



## To the Extent of Knowledge of Causative Agents of Coccidiosis in Farm Animals in Azerbaijan

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### Abstract

The article discusses problems associated with the significant spread of unicellular protozoal pathogens of large and small cattle, buffaloes and other farm animals. Eimeriid intestinal *Coccidia* of the genera *Cryptosporidium* and *Eimeria*, cyst-forming *Coccidia* of the genus *Sarcocystis* affect more than half of farm animals of different ages, which cause significant harm to livestock. The symptoms of various coccidiosis are described - eimeriosis, cryptosporidiosis and sarcocystosis. Measures are proposed to prevent and combat the spread of coccidiosis pathogens.

**Keywords:** Eimeriid *Coccidia* (*Cryptosporidium*, *Eimeria*, *Sarcocystis*); Coccidiosis; Spread and Prevention

*Coccidia* (*Coccidia*, Sporozoa) are intracellular parasitic protozoa (Protozoa), which are a cell and, at the same time, an independent organism. *Coccidia* of vertebrates are widespread throughout the world, including in Azerbaijan. These parasites, once in the host's body, cause diseases collectively called coccidiosis. In many adult animals, *Coccidia* also cause serious illness, often fatal. The best known coccidiosis are eimeriosis, sarcosporidiosis and cryptosporidiosis [1-3].

*Eimeria* (*Eimeria*, Eimeriidae) are the causative agents of eimeriosis - *Coccidia* of the genus *Eimeria* (Eimeriida Eimeriidae). *Eimeria* causes diseases of the gastrointestinal tract of birds, rabbits, large and small cattle, buffaloes and other domestic animals. In wild animals, infection with *Eimeria* occurs through the fecal-oral route when they ingest *Coccidia* oocysts containing spores in food or water contaminated with the feces of infected animals. In sick animals, productivity decreases and mortality increases, especially among young animals.

Eimeriosis is mainly a disease of young animals. In sick animals, productivity decreases and mortality increases, especially among young animals. Adult animals get sick less often. Clinically, in all sick animals, eimeriosis is manifested by general depression, decreased appetite, diarrhea, and the animals lose a lot of weight. In sick birds - ruffled feathers, drooping wings, pale combs, in livestock - the fur becomes disheveled and loses its shine. *Eimeria* of different species, having penetrated the corresponding organ of the host body, destroys the epithelial cells lining the organ cavity. In this case, the "gates of infection" seem to open, i.e. Various bacteria begin to multiply intensively, causing inflammatory processes.

Thus, the disease becomes generalized. Eimeriosis caused by any type of *Eimeria* is not limited to damage to one organ (most often the intestines), significant changes occur in all organs [3,4].

Animals that survive the disease acquire immunity and become carriers of the infection, since during repeated infections with

pathogens of eimeriosis, they themselves do not get sick, but release oocysts into the environment, where the oocysts become invasive; under favorable conditions, sporulation occurs, i.e. formation of spores and sporozoites. Under favorable conditions: sufficient humidity and air temperature 18-22°C, sporulation is completed within 2-4 days. At higher temperatures and high insolation, oocysts die; at low temperatures, sporulation slows down.

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Eimeriosis can occur acutely, subacutely and chronically. This depends on the number of protozoal pathogens that have entered the host's body, the age and condition of the host, and, ultimately, on the living conditions of the animals. In farms with intensive livestock and poultry farming, where hundreds of animals are kept in relatively small premises and small areas, even if all sanitary and veterinary standards are observed, animals are easily re-infected with various types of *Coccidia*.

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Sarcosporidium, the causative agent of sarcosporidiosis, also poses a danger when breeding and keeping animals. This is the general name of the disease, the causative agent is *Coccidia* of the genus *Sarcocystis* (*Eimeriida*, *Isosporidae*, *Sarcocystinae*).

In Azerbaijan, 7 species of sarcosporidium have been diagnosed in farm animals, cattle and small cattle, and their definitive hosts, dogs and cats, have been experimentally established. Unlike

*Eimeria*, the life cycle i.e. sarcosporidium, the development of the parasite from oocyst to oocyst occurs in the body of a herbivore (intermediate host) and a predatory or omnivore (definitive host). Oocysts (sporocysts) of sarcosporidia, having entered the body of an intermediate host with food or water, form tissue cysts, sarcocysts, the so-called "Micher sacs" in the skeletal muscles and muscle tissue of various organs (heart, esophagus, diaphragm). These are dense formations filled with developmental stages of sarcosporidium, cystozoites.

Diseases caused by Sarcosporidium occur differently in the final and intermediate hosts [Beyer, Radchenko, 2003, 2015]. In the intermediate host, the causative agent of the disease is the precystic stages of parasite development, which originate from oocysts (sporocysts) ingested by the host [5,6]. From the stomach of the herbivorous host, through the blood vessels, the precystic stages of development enter the muscle tissue, where they form tissue cysts, sarcocysts. Predators (dogs, wolves, jackals, cats, etc.), eating meat waste affected by sarcocysts, become infected with the cystic stages of development of sarcosporidium. The parasite affects intestinal cells. In the intermediate host, sarcocysts infect muscle tissue. Ultimately, the causative agent of the disease is the contents of the sarcocysts, i.e. cystic stages, cystozoites. Thus, the pathogen is the same *Sarcocystis*, but different stages of development. Diseases of intermediate hosts are usually called sarcocystosis, and diseases of the final hosts are called sarcosporidiosis.

Sarcosporidiosis has long been considered an asymptomatic infection. In the intermediate host, sarcocystosis has two phases - acute, which occurs in the vessels of internal organs, and chronic, in the muscles. The acute phase of the disease caused by different species can last from 2 weeks to 1.5 months. The symptoms of acute sarcocystosis resemble the picture of a disease in calves previously described under the name "Dalmeny disease". Sick animals experience fever with high temperature, vasculitis, enlarged lymph nodes, anemia, hemorrhages in the internal organs of the external and internal lymph nodes. The muscles of calves affected by sarcocysts are dark brown in color with a marbled pattern. Due to increased permeability of the walls of blood vessels and extensive massive hemorrhages, the calves developed anemia. The reproduction of the pathogen, along with the toxic and mechanical effects on the host's body, causes changes in it that develop like allergic reactions.

After the formation of tissue cysts in the muscles, the chronic phase of sarcocystosis begins. Symptoms of the disease in this phase are not pronounced, the animals look healthy. In chronic sarcocystosis, many metabolic products of the parasite accumulate in muscle tissue. This is also reflected in the state of uninfected muscle cells. Despite the intracellular localization of the sarcocyst, its negative impact extends not only to the cell enclosing it, but also to neighboring muscle fibers and even to cells of connective and nervous tissue. This ultimately leads to generalized damage to the entire host organism (Beyer, Radchenko) [6].

In the definitive hosts - predators (from domestic animals - cats and dogs), sarcosporidiosis occurs as a typical intestinal coccidiosis. The integrity of the villous epithelium is disrupted, and the "gate of infection" opens, through which enterococci, *E. coli* and other pathogens can penetrate. In case of severe infection, death of young animals is possible.

Cryptosporidiosis of farm animals is of no small importance for livestock farming. In Azerbaijan, this coccidiosis has not been studied enough. The causative agents of these infections are *Coccidia* of the genus *Cryptosporidium* Eimeriidae (*Cryptosporidiidae*). Unlike *Eimeria*, *Cryptosporidium* oocysts sporulate in the host body. They are excreted into the external environment with feces, already invasive and capable of infecting a new host. *Cryptosporidium* is the causative agent of opportunistic or opportunistic infections, the development of which is activated when the host's immune status is impaired.

Since the first discovery of *Cryptosporidium* in mice, they have been identified in other animals. However, *cryptosporidium* was considered non-pathogenic; even in the presence of clinical manifestations of the disease, researchers did not associate it with exposure to the parasite. In the 70-80s of the last century, it was found that the development of *cryptosporidium* can occur not only in the intestines, but also in other organs of animals - the lungs, respiratory tract, bile ducts, kidneys, cloaca, and bursa of Fabricius in birds. In the same decade, the ability of *cryptosporidium* to circulate between humans and animals was proven (Nime., *et al.* 1976) [7].

It turned out that the manifestation of a parasitic infection depends on the immune state of the host. Subsequently, due to the spread of the "plague" of our time, HIV infection and

the intensification of research into concomitant diseases, the opportunistic nature of these *Coccidia* was revealed. Human cryptosporidiosis is currently classified as an HIV-associated disease or AIDS-marker disease, or superinfection.

*Cryptosporidium* poses a significant danger to farm animals. Calves are especially seriously ill in the first days of life. The main clinical sign is common to humans and animals - diarrhea, accompanied by frequent bowel movements. The disease causes anorexia, weight loss, dehydration, and general depression. With cryptosporidiosis, atrophy of the intestinal villi is observed. It has been established that cryptosporidiosis, suffered at an early age, leads to severe pathological changes in the heart and liver of the host.

In immunodeficient individuals, cryptosporidiosis becomes a deadly disease. The latest research shows that modern treatment of cryptosporidiosis is ineffective, since the drugs created do not have any effect on the parasite itself.

The main mechanism of infection transmission is the same as for *Eimeria* - fecal-oral. But, unlike *Eimeria*, infection can occur not only when oocysts are ingested in food or water contaminated with *Cryptosporidium*. Infection can occur through direct contact with an infected person or animal. Almost all mammalian *cryptosporidiums* are dangerous to humans. In Azerbaijan, currently, based on the biometric parameters of oocysts, the presence of 11 species of *cryptosporidium* has been established, of which 10 species infect various mammals and humans.

Despite compliance with all veterinary and sanitary standards for keeping animals, the danger of human infection with *cryptosporidium* is quite high. However, there is little data on human infection with *cryptosporidium*. It can be assumed that in some cases, diarrhea of sick people caused by *cryptosporidium* is diagnosed as an "intestinal infection of unknown etiology".

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