

VETERINARY SCIENCES

PROBLEM PROTOZOA OF PIGLETS, MEANS OF THEIR CHEMOTHERAPY AND PREVENTION

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Abstract

The article presents data on the spread of isosporosis, cryptosporidiosis, eimeriosis, and balantidiosis, which are problematic when growing suckling piglets and their pathogenic effect on the body. The results of the use of a complex treatment agent for the mixed course of isosporosis-cryptosporidiosis and eimeriosis-balantidiosis infestation of piglets are provided.

Keywords: isosporosis, cryptosporidiosis, eimeriosis, balantidiosis, piglets

Pig farming, due to its economic importance, occupies an important place among other branches of animal husbandry, and in crisis situations, pork breeding is one of the main sources of rapid increase in meat production [1]. Therefore, the development of this branch of the agricultural sector is extremely important and promising [2].

Intestinal protozoa are parasites that threaten the health and welfare of pigs and impair the sustainability of pig farms, resulting in monetary losses. Protozoa are major biological barriers to efficient pig production, but are often overlooked because clinical symptoms are rarely detected. [3].

The impact of endoparasites depends on the parasite load and the individual resistance of the animal, which can be influenced by environmental and nutritional factors. Endoparasitism can occur both with and without clinical symptoms. The disease with clinical manifestation can lead to death, especially in the initial phase of animal growth. The absence of clinical symptoms is important for production, because if it remains undetected, it can lead to economic losses due to reduced pig productivity [4].

Parasitocenosis in the intestines is the most abundant and diverse. Various types of bacteria, pathogenic fungi, protozoa and helminths are localized in it. All these organisms are in certain relationships not only with the host, but also with each other. Existing relationships can be both antagonistic and synergistic [5].

K.I. Skryabin (1950) wrote that the life of a parasite is connected not only with the chemistry of the tissues of its definitive hosts and the presence of a particular parasite in a certain area, but also depends on a more complex set of factors, including economic ones.

The relationship between the parasite and the host, in some cases, leads to the formation of immunopathological reactions. At the same time, their importance in the pathogenesis of certain invasions may exaggerate the direct effect of the parasites themselves. It is known that the causative agents of invasive diseases affect the functional activity of the immune system, causing a

state of secondary immunodeficiency, therefore its imbalance becomes a decisive factor that determines the occurrence and course of the invasive process. A decrease in the immunological reactivity of the body with protozoa reduces the effectiveness of deworming and at the same time increases the susceptibility of the body to re-infection with parasites [6].

Clinical manifestations of parasitocenosis are highly variable and depend on the genotypic and phenotypic heterogeneity of parasites and hosts, the quantitative and qualitative composition of micropopulations, the state of the immune system of the macroorganism, the accompanying non-infectious pathology of the host, the virulence and pathogenicity of the pathogen, etc. The polysymptomatic nature of the clinical picture of parasitocenoses complicates their diagnosis and prevention, which requires the use of the latest technologies along with traditional diagnostic techniques [7].

There is a constant circulation of opportunistic, pathogenic microorganisms, as well as helminths, protozoa and fungi in the piglets' body. In the artificially created conditions of keeping pigs and, in particular, piglets, due to their high concentration in a limited area, permanent parasitocenoses are formed [8-10].

Endoparasitism in pigs indicates the heterogeneity of the involved parasite species and their pathogenicity [11, 12]. In addition, infested pigs are generally more susceptible to infectious and non-infectious diseases that undermine their health and welfare [13].

Gastrointestinal parasites are the main cause of reduced productivity in pigs. They affect performance by directly competing for nutrients required for optimal growth and reproduction. In addition, these parasites can cause tissue damage (lesion) leading to organ culling during meat inspection, poor feed conversion, diarrhea and dehydration, or even animal death [14].

Cystoisospora (syn. *Isospora*) *suis* is the causative agent of coccidiosis in newborn pigs and one of the main causes of diarrhea in suckling piglets worldwide.

Piglets become infected after eating sporulated oocysts from a contaminated environment. The parasite

multiplies in the enterocytes of the small intestine, causing catarrhal enteritis associated with shortening and fusion of intestinal villi, nonhemorrhagic diarrhea, and weight loss. While pigs of all ages can shed oocysts after infection, usually only weanlings develop typical intestinal lesions and signs of disease during the first weeks of life. This is related to the functional immaturity of the immune system of piglets during the first weeks of life [15].

Cryptosporidium is a genus of apicomplexan parasites that is distributed throughout the world and consists of many different species and genotypes. *Cryptosporidium* spp. are parasites with a direct life cycle and pigs become infected when they ingest infectious oocysts from the environment. The infectious dose of *Cryptosporidium* is only ten oocysts, and since such oocysts can survive well in the environment, the probability of spreading to new hosts is high. When ingested, the oocysts are secreted in the pig's small intestine and release sporozoites that penetrate the epithelial cells. Clinical signs in pigs are characterized by diarrhea, anorexia and poor weight gain and depend on the species or genotype [16].

6 species of *Cryptosporidium* were isolated from pigs, namely *C. suis*, *C. parvum*, *C. muris*, *C. andersoni*, *C. scrofarum* (previously called *Cryptosporidium* genotype II) and *C. tyzzeri* (previously called *Cryptosporidium* mouse genotype I). At the same time, experimental studies showed that pigs were also susceptible to infection with *Cryptosporidium hominis* and *C. meleagridis* [17].

Eimeriosis of pigs cause significant economic losses, which are caused by a decrease in the productivity of animals, a delay in growth and development, a decrease in resistance, and a high level of mortality in young animals. The percentage of mortality increases significantly with simultaneous infection of animals with eimeria, bacteria and helminths. *Eimeria* spp. in pigs, it is considered by some authors as an indicator of the hygienic status of the farm - the lower the level of hygiene, the more common *Eimeria* [1, 18].

Eymeriosis is one of the most common causes of diarrhea in piglets. The results of international, mainly Western European studies have shown that Eymeriosis is present on 75-76% of pig farms, and 40-100% of piglets on the farm can be infected regardless of hygienic conditions [19].

In pigs affected by *Eimeria*, in response to the penetration of parasites into the epithelial cells of the intestinal canal, the body reacts with changes in the blood. At the same time, eosinophilia, leukocytosis with a shift of the neutrophil nucleus to the left, the number of erythrocytes and the hemoglobin content decrease [20]. In the blood serum for swine eimeriosis, a decrease in the content of total protein due to albumins and an increase in the content of globulins, mainly due to gamma globulins, is noted [21].

Balantidiosis, caused by *Balantidium coli* (syn. *Neobalantidium coli* or *B. coli*), is a forgotten parasitic infection of zoonotic significance that affects various

hosts, including humans. *B. coli* (Malmsten, 1857), a ciliated protozoan belonging to the family Balantidiidae, is considered to be a commensal of the intestines of several mammalian hosts (e.g., pigs, humans, camels, monkeys, and rarely dogs and rats). The reservoir host is domestic and wild pigs, in which the parasite inhabits mainly the villi or lumen of the large intestine. *B. coli* has a direct life cycle with the faecal-oral route of transmission occurring mainly through consumption of food and water contaminated with cysts. High temperature and humidity favor the development and survival of this parasite [22].

Parasite control should focus on eliminating parasites from animals and minimizing the survival and transmission of parasites in the environment. The use of antiparasitic drugs alone is insufficient. Using drugs in small doses or treating pigs at non-strategic moments of time can not only lead to treatment inefficiency, but also to the emergence of resistance.

Treatment of protozoa is most effective in the period of preparation for pregnancy in order to timely interrupt the development of the parasite in the intestine in order to reduce damage to the intestine due to the stages of development and the formation of new oocysts. Studies have shown that the use of the triazinon toltrazuril in the prepatent period reduces diarrhea and oocyst excretion by almost 100% in experimental conditions, and is also effective in field conditions [23].

The most common practice was to treat sows prior to farrowing with fenbendazole administered in feed or water or ivermectin administered subcutaneously or in feed [19].

For the treatment of the mixed course of isosporosis-cryptosporidiosis infestation and eimeria-balantidiosis infestation in piglets, we developed a complex treatment agent, which showed a fairly high efficiency of 96.2% during testing. The basis of the useful model is the agent with an immunostimulating effect "Amprolev", which contains levamisole (Brovalevamisole), by adding amprolium 22%, vikasol and vitamin C (ascorbic acid) [24].

The main requirements for chemotherapy drugs are their effectiveness and safety. In addition, they should be cheap, convenient to use, and easy to use. It is known and proven that long-term use of the same drugs leads to a decrease in their effectiveness, therefore, the pig industry, like no other, needs constant research and development of new chemotherapeutic drugs.

For the prevention of coccidiosis, the physical removal of organic matter is probably more important than the final disinfection step, as sporulated *I. suis* oocysts are resistant to most disinfectants [25].

Successful on-farm control requires a combination of chemotherapy and strict hygiene measures. Thus, proper sanitation, such as steam cleaning and disinfection, is imperative to reduce infestation intensity. Active agents must be used for disinfection, as most disinfectants do not have any effect on removing persistent oocysts from the environment.

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