

Taxonomy of *Giardia* and *Cryptosporidium*: facts and controversies

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Protozoan parasites of the *Giardia* and *Cryptosporidium* genera are important causes of disease and morbidity in humans and are responsible for significant economic losses in livestock breeding. Parasites of both genera infect many species of animals as well as humans. Environmentally resistant dispersive stages of the parasites are excreted with the host faeces; they are a contributing factor to the biological contamination of the environment, particularly in water ecosystems. To date, over 300 waterborne outbreaks caused by these protozoan parasites have been reported worldwide. These outbreaks constitute a significant threat to human health and pose a great challenge to public health systems worldwide. The aim of this paper is to outline facts and controversies associated with the taxonomy and nomenclature of *Giardia* and *Cryptosporidium* species.

The *Giardia* and *Cryptosporidium* genera comprise 6 and 26 species, respectively, with a diverse host range. Identification of the parasite species is very difficult because cysts and oocysts of most species have the same morphology. Moreover, definition of protozoan species is very difficult, because the notion of biological species that has been used for higher organisms is inappropriate. A further complication is their considerable genetic heterogeneity. Some *Giardia* and *Cryptosporidium* species, assemblages, sub-assemblages, genotypes, and even subtypes, are host-specific, whereas others indiscriminately infect humans and many species of animals.

The taxonomy of *Giardia* has been controversial for many years, while controversies concerning the species status of *Cryptosporidium* have been intensifying in recent years, which is associated with proliferation of new species descriptions. The constantly changing opinions on *Giardia* and *Cryptosporidium* taxonomy aptly illustrate the importance of accurate identification and/or nomenclature of pathogens in setting legal standards related to water quality, assessing the risk of human infection, in epidemiological studies, in particular to determine the source of water pollution or waterborne and foodborne outbreaks and to take all available preventive measures, and in the development of reliable diagnostic tests.