

Electron microscopic observation of the invasion process of *Cryptosporidium parvum* in severe combined immunodeficiency mice

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Cryptosporidium parvum mainly invades the intestinal epithelium and causes watery diarrhea in humans and calves. However, the invasion process has not yet been clarified. In the present study, the invasion process of *C. parvum* in severe combined immunodeficiency (SCID) mice was examined. Infected mice were necropsied and the ilea were observed by scanning and transmission electron microscopy. In addition, ruthenium red staining was used to observe changes in the microvillus membrane that resulted from the invasion of *C. parvum*. Scanning electron micrographs showed elongation of the microvilli around the parasite. The microvilli were shown to be along the surface of the parasite. Transmission electron microscopy confirmed that the invading parasites were located among microvilli. Parasites were seen in a parasitophorous vacuole formed by the microvillus membrane. The parasite pellicle attached to the host cell membrane, and then the pellicle and host cell membrane became unclear. Subsequently, the pellicle structure became more complex and formed a feeder organelle. Invasion of the parasite was not observed in either a microvillus or the cytoplasm of the host cell. We have showed that *C. parvum* invades among the microvilli, is covered with membranes derived from numerous microvilli, and develops within the host cell.