shown by proteins in general. Although the nature of the effect described here is not understood at present, it is evident that for the enhancement of the reaction the pigment formed need not be precipitated.

In this connexion it is noteworthy that microscopic sections exert similar effects on the Feulgen reaction, probably because of their protein nature, and results have been obtained comparable with the "developed nucleal stain" of Choudhuri[4]. However, sections treated with hydrolysed deoxyribonucleic acid plus Feulgen reagent and washed exhaustively exhibit an over-all violet coloration, and chromosomes stain by no means selectively, as Danielli[5] has already pointed out. According to my observations, mammalian red cells stain by this procedure most strongly.

Experiments to determine the conditions affecting the intensity of the Feulgen reaction are in progress.

ATUHIRO SIBATANI

Institute for Microbial Diseases,
Osaka University,
Osaka.
May 10.

[1] Stedman, E., and Stedman, E., *Nature*, **152**, 267 (1943).
[2] Mirsky, A. E., and Pollister, A. W., *J. Gen. Physiol.*, **30**, 117 (1946).
[3] Petermann, M. L., and Lamb, M., *J. Biol. Chem.*, **176**, 685 (1948).
[4] Choudhuri, H. C., *Nature*, **152**, 475 (1943).
[5] Danielli, J. F., *Symp. Soc. Exp. Biol.*, **1**, 101 (1947).

Biological Detoxication of 2,4-Dichlorophenoxyacetic Acid in Soils: Isolation of an Effective Organism

IN a recent paper[1], evidence was presented to support the view that the detoxication of the selective herbicide, 2,4-dichlorophenoxyacetic acid in soil was due almost entirely to the action of micro-organisms. The evidence from this and other similar confirmatory work is entirely indirect, and attempts were therefore made to isolate the organism or organisms concerned.

The method employed was to make, on plates of basal medium[2] containing 0·1 per cent of sodium 2,4-dichlorophenoxyacetate, smear inoculations with drops of perfusate from soils enriched in the relevant organisms by the Lees and Quastel perfusion technique[3,4]. The plates were incubated at 25° C. for seven to ten days, when uniform translucent colonies, apparently of a single species of bacterium, appeared with occasional fungal contaminants. Pure cultures of the organisms were established with little difficulty on the same medium and have been subcultured at fortnightly intervals for the last five months. Repeated attempts to subculture the organism on the basal agar medium alone without sodium 2,4-dichlorophenoxyacetate have so far failed, and it seems likely, therefore, that it is using this compound as its sole source of carbon.

That this organism is the one concerned in the breakdown in the soil is supported by inoculation experiments on soil. The garden soil which has so far been used requires from fourteen to twenty-eight days of continuous perfusion with 0·01 per cent sodium 2,4-dichlorophenoxyacetate solution before an enrichment population capable of the maximum rate of breakdown (that is, 0·01 mgm./gm. dry weight soil/hr.) can be established. If, however, the perfusing solution is first inoculated with a suspension of the organism, the maximum rate is rapidly attained, namely, during the first day's perfusion. So far, the organism has resisted all attempts to grow it in liquid culture of the basal medium containing sodium 2,4-dichlorophenoxyacetate alone; but it will grow readily if small traces of agar (0·1 per cent) are added, suggesting the existence of a necessary growth factor in the agar used. Such a growth factor must also be present in the soil. On the other hand, a heavy suspension of the organisms in aerated basal medium will readily break down the sodium 2,4-dichlorophenoxyacetate in the absence of agar.

The bacterium forms large smooth translucent colonies of a dull cream colour, and is a Gram-negative rod of irregular shape and size with Gram-positive granules. Its growth, fermentation reactions, etc., have been tested on the usual differentiating media, and it has thereby been shown to belong to the very common soil organisms of the "*Bacterium globiforme* group" of Lochhead and Taylor[5]. The type organism of the group was originally isolated and described by Conn[6]. The fact that the organism decomposing sodium 2,4-dichlorophenoxyacetate belongs to such a group of very common and prolific soil bacteria opens up a wide field for speculation. The nature of the normal carbon substrate for organisms of the *B. globiforme* group is still largely a matter for conjecture; but the kinetics of breakdown of 2,4-dichlorophenoxyacetic acid in soil, showing a long initial lag phase, suggest that this molecule is not attacked by the normal soil *B. globiforme* flora. The ultimate rapid attack on the molecule is therefore most likely to be accounted for either by the selective proliferation of a mutant endowed with suitable enzyme systems, or by the adaptive development of such enzymes in normal soil species. So far, very few perfusates of enriched soils have been examined in this way, and it is not improbable that other species of organism, also capable of decomposing 2,4-dichlorophenoxyacetic acid, may be isolated in due course. Full details of this work will be published later.

My thanks are due to Dr. W. T. Williams and to Mr. G. S. Spencer for their help in the identification of the organism.

L. J. AUDUS

Botany Department,
Bedford College,
(University of London),
Sussex Lodge, Regent's Park,
London, N.W.1.
June 13.

[1] Audus, L. J., *Plant and Soil*, **2**, 31 (1949).
[2] "S.A.B. Manual of Methods", **2**, 14 (1944).
[3] Lees, H., and Quastel, J. H., *Biochem. J.*, **40**, 803 (1946).
[4] Audus, L. J., *Nature*, **158**, 419 (1946).
[5] Lochhead, A. G., and Taylor, C. B., *Canadian J. Res.*, C, **16**, 152 (1938).
[6] Conn, H. J., N.Y. Agric. Exp. Station Tech. Bull. No. 138 (July 1928).

An Antagonist of Dihydrostreptomycin and Streptomycin Produced by *Pseudomonas pyocyanea*

DIFFICULTY arises in testing the sterility of dihydrostreptomycin preparations because there are no antagonists which will inactivate the antibiotic in the test cultures, and so allow any contaminating microbes to grow. The reagents used for inactivating streptomycin in such tests, for example, semicarbazide and hydroxylamine, are inactive against dihydrostreptomycin, because the aldehyde group with which they react has been reduced. Moreover, these reagents, being themselves bacteriostatic, are, in fact, unsatisfactory for testing streptomycin, since some