against cultures 168 and 169 which were also the most susceptible to the filtrates from fecal specimens.

The American Type Culture Museum's *Eb. typhi* cultures Nos. 191 and 196 apparently carry with them a bacteriophage. These bacteriophages are almost identical in their activity on the other museum strains. The resistance of these cultures to the bacteriophage action of feces filtrates is explained by the presence in the cultures of a bacteriophage. The cultures consist almost entirely of resistant cells, but there is probably produced in the growing culture enough susceptible cells to allow the bacteriophage to continue to multiply and maintain its presence.

*Conclusion.* 1. Cultures No. 168 and No. 169 are the most susceptible to bacteriophage action and are the most dependable to demonstrate typhoid bacteriophages in feces filtrates.

2. Cultures No. 191 and No. 196 are very resistant to bacteriophage action and give little indication of the presence of a bacteriophage when used as test organisms.

3. Cultures No. 191 and No. 196 carry with them a bacteriophage exhibiting activity against most other strains, but showing no reciprocal or homologous activity.

## 3632

## Biological Study of Mushroom Extract and Effect of Sodium Ricinoleate on its Toxicity.

R. G. GREEN AND A. V. STOESSER.

*From the Department of Bacteriology and Immunology, University of Minnesota.*

A watery extract of the poisonous mushroom, *Amanita-phalloides,* was prepared according to the method of Ford.[1, 2] The extract was concentrated and sterilized by filtration. Using 1 cc. of a 5 per cent suspension of red blood corpuscles, 0.02 cc. of the extract produced complete hemolysis of guinea pig corpuscles. When injected into guinea pigs 1 cc. of the extract was sufficient to kill a 300 gm. guinea pig in 5 days. Upon the addition of sodium ricinoleate a precipitate was formed. A modified extract was prepared by the addition of sodium phosphate ($Na_3PO_4$), the precipitate being removed by filtration. Modified extract gave a clear, dark brown solution with sodium ricinoleate. 0.10 of this extract was necessary to hemolyze 1 cc. of a 5 per cent suspension of guinea pig erythro-

cytes. 1 cc. of the modified extract killed a 300 gm. guinea pig in 7 days. The addition of non-toxic amounts of castor oil soap to the mushroom poison greatly increased its toxicity. The addition of 0.03 gm. of castor oil soap to 1 cc. of toxin reduced the life interval from 7 days to 1½ hours. A similar increase in toxicity has previously been noted by Larson[3] upon the addition of castor oil soap to Botulinus toxin. Various mixtures of castor oil soap and mushroom toxin were studied and it was found that increase in toxicity depended both upon the concentration of the soap and the concentration of toxin.

This is a preliminary report.

[1] Ford, *J. Infec. Dis.*, 1906, iii, 192.
[2] Ford, *J. Exp. Med.*, 1906, viii, 437.
[3] Larson, *Ibid.*, 1924, 278.

3633

## The Increase in Toxicity of Mushroom Poison Produced by Sodium Ricinoleate.

R. G. GREEN AND A. V. STOESSER.

*From the Department of Bacteriology and Immunology, University of Minnesota.*

It has been found by the authors that mixtures of sodium ricinoleate and mushroom poison were more toxic than the mushroom poison alone. Experiments were carried out upon the effects produced by the separate injection of the two components into guinea pigs. Simultaneous but separate injections of mushroom toxin and castor oil soap gave toxic effects comparable to the injection of a mixture. The toxic effect was also evident if the injection of either component was delayed up to 48 hours. After the injection of an M.L.D of toxin, 1 cc. of soap injected 48 hours later, reduced the life interval from 7 days to 1 day. After the injection of 1 cc. of a 3 per cent soap solution, an M. L. D. of toxin injected after 48 hours produced a fatal termination in 2 days instead of 7 days. Various combinations of dosage at different intervals between injections showed that the longer the interval between injections, the larger must be the dose of toxin to produce corresponding results. With the injection of 0.03 gm. of soap, death is produced by the simultaneous injection of 0.1 M. L. D. of toxin. If, however, the injection of 0.1 M. L. D. is delayed 3 hours, the toxicity is not developed.