

Prototheca spp. in Bovine Infections

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Prototheca microalgae, although still considered uncommon etiologic agents, represent an insidious intruder, threatening cattle herd health and determining productive losses. Increasing numbers of clinical cases globally identified would indicate these microalgae as emerging pathogens. They can be isolated from a wide variety of environmental and non-environmental sources, due also to their ability to produce biofilm. This ability to spread and contaminate a huge variety of substrates, as well as the high resistance to elevated temperatures, renders *Prototheca* prevention a very hard task. In addition, early infection signs are subtle and difficult to detect. The poor response to conventional antimycotic drugs represents an additional challenge when facing this infection. Although it would seem unrealistic to completely eradicate the exposure risk of cows to these microalgae, the adoption of proper on-farm protocols and management, with the highest attention to hygiene measures, would be beneficial in reducing the magnitude of this problem. Keeping the attention focused on early diagnosis, together with the development of new, alternative, and effective agents and formulations, would be strongly advised to prevent, treat, and control *Prototheca* infections.

microalgae

Prototheca bovis

Prototheca blaschkeae

Prototheca ciferrii

bovine protothecosis

mastitis

cattle

Prototheca spp. (family *Chlorellaceae*, order *Chlorellales*, class *Trebouxiophyceae*) are achlorophyllous microalgae, widely distributed in the environment and repeatedly reported as responsible for human and animal disease. Bovine mastitis represents the most important form of *Prototheca* infection in animals and consists of clinical or subclinical forms. Dairy-cattle-associated *Prototheca* species are *Prototheca bovis*, *Prototheca blaschkeae*, and *Prototheca ciferrii* [1]. The ecology of *Prototheca* is not fully elucidated yet. These organisms can be recovered from animal waste, sludge, sewage, rivers, and fountains, preferring moist areas with high organic contents. Bovine protothecosis is reported to occur worldwide, in the presence of large dairy herds, mostly in tropical and temperate areas [2]. Predisposing factors to protothecosis are reported to be unclean or repeated intramammary infusions, and antibiotic drug treatments in the udder, where *Prototheca* would act as an opportunistic pathogen favored by antibiotic-induced suppression of the local flora [3][4][5][6][7][8]. *Prototheca* spp. can survive a wide range of environmental conditions as well as disinfectants [9][10]. *Prototheca* spp. can produce biofilm [11][12]. Bovine mammary gland can be infected by *P. bovis* following teat trauma by mechanical milking, and subsequent contamination of the teat orifice by environmental organic matter [13][14]. Infection of the mammary gland is often subclinical, without any visual sign, and can be revealed by raised somatic cell count only, although the high result is not continuous [6][15].

An environmental control approach would include action in stables, aisles, run as well in milking parlor. The main strategy is devoted to controlling algal amounts in the environment enhancing hygiene measures by using conventional and natural disinfectants, as well as physical tools [16]. To date, no treatment protocol has been proven fully effective in controlling *Prototheca* spp. infection in dairy cows [2].

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