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Intestinal parasites in domestic pigs (*Sus scrofa domesticus*) in farms of Azerbaijan

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Abstract

In the article are presented the results of research of domestic pigs (*Sus scrofa domesticus*) infected with intestinal coccidia of genera *Cryptosporidium*, *Eimeria*, *Isospora*, as well as parasitic infusian genus of *Balantidium*. We have found the following 5 coccidian species in pigs: *Eimeria deblieski*, *Eimeria scabra*, *Eimeria polita*, *Isospora suis* and *Cryptosporidium suis*. The most widely distributed is *E. deblieski*, it was found in pigs in all the studied private households.

The extent of infestation with *Eimeria* and *Cryptosporidium* was higher in the lowland areas of the Absheron Peninsula, in Salyan region - 46.0 and 45.1%, respectively. In foothill area (Khudat) was - 39.0 and 42.5%, in the mountainous (Shamakhi, Ismayilli) -12.3 and 19.5%. It noted the mixed infection in domestic pigs of coccidia from 2 genuses - cryptosporidium with eimeria and from 3 genus eimeria with cryptosporidium with balantidium.

Keywords: Coccidia, eimeria, isospora, cryptosporidium, balantidium, species, domestic pig, infection

Introduction

Intestinal parasites, the protozoa of the genus *Cryptosporidium*, *Eimeria*, *Isospora* (Apicomplexa, Sporozoa, Eucoccidiida, Eimeriidae), as well as representative genus *Balantidium* (Ciliophora, Litostomatea, Balantidiidae, Balantidium) is parasitizes in many animals everywhere. They disrupt the normal functioning of the digestive and excretory organs, can cause severe illness, settling on the intestinal epithelial cells. Eimeriosis, isosporiasis, cryptosporidiosis, balantidiasis cause significant damage to pig-breeding. Sick animals are stunted growth, they lose weight and their productivity is reduced. The main mechanism of infection is fecal- oral transmission. Infection can be transmitted through direct contact with an infected person or animal as well as through objects of environmental contamination with protozoan parasites. A heavy infestation can cause death.

Cryptosporidiosis and balantidiasis are most important diseases among these protozoal infections. Their causative agents - cryptosporidiosis and balantidiasis have zoonotic nature.

The beginning of coccidiosis research was initiated in 1931 in Azerbaijan by Jakimov [1]. In Azerbaijan in the 60s of the 20th century began systematically to study of *Eimeria* coccidia were headed by academician M. A. Musaev [2, 3]. In Azerbaijan *Cryptosporidium* were investigated since 1987 [4, 5].

Pig breeding has never been profiling livestock industry in Azerbaijan. Parasitic protozoa were searched in studying of general parasitological situation of some animal complexes. In the last decade the many private farms become engaged in pig breeding in some areas of Azerbaijan.

The purpose of this study was to find out the pollution degree of domestic pigs with intestinal coccidia and balantidium in private farms of some regions of Azerbaijan.

Materials and Methods

Material collection was carried out in private ancillary pig farms of Binagadi, Shemakha, Khudat, Ismayilli (Ivanovka) and Salyan regions. All fecal samples were examined for parasitic protozoa from 1825 pigs of different ages during 2009-2015.

We examined the collected material in the Laboratory of Protistology, Institute of Zoology of National Academy of Sciences of Azerbaijan. Each sample of feces from each animal was stored in 2.5% potassium dichromate solution. The samples of feces were detected by the flotation method according to Fülleborn with the use of Darling's solution.

Following centrifugation, upper layer the supernatant was screened by a light microscope AMPRIVAL with magnification x 100, 400 and x1000 for detecting *Cryptosporidium* oocysts. Preparations after ethanol fixation were stained karbol-fuchsin, methyl green by Ziehl-Nielsen

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in the modification adopted for detecting *Cryptosporidium* oocysts [6]. For storage on the viability of balantidium cysts was used preservative of Safaraliev. Fresh fecal samples put to a glass slide, mixed with an equal amount of warm isotonic sodium chloride solution. Then the sample is covered with a cover glass and examined preparation at a low magnification (x100). At detection vegetative forms of balantidium cysts and oocysts of coccidia they were measured on the scale of the ocular micrometer 7x.

Identification species of *Eimeria* oocysts was carried out using diagnostic tools and original works on the theme of coccidia of Azerbaijan animals [7, 8, 3, 5]. Dimensional characteristics of oocysts of coccidia were treated biometrically [9]. For each species of animals was determined extent of infestation (EI), i.e. the percentage ratio of number animals excreting oocysts, to the total number examined. The intensity of invasion (II), i.e. parasite population density in the host organism, was

determined by counting a certain number of oocysts in the microscope field of view, under the cover glass in size of 18x18 mm, with magnification x100 (for *Eimeria*) and x1000 (for *Cryptosporidium*).

Results

A total of 1825 pigs of different ages from the three climatic zones of Azerbaijan: the lowlands (Binagadi, Salyan, and Bina) foothill (Khudat) and mountain (Shamakhi and Ismayilli) were examined for presence intestinal parasites. Analysis of infection of domestic pigs by coccidia showed presence mixed coccidian infection of the genus *Eimeria* with *Cryptosporidium* and of the genus *Eimeria* with *Cryptosporidium* and *Balantidiidum*. Research of fecal samples for the presence of *Eimeria* oocysts from 1825 heads domestic pigs was detected different species of *Eimeria* oocysts from 658 faecal samples (36.0%) (Table 1).

Table 1: The investigation of pigs infected with coccidia of the genus *Eimeria* and *Isospora*

Geographic location	Amount of animals		Extent of invasion (%)	Detected species of <i>Eimeria</i>
	Investigated	Infected		
Absheron	920	423	46.0	<i>E.polita</i> , <i>E.deblieski</i> , <i>E.scabra</i> , <i>Isospora</i>
Shemakha	393	79	20.1	<i>E.deblieski</i> , <i>E.scabra</i>
Khudat	195	27	12.3	<i>E.polita</i> , <i>E.scabra</i>
Ismailli (Ivanovka)	220	88	45.1	<i>E.polita</i> , <i>E.deblieski</i> , <i>E.scabra</i> , <i>Isospora</i>
Salyan	97	41	42.3	<i>E.polita</i> , <i>E.deblieski</i> , <i>E.scabra</i> , <i>Isospora</i>
Totally	1825	658	36.0	

In the farms of the lowlands and foothill areas in pigs we found 3 species of coccidia genus *Eimeria* (*E. polita*, *E.*

deblieski, *E. scabra*) and one species of *Isospora* - (*I.suis*) (Figure 1).

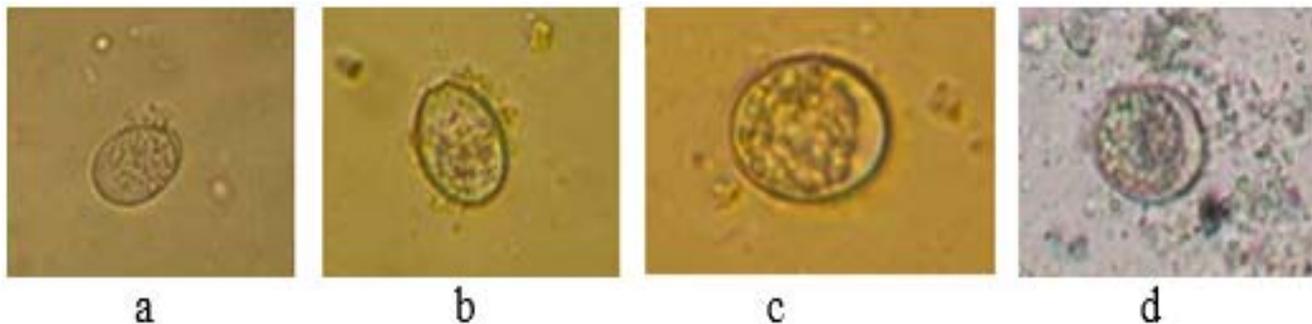


Fig 1: a) *Eimeria deblieski* Douwes, 1921; b) *Eimeria scabra* Henry, 1931; c) *Eimeria polita* Pellerdy, 1949; d) *Isospora suis*

In pigs from mountain area we found 3 species *Eimeria* (*E.deblieski*, *E.scabra*, *E.polita*). Extent of infestation in domestic pigs ranged from 12.3% to 46.0%. In the feces of 603 animals from 1779 (34.0%) have been revealed *Cryptosporidium* oocysts (Table 2).

Table 2: Infestation of investigated pigs by coccidia *Cryptosporidium*

Geographic location	Amount of animals		Extend of invasion (%)
	Investigated	Infected	
Absheron	874	339	39.0
Shemakha	393	94	24.0
Khudat	195	83	42.5
Ismailli (Ivanovka)	220	43	19.5
Salyan	97	44	45.3
Totally	1779	603	34.0

We found that extent of infestation in lowland and foothill zone was higher: 46.0 and 45.1% - 39.0 and 42.5%, than in the mountain 12.3 and 19.5% (Figure 2).

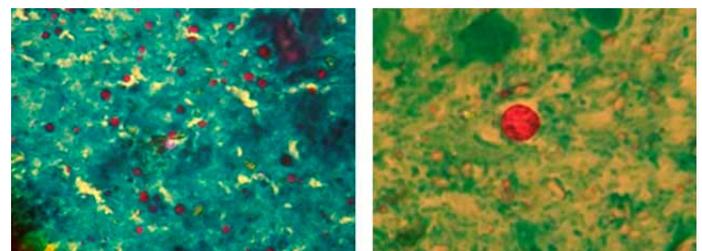


Fig 2: *Cryptosporidium parvum*

In Table 1 and 2 shows that pigs contained in the lowland farms have almost the same infection with *Eimeria* and *Cryptosporidium*. In mountain areas extent of infestation in pigs with *Cryptosporidium* and *Eimeria* was 24.0% and 20.1%. In foothill zone was high infection with *cryptosporidium* and *Eimeria* (EI-42.5 and 45.1%, respectively). Most detected *Cryptosporidium* oocysts have had medium size in the range of 4,0x4,7 mkm. Fresh feces from 714 heads of domestic swine were investigated for the presence cysts *Balantidiidum* and its were found in the feces from 241 pigs (34.0%) (Fig. 3).

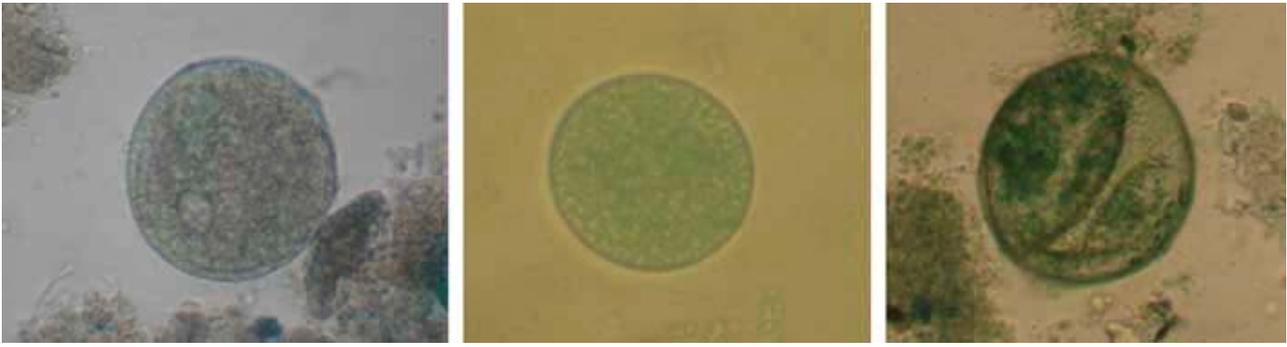


Fig 3: *Balantidium coli*. A cyst. Cysts with diameter 50 x 90 mm (7x40).

On the Absheron peninsula was established highest infestation with balantidiums in pigs of all age groups and it was 41.0%, the lowest was in the Ismayilli region - 18.2%.

It is known that pigs balantidiasis caused by two species of ciliates: *Balantidium suis* и *Balantidium coli* (family Balantidiidae). Representatives of genus *Balantidium* exist in two forms: vegetative and cystic. Vegetative forms of balantidiums in the environment are unstable and quickly die. Balantidiums cysts have had a round shape of cysts. The dimensions were as follows (37.53-50.4 x 95.91-79.23 microns), the vegetative form was not enough, as they quickly died.

Discussion

It is known that since 1976-1980's the investigations of pigs coccidia were examined for oocysts of coccidia infection in Cuba-Khachmaz region of Azerbaijan and Absheron peninsula. Fauna of coccidia in domestic pigs represented by three species of *Eimeria* (*E.debliecki*, *E.polita*, *E.scrofae*) and one species of *Isospora* - *I.suis* [10, 11, 8]. Extent of infestation was - 16.36% and 29.6%. Later, in 1982 and 1988 domestic pigs were studied for the presence of *Sarcocystis* and *Cryptosporidium* [3, 5, 8]. The study of the spread balantidiasis in Azerbaijan began in 1949 [12, 13, 14].

In pigs according to the literature are registered 13 species of *Eimeria* and one species of the genus *Isospora* [15]. Today 11 species of *Eimeria* are accepted as valid.

The following species: *E.polita* (Pellerdy, 1949), *E.deblieski* (Douwer, 1921); *E.scabra* (Henry, 1931); *Isospora suis* (Biester u Murray, 1934) are frequently met in private farms of Azerbaijan. The species - *E.deblieski*, *E.polite*, *E.scrofa*, *I.suis* have been noted earlier.

Among the agents of *Eimeria* major role is played species - *Eimeria debliecki* have been found in pigs in all the investigated households in the greatest quantity compared with other species of *Eimeria*.

Species *E.polita*, *E.scabra* и *Isospora suis* were less frequently found. Studying the spreading *Eimeria* in domestic pigs was found EI - 46.0% and 42.3% in farm of the lowland areas of Absheron and Salyan region, in the foothills (Khudat area) - 45.1%, in the mountain (Shamakhi and Ismayilli) - 20.1 and 12.3%. *Cryptosporidium* oocysts from the 1779 studied pigs were found in 603 (34.0%) animals. The infection was highest in animals identified in farms of Salyan region (45.3%).

The studying intestinal coccidia infected pigs of genus *Cryptosporidium*, from different regions of the vertical zonation have been revealed the highest extensive of pigs invasion- 39.0% and 45.3% in farms of lowland area, and low in the mountainous regions of Shamakhi and Ismayilli - 24.0% and 19.5%. According to the literature sources the genus *Cryptosporidium* officially includes 26 species [16]. The domestic pigs (*Sus scrofa domestica*) and wild boar (*Sus*

scrofa) have 2 species of *Cryptosporidium* - *Cryptosporidium muris* and *Cryptosporidium suis* [17]. At this stage of research we can diagnose the presence of two species of *Cryptosporidium* in pigs of Azerbaijan. In pigs from farms of Absheron, Shemakha, Khudat and Salyan regions, we have established mixed infection of cryptosporidium with eimeria and eimeria with *Cryptosporidium* with balantidiums. In researched farms extent of infestation in domestic pigs with eimeria was from 20.1% to 46.0%, with *Cryptosporidium* from 24.0% to 45.3%, with balantidium – from 18.2% to 41.0%.

Among the parasitic protozoa most often encountered coccidiosis (*eimeriosis*, *isosporiasis*, and *cryptosporidiosis*) and balantidioza that can affect swine of different ages, but mainly have pathogenic effects on the organism of young animals.

The results of the research showed appearance of cryptosporidium, eimeria and balantidium found in all seasons, regardless of the vertical zonation. Because the causative agent of coccidiosis is resistant [18] and animals are infected constantly, extent of infestation is high.

Overcrowding of animals, the presence of rodents in pig farms create optimal conditions for infection, increase the risk of the spread of cryptosporidium oocysts and balantidium cysts, and increase the extent of animal infection. Prevention and control of coccidiosis in pigs relies to carry out in spring and autumn because at this time the animals at the ages of 1 -6 are most susceptible to coccidiosis.

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