COMMENTARY

Methods of in vitro coccidian parasite cultivation

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Abstract

Many different protozoan parasites fall under the category *Coccidia*, which includes significant human and animal infections such *Toxoplasma gondii*, *Neospora caninum*, *Eimeria spp.*, and *Cystoisospora spp*. They frequently only have one host species for the entirety of their life cycle, which involves a transition from asexual to sexual stages. *Coccidian* parasite research at the moment is mostly concerned with cell biology and the underlying processes of protein expression and trafficking at various stages of life, host cell invasion, and host-parasite interactions. Novel anticoccidial medication targets are also assessed. *In vitro* production of Coccidia needs to be improved and developed further to suit these requirements due to the range of research topics and the desire to lessen and replace animal experiments. Systems of established culture are continually enhanced for these goals. New in vitro culture systems have also recently become very important in Coccidia research. As demonstrated by Cystoisospora suis and Eimeria tenella, well-established and optimized in vitro cultures of monolayer cells can support the viability and development of parasite stages and even allow completion of the life cycle *in vitro*.

INTRODUCTION

Members of the genus Cryptosporidium and the subclass *Coccidia*, which includes *Eimeria, Toxoplasma, Cystoisospora*, *Sarcocystis*, and *Neospora*, are among the most significant protozoan diseases of people and animals that belong to the class *Conoidasida*. Major diseases caused by some species can harm human and/or animal health, as well as the growth and reproduction of animals, all of which are associated with financial losses for the livestock that are afflicted. Extensive *in vivo* experiments are frequently needed for scientific research on the biology of parasites and therapeutic alternatives. The three Rs, which serve as the foundation for ethical animal usage in science, have been followed in the majority of research labs since the late 1950s.

They include initiatives and guiding concepts for eliminating, replacing, and improving animal testing. For the purpose of reducing animal testing, techniques that use fewer animals per experiment or opportunities to get more data from the same number of animals are put into practice. While refinement applies to all facets of animal use, from housing and husbandry to the processes used, replacement attempts to avoid the use of animals and seeks to replace animal trials with alternative approaches.

A significant advance in the study of coccidians was the substitution and restriction of animal testing in accordance with the three Rs with in vitro cultivation techniques. As part of ethical considerations, more and more tools for study into many elements of this significant parasite group of coccidians are and will be made available thanks to the ongoing development and advancement of in vitro culture systems. There are already a number of well-established in vitro monolayer cultures that can be used to investigate various facets of coccidian biology and parasite management. Even while just a few species' whole life cycles can be supported in vitro, we are optimistic that ongoing scientific advancement will remove the current challenges. To produce a high output of parasitic stages during culture and significantly advance our understanding of coccidian biology, life cycle, and host interactions, cell monolayers have been continuously enhanced. Additionally, the pharmaceutical industry, as well as academic institutions, have been impacted by the strategic focus on a significant reduction in animal experimentation regarding toxicological and compound efficacy testing, and there was a significant increase in the creation and use of *in vitro* tests.

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