INVESTIGATIONS OF THE BACTERIAL FLORA CHARACTERISTIC OF SOILS

Abstract

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The evidence at present available indicates that suitable artificial media, e.g., 0.25% autolysed yeast + 0.25% peptone, are capable of supporting the growth of the bacteria which predominate in most soils. These organisms are differentiated from other bacteria by their aerobic nature and oxidative metabolism, their slow proliferation under all conditions of artificial culture so far tested, their low temperature requirements, and their slow action on the organic compounds which have been shown to be available to them. They do not form spores, and as they lack distinctive physiological characters, they are difficult to classify by customary bacteriological methods. In soils to which fresh organic matter has not been recently added the predominant organisms appear to be corynebacteria and related types. These are Gram-positive rods which frequently show the “angular growth” characteristic of diphtheroids and tend to divide into very short or coccoid forms as a culture matures. A proportion produce during the early stages of growth a slender branching mycelium and some, including the mycelium-forming types, are motile. It has been shown that mycelium production, pigmentation and action on nitrate are unstable characters of the organisms. The occurrence or absence of motility appears to be stable, but the motile and non-motile types are essentially identical and should not be widely separated in any system of classification. This series of organisms, which includes types previously identified as Proactinomyces and Bacterium globiforme, is relatively homogeneous and sub-division is difficult. Other investigations of the autochthonous microflora have yielded results which differ in certain details, particularly as regards the portion of Gram-negative types. Differences in the findings may be due in part to variations in the inoculation media, in the techniques used, and in the incubation temperatures. Of the numerous nitrogen sources which have been tested a yeast autolysate is the only material which has been found suitable for all strains of the Corynebacterium complex. The treatment of soils also influences the results; Gram-positive organisms are quickly outnumbered by Gram-negative types if fresh organic matter is added to a soil or even if samples are merely sieved and then held at 22°C.

Much of the previous work on aerobic spore-forming bacilli indicates that B. mycoides, B. megatherium and B. subtilis are the most prevalent species of the group in soils. On the other hand, our results show that in several soils many of the predominating spore formers are types which proliferate slowly and produce only a scanty growth on artificial media. The strains which occur most numerously are: (1) organisms related to B. justi-
formis, (2) organisms related to B. circulans, and (3) B. carotarum. Strains of B. carotarum are edly uniform in character, but the first two are each complexes exhibiting variations in several directions and they cannot yet be divided into sharply-defined species. The strains of (1) and (2) occur most abundantly in soils resemble the Corynebacterium complex in being relatively uniform as compared with the better known bacteria, and they are accordingly difficult to classify in any detail. Strains in both groups have a maximum tem