, aged 32, was first seen in February, 1918. He complained of pain over the heart, which at times was of a stabbing nature, and which radiated down the left arm on exertion or after attacks of indigestion. He had experienced this pain occasionally for two years. He had the usual symptoms of shortness of breath and exhaustion, and was at times in considerable distress. The heart was dilated, and there was marked gastric catarrh. He was a commercial traveller, and had not only been much overworked, but his meals were most irregular.

After several weeks' rest and careful diet all the distressing symptoms abated, and he gradually returned to his duties; at present is able to do a considerable amount of work. He is very careful as to his diet, and often is able to obtain an extra day's rest at the week-end. I am of opinion that the prognosis is good in this case.

CASE III.

A man, aged 55, consulted me in May, 1919. He had worked abroad for many years, and his heart had been weak since 1915. He complained of pain over the precordium and shortness of breath, which were aggravated by exertion. The heart was dilated, the pulse rate was 80, and the tension 140 mm. Occasionally he had Cheyne-Stokes breathing and the stomach was dilated.

After six weeks' treatment the pain left him, the Cheyne-Stokes breathing disappeared, and he could walk several miles without exhaustion. The prognosis in this case is distinctly good.

CASE IV.

A lady, aged 50, had suffered from palpitation and exhaustion for eight years, subsequent to an attack of influenza. She was in poor health, the attacks of palpitation occurred frequently at night, and her sleep was much disturbed. She had slight pain over the heart, was short of breath, and easily fatigued on exertion. There was marked flaccid distension of the stomach, the heart was dilated, and the pulse tension was 140 mm. The diet was strictly regulated and ammonium bromide prescribed. In a few days she began to improve, the palpitation was much less, the digestion better, and she slept well. After a month's treatment she said she was more active and was feeling stronger than for several years. The prognosis in this case is good.

CASE V.

A man, aged 47, consulted me in August, 1917. He had had rheumatic fever ten years previously, and had worked very hard for many years. He complained of a stabbing pain over the heart, but it did not extend down the arm. He often had attacks at night, when he also experienced a smothering feeling. He was breathless and easily exhausted, and the stomach was distended with flatus. The heart was dilated; the tension of the pulse was 160 mm. He was carefully dieted and advised to reduce the amount of his daily work as far as possible, but at the same time my prognosis in his case was bad. I saw him in September, 1918, when he was much improved; the pain was less, and although he still had a smothering sensation at night there was less exhaustion, and he was able to get through his work fairly well. I saw him again in August, 1919, and found the improvement maintained. The pain was not so frequent, and he could walk three or four miles a day.

ON THE DIRECT CULTIVATION OF TUBERCLE BACILLI FROM TISSUES.*

BY

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THE method of isolating tubercle bacilli from tuberculous tissues described below was devised in the course of an investigation, undertaken on behalf of the Medical Research Committee, into the types of tubercle bacilli found in children. It depends on the use of (a) a special medium for culture, as described below, and (b) the trituration of the tissue with dry quartz sand before the application of antiformin to destroy contaminating organisms.

The efficacy of antiformin as an aid to the detection or cultivation of tubercle bacilli in sputum, etc., is generally recognized, and the benefit derived from its use may be said to depend on two factors. In the first place, the antiformin exercises a disintegrative action on tissues and cells and liquefies mucus, so that the organisms may be concentrated by centrifugalizing, and, secondly, contaminating bacteria are killed off. So far as sputum or

*The Mineral Water of Llangammarch Wells, BRITISH MEDICAL JOURNAL, October 24th, 1903.

*The expenses of this research are being defrayed by the Medical Research Committee, to whom I have pleasure in recording my indebtedness.

other fluid material is concerned, the method as ordinarily employed (1919¹) is satisfactory, since solution is effected in a comparatively short time and the tubercle bacilli are not damaged; but, in the case of tissues, prolonged exposure to the reagent may be necessary before the material becomes sufficiently fluid to allow of its being centrifugalized, and in these circumstances the growth of tubercle bacilli, as well as that of less resistant organisms, may be inhibited. In the methods here described the tissue material is reduced to a very fine state of division by mechanical means, and a very short exposure to the antiformin serves to destroy bacterial contamination.

Process.

The tissue to be investigated is cut up into small pieces with scissors, and is thoroughly rubbed up in a mortar with a small amount of dry sterile quartz sand. The rubbing up is continued till the fibrous tissue is disintegrated as far as possible, and the material forms a slightly moist, crumbling mass. The contents of the mortar are then washed into a wide test tube with 15 to 20 c.cm. of sterile saline solution. The sand is allowed to sediment for a few minutes; as it falls, it carries down with it any coarser particles of tissue which remain. The supernatant fine suspension is then pipetted off, and thoroughly mixed with an equal volume of 15 per cent. antiformin. After five minutes, during which it should be stirred continuously, the mixture is centrifugalized at high speed for a few minutes, and the supernatant fluid is discarded. The sediment is shaken up with sterile saline solution and again centrifugalized. The shaking up of the sediment with sterile saline solution and centrifugalizing are carried out three times in all, so that no trace of antiformin remains. The sediment resulting from the final centrifugalizing is used for making cultures, or, after emulsifying with a convenient amount of sterile saline solution, is injected into a suitable animal. It may be mentioned at this point that in none of a large number of films made from the sediment obtained by this procedure was any evidence found that the bacilli tended to be broken up. It is certain that their vitality cannot be seriously diminished as in some cases growth was obtained although the tubercle bacilli were present in such small numbers that none could be demonstrated in films. Further, in many instances, control cultures on agar were put up at the same time as the egg medium cultures. These invariably remained sterile.

Preparation of Medium.

The medium used is simple to prepare and is a modification of Dorset's medium (1919²), in which the contents of eggs are mixed with a tryptic digest of horse heart instead of with water. Various digests were tried, including horse heart digested for varying periods, Cole and Onslow's casein digest (1916³), and a tryptic digest of gliadine. All the media containing a protein digest were found to yield a more rapid and abundant growth than the original Dorset medium, but the product which so far has given the most satisfactory result is that obtained by digesting horse heart with trypsin for a period of three weeks.

Preparation of Horse Heart Digest.

Take:

Horse heart, freed from fibrous tissue and fat as far as possible, and minced	...	500 grams.
Water	...	1,000 c.cm.

1. Render faintly alkaline to litmus, using 20 per cent. sodium hydrate, and heat slowly to 80° C.
2. Cool to 40° C. and add 1 per cent. liquor trypsin co. (Allen and Hanbury) and 30-40 c.cm. chloroform. Shake well and cork with a loose stopper.
3. Incubate at 37° C. for ten days, shaking daily.
4. Add a further 1 per cent. liquor trypsin co. and leave in incubator for another ten days without shaking.
5. Render slightly acid to litmus with glacial acetic acid and boil for fifteen minutes.
6. Leave overnight in ice chest and decant off clear fluid, or filter through Chardin paper.
7. Adjust reaction to 1.2 per cent. acid to phenolphthalein; autoclave at 118° C. for twenty minutes; cool and filter; sterilize.

It is important to test the reaction of the digest at intervals during the period of incubation, as it tends to become acid, and, should this occur, a further addition of alkali must be made till it is again just alkaline to litmus.

The contents of several fresh eggs are well beaten up, and the above digest is added in the proportion of one part to three parts of the beaten eggs and thoroughly mixed. The mixture

is filtered through muslin to remove air bells and filled into tubes which are heated in the sloped position at 70° C. till complete solidification has occurred. The medium is then sterilized high up in the Koch sterilizer (to avoid bubbling) for twenty minutes on each of three succeeding days. Prepared in this way the medium forms a smooth slope, free from air bells, of a pale yellow colour. Glycerin is added to the medium before solidifying, when desired.

An important point to be observed in the preparation of Dorset's medium or of this modification is that the eggs used must be as fresh as possible. Commercial "fresh" eggs are often quite unsuitable, and the more nearly the eggs approximate to "new-laid" the better are the results likely to be. Whatever the component of new-laid eggs may be which renders their use in the preparation of media more favourable to the growth of tubercle bacilli, it not only resists the heating incident to sterilization, but is actually rendered more stable by it, since media prepared from fresh eggs retain their growth-producing properties for many weeks at least, whilst these properties are lost in a few days if the eggs are kept before being made into medium.

On this medium growth, both in primary cultures and in subcultures, is rapid, being visible, as a rule, in less than a week, sometimes in four days, and copious in less than three weeks. Bovine types of bacilli are markedly inhibited by the presence of glycerin in the medium, as occurs in Dorset's medium prepared in the ordinary way. The differences between the cultural characteristics of the human and bovine strains are very well brought out, the human type producing a copious, heaped up, dry and wrinkled growth, often with a slight brownish tint; the bovine a growth which is flatter, fairly smooth, and with a distinctly slimy appearance. So far, direct cultures of tuberculous material from twenty-five cases have been made on this medium, and in twenty-four of these growth has been obtained. The remaining case was one of tuberculous meningitis in which only one tubercle bacillus could be found in films from the sediment obtained on centrifugalizing a large amount of cerebro-spinal fluid.

SUMMARY.

1. The disintegration of tuberculous tissue and the destruction of contaminating bacteria by antiformin can be greatly facilitated by a preliminary trituration of the tissue with quartz sand.
2. This procedure appears to exercise no deleterious effect on the bodies of the bacilli or on their vitality.
3. The growth of tubercle bacilli on egg media of the Dorset type is enhanced when the media are prepared with a twenty-one day tryptic digest of horse heart instead of with water.
4. Egg media intended for the growth of tubercle bacilli should be prepared from eggs which are as nearly as possible new-laid.
5. The addition of glycerin to such media inhibits the growth of bovine strains, and the other cultural characteristics of bovine and human strains are well defined.

NOTE.—Further experiments with these and other digests are being carried out with a view to the preparation of fluid media; and also, by the use of more delicate indicators, for the determination of the optimum reaction of the various components.

REFERENCES.

- ¹ Muir, R., and Ritchie, J.: *Manual of Bacteriology*, 1919, seventh edition, p. 297.
- ² Ibid., p. 46.
- ³ Cole, S. W., and Onslow, H.: *Lancet*, 1916, ii, p. 9.

NASAL DRILL: AN INVESTIGATION OF ITS VALUE IN THE TREATMENT OF ADENOIDS.

BY

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IN the *Lancet* of August 24th, 1918, and in several later issues, some remarkable results were published of the effect on adenoids of systematic nasal drill, as conducted by Mrs. Handcock. At that time, owing to the depletion of staff at the various hospitals, numbers of cases of adenoids waited month after month for operation. Thus the moment seemed opportune to ascertain whether the troublesome symptoms of these children could be alleviated by means other than surgical. I therefore went up to London and Mrs. Handcock kindly demonstrated the method to me.