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MONITORING OF TRICHINOSIS IN PIGS AND WILD BOARS IN TERMS OF HAZARDS TO HUMAN HEALTH IN THE PROVINCE POMERANIAN – POLAND

Balicka-Ramisz A.¹, Grupiński T.², Laurans Ł.³, Ramisz A.¹, Pilarczyk B.¹, Udała J.¹

¹ Department of Biotechnology of Animal Reproduction and Environment Hygiene, West Pomerania University of Technology, 71-466 Szczecin, Poland, e-mail: abalicka52@gmail.com

² District Veterinary Inspectorate, 71-337 Szczecin, Poland

³ Chair and Clinic of Infectious Diseases and Hepatology, Regional Hospital 70-204 Szczecin, Poland

Abstract

The main reservoirs of trichinosis in the province Pomeranian (Polish) are wild boars and pigs which are still a serious threat to human health. The aim of the study was to investigate the prevalence of *Trichinella spp.* among wild boars and pigs in province Pomerania. From the veterinary and epidemiological perspective it was of the prime importance to identify the reason for the increasing prevalence of *Trichinella spp.* larvae infections among wild boars observed in the years 2008–2013. In the animal study of parasitology for *Trichinella* larvae presence were performed post mortem by digestion method. Evaluation of microscopic samples of muscle preceded by digestion tests in artificial stomachs. *Trichinella* diagnosis in humans was based on immunoassay for the detection of presence *Trichinella* specific antibodies in serum. The assessment was based on official data on the number of cases of trichinosis in pigs and wild boars, derived from the annual reports of the Veterinary Inspectorate in Szczecin and annual bulletins of the National Institute of Public Health – National Institute of Hygiene. In 2008, 16 583 tested boars *Trichinella* larvae were found in 92 cases, which accounted for 0,55 %. However, in 2013 it was 158 infected animals, which constituted the prevalence of 1,19 %. In 2005, 2006 and 2007 on Polish territory were major outbreaks of epidemic trichinosis. The largest of these took place in the province West Pomerania, where around 300 people were hospitalized. The diagnosis of trichinosis is based on the clinical picture, an interview with epidemiological and laboratory diagnostic

examinations. The conducted monitoring over the years has shown cyclical nature of the occurrence of a tendency to create an epidemic.

Keywords: trichinellosis, pigs, wild boars, epidemiology, West Pomerania Region Poland.

МОНИТОРИНГ ТРИХИНЕЛЛЕЗА СВИНЕЙ И ДИКИХ КАБАНОВ В ПРОВИНЦИИ ПОМЕРАНИЯ (ПОЛЬША) С ТОЧКИ ЗРЕНИЯ ФАКТОРОВ РИСКА ДЛЯ ЗДОРОВЬЯ ЧЕЛОВЕКА

Balicka-Ramisz A.¹, Grupiński T.², Laurans Ł.³, Ramisz A.¹, Pilarczyk B.¹, Udała J.¹

¹ Кафедра Биотехнологии Репродукции Животных и Гигиены Окружающей Среды, Технологический Университет Западной Померании, 71-466 Щецин, Польша, e-mail: abalicka52@gmail.com

² Районная Ветеринарная Инспекция, 71-337 Щецин, Польша

³ Отделение Инфекционных Болезней и Гепатологии, Региональный Госпиталь, 70-204 Щецин, Польша

Реферат

Основными носителями трихинеллеза на территории провинции Померания (Польша) являются дикие кабаны и свиньи, которые по-прежнему представляют серьезную угрозу для здоровья человека. Целью данной работы является изучение распространения *Trichinella* spp. среди диких кабанов и свиней провинции Померания. С точки зрения ветеринарии и эпидемиологии, было необходимо в первую очередь установить причину нарастающего распространения инфекции среди диких кабанов, вызванной *Trichinella* spp. larvae, на протяжении 2008–2013 годов. Было проведено посмертное вскрытие и исследование ЖКТ животных для определения наличия *Trichinella* larvae. Проведено исследование образцов мышечной ткани под микроскопом, используя метод переваривания в искусственном желудочном соке. Наличие инфекции *Trichinella* larvae у человека определяется с помощью иммунного анализа, который позволяет обнаружить в сыворотке крови антитела к *Trichinella* spp. Наша оценка основана на официальных данных исследования ряда случаев трихинеллеза у диких кабанов и свиней, полученных из ежегодных отчетов Ветеринарной Инспекции г. Щецин и ежегодных бюллетеней Национального Института Общественного Здоровья и Национального Института Гигиены. Из 16 583 кабанов, обследованных в 2008 г. *Trichinella* larvae была установлена в 92 случаях что составило 0,55 %. Однако, в 2013 г. было зарегистрировано 158 инфицированных животных, что составило 1,19 %. В 2005, 2006 и 200г г.г. на территории Польши были отмечены крупные вспышки эпидемии трихинеллеза. Наиболее сильная вспышка трихинеллеза была зафиксирована в провинции Западная Померания, где было госпитализировано около 300 человек. Диагноз трихинеллеза ставился на основании клинической картины, эпидемиологического анамнеза и лабораторных исследований. Природа цикличности эпидемий трихинеллеза изучалась в процессе мониторинга, проводимого на протяжении ряда лет.

Ключевые слова: трихинеллез, свиньи, дикие кабаны, эпидемиология, Западная Померания (Польский регион).

Introduction

In recent years implementing the provisions of the European Union in Poland made a number of significant changes for the sealing of meat inspection. Introduced

restrictive provisions governing trade in meat slaughter and sanitary-veterinary examination of slaughter animals and meat and sanitary supervision over the production and marketing of food of animal origin (Flis, 2012). The laboratory diagnosis of trichinosis both methods, direct and indirect introduces a more sensitive assay. The method of etching and immunoassays substantially. They contributed to the detection of larvae *Trichinella* in animals. While the use of molecular techniques made it possible to determine the species or genotype of *Trichinella* isolates. The high sensitivity of PCR techniques, multiplex PCR and PCR-RLFP – allows for genetic identification of the *Trichinella* based on the examination of a single larva. The indirect methods that are used in the diagnosis of the genus *Trichinella* in animals and humans are recognized also by indirect immunofluorescence, indirect hemagglutination method, competitive inhibition assay, immunoblotting and ELISA method, they have applications by routine testing in the diagnosis of trichinosis. PCR method and its variants are highly sensitive and specific, but their proper execution requires great skill (Pozio, La Rosa, 2003).

The only way to prevent trichinosis is the elimination from the market of animals infected with *Trichinella*. The method recommended by The ICT for testing meat for consumption in the direction of *Trichinella* larvae, at the stage of post-mortem, is the method of etching, which consists of a direct confirmation of the presence of larvae of *Trichinella* spp. In carcasses analyzed (Nöckler et al., 2000, Commission Regulation, 2005). A greater percentage of contracting trichinosis animals have been observed in countries with large forested areas. This situation is related to the interaction between animals and the environment in which they live.

In recent years conducted extensive research in different parts of the world of animals – reservoirs of trichinosis. In Europe, main natural reservoirs animals are wild boars (*Sus scrofa*), foxes (*Vulpes vulpes*) and rodents. These are primarily carnivores or omnivores. The literature also found the presence of *Trichinella* in: wolves (*Canis lupus*), bears (*Ursus arctos*), jackals (*Canis aureus*), badger (*Meles meles*), European pine marten (*Martes martes*), otter (*Lutra lutra*), raccoon dogs (*Nyctereutes procyonoides*) (Pozio et al., 2009, Pannwitz et al., 2010).

The spread of trichinosis importance may also have dogs, cats. Due to the large migration of people with different cultural habits, or in countries where there is a tradition of eating dog meat, the meat may pose some risk to human health. In the sixties observed a high prevalence of *Trichinella* infection in dogs in Greenland, Alaska, which probably resulted from the feeding of meat of hunted animals (Madsen, 1961). In Finland the incidence of trichinosis in animals forest is higher than in most other EU countries, which was echoed in the larger percentage of dogs trichinosis infection. This fact was explained in the Finnish way of life, where dogs often have access to dead animals free-living (Pozio, 1998). Since 1986 in the European Union slaughter of dogs and their meat trade is prohibited. In Russia, at 11,9 %, it was found infected people trichinosis after eating dog meat (Ozeretskovskaya, 2005).

In China was described two outbreaks, which were linked to the tradition of eating raw or parboiled dog meat. In this country, there is no obligation survey of dog meat for trichinosis [9]. In Egypt, the larvae of *T. spiralis* isolated from stray dogs (Wang et al., 2006).

Despite such significant changes in Poland as the risk for trichinosis caused by the invasion of *T. spiralis* (Mikhail, 1994; Cabaj et al., 2005).

The human biotope most important, from the point of view of the epidemiological has pigs. Despite the improvement of research methods, pork constantly comes to human infection with this parasite. The most common cause of

poisoning is consumption of meat products prepared for its own use (Sadkowska-Todys, Gołąb, 2009) .

Materials and methods

The degree of infection significantly influenced by local environmental conditions. In the analysis of epizootic situation in Poland, West Pomerania (North 54 ° 34'10 "N, 52 ° 37'28 noon" N, 14 ° 07'22 west "E, east of 16 ° 58'55" E) is considered too the region with the most intense invasion of trichinosis. This is due to the large (more than 35 % of all sites) afforestation of the area and a large concentration of various water bodies (Fig. 1)

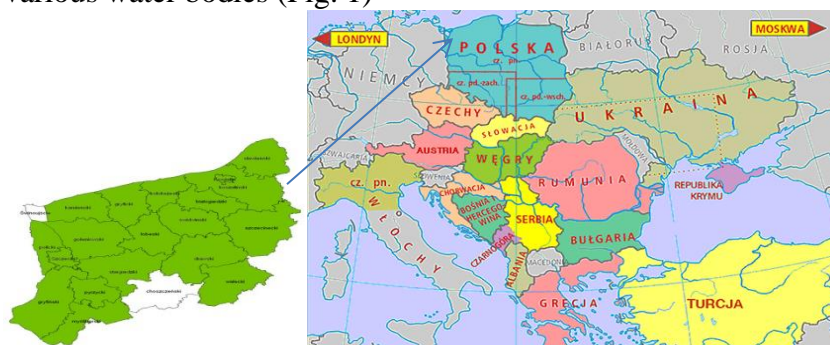


Fig. 1. Map province West Pomerania in Poland (central Europe)

The aim of the study was to present the epizootic situation of trichinosis province Pomeranian in pigs and wild boars, which are primary reservoirs of *Trichinella*. In the animal study of parasitology for *Trichinella* larvae presence were performed post mortem by digestion method. Evaluation of microscopic samples of muscle preceded by digestion tests in artificial stomachs. *Trichinella* diagnosis in humans was based on immunoassay for the detection of presence *Trichinella* specific antibodies in serum.

The assessment was based on official data on the number of cases of trichinosis in pigs and wild boars, derived from the annual reports of the Veterinary Inspectorate in Szczecin and annual bulletins of the National Institute of Public Health – National Institute of Hygiene.

Results and discussion

In the area of West Pomerania are conducted for a long period of time researching the prevalence of *Trichinella* larvae in the wild animals.

In the nineties *Trichinella* larvae were found in 0,18 % from 4,57 % wild boar and foxes (Ramisz et al., 1998; Ramisz et al., 2001). In 2006–2009 was diagnosed with trichinosis in wild boars 0,64 % [16]. Analyzing the period 2008–2013 further notice growth has *Trichinella* infected animals (Table 1). In 2008, 16 583 tested boars *Trichinella* larvae were found in 92 cases, which accounted for 0,55 %. However, in 2013 it was 158 infected animals, which constituted the prevalence of 1,19 %. Overall, IP were surveyed during on 51 936 wild boars degree of infection was 0,77 %.

Table 1

The presence of *Trichinella spiralis* in pigs and wild boars in the province West Pomerania in 2008–2013

Years	Pigs			Wild boars		
	Number of respondents	Number infected	%	Number of respondents	Number infected	%
2008	1 077435	5	0,00046	16 583	92	0,55
2009	872823	6	0,00068	15 540	110	0,71

2010	1 092 885	2	0,00018	13 105	112	0,85
2011	968 902	0	0	6 708	83	1,24
2012	988 151	1	0,000101199	16737	142	0,8484
2013	2177545	4	0,000184	13233	158	1,1939
Total	4 012045	13	0,000324	51 936	397	0,77

It is increased in contagion trichinosis in wild boars Western Pomerania which may also have to explain the actions taken by humans. In the second half of the nineties in the Polish Western (along the Oder), including in the province West Pomeranian undertaken an extensive campaign of mass oral vaccination of foxes against rabies. The results of vaccination proved to be very good, because in more than 70 % of foxes found antibodies against the rabies virus (research conducted at the National Veterinary Institute in Pulawy). The consequence of vaccination was carried out by a significant increase in the number of foxes Western Pomerania. Trichinosis was found in 4,35 % tested foxes. Rabies was a biological factor regulating the population of foxes in the biotope. Also decreased interest in the skins of foxes and hunted animals are often left in the environment and can be a source of infection of wild boars *Trichinella*. The high prevalence of infection in animals *Trichinella* larvae impact on the number of cases of people with the disease.

Trichinosis despite an increased action on health care remains a threat to human health. In 2005, 2006 and 2007 on Polish territory were major outbreaks of epidemic trichinosis. The largest of these took place in the province West Pomerania, where around 300 people were hospitalized (Fig. 2). The diagnosis of trichinosis is based on the clinical picture, an interview with epidemiological and laboratory diagnostic examinations. No deaths were recorded. The conducted monitoring over the years has shown cyclical nature of the occurrence of a tendency to create an epidemic.

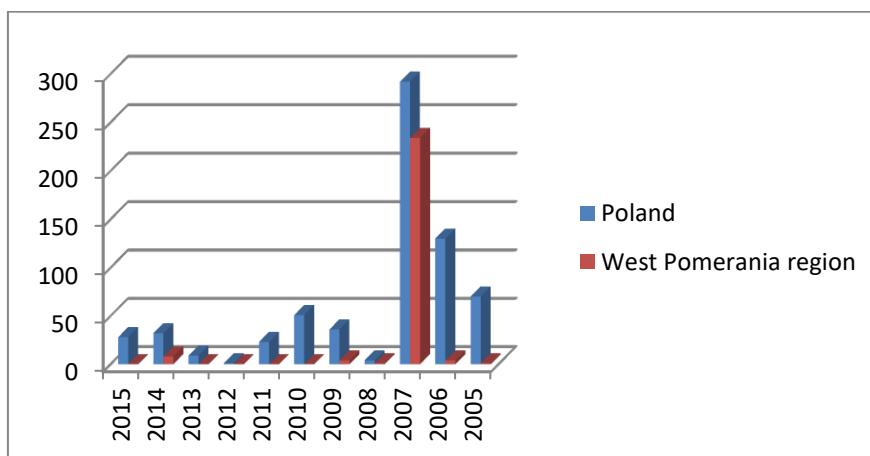


Fig. 2. Number of cases of trichinosis people in 2005–2014 in West Pomerania

The analysis of global data shows that in 1986–2009 the main source of trichinosis infection in human are domestic pigs (53 %). However in period 2010–2013 in majority of cases the source of infection was a meat from wild animals (54 %) (Murrell, Pozio, 2009). In UE, more cases from 2013 was coming from pork, mostly in this incidents took place in eastern Europe. On trichinosis frequency have influence a social-economic disruptions that change a pork production practice (Djordjevic et al., 2003). This fact have influence on changeability of trichinosis infection on Ukraine. In 3 regions (Zakarpacie, Żytomski, Zaporozże) wild predators were infected in 30–50 %.

Infection was shown in wild boars 3 %, wolves 15 %, foxes 10 %, badgers 5 % and martens 2 % (Akimow, Didik, 2009). Trichinosis was able to spread among animals by increasing number of raccoon dogs, that are eating mainly carcass. Research that was carried on in Germany shows, that the most infected animals are living in the woods: wild boars, foxes and for short raccoon dogs. The result of meat analysis shows 0,003 % trichinosis infection in wild pig meat and < 1 % infection in red (Mayer–Scholl et al., 2011). However in raccoon dogs the positive results were in 1,9 % of animals (Pannwitz et al., 2010). Increasing of infection extensity leads to spreading of trichinosis in nature. However we can't ignore a domestic animals as a source of trichinella infection. New trend in pigs breeding, specially more ecologic productions and free breeding can increase the risk of trichinosis (Murrell, 2016). In 2014 the research carried in Romania shows the highest rate of trichinella infection in bears (12,93 %) and wild boars (1,66 %). Domestic pigs were infected in 0,20 % (Nicorescu et al., 2015). In Poland the level of infections since 1968 is 0,002–0,005 %. However is observed a systematic increase of infection in wild boars from 0,11 % in 1964 to 0,39 % in 1992.

In spreading of trichinosis we can't ignore other animals like horses or coypu (Wieteska, 2012). The criteria of UE regulate a removal of shunted animals from hunting area (Regulation No 1774/2002). Eating an infected meat, that was not examined is the main reason that people can get sick on trichinosis. The wild boars are potential source of infection for people in Poland.

The main reservoirs of trichinosis in Poland are still wild boars and pigs. But you cannot ignore other animals as a source of potential danger of *Trichinella* people.

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