chopped beef, or brain. To half of each series was added 1 per cent soluble starch. One half of the flasks were inoculated with saline emulsions of feces from a patient with pernicious anemia, and the other half with feces from a normal individual. Control uninoculated flasks were incubated for the same periods. The flasks were removed from the incubator at intervals of 1 week, 2 weeks and 4 weeks, and the contents passed through Berkefeld filters. Only those filtrates found to be sterile by aerobic and anaerobic methods were used. The filtrates were kept in the ice-box, but even then the toxicity soon decreased.

Rabbits were used in all experiments. The filtrates were given intravenously in amounts of 0.25 to 0.5 cc., diluted 1 to 3 with salt solution, or subcutaneously in 1 cc. doses. The injections were given at intervals of 48 hours. Blood examinations were made at frequent intervals both before and after the injections were started.

All the animals developed an anemia of the secondary type, beginning after the third or fourth injection. The lowest count observed was 1,530,000. At times remissions occurred in spite of the continued injections, but they were usually of brief duration. Only an occasional nucleated red cell was observed. At times the reticulated cells were slightly increased, but for the most part they remained within the normal limits. The white count remained low. Very little, if any, change was observed in the size and shape of the red cells. Practically no immunity was produced, as doubling the dose of toxin would frequently kill animals which had received many previous injections.

3543

Effect of Bile, Sodium Salts of Bile Acids, and Unsaturated Fatty Acids on Bacteriophagic Action.

GORDON M. KLINE. (Introduced by A. B. Wadsworth.)

From the Division of Laboratories and Research, New York State Department of Health, Albany.

Previous investigators record different observations on the effect of bile on bacteriophagic action. Hauduroy,[1] Jong and Hauduroy,[2] and d'Herelle[3] found that bile was decidedly inhibitory, whereas Caublot,[4] in observations extending over a period of two years, obtained no evidence of an inhibitory action of bile on bacteriophage.

In the studies, recorded here, of the action of bile on bacterio-

phage, *B. coli, B. typhosus* and *B. dysenteriae* Shiga and Mt. Desert strains were used with bacteriophages obtained from stool filtrates and from culture filtrates. In no case was there any inhibition of the bacteriophage in the presence of bile, although the bile was added to broth medium in concentrations of 10 per cent and 50 per cent. Filtered bile was tested as well as bile sterilized by heat, and a peptone medium was substituted for beef infusion broth, but the end result was always the same, the bile never inhibited the bacteriophage.

Bachmann and Aquino[5] report that, in their experiments, bile stimulated the production of a lytic substance by bacteria; but these authors also obtained a transmissible lytic substance from the bacterial culture alone. With the purpose of studying this property of bile, experiments were carried out both with bacterial strains from which lytic substance had never been obtained, and with strains which were known to produce bacteriophage at frequent intervals. Bile, however, did not promote formation of bacteriophage in any of these bacterial cultures.

The effect of sodium oleate, sodium taurocholate, sodium ricinoleate and the sodium salts of the unsaturated acids of linseed oil on bacteriophagic action was studied with the same bacterial strains as those used in the bile experiments. Sodium oleate and sodium taurocholate did not inhibit in concentrations of 0.1 per cent and 0.4 per cent; on the other hand, sodium ricinoleate and the sodium salts of the unsaturated linseed oil acids showed marked inhibitory properties on the bacteriophagic action. Sodium ricinoleate was markedly inhibitive at 0.1 per cent and 0.4 per cent concentrations; the unsaturated salts from linseed oil were almost completely inhibitive at 0.1 per cent concentration and were completely so at 0.4 per cent concentration. Broth, containing these salts, inoculated with organisms without the addition of bacteriophage, yielded a good growth.

Further studies are in progress to determine the nature of the inhibition, whether the salts act by lowering the surface tension, or whether they are effective because of the unsaturated group present.

This is a preliminary report.

---

[1] Hauduroy, Paul, *Comptes rendus Soc. de Biol.*, 1925, xcii, 1442.

[2] De Jong, S. I., and Hauduroy, P., *Bull. et Mém. Soc. Méd. d. Hôp. de Paris*, 1925, xlix, 1561.

[3] D'Herelle, F., The Bacteriophage and its behavior. The Williams & Wilkins Company, Baltimore, 1926.

[4] Caublot, Paul, *Comptes rendus Soc. de Biol.*, 1925, xciii, 1583.

[5] Bachmann, A., and Aquino, L.-I., *Comptes rendus de Biol.*, 1922, lxxxvi, 1108.