slide is not employed. The agar drop must be of such a size that when the coverslip is gently pressed flat the agar occupies a circle about half the diameter of that of the coverslip.

The slide-culture is incubated in a petri dish, in the bottom of which are a few layers of wet filter paper, the whole having previously been autoclaved. Suitable glass supports raise the slide well above the level of the wet paper. During incubation it is important that the paper should not dry out, and sterile water should be added periodically if necessary. Smith⁴ (p. 176) recommends the use of a 20 per cent solution of glycerol instead of water, as the latter tends to wet agar.

On incubation the mycelium spreads rapidly through the agar, and hyphae and sporophores then grow out into the airspace under the coverslip. When a suitable growth has occurred, usually after three or four days, the preparation may be made into a semi-permanent mount by introducing Shear's mounting fluid, with or without added stain, under the coverslip. Air bubbles which are formed are easily removed by placing the preparation in a jar, which is then evacuated by means of a vacuum pump. More durable preparations can then be made by ringing the coverslip with any of the usual ringing cements.

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¹ Henrici, A. T., "Moulds, Yeasts and Actinomyces" (New York, 1930).

² Lewis, G. M., and Hopper, M. E., "An Introduction to Medical Mycology" (Chicago, 1939).

³ Langeron, M., "Précis de Microscopie" (Paris, 1925).

⁴ Smith, G., "An Introduction to Industrial Mycology" (2nd Edit., London, 1942).

Fatty Constituents of Tubercle Bacilli as Growth-inhibitors of the same Bacilli

A most valuable clue in the search for bactericidal compounds has recently been found in the so-called 'antagonism principle' between bacterial vitamins and similarly built molecules of 'antivitamins'.¹ In the field of tuberculosis, this principle is unfortunately of little interest, as the bacilli responsible for this disease seem to need no vitamins for their growth. But an antagonism may be conceived to arise between plastic constituents of tubercle bacilli and substances with very closely related molecular structure, so that such substances can replace the former in the cellular frame without being able to exert any of the necessary vital functions.

Attempting to approach the problem of chemotherapy of tuberculosis from this point of view, I have studied the substitution of a naturally occurring chemical function by an 'unbiological' one, in the very molecules of some constituents of tubercle bacilli. Anderson, Chargaff, Robinson and others² have shown that these bacteria contain a fairly high proportion of numerous fatty acids that have not been encountered yet in any other living cell. Only two of these acids have been characterized with sufficient chemical accuracy (the tuberculostearic (I) and the phthioic acids (II)); but it has become clear now that many others are also highly branched-chain molecules. Employing Anderson's method, a mixture of such fatty acids was isolated from the dead bacilli of a virulent stock of human origin,

and distilled in cathodic vacuum to remove the fractions of too high molecular weight, as well as any traces of waxy alcoholic acids. It was converted then, through the acid chlorides and the amides, into a mixture of primary amines, using a slightly modified Jeffreys' method. Whereas the initial material and the amides are practically inactive, the mixture of amines so obtained (in form of the hydrochlorides) proved itself to be strongly bacteriostatic against tubercle bacilli growing on synthetic media (at such high dilutions as 1/10,000 and more). Hence it is clear that a naturally occurring substance endowed with vital properties may be changed into a specifically toxic material through the single replacement of a carboxyl by an amino-group. It is noteworthy that synthetic fatty amines such as (III), prepared from higher fatty amides following Montagne's process³, also exhibit more or less bacteriostatic properties against acid-fast bacteria.

Work is in progress in this field, and also to ascertain whether the amidine-group may be of use for the same purpose. But it is perhaps worth while stressing the fact that such an *in vitro* conversion of the constituents of a bacterium into an inhibitor, through the modification of a radical while maintaining the molecular configuration, forms a bridge between chemotherapeutic methods and immunological ones.

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¹ Woods, Fildes, McIntosh, Whitby and others, quoted by Wagner-Jauregg, Th., *Naturwiss.*, **31**, 341 (1943).

² Anderson, R. J., "Fortschritte der Chemie organischer Naturstoffe", **3**, 145 (Vienna, 1939). Chargaff, E., *Ber. deutsch. chem. Ges.*, **65**, 745 (1932). Robinson, Sir R., *J. Chem. Soc.*, 507 (1940). Buu-Hoi, Ng. Ph., and Cagniant, P., *Ber. deutsch. chem. Ges.*, **76**, 692 (1943).

³ *Ann. Chim.*, **13**, 40 (1930).

A Case of Molybdenum Deficiency in New Zealand

IN a small private-garden investigation into the disease 'whiptail' of cauliflowers, extreme symptoms appeared in those plants not treated with the group of trace elements manganese, zinc, copper and molybdenum. The matter was therefore studied more closely in the glasshouse. In an experiment involving some twenty combinations of two and three of the elements manganese, zinc, copper, molybdenum and