CURRENT STATUS OF FOOD-BORNE PARASITIC ZOONOSES - EASTERN EUROPE

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Abstract. For this review, the countries of Eastern Europe are the USSR and Poland (in the eastern part of the European continent), what was formerly East Germany, Czechoslovakia, and Hungary (in the north and center), and Yugoslavia, Romania, Bulgaria, and Albania (to the south). During 1989 and 1990, all of these countries experienced remarkable political and social change, thereby making the term "Eastern Europe" a political anachronism. There are a great many differences among these countries in terms of human behavior, parasites, environment and animal husbandry practices. In spite of recent political changes, however, livestock husbandry practices, which affect the status of food-borne parasites, will not likely change in the near future. Some of the characteristics of the eastern European countries allow the epidemiology of food parasitic zoonoses to be discussed as a common problem.

INTRODUCTION

In the countries of Eastern Europe, the stress is still placed on large industrial farms in public or state ownership with great concentration of animals on a comparatively small area. Epidemiologically, animals on such farms are incommunicado in terms of introduction of parasitic infections. They are subject to regular veterinary and sanitary control and their diet is well-balanced, although the latter is often neglected. This style of animal husbandry, however, has produced fair results in the control of some parasitic zoonoses, such as *Taenia spiralis*. Such great concentrations of animals in small areas, however, has had some adverse effects and has contributed to the spread of zoonotic infections, such as bovine cysticercosis.

This type of animal husbandry greatly differs among the Eastern European countries. In Yugoslavia, for example, over 80% of arable land has always been owned by small farmers. Similarly, over 80% of the livestock has been raised on privately owned farms. In the USSR, the situation is reversed; however, notwithstanding their advantages in the control of parasitic infections, these large farms may not persist at the current level for purely economic reasons.

Another factor influencing food-borne zoonotic parasitoses in Eastern Europe is the existence of vast areas of very rich flora and fauna, and the increase in animal hunting. Commerce among these areas will increase, and the animal life there will become an ever increasing source of infection to man.

In the eastern countries, there are three food-borne parasitic zoonoses hazardous to humans: trichinellosis, cysticercosis and toxoplasmosis. The current status of each infection and its host country will be discussed.

Trichinellosis

In the USSR, infection with *Trichinella spiralis* is a severe and ever present hazard to human health and a great economic problem for the livestock husbandry and commercial hunting. This disease was first described in 1866 at the time of Czarist Russia (Bessonov, 1972). Ever since numerous epidemics in man have been reported. Frequent infections were reported from 1946 to 1967, when 12,000 people were registered as having trichinellosis (Pashuk and Vershenya, 1976), most often the result of consuming infected pork. Since that time, the incidence of infection decreased probably due to the introduction of new technologies for pig management and breeding (Bessonov, 1981). At the same time, however, hunting was on the rise, making game animals an important source of human infections (Bessonov, 1985). Today, the major source of infection to humans is wild animal meat: polar bear in the Arctic; brown bear in Kamchatka, Ural mountains

and Kazakhstan; wild boar in Belorussia; and badger in Belorussia and the Moscow region. Some epidemics in humans have had a high rate of mortality (5%). Postmortem examinations for *T. spiralis* revealed that approximately 1% of the deceased had been infected with *T. spiralis* (Bessonov, 1981).

Effects of industrial-scale pig fattening on the reduction of *T. spiralis* infections can best be assessed from data obtained by mandatory trichinelloscopy in pig carcasses at abattoirs throughout the Soviet Union. For example, in 1969, when industrial pig management was given a strong impetus, the percentage of infected carcasses was 0.0112%, and this dropped to 0.00025% in 1978 and to 0.000004% in 1983. At that time, the method of enzymatic digestion was introduced, resulting in a slightly raised percentage of infections detected at abattoir examination, which was attributed to the higher sensitivity of the newly introduced test (Bessonov, 1985).

Infected pigs were most often found in the republics of Russia, Ukraine, Belorussia, Lithuania and Georgia, seldom in Moldavia, and almost never in Siberia, central Asia and Kazakhstan. Infections occurred, for the most part, in pigs on free pasture where they were likely to consume wild animal flesh.

Among wildlife and synanthropic animals, *T. spiralis* was detected in 52 species (Bessonov, 1985). Based on the examination of 337,000 animals, the infection rate was as follows: wolf 33.3-65.2%; brown bear 10.0-54.5%; raccoon 32.3-39.9%; red fox 6.8-37.5%; wild boar 0.23-0.84%; and lynx 28.5%.

In Poland, trichinellosis is also a serious health and economic problem. From 1946-1965, 11,963 humans were infected with *T. spiralis*, an average of 582 per year (Kozar, 1970). Postmortem examinations of elderly people revealed a prevalence of 3.9%. The major source of human infections was pork and wild boar. Recently, the infection rates have dropped to about 200 cases per year. From 1980-1982, the death per case rates varied between 1% and 2% (Campbell *et al,* 1988). Infection rates in pig carcasses were between 0.0014-0.0035%. This is a remarkable drop from the 1960s infection rates of about 0.015%, the highest percentage of trichinellosis-infected pigs in Europe.

Among wildlife in Poland, relatively high infection rates are reported: wolf 25%; fox 7.3%; badger 2.9%; marten 1.5%; and polecat 1.3%.

In Romania trichinellosis is widespread among man, pigs and wild animals (Lupascu *et al,* 1970). From 1964-1968, trichinellosis infection was reported in 1,569 humans. The number of people actually infected was probably higher, since only people who were tested by a doctor who had the means to diagnose the infection were reported. Recognition of infection with *T. spiralis* is not simple.

Until 1974, *T. spiralis* infections in pigs were quite common. About 0.039% of the carcasses were infected. Since then, pig breeding and fattening technologies have changed (ie, the creation of huge industrial fattening units), and *T. spiralis* infection in pigs has become scarce, according to official information (Cironeanu, 1981). Distribution of trichinellosis infection among wild animals in Romania is the following: wild boar 0.28%; bear 10%; wolf 42%; fox 22.8%; wildcat 26.1%.

In Bulgaria, especially in its western region, trichinellosis epidemics in man are frequent. Postmortem examinations reveal an infection rate of 6%; some of the deceased were from regions which previously had not reported any infections in either humans or animals (Steel, 1984). From 1922-1980, there were 45 epidemics in humans, with 832 infections and 17 deaths reported (Guenov *et al,* 1981). In 32 of the epidemics, pork was the source of infection; in the other epidemics, wild boar was the source.

Bulgaria also had a considerable drop in the rates of trichinellosis in pigs after the introduction of industrial breeding and fattening; the rate dropped from 0.007% infected pigs in 1951 to only 0.0001% in 1975 (Stoimenov and Gradinarski, 1981).

In Czechoslovakia, trichinellosis is not considered a major problem and outbreaks in that country are relatively rare. Records on trichinellosis go back to 1855. Within a 100 year period, 1,000 humans were reported to have trichinellosis and

the death rate was 5%. Today, wild boar is being made into a smoked sausage that is very popular throughout the country and it has become a prime source of infection. An outbreak of infection occurred in 1990 in 28 humans who had consumed infected pork (Havasiova and Stefancikova, 1990). For a number of years prior to this, there were no reported cases of infections from pork in either humans or pigs. This emphasizes the need for mandatory meat inspection, regardless of the prevalence in an endemic region, as the best prevention of transmission.

In Hungary, trichinellosis is not a major risk to human health. Following World War II, there were 50 epidemics involving 500 humans, with nine deaths reported (Steel, 1984). The source of infection was wild boar. In wild animals, the rate of trichinellosis was 5% in foxes and 1% in wild boar (Nemeseri, 1970).

In Yugoslavia, trichinellosis is receiving particular attention because of the risks it presents to human health and the country's economy. The public is being made aware of the health hazards; every outbreak of infection in humans or animals is being reported in the press. It is hoped that this concern will result in increased prevention and control of the infection.

Human infections mostly occur annually and are restricted to the winter. Over the past 10 years, the number of humans infected per year ranged from 100-200, except in 1985 when it was estimated that as many as 1,240 people were infected (Timotin, 1986). The source of infection was pork that had not been subjected to veterinary control. In 1989, 90 infected pigs were detected out of 1.2 million pigs examined (Djordjevic, 1989). Wild animals, such as wild boar, bear, and badger, have also been sources of infection to humans. In wild animals the infection rates are as follows: fox 4.9-27.7%; wolf 43%; badger 5.1%; wildcat 4.5%; weasel 1.4%; marten 2.3%; bear 7-14%; and wild boar 1-3.5% (Brglez, 1988; Rukavina *et al,* 1967; Rukavina and Brglez, 1970).

Taeniasis and cysticercosis

Taeniasis in humans and cysticercosis in cattle are important public health and economic problems in Eastern Europe countries. The fact that man is the only definitive host of *T. saginata* and *T. solium* simplifies the epidemiology of taeniasis. Transmission from man to animals may be either direct or indirect. Direct transmission occurs when hands contaminated with *T. saginata* eggs feed and handle calves (Urquhart *et al,* 1987). Indirect transmission occurs from contact with contaminated cattle feed, soil, or sewage, and is spread by birds and flies, etc. In general, when there is close contact between infected humans and susceptible animals, heavy infections result. When eggs are widely distributed in the environment, most infections are light. The animal husbandry practice in Eastern Europe since World War II of large-scale animal production units, increasing the density of animals per area of stabling and the frequency of contact between man and bovines, created favorable conditions for the transmission of *Taenia* infections from man to animals.

The reported prevalence of human taeniasis from *T. saginata* and *T. solium* should be evaluated critically because laboratory procedures are not standardized and only a small part of the population is examined; therefore, the data from most countries is incomplete. In the USSR and Poland, mass surveys have been carried out, and the data on cysticercosis from *T. saginata* comes mainly from meat inspection reports.

In the USSR, stool examinations in 14.2 million people revealed a 0.6% prevalence of infection with *T. saginata* in 1952 (Prokopenko, 1966; 1968). Examinations in 1960 of 46.4 million people and in 1966 of 65.8 million people showed prevalences of 0.3 and 0.075%, respectively. This sharp decline was attributed to a mass drug treatment program.

Animal infection data is very scanty. The incidence of cysticercosis was about 1% for the whole USSR in 1960 (Pawlowski and Schultz, 1972). The main source of infection was farm workers infected with *T. saginata* who were engaged in the preparation and distribution of food. Since then, the development of large-scale livestock production in the USSR, accompanied by radical changes in animal husbandry practices and social and demographic changes, has resulted in a decrease in the prevalence of cysticercosis (Bessonov, 1982). The practice of establishing

large fattening units near big cities and the use of city sewage for irrigation of pastures and forage crops, however, has caused repeated epidemics, making taeniasis an urban rather than a rural infection.

Human taeniasis in Poland after World War II has decreased. For example, stool examinations in 1954, 1955, and 1956 revealed infection rates of 259 per 100,000; in 1967, the rate decreased to 9 in 100,000 (Pawlowski and Schultz, 1972). At that time, *T. saginata* in cattle ranged from 0.56-0.58. The finding of an seven-fold greater infection rate in cattle in the industrial-scale abattoirs than in the cooperative farms suggests the necessity of improving the meat inspectors training.

The incidence of human taeniasis in Czechoslovakia is relatively low, about 0.03% or less. The rate for cattle from 1971-1980 was approximately 200 times greater. In 1961 in south Bohemia, the rate was 0.21%; it increased to 2.7% in 1970, to 4.02% in 1972, and to as much as 6.84% in 1980 (Prokopic, 1982). In Slovakia, human infection with *T. saginata* increased from 3.8 per 100,000 in 1971 to 5.6 per 100,000 in 1980 (Hovorka *et al,* 1985), but has dropped since 1981. An increase in infection in cattle was also reported from 1971 (0.57%) to 1984 (0.80%)

Based on the data collected from its republics, the prevalence of infection in humans with *T. saginata* in Yugoslavia varies greatly (Delic and Rukavina, 1970; Wikerhauser, 1982). The lowest infection rates were recorded in Croatia (0.002%) and Slovenia (0.15-0.70%), and higher rates were reported in Serbia (0.3-6.0%), Macedonia (0.39-2.06%), Montenegro (0.26-10.0%), and Bosnia and Herzegovina (0.6-6.0%). Over the past several years, the infection rate in man has been reduced to a very low level in all Yugoslav republics owing to legislation mandating sanitary facilities, and an overall improvement in living standards. Together with great efforts by veterinary services and health control measures, there has been a considerable reduction also in the infection rate in cattle and swine (Wikerhausert, personal communication).

In general, the highest prevalence (40%) was recorded in industrial units with a high density of animals. However, for the reasons cited above for humans, the percentage of infected cattle dropped to 0.3% from 1985-1989. This result is based on the examination of 1,662,873 carcasses in abattoirs in Serbia, where the prevalence of infection in animals was above the country average.

Infections in pigs with *T. solium* has also become a rarity. Over the past five years (1985-1989), *T. solium* was detected in 274 out of 3,202,772 pig carcasses (0.008%). At the same time, the number of patients referred to surgery for cysticercosis in the brain has also decreased. Some recent findings suggest that the number of these patients is not negligible because as many as 12% of epileptic patients were found to actually have cerebral cysticercosis (Umicevic, 1988). However, Yugoslavia has nearly eradicated *T. solium* and human cysticercosis.

In Hungary and Bulgaria, the incidence of cysticercosis is low, less than 1%; and human cysticercosis and taeniasis in both countries has also decreased (Pawlowski, 1972).

Toxoplasmosis

Toxoplasma gondii is distributed worldwide. Based on antibody surveys, antibodies to the parasite are found in human populations in each Eastern European countries tested (Dube and Beattie, 1988; Sibalic D, personal communication). From the available data, three routes of natural transmission were most prominent: congenital transmission (transplacental infection), contact with oocysts from infected cats or in contaminated soil, and ingestion of raw meat containing *T. gondii* cysts. Research is needed to determine the most important route of transmission in Eastern European countries. A reported prevalence of *T. gondii* should be viewed with caution since there is no standard test procedure used in all countries or even within any one country which would allow comparisons to be made.

In Eastern Europe, as elsewhere, pork is considered a major potential source of toxoplasmosis in humans. However, meat from sheep, cattle, rabbits, birds, and other wild animals cannot be ignored as potential sources. The prevalence of porcine toxoplasmosis in Eastern European countries is shown in Table 1 (Dubey, 1986).

Table 1

The prevalence of *T. gondii* antibody in porcine sera and isolation of *T. gondii* from mice inoculated with procine tissues from naturally infected swine in Eastern Europe.

Country	Antibody findings			Isolation of *T. gondii*	
	Test	No. of animals	% Positive	No. of animals	% Positive
CSSR	DT	995	19.2	597	8.5
	CF	9,481	5.0		
DDR	DT	1,506	41.7		
	CF	292	11.0		
Hungary	DT	292	16.0	50	3
Poland	DT	198	46.0		
Romania	DT	395	25.0		
Yugoslavia	DT	455	26.0		
USSR*				206	3.8

*Consistent results for swine toxoplasmosis were not available to the author.

Serological data on toxoplasmosis in pigs varies from country to country, and from one source of information to another within a country. Parasitological data on the infectivity of meat are minimal, and any possible association between seropositivity and the degree of infection (number of tissue cysts) is unknown. It is worth mentioning here that the pig is a rather poor immunoresponder; therefore, seronegativity cannot guarantee swine to be free of infection with *Toxoplasma*.

In conclusion, it should be stressed that *Toxoplasma* is a very important public health problem in Eastern European countries. Additional research, and veterinary and public health services on a national and international scale are needed to acquire a better understanding of this zoonosis.

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