Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(5): 1154-1155

Received: 14-07-2018
Accepted: 15-08-2018

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Effect of *Cryptosporidium* in 0 to 3 months calves: A review

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Abstract
In India *Cryptosporidium parvum* is most important parasite which transferred from animal to human or human to animal. This protozoan parasite infects gastrointestinal tract of human and animal. *Cryptosporidium parvum* mostly affect on young calves and particularly neonatal calves. 0 to 3 month calves might be suffering from watery diarrhoea. In severe cases, due to loose motion loss of more water as result death of calf may occur. Till now there is no effective treatment. *Cryptosporidium* is zoonotic parasite, causing disease in young children. There is more economic losses of farmer due to supportive treatment and death of calf. To minimize this infection sanitation and cleaning of farm must be maintained.
This review discusses the impact of *Cryptosporidium* in 0 to 3 month calves and describes the host–pathogen interactions may help to identify novel prevention and control strategies.

Keywords: *Cryptosporidium*, calves, merozoites

1. Introduction
Cryptosporidiosis is now recognised as endemic in cattle worldwide and is one of the most important causes of neonatal enteritis in calves globally [1, 2, 3]. Cryptosporidiosis due to *C. parvum* is an important zoonotic disease caused by a small apicomplexon protozoan parasites belonging to genus *Cryptosporidium*. Domestic cattle have been considered the major reservoir of *Cryptosporidium* for human infections [4]. Calves below one month of age are found to be most susceptible to the infection than the other age group [5] and a major contributor of zoonotic *C. parvum* [6]. Cattle are mammalian species commonly infected with *Cryptosporidium*, and pre weaned calves are considered the most important reservoir for zoonotic infections. Large numbers of studies have suggested that *C. parvum*, *C. bovis*, *C. andersoni*, and *C. ryanae* are the most common species infecting cattle, although *C. felis*, *C. hominis*, *C. suis*, *C. scrofarum* (formerly pig genotype II), and *C. suis*-like genotype have also been detected [7]

2. Prevalent species of *Cryptosporidium*
There are different species of Culicoides prevalent in worldwide: a) *Cryptosporidium parvum*, b) *C. bovis* c) *C. andersonii* d) *C. wrairi* e) *C. hominis* f) *C. Meleagridis* g) *C. canis* h) *C. Felis* i) *C. saurophilum* j) *C. bovis* k) *C. baileyi* l) *C. muris* m) *C. serpentis* [8].

3. *Cryptosporidium* life cycle in calves
Oocysts of *Cryptosporidium* parasite transferred by various routes such as Faecal-oral route or directly contact with *Cryptosporidium* infected faeces, *Cryptosporidium* infected food and water. In gastrointestinal tract due to low pH, excystation oocyst occurs and four number of sporozoites are released. Sporozoites of *Cryptosporidium parvum* attaches to epithelial cells of the ileum. After attachment, vacuole formed by host cell. The parasite begins asexual reproduction and develops into a type I meront which releases merozoites. The merozoites that are formed within the type I meront canimmediately re-infect the host, by invading neighbouring epithelial cells and beginning asexual reproduction again, or develop into a type II meront. Type II meronts release four merozoites that initiate the sexual reproductive cycle. The released merozoites invade host cells and differentiate into either macrogamonts or microgamonts. Microgamonts develop multiple nuclei and release free microgametes that penetrate and fertilise the macrogamete, producing a zygote. Meiosis occurs and the zygote differentiates into four sporozoites as the oocyst develops and is released from the lumen.

The sporozoites may be released directly into the lumen either from thin-walled oocysts that re-infect the host, or are contained in thick-walled oocysts [9]

4. Effect of *Cryptosporidium* on calves

- Due to acute enteritis result in to watery diarrhoea
- Mild fever, Weakness, emaciation
- Reduced weight gain
- Due to dehydration death of calves may occur

5. Economic losses

Losses related to calf cryptosporidiosis have not thus far been examined but severe losses of farmer or dairy industry in term of treatment to calves for rehydration

Therapy and cure of enteritis also retarded growth. Also loses due to death of calf.

6. Preventive measure to avoid *Cryptosporidium* infection in calves:

Currently in India or in worldwide there is no vaccine available for control of *Cryptosporidium* in calves anyhow for control of *Cryptosporidium* General

Sanitation practices are also a primary control method that yields high results. The oocysts are resistant to many disinfectants [10]. Noninfected calves moves to clean area from infected calves because chances of spread of infection from infected to healthy one. *Cryptosporidium* infection occurs in immune supressed calves, so avoid management stress on calves.

7. Treatment: There is no affective or approved treatment for Cryptosporidiosis. Morbidity is high with this disease but mortality is generally low. However, calves do need intensive supportive care. Sick calves should be housed in a clean, warm, and dry environment. They need fluid therapy to counteract and prevent further dehydration as well as electrolytes to replace those lost due to diarrhoea. They also need nutritional support to give them energy to fight disease and repair their bodies. A recent study showed no clinical benefit to Administering decoquinate as a preventative treatment for cryptosporidiosis [11].

8. Conclusion: it is suggested that *Cryptosporidium* infection on farm and environment is very difficult to control. Anyhow to avoid economic losses on farm remove stress factors of farm. Good sanitation and environmental condition leads to increase in immunity of calves. Provide 1/10 body weight of colostrum to avoid or susceptibility to *Cryptosporidium*.

9. Acknowledgment

Authors would like to thank college of Veterinary and Animal science Parbhani for conducting research which formed a framework for writing this article

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