21 Recent Advances in the Developmental Biology and Life Cycle of *Cryptosporidium*

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Abstract

Cryptosporidium is an apicomplexan parasite that has gained much attention as a clinically important human pathogen since the late 1980s; however, little is known regarding the developmental biology of this parasite. Recent molecular and biological studies provide evidence that *Cryptosporidium* should be placed in a taxonomic group separate from the coccidia and closer to the gregarines (reviewed in Barta and Thompson, 2006). Furthermore, novel extracellular gregarine-like life cycle stages have been described. In addition to these findings, Hijjawi *et al.* (2004) reported the cell-free propagation of the life cycle of *C. parvum*, which also led to the identification of developmental stages similar to those observed in some gregarine species. The completion of the life cycle of *Cryptosporidium* in the absence of host cells raises many questions about the developmental nature of this parasite and its relationship to lower species of apicomplexans such as gregarines. This chapter covers recent observations on the developmental biology and life cycle of *Cryptosporidium* in an attempt to highlight more facts on the evolutionary biology of this unique parasite. Similarities between *Cryptosporidium* and some gregarine species are also included.

Introduction

Cryptosporidium has emerged as a well-recognized cause of acute gastrointestinal disease in humans and animals throughout the world and is associated with a substantial degree of morbidity in immunocompromised individuals such as AIDS patients (Hunter and Nichols, 2002). The lack of a well-defined model of *Cryptosporidium* infection has severely hampered research into the biology and development of this important parasite. Several attempts by scientists to complete the life cycle and maintain propagation of this parasite in different cell lines has failed (see review by Hijjawi, 2003). Continuous culture of the parasite and the production of large numbers of developmental stages *in vitro* await elucidation on the right combination of growth conditions that stimulate and support the autoinfective cycle.

 Giardia and Cryptosporidium: From Molecules to Disease (eds G. Ortega-Pierres *et al.*)