



Fig. 2. (a) Gametocytes (*g*) in epithelial cells of the chorioallantoic membrane and oocysts (*o*) free in the allantois of a 20-day-old embryo, 10 days after inoculation with sporozoites. Stained by haematoxylin and eosin ($\times 210$). (b) Oocysts (*o*), gametocytes (*g*) and merozoites (*m*) in the same embryo. Unstained preparation ($\times 600$)

These schizonts were similar to the second generation schizonts of *E. tenella* in the caeca of hatched chickens on days 5 and 6 after receiving sporulated oocysts *per os*. The nine embryos found dead on day 7 after inoculation were presumed to be due to the very large numbers of schizonts in the chorioallantoic membrane and haemorrhage which occurred in the allantoic cavities. Gametocytes and oocysts were found in small numbers on day 7 and were found in increasing numbers until day 11. Oocysts were found free in the allantoic fluid and in necrotic material sloughed off from the chorioallantoic membranes. Photomicrographs of the different stages observed are shown in Figs. 1 and 2. The oocysts recovered from a ten-day-old infection sporulated normally and produced typical caecal infections when inoculated into one-week-old chickens.

The results show that the life-cycle of *Eimeria tenella* can occur at a site other than the caeca of the chicken and this may have important consequences. The life-cycle appears to be slightly delayed (large numbers of oocysts occurring after day 9 of the infection) and the phase of schizogony extended.

Maintenance of the avian *Eimeria* normally necessitates frequent passaging in fowls kept in strict isolation. The growth of *E. tenella* in the chick embryo may provide a more convenient and less expensive alternative. It is possible that other species of *Eimeria* also develop in embryos. An extension of this work is proceeding with other species of *Eimeria* of the fowl and *E. stiedae* of the rabbit. The method may be of use in the evaluation of anti-parasitic substances and, in addition, provides bacteria-free material for immunological investigations. Of particular interest is the apparent prolongation of schizogony of the parasite and the opportunity now afforded for studying the parasite in a host in which resistance is minimal⁸.

P. L. LONG

Houghton Poultry Research Station,
Houghton,
Huntingdon.

¹ Pellerdy, L. P., *Catalogue of Eimeriidae (Protozoa; Sporozoa)* (Hungarian Academy of Sciences, 1963).

² Sharma, N. N., and Reid, W. M., *J. Parasit.*, **48**, Sect. 2, 33 (1962).

³ Davies, S. F. M., and Joyner, L. P., *Nature*, **194**, 996 (1962).

⁴ Long, P. L., and Rose, M. E., *Exptl. Parasit.*, **16**, 1 (1965).

⁵ Horton-Smith, C., *Proc. First Intern. Parasitol. Cong., Rome, 1964* (in the press).

⁶ Horton-Smith, C., and Long, P. L., *Parasitology*, **55**, 401 (1965).

⁷ Farr, M. M., and Doran, D. J., *J. Protozool.*, **9**, 403 (1962).

⁸ Burnet, F. M., Stone, J. D., and Edney, M., *Austral. J. Exp. Biol. Med. Sci.*, **28**, 291 (1950).

MISCELLANEOUS

Effect of Certain Types of Paper on Sexual Maturation of the Insect *Pyrhcoris apterus*

ON reading the article entitled "Juvenile Hormone Activity for the Bug, *Pyrhcoris apterus*", by Sláma and Williams¹, I was struck by a likely correlation.

These authors report that this European insect fails to undergo normal sexual maturation in the presence of certain American papers (*New York Times*, *Wall Street Journal*, *Boston Globe*, *Science* and *Scientific American*), while British papers (*The Times* and *Nature*) had no inhibitory effect on the attainment of normal sexual maturity by this insect.

The active principle in the paper was found to be heat stable (100° C) and insoluble in water, but soluble in methanol, acetone, ether and petroleum ether. The authors ascertained that balsam fir, hemlock and yew contained the active principle, while red spruce, European larch and southern pine possessed very little activity.

The heart wood of Douglas fir contains dihydroquercetin as was first shown by Pew², and this is well known in the American wood pulping industry, for this substance interferes with pulping and tends to oxidize to quercetin, which is yellow on account of its cinnamoyl resonance; this spoils the appearance of the paper, so steps are taken to prevent its oxidation.

Moewus³ showed that quercetin occupies a central position in the development of sexuality in the primitive biflagellate alga *Chlamydomonas eugametos*, being a precursor of isorhamnetin required in the female gametes and of peonin required in the males.

It might therefore be profitable for entomologists to ascertain whether the inhibitory substance may not be dihydroquercetin, which could well interfere with sexual maturation if quercetin should be a step in the pathway to sexual maturity in these insects, as it is in *Chlamydomonas eugametos*.

C. A. B. CLEMETSON

Department of Obstetrics and Gynecology,
University of California Medical Center,
San Francisco,
California.

¹ Sláma, K., and Williams, M., *Proc. U.S. Nat. Acad. Sci.*, **54**, 411 (1965).

² Pew, J. C., *J. Amer. Chem. Soc.*, **70**, 3031 (1948).

³ Moewus, F., *Ann. New York Acad. Sci.*, **61**, 660 (1955).