Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2018, 8(3), 149-153

ORIGINAL ARTICLE

Some species of the helminth fauna of reindeer (*Rangifer tarandus* L.) in conditions of the north part of Western Siberia (The Yamal Peninsular)

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Received: 06.07.2018. Accepted: 21.08.2018

The researching of the helminth fauna of reindeer has significant meaning for maintaining the epizootical welfare of the Yamal Peninsular. Reindeer's helminthiasis is a widespread infection around the territory of Yamal-Nenets Autonomous Area which causes loss to the economy of this region. Reindeer husbandry is an ethnicity-saving industry for local people. It provides clothes and food for them, so the welfare of reindeer is an important issue for indigenous people as well as for the regional economy in general.

The helminth infections cause substantial damage, decreasing the animals' productivity and blunting their immunity that might lead to exhaustion and death of the animals. With a view to research the epizootical situation we examined some reindeer husbandry enterprises in Tazovskiy, Yamalskiy, Preuralskiy and Purovskiy areas. For the examination of reindeer we used intravital and postmortal methods (the K. Skryabin's methods of a partial and full autopsy, the methods of helminth scatoscopy and microscopy).

Reindeer's helminthiasis is the most numerous group of helminth infections by the number of helminthes' species diversity. While examining the incidence of helminth infections of reindeer we found out that the most widespread infection in Yamal-Nenets Autonomous Area is caused by cestodiasis whereas the parenchymal cysticercosis has got the highest intensity and the cysticercosis tarandi can be rarely seen. The tenuicolic cysticercosis has got the lowest rate in the region. The number of reindeer species infected with echinococcosis in the region is estimated at 4.2%. The monieziasis infection which extension in the region is about 25% has got marked seasonal character. The invasion intensity of such helminth infections as paramphistomatosis and nematodosis amounted to 100%.

Taking into account all the provided data we can confirm that despite the existence of highly-efficient antihelminth means the problem of helminth infections of reindeer still remains relevant and requires the improvement of already existed and implementation of new measures to deal with mentioned diseases.

Keywords: Helminth fauna; reindeer; helminth invasion; cysticercosis; seasonality; extension; deworming; Yamal

Introduction

Russia is the largest reindeer herding country in the world. The share of the worlds herds of reindeer in Russia amounts to 70%. The biggest part of it is situated in Yamal-Nenets Autonomous Area where during the long history the unique reindeer herding civilization with nomadic and semi-nomadic lifestyles was formed.

As a branch of the local agriculture reindeer herding generates great income for the regional budget and, what is more, it plays essential and ethnisity-saving role in lives of indigenous people of the North.

Reindeer provide the local people the material for their housings, clothes and gives them food in severe climate conditions of their living. The processing of raw reindeer material has almost zero waste.

The large range of helminth infections hinders the successful development of reindeer herding industry. Despite the existence of highly-efficient antihelminth means the problem unified under the name of helminthiasis still remains relevant and greatly decreases the reindeer productivity, blunts their immunity and leads to the exhaustion and death of the animals. (Leshyov, Boykova & Kornienko, 2007; Mitskevich, 1967; Sivkov, Sergushin, Babin & Sokolov, 2003).

The reindeer with helminth infections are more susceptible to non-contagious diseases. Some of the helminth infections are dangerous for humans as well.

Research objective is the examination and analysis of the helminth fauna of reindeer in Western Siberia.

Materials and methods

This study was done with the view to research the epizootical situation related to parasitic diseases in Tazovskiy, Yamalskiy, Preuralskiy and Purovskiy areas during 2010 – 2015. We examined more than 5000 species of reindeer using the intravital and postmortal methods taking into account the epizootical factors. We also used the helminth scatoscopy and K. Skryabin's methods of a partial and full autopsy for helminthiasis diagnosis.

The species identity was defined during the microscopy. We also used the methods of defining the extensity and intensity of helminth invasion. The extension of the helminth invasion is the percentage of infected animals in a herd in relation to the total number of animals while the intensity is the number of helminthes invaded in one infected animal in a herd.

Results and discussion

The helminthiasis of reindeer is the largest group by the number of helminth diversity. The most widespread cestodiasises in Yamal-Nenets Autonomous Area are presented in this study as cysticercosis, echinococcosis and monieziasis. We also researched the trematode infection (paramphistomatosis) and nematodosis.

The cysticercosis (Cysticercoses) of reindeer is presented by three types of Taenia: *Cysticercus parenchimatosa* (parenchymal), *Cysticercus tarandi* (cysticercosis tarandi) and *Cysticercus tenuicollis* (tenuicolic). Their reproductive specimens parasitize in the bowels of reindeer herding dogs and other species of the Caniidae type.

The larvae of Taenia hydatigena-Cysticercus tenuicollis parasitize on the surface of rumens, mesenteries, diaphragms, omentums and serosa of parenchymatous organs (liver and kidneys).

The larvae of Taenia krabbei-*Cysticercus tarandi* were found in muscular tissue, hearts, tongues, oesophagus muscles and on the surface of bowels.

The larvae of Taenia parechimatosa-*Cysticercus parechimatosa* were found in livers, hearts and tongues.

As a result of the research we found out that the parenchymal cysticercosis has got the highest extensity of the helminth invansion which amounted to 33% (Figure 1). The cysticercosis tarandi extensity is lower-23.3%. The tenuicolic cysticercosis has got the lowest level of extensity-only 2%. We also considered the cysticercosis invasions in relation to the districts of Yamal-Nenets Autonomous Area and found out that the highest extensity of helminth invasion is in Yamalskiy (43%) and Tazovskiy (31%) areas.

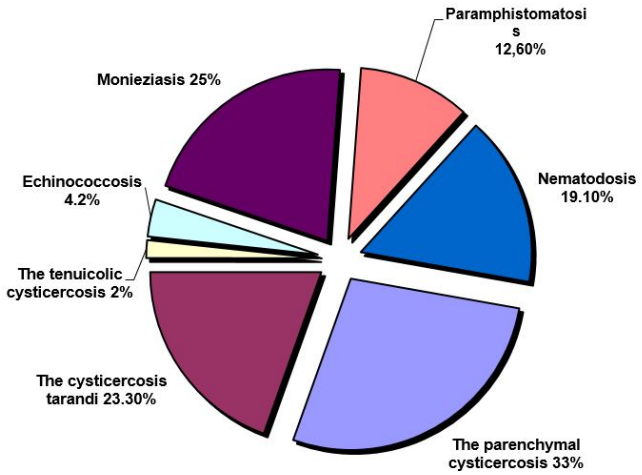

Figure 1. The extensity of the helminthiasis of reindeer in Yamal-Nenets Autonomous Area.

During the research we found out that only mature reindeer have got helminth invasion while calves do not infected with larval cestodiasis. This fact can be probably related to an unpractical use of pastures. Long herding encampments and unchangeable locations make the problem of parasitic infections in the region worse.

One of the reasons of infecting reindeer with cysticercosis is recently weakened work with reindeer herding dogs such as no counting and control over their movements, untimely and low-tech diagnosis and deworming, challenges with deworming of wild flesh-eating animals like ice foxes, foxes and wolves.

Moreover, a well-organised slaughtering of reindeer including the correct equipping of the places for slaughtering, well-timed veterinary and sanitary assessment and thorough processing of raw animal materials in coincidence with the veterinary and sanitary assessment results are also very important. The absence of unified rules for treatment and prevention of cysticercosis restrains the solution of this problem. As the result of our research we also presented the methodological recommendations which were given to the industry representatives.

Echinococcosis is a zooanthroponosic disease of humans and animals caused by the larval stage of a cestode (Taeniidae-*Echinococcus granulosus*) located in small bowels of definitive hosts such as dogs, wolves, domestic and wild fur-bearing animals.

The oncospheres ingested in organisms of their intermediate hosts (cattle, sheep, goats, pigs, reindeer and humans) take off their covers then their embryos get through the intestinal walls to capillary tubes and get to different organs and tissues with blood and plasm where they form monothalamous bladder-*E. granulosus*.

The level of the echinococcosis invasion of reindeer in researched herding households varied from 1.2 to 7.2%. On average for the region the invasion level amounted to 4.2% (Figure 1). While examining on echinococcosis invasion we counted only reproductive specimens. The most infected were female reindeer (Vazhenkas) which level of invasion reached 67% from all the infected animals (Figure 2). The level of invasion of bulls amounted to 22.8% whereas only 10.2% of male reindeer (Khors) were infected.

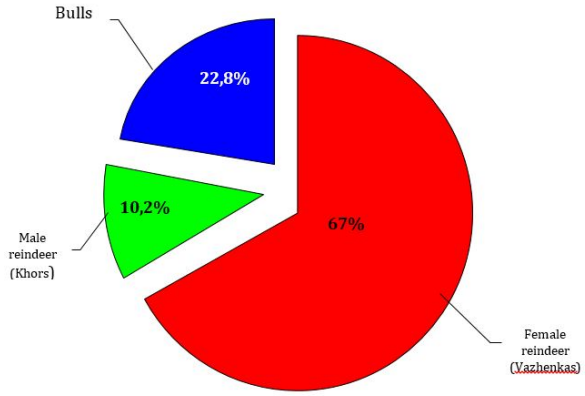

Figure 2. The extensity of echinococcosis among the sex groups of reindeer.

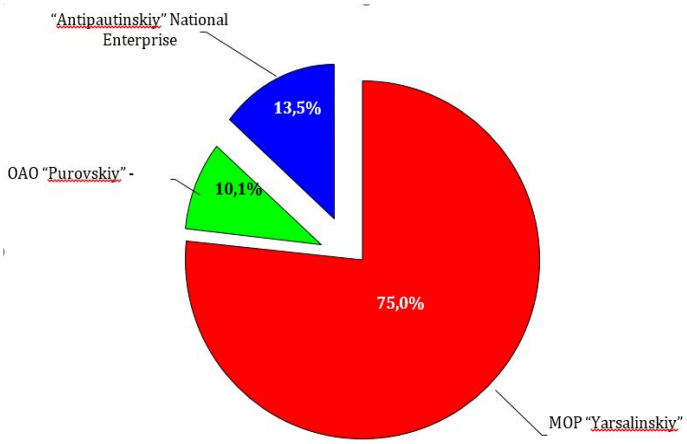

Figure 3. The extensity of echinococcosis among the researched enterprises.

In the working conditions of MOP "Yarsalinskiy" we were provided with an opportunity to diagnose reindeer infections after their slaughtering with a high accuracy. In those conditions we defined that the level of echinococcosis invasion of reindeer is very high-about 75% (Figure 3) compared to the assessment of the invasion in conditions of slaughtering places in National Enterprise "Antipautinskiy" where the level of echinococcosis invasion of reindeer reached only 13.5% and in conditions of corrals in OAO "Purovskiy" it reached only 10.1%.

According to provided data we confirm that conditions of slaughtering places and assessing make adjustments to the accuracy of the infections' diagnosis.

The extension of this particular invasion as well as others helminth invasions around the territory of the Yamal Peninsular is the result of some difficulties with following the prevention measures and considering the nomadic lifestyle. However, taking the fact that echinococcosis invasion is a real threat for people living in Yamal region into account, Yamalskiy, Tazovskiy and Preuralskiy areas still remain the most endemic in the issue of echinococcosis.

The importance of well-timed and thorough expertise of products of reindeer slaughtering and well-timed prevention of definitive hosts (dogs, cats, wild commercial animals) from helminth infecting needs to be acknowledged. Many researchers (Leshyov & Sivkov, 2005; Luzhkov, 1956; Sivkov, Sergushin, Babin & Sokolov, 2003) had already found out that echinococcosis is widespread aroung Yamal region through dogs and other animals. That is why the work against helminth infections extension must be enhanced by the veterinary services of Yamal region.

The monieziasis of reindeer is caused by the cestode Anoplocephalidae: *Moniezia benedeni, Moniezia baeri, Moniezia rangiferina, Moniezia taymirica*.

The specimens of all these types parasitize in small bowels. Monieziasis was found in all the researched areas of the Yamal region. The average extensity of long-term invasion among the areas is 25% (Figure 1) while the intensity of the invasion hesitates from 1 to 8 tapes of moniezia per one animal.

Monieziasis can be characterized by its seasonality and was recorded from July to September, but the first reproductive cestodes were found in the end of June and in the beginning of July among the 2-3 month old reindeer.
In December only 1% of reindeer is infected by single moniezias. Mostly young reindeer is infected with monieziasis and the extention level among them sometimes reached even 100% while the extensity level of invasions of mature reindeer amounted to 23.3% and the intensity of monieziasis invasion was three moniezias per a reindeer.
In monieziasis-troubled herds the calves were exhausted and looked like weaklings. They had diarrhea and their growth and development stopped. In July and August their massive deaths started with the specific characteristics of monieziasis such as blocking of small bowels with numerous moniezia tapes.
The problem of treatment and prevention of this disease is very challenging because of the lack of high-efficient and available antihelminth medicine and labour-saving techniques and their implementation in reindeer herding industry. The most sensible direction in this field is the creation and development of the antihelminth medicine bases on salt briquettes.
The paramphistomatosis of reindeer is cause by flukes Cotylophoron skrjabini from Paramphistomatidae family that parasitizes in rumens of reindeer. It was recorded in three out of four researched areas of Yamal: Purovskiy, Preuralskiy and Yamalskiy areas. The highest extensity amounted to 100% was found in Purovskiy area (in forest tundra). The intensity reached from 20 to 1500 paramphistomas per a reindeer. The extensity in Preuralskiy area (in arctic Ural zone) was much lower and reached 6.4% while the intensity reached 200 paramphistomas per a reindeer. In Yamalskiy area paramphistomatosis was found only in southern tundra zone and its extensity was 9.7% and intensity hesitated from 80 to 400 paramphistomas per a reindeer. In arctic tundra paramphistomatosis was not found at all.
The paramphistomatosis of reindeer has seasonal character, so the first paramphistomas were found in the end of June and the peak of the invasion was recorded from the end of August to the end of September. This invasion absolutely stopped in the middle of January.
In Purovskiy area both mature and young reindeer were infected with paramphistomatosis. In Preuralskiy and Yamalskiy areas only young male and femail reindeer were infected. The average extensity of the invasion for the Yamal region reached 12.6% (Figure 1).
The massive infecting of reindeer with paramphistomatosis in conditions of the high intensity level requires paying close attention to this nosology from the specialists and scientists of Yamal. The main challenge of coping with this problem is the fact that nowadays there are no methods of treating such diseases. The members of our scientific institute try not only to research this problem in conditions of Yamal, but also to find the means and methods to deal with it. For instance, the range of medicine based on rafocsanidum was successfully tried out. There is also a technological refinement of using some medicine based on salt briquettes.
The nematodiroses of reindeer in Yamal is caused by Nematodirella longissimespiculata from the Trichostrongylidae family that parasitizes in small bowels of reindeer. It was recorded in all the researched areas: Purovskiy, Yamalskiy, Preuralskiy and Tazovskiy. The extensity of this invasion does not depend on the landscapes or climate zones and reached up to 100%. The intensity of this invasion varied depending on the age of reindeer. For example, examining the 2 month old calves we found from 26 to 150 specimens per animal. The highest intensity of the invasion was found among heifers and reached from 70 to 800 specimens per animal. The intensity of nematodiroses which mature reindeer were infected reached from 7 to 50 specimens. It also was characterized by its seasonality. The invasion lasted during the summer and autumn with the peak in August and in winter it greatly decreases. From November to June the main part of reindeer do not infected with nematodiroses. The average extensity of the invasion for the region amounted to 19.1% (Figure 1).
The high level of the invasion of reindeer with nematodiroses also needs close attention from the specialists of Yamal. The solution of this problem might be successful due to the trial experiments with medicine based on macrocyclic lactons which are widely used against the reindeer warble flies and also have harmful effect on nematodiroses. But the technological schemes of the period and frequency of using this medicine still need to be created.

Conclusions

The research that was done showed that, despite the existed highly-efficient means, the problem of fighting against parasitic diseases of reindeer remains the most essential because the invasion of the animals with helminth infections in the region is very high. Without the scientific-proven range of treatment and prevention methods this unfavourable situation in Yamal will be continuing and leading to the decline of the quality of reindeer herding industry products, decreasing the number of animals in herds and as the result it will lead to a big economical loss in the region in general.
The bright example is MP “Yamalskie oleny” where more than 10000 reindeer are slaughtered every campaign. Because of the helminth infections only 20% of this number is sent to the further processing. One kilo of reindeer meat costs about 300 rubles, so the total economical loss of the enterprise is huge and amounted to 15 million rubles every slaughtering campaign.
The solution of the problem of high extensity of helminth infections can be solved through the expansion and development of the scientific research in this field, supplying the reindeer herding enterprises with treatment, preventive medicine, special literature and modern equipment. The maintaining of the quality of veterinary service considering the specific life conditions on the Russian North can also help to deal with the problem.

Gratitude

The article was prepared with the financial help of the Federal Agency of Scientific Organizations in Russia as part of the

Program of Fundamental Research in 2013-2020 (AAAA-A18-118020690240-3) "The monitoring of the epizootical situation and prediction of probable development of animal parasitic diseases".

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Citation: Gavrichkin, A., Leshyov, M., Gavrichkina, A. (2018). Some species of the helminth fauna of reindeer (Rangifer tarandus L.) in conditions of the north part of Western Siberia (The Yamal Peninsular). Ukrainian Journal of Ecology, 8(3), 149-153.