without effect on the color. The effect of glycine was slight and that of glycylglycine slightly more, but not so great as that of the dicarboxylic acids.

The present work is being continued.

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Allergy and Immunity in Coccidial Infections.

DORA PRIAULX HENRY. (Introduced by C. A. Kofoid.)

From the Department of Zoology, University of California.

Immunity to the several species of coccidia which occur in chickens has been thoroughly demonstrated by Tyzzer[1] and by Henry.[2] A similar host response has been shown to occur in rabbits (Bachman[3]) and in cats and dogs (Andrews[4]).

The purpose of this paper is to report the development of a similar immunity in guinea pigs infected with *Eimeria caviae,* together with the appearance of degenerate forms of the parasite in partially immune animals, observations on the production of hypersensitivity to the protein of the infecting organism, and a cutaneous hypersensitivity to *E. caviae* in this host.

The reinoculation of 35 previously infected guinea pigs has in all cases shown the presence of some immunity. In most cases the resistance has been sufficient to completely prevent the occurrence of clinical symptoms, which are invariably present in initial infections. While the mortality in guinea pigs upon infection with *E. caviae* for the first time has been found to be 40%, not one of the guinea pigs infected 2 or more times died from a typical coccidial infection.

A rather constant indication of the effect of previous infection was the altered prepatent period in cases of the second infection. While this period has been found to be exceedingly constant in all of the initial infections, a variation from 2 to 4 days from the normal 11½-day period in the appearance of oocysts was found in most cases. A more striking indication of the effect produced by the host upon the parasite as a result of the development of partial immunity is the occurrence of degenerate cysts. These occur only

[1] Tyzzer, E. E., *Am. J. Hyg.*, 1929, **10**, 1.

[2] Henry, D. P., *Univ. Calif. Publ. Zool.*, 1931, **36**, 157.

[3] Bachman, G. W., *Am. J. Hyg.*, 1930, **12**, 641.

[4] Andrews, J. M., *Am. J. Hyg.*, 1926, **6**, 784.

in the *later* stages of initial infections, whereas in instances of the second to the sixth infections thus far tested they occur in the *early* stages, either alone or associated with normal cysts.

In some instances, guinea pigs which were fed mature oocysts after recovering from a previous infection died within 2 to 10 days thereafter with symptoms and lesions differing in all respects from those found in coccidiosis as observed in this host. Death was usually sudden and preceded by symptoms typical of those described for delayed anaphylaxis in guinea pigs. At autopsy severe hemorrhage was found to have occurred in the lungs, and the intestines were noticeably hyperemic. Cultures of the various organs were in most cases sterile, and in those cases in which growth was obtained a miscellaneous group of the commoner non-pathogenic bacteria was found. Similar symptoms have been produced in animals sensitized by subcutaneous injections of oocysts and subsequent intraperitoneal inoculations of the shock dose.

Intradermal injections of oocysts of *E. caviae* into guinea pigs which had recovered from infection with this coccidium have clearly demonstrated a cutaneous hypersensitivity. This was manifested by the appearance in approximately 48 hours of an inflamed area surrounding the point of injection, swelling, induration, and somewhat later, by central necrosis. In the only animal which received an intradermal injection while suffering from an active infection, the response occurred within 2 hours after injection. An area 3 cm. in diameter surrounding the point of injection became bright red at the end of 18 hours. Twenty-four hours after the injection the animal died. Six normal animals injected at the same time failed to show any reaction other than a slight irritation at the point of inoculation, which disappeared in 24 to 48 hours.

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Effects of Carbon-Dioxide Inhalations on Intrapleural Pressure in Dogs.*

MYRON PRINZMETAL, SELLING BRILL AND C. D. LEAKE.

From the Department of Surgery, Division of Thoracic Surgery, and the Pharmacological Laboratory, University of California Medical School.

In our studies on the effects of broncho-constricting drugs on in-

* Supported in part by the J. J. and Nettie Mack and the Purington Research Funds.