

BACTERIAL GROWTH FACTORS IN SOIL¹

In a study of the nutritional requirements of indigenous soil bacteria, isolated by non-selective plating methods, special attention was given to organisms unable to grow in a basal salts-glucose medium to which was added a mixture of ten amino-acids (or peptone) plus seven growth factors, or even in one containing yeast extract supplement. Such organisms, comprising approximately 20 per cent. of the isolates from soil, were found to grow well in yeast extract medium upon the addition of a heated aqueous extract of field or garden soil, more than 80 per cent. of them showing good or sub-maximal growth without the yeast extract. For the great majority of the 63 strains studied the growth-promoting properties of soil extract were dependent upon a factor or factors (not concerned with the ash constituents) present in the acetone, but not in the ether extract, and capable of being adsorbed by Norit and eluted with ammoniacal alcohol.

It has already been shown that certain vitamins may be present in soil. Thus Lilly and Leonian² have demonstrated the presence of thiamin, while the occurrence of biotin in plant and animal tissues readily accounts for its presence, particularly in well-fertilized soils. Furthermore West³ has shown that measurable quantities of thiamin and biotin may be excreted by the roots of seedlings. Since the organisms studied by us, however, showed no growth in the presence of the growth factor supplement, which included thiamin,

biotin, riboflavin, pyridoxin, pantothenic acid, nicotinic acid and inositol, it is suggested that the growth-promoting properties of soil extract for this group of bacteria are to be ascribed to factors other than those listed.

More than one such growth-promoting factor appears to be present in soil extract, one or more of which are capable of being synthesized by certain other soil organisms having simpler nutritional requirements. Thus it was found that for certain strains the nutritive effect of soil extract could be replaced by a filtrate from cultures of bacteria capable of maximum development in the basal salts-sugar medium. For other organisms similar filtrates were ineffective, indicating distinctly different growth requirements. In the case of the relatively small number of isolates requiring yeast in addition to soil extract, it was found that the effect of yeast could be likewise supplied by filtrates of certain bacteria growing in the basal medium. The associative influence of organisms producing such by-products doubtless explains the ability of certain more fastidious bacteria to grow on the original plating medium which contained soil extract without additional nutritive supplements.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MICROSCALPEL FOR USE IN EXPERIMENTAL EMBRYOLOGY¹

A MICROSCALPEL that has been found to be very suitable for many kinds of operations and dissections may be made from the cutting edge of a razor blade. Such small scalpels have been used with success, principally in the microsurgery of experimental amphibian embryology, but have also proved valuable in the dissection of annelids, copepods and insects. The scalpels are easily made and are usually prepared in lots of ten or more so that they may be discarded when dull without loss of time.

The razor blade used is of the thin, double-edged type. A narrow strip of steel, which bears one of the cutting edges is broken off by clamping the blade firmly in a hand vise, then bending the protruding

part of the blade sharply against a glass plate or other smooth, flat surface (Fig. 1). It is important to clamp (*i.e.*, break off) as narrow a strip of the blade as can be firmly held in the hand vise for this will minimize the time required to finish the scalpel. Care should be exercised upon inserting the edge of the blade into the hand vise to avoid dulling or nicking the cutting edge.

The shaft of the microscalpel is made from a fine embroidery needle, the tip of the eye of which is ground away on a fine emery wheel or oil stone, leaving two prongs (Fig. 2). Between these prongs, the small portion fractured from the razor blade is fastened by means of solder (Fig. 3). In order to make a delicate joint, the soldering is best done with the use of a rosin base soldering flux and by first coating the prongs thinly with a layer of solder (tinning). One end of the razor edge is then coated with flux (only) and inserted between the tinned prongs of the needle. The prongs are pressed lightly upon the point

¹ Contribution No. 156 (Journal Series).

² V. G. Lilly and L. H. Leonian, *SCIENCE*, 89: 292, 1939.

³ P. M. West, *Nature*, 144: 1050-1051, 1939.

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