in a combination of amino acids. It was subsequently found that a mixture of phenylalanine and cysteine promoted partial reversal of the inhibition, but that in the presence of a B vitamin supplement, the activity of the cysteine was less pronounced, whereas a mixture of phenylalanine and glutamic acid showed even greater activity. The activity of the vitamin supplement resided in its niacin and pantothenic acid content, as shown in table 1, in which the values represent the percentage of the growth obtained in identical cultures lacking the inhibitor. Growth was measured turbidimetrically after incubation for 16 hr at 37 C. Tyrosine and 3,4-dihydroxyphenylalanine were completely inactive. A mixture of pantothenate, niacin, glutamic acid, and phenylalanine gave 85 per cent release of the pipradrol inhibition, and nothing that we have been able to identify in the yeast extract further potentiated this effect.

DISCUSSION

The individual roles in brain metabolism played by the four members of the reversing complex have been so well established in recent years that it is tempting to suggest from the data presented that pipradrol acts pharmacologically by competing for some enzyme system to which the four metabolites are related as precursors. Unfortunately, however, extended further study will be essential before it can be stated with certainty that the bacterial enzyme system blocked in this instance is functionally identical with that affected by pipradrol in mammalian brain tissue.

ISOLATION OF BACTERIOPHAGE ACTIVE AGAINST ALL TYPES OF *MYCOBACTERIUM TUBERCULOSIS*

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Bacteriophages active against saprophytic acid-fast bacilli have been reported by several investigators. Recently, Froman *et al.* (Am. J. Public Health, **44**, 1326, 1954) succeeded in isolating phages which lyse *Mycobacterium tuberculosis* of both human and bovine types. No reference, however, to a phage active against *Mycobacterium avium* and *Mycobacterium muris* (Vole bacillus) has been found in the literature. Attempts were made to isolate phages active against these mycobacteria.

Modifications of the soil enrichment technique

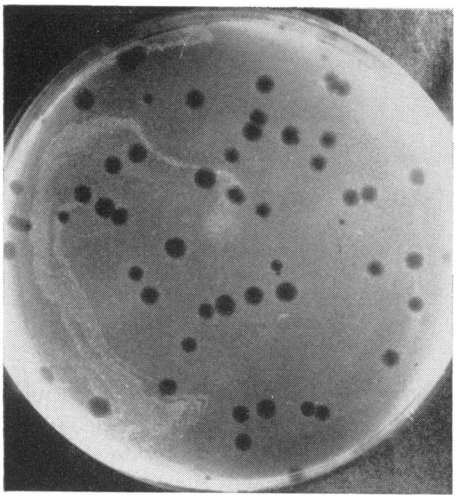

Figure 1. Plaque type of bacteriophage B1 strain on host strain *Mycobacterium avium* (Jucho).

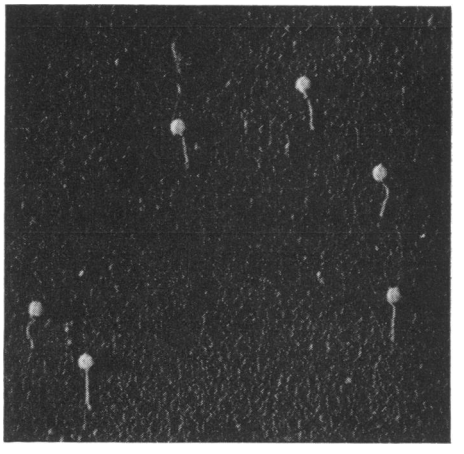

Figure 2. Electronmicrograph of bacteriophage B1 strain. Shadowed with chromium.

of Froman *et al.* was used for the isolation of phage. Samples of soil, weighing 100 g, fertilized with human or chicken feces were taken into sterilized bottles and kept at 37 C. Four to ten day cultures of several different strains of saprophytic acid-fast bacilli and *M. avium* were suspended in distilled water after washing and were inoculated twice weekly. After six to ten inoculations the supernatant fluid was filtered through a Berkefeld bacterial filter and a drop of each of the soil filtrates was spotted on a 3 per cent glycerol agar plate which had been inoculated previously with each of the microorganisms used in enrichments. Phage dilutions of 10^8 particles per ml were used to determine the susceptibility of the organism.

As nine phage strains were obtained out of nine samples of soil, the efficiency of isolation was 100 per cent. The efficiency, however, was very low when unfertilized soil was used as a source. Most of the phage strains isolated had a lytic activity against certain strains of virulent tubercle bacilli. Four phage strains were active not only against saprophytic acid-fast bacilli but also against human, bovine, avian, murine and so-called cold-blooded types of tubercle bacilli. The phage strain which had the broadest host range was named B1. The plaque type of B1 on host strain *M. avium* (Jucho) is shown in figure 1. B1 had a lytic activity against 8 out of 10 strains of human type, 1 out of 3 strains of bovine type, 3 out of 4 strains of avian type, 1 strain of murine type, 1 strain of so-called cold-blooded type of tubercle bacilli and 37 out of 57 saprophytic strains. An electron micrograph of an air-dried specimen of B1 is shown in figure 2 The heads were about 70 to 75 mμ in diameter and the tails were about 170 to 200 mμ in length.

INDUCTION OF MOTILITY AND CAPSULATION IN *BACILLUS ANTHRACIS*

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The classical description of *Bacillus anthracis* includes the statement that the species is non-motile, this being one of the characters distinguishing it from other spore formers which it may superficially resemble. Since Smith *et al.* (U. S. Dept. Agr. Misc. publication, No. 559, 1946) classified *B. anthracis* as a variety of *Bacillus cereus* there have been several claims that motile anthrax strains have been observed or produced. Although we believe there are excellent reasons for assigning specific rank to *B. anthracis*, we are not concerned here with questions of taxonomy but of fact. To the clinical bacteriologist the absence of motility is important in the recognition of anthrax, and therefore reports that motile strains occur should be particularly well scrutinized, as they have repercussions extending beyond the limits of academic discussion.

Whenever we have encountered motile organisms in an anthrax culture we have been able to identify these as contaminants. Some of these could have been confused with *B. anthracis*, and to our knowledge have on occasion been so confused. The following brief discussion explains why we have remained sceptical about reports on the occurrence of motility in *B. anthracis*.

Flewett (J. Gen. Microbiol., **2,** 325–333, 1948) mentioned the appearance of motile variants in ageing cultures of anthrax, but more recent observations on these "mutants" have convinced him that they were contaminants (Flewett, *personal communication*). Manninger and Nógrádi (Experientia, **4,** 276–277, 1948) described a motile, capsulated "mutant" derived from an avirulent strain of anthrax by the action of an extract from a capsulated *Bacillus mesentericus* (?). Tomcsik (Schweiz. Z. Allgem. Pathol. u. Bakteriol., **12,** 489–499, 1949) was unable to repeat this observation and found (Tomcsik, *personal communication*) that Manninger's transformed strain and the *B. mesentericus* strain which provided the transforming principle were both *Bacillus subtilis*. Tomcsik (Schweiz. Z. allgem. Pathol. u. Bakteriol., **13,** 616–624, 1950) himself detected a motile capsulated organism closely resembling *B. anthracis* in a