Short Communication

Electron Microscope Observations Concerning the Penetration of a Host Cell by *Eimeria ferrisi in vivo*

Erich Scholteyseck
Zoologisches Institut der Universität Bonn, Abteilung für Protozoologie, Germany

Bill Chobotar
Department of Biology, Andrews University, Berrien Springs, Michigan, USA

Invasive stages of Sporozoan parasites may enter host cells by producing an invagination in the host cell (erythrocyte) membrane as in *Plasmodium* (Ladda, Aikawa, Sprinz, 1969), by phagocytosis of mammalian macrophages as described for *Toxoplasma gondii* (Jones, Yeh, Hirsch, 1972) or by an interruption of the host cell membrane as reported for several species of *Eimeria*.

In *Plasmodium* species the merozoite makes contact with the host cell, forming a depression in the host cell (erythrocyte) membrane which becomes a cavity, the parasitophorous vacuole, enclosing the parasite (Ladda *et al.*, 1969). In this process the invaginated plasma membrane of the host cell becomes the lining of the parasitophorous vacuole. The different mechanisms of cell entry of these parasites may be due to the type of host cells.

Observations of sporozoites of *Eimeria* species have shown that such sporozoites enter and leave bovine kidney cells readily and quickly after inoculation into cell cultures. In both, light and electron microscope studies sporozoites of several *Eimeria* species were constricted at the point of entrance, in some cases resulting in longitudinal folding of the sporozoite pellicle (Roberts, Speer, Hammond, 1971). These workers indicated that during penetration by sporozoites of *E. larimerensis* the host cell membrane may have been interrupted either at the initial site of entry or after becoming invaginated as penetration was proceeding. In a recent study Jensen and Hammond (1974) saw no evidence of host cell membrane disruption by sporozoites of *E. magna* while penetrating cultured bovine kidney cells.

Previous observations of penetration in eimerian species were done using cell cultures, but recently during a study of the development and ultrastructure of the tissue stages of *E. ferrisi* in *Mus musculus* we obtained serial sections of a merozoite penetrating an intestinal epithelial cell. Material for study was obtained and processed as previously described (Chobotar, Scholteyseck, Sénaud, Ernst, 1975).

In a section through near the longitudinal plane of the merozoite the body was markedly constricted at the point of entrance into the epithelial cell (Fig. 1). Penetration of the merozoite had proceeded more than half-way, to the level of the nucleus which had stretched into a dumb-bell shape at the constricted portion of the merozoite (Fig. 1). In one section a portion of the host cell membrane turned inward for a short distance and abruptly terminated, indicating a break in the cell membrane (Fig. 2). In deeper parts of the cell, portions of the parasite appeared to be in contact with the host cell cytoplasm, whereas in other portions

* Supported in part by the Alexander von Humboldt Foundation, the Deutsche Forschungsgemeinschaft, and by Research Grant 5 R01AI-07488-08A1 from the NIAID, U.S. Public Health Service.
Figs. 1—3. Serial electron micrographs of an *E. ferrarisi* merozoite penetrating an epithelial cell of the colon of *Mus musculus*, 72 h after inoculation. Abbreviations: AM Amylopectin; CM Host cell membrane; FM Fusion of microvilli; IM Inner layer of pellicle; MI Mitochondrion; MN Micronemes; MV Microvilli; N Nucleus; NU Nucleolus; OM Outer membrane of pellicle