on explants made at hourly intervals during the early phases of growth likewise yielded no evidence of an initial stimulus to the rate of growth from the presence of subinhibitory concentrations of streptomycin.

Comment. The morphological changes in bacteria resulting from streptomycin appear to be less marked than those which occur with exposure to penicillin.[6-9] Like the latter, however, they occur with concentrations of streptomycin which are only slightly bacteriostatic. Alterations in morphology are not regularly associated with bacteriostasis. The growth of all of the organisms studied was inhibited by streptomycin, in concentrations varying between 1 and 50 γ per ml, but only a few strains exhibited abnormalities in size and shape.

Because of its pronounced effect on bacterial morphology, as well as its failure to sterilize nonmultiplying cultures, penicillin is presumed to interfere directly with bacterial fission. In the case of streptomycin it is suggested that the observed morphological changes may be secondary effects resulting from disturbances of intermediary metabolism rather than primary effects on fission. Such an hypothesis is also consistent with the observed bactericidal action of streptomycin on resting, nonmultiplying cells.

The failure of resting cells to develop resistance to streptomycin and the greatly increased concentrations of antibiotic required to effect sterilization in the resting state, as contrasted with the multiplying state, suggest that streptomycin may act on a different locus or by a different mechanism under the 2 conditions of study. However, cells made resistant to streptomycin under conditions of growth are also resistant in the resting state. This observation appears to support the view that the mechanism of action of streptomycin on resting and on multiplying cells is fundamentally the same, the observed differences in behavior being accounted for on the basis of differences in the rate of bacterial metabolism.

Summary. 1. Streptomycin in bacteriostatic concentrations produced morphological changes in some Gram-negative bacilli but not in others. Gram-positive cocci were only slightly affected, and Gram-positive bacilli were not affected. 2. Streptomycin was bactericidal for *E. coli* in the resting state, the effect being related both to the size of the inoculum and the concentration of the antibiotic. 3. Strains of *E. coli* resistant to streptomycin under conditions permitting growth were also resistant in the resting state, but exposure of susceptible strains to streptomycin in the resting state did not result in increased resistance. 4. No stimulation of the rate of growth of *K. pneumoniae* was observed *in vitro* by subinhibitory concentrations of streptomycin.

Grateful acknowledgment is made to Elizabeth Watson for assistance with the morphological studies.

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Similarities in Electron Micrographs of Purified Lansing and SK Poliomyelitis Virus.

HUBERT S. LORING.

From the Department of Chemistry and the School of Medicine, Stanford University, California.

This note is written to correct the impression which was erroneously given[1] that purified SK poliomyelitis virus consists of asymmetric particles of the type described by

1 Loring, H. S., Marton, L., and Schwerdt, C. E., PROC. SOC. EXP. BIOL. AND MED., 1946, **62**, 291.

Gard[2] for a strain of Theiler's mouse virus. While this conclusion was suggested by one of Bourdillon's[3] experiments in which an older dialyzed, purified preparation showed double refraction of flow, the results published by Jungeblut and Bourdillon[4] show a remarkable agreement between purified SK and our purified Lansing preparations. The purified SK samples in contrast to those from unpurified tissue cultures showed the presence of "spherical or elliptic bodies" having a diameter between 25 and 30 mμ. It is noteworthy that particles of the same relative size and shape have been obtained, therefore, from 2 different strains of poliomyelitis virus, both of which were isolated originally from infectious human material. As it might be expected that different human strains would have similar physical properties, the results from the 2 laboratories confirm the fact that human poliomyelitis virus as cultivated in mice and in cotton rats consists of relatively spherical particles of about 25 mμ diameter.

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Further Studies of Factor R.*

L. W. CHARKEY,† LOUISE J. DANIEL, FLORENCE A. FARMER, L. C. NORRIS, AND G. F. HEUSER.

From the Agricultural Experiment Station and the School of Nutrition, Cornell University, Ithaca, N.Y.

Bauernfeind, Schumacher, Hodson, Norris, and Heuser[1] announced the existence of a new factor required for growth and reproduction in the domestic fowl. Schumacher, Heuser, and Norris[2] presented evidence that the factor consisted of 2 components; factor S precipitated from an acid solution by alcohol, and factor R precipitated by alcohol from neutral solution.

While these studies on factors R and S were in progress, evidence of the existence of a factor required for the growth of *L. casei* and *S. faecalis* was presented by various laboratories. This factor is now generally referred to as folic acid. Briggs, Luckey, Elvehjem, and Hart[3] reported that chicks grew normally on a diet containing no more than 8 μg of folic acid per 100 g of diet. Hill, Norris, and Heuser[4] concluded that factor R was not identical with folic acid, and that if folic acid was required by the chick, the amount needed was less than 15 μg per 100 g of diet.

Binkley and associates[5] reported the presence of vitamin B_c (folic acid) conjugate in yeast. This substance was highly active for the chick, but only slightly active for *S.*

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† Present address, Department of Chemistry, Colorado A. and M. College, Fort Collins, Colo.

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3 Briggs, G. M., Jr., Luckey, T. D., Elvehjem, C. A., and Hart, E. B., *J. Biol. Chem.*, 1945, **158**, 303.

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5 Binkley, S. B., Bird, O. D., Bloom, E. S., Brown, R. A., Calkins, D. G., Campbell, C. J., Emmett, A. D., and Pfiffner, J. J., *Science*, 1944, **100**, 36.