

Incidence of bovine tuberculosis in cattle in seven Central European countries during the years 1990–1999

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ABSTRACT: The post-eradication incidence of bovine tuberculosis in seven Central European Countries (Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Poland, Slovakia and Slovenia) was studied between 1990 and 1999. The majority of cattle to the age of 24 months were screened by tuberculin skin test on annual basis. Tuberculous lesions observed during meat inspection at abattoirs were further laboratory examined by direct microscopy, cultivation and histology for the presence of mycobacteria. Data describing the incidence of the disease in animals for the whole period were obtained from all countries except Bosnia and Herzegovina, where data were obtained after the year 1995. Between the years 1990 and 1999, bovine tuberculosis was diagnosed in a total of 1 084 cattle herds. Nine hundred and seventy five (89.9%) outbreaks of the disease were reported in small herds (≤ 10 cows) and 109 (10.1%) outbreaks in large cattle herds (> 10 cows). The last outbreak of bovine tuberculosis in cattle was diagnosed in Slovakia, Slovenia, the Czech Republic, Croatia and Bosnia and Herzegovina in 1993, 1993, 1995, 1999 and 1999, respectively. Bovine tuberculosis was diagnosed under proper quarantine in Slovenia in 37 fattening bulls imported from two European countries before animals were introduced to the targeting farms.

Keywords: *Mycobacterium bovis*; veterinary epidemiology

Bovine tuberculosis, caused by *Mycobacterium bovis* (*M. bovis*) is considered as the serious epizootics of animals and humans (Thoen and Steele, 1995; Grange, 1996). Beyond food producing animals, mainly cattle, bovine tuberculosis is known to have a wide range of hosts. Although the incidence of the disease in the

industrially advanced countries of Europe has declined dramatically since the completion of the eradication programmes, the infection is considered among serious epizootic diseases which are subject to mandatory announcement and obligatory eradication. Thus when dealing with bovine tuberculosis one should bear in

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Table 1. Data describing national control programmes against bovine tuberculosis in cattle*

Country	National control programmes	Number of				
		establishments**	cattle (total in mil.)	cows (mil.)	km ²	inhabitants (mil.)
Bosnia and Herzegovina	1962–1973	n	0.250***	0.150***	51 233	4.000***
Croatia	1953–1966	n	0.493	0.330	56 538	4.505
Czech Republic	1959–1968	5 410	2.030	0.830	78 864	10.330
Hungary	1962–1980	50 936	0.910	0.420	93 031	10.160
Poland	1959–1975	1 373 500	7.937	3.763	312 683	35.735
Slovakia	1959–1968	1 369	0.916	0.348	49 035	5.350
Slovenia	1962–1973	n	0.504	0.210	20 251	1.950
Total	1953–1980		13.040	6.051	661 635	72.030

Explanations:

*official data from 1995: WHO (<http://who.int>), Surveillance of Tuberculosis in Europe (<http://www.ceses.org/eurotb/eurotb.htm>) and FAO-OIE-WHO (1997)

**official data from 1997: OIE (1998)

***estimated in 1995

n = official data not available

mind that the disease, first and foremost, is a human problem. Variable epizootic conditions of the disease have been reported in animal populations of each country, and so was the proportion of *M. bovis* in human tuberculosis cases (Thoen and Steele, 1995).

With the framework of the national bovine tuberculosis control programme of each country, the disease was successfully eliminated between 1953 and 1980 (Table 1). For example, Poland has controlled bovine tuberculosis in 1975 (Lis, 1998; Zorawski and Lipiec, 1998). Czechoslovakia, comprising the current Czech Republic and Slovakia, has achieved this goal in 1968 (Polak, 1969; Laktis *et al.*, 1970; Kouba, 1988; Pavlas, 1999), while Hungary has attained bovine tuberculosis free status in 1980 (Jamniczky *et al.*, 1995; Balint, 1995; Körmendy, 1995). In the states of the former Yugoslavia: e.g. Slovenia, Bosnia and Herzegovina and Croatia, bovine tuberculosis was eradicated in 1973 (Prevocnik and Ocepek, 1994), 1973 and 1966 (Kovacic *et al.*, 1998) respectively.

In the Czech Republic, according to Pavlik *et al.* (1998), the incidence of bovine tuberculosis in cattle was recorded following the post-elimination period (1969–1978), where incidence have been reached 12 to 16 outbreaks per year. During the following decade however (1979 to 1988), this incidence was decreased to one up to nine outbreaks per year with consequent decline to zero outbreaks in the years 1981, 1987 and

1988. Nevertheless, bovine tuberculosis of cattle was observed sporadically (1 to 2 infected herds per year) and the last outbreak was reported in 1995 (Pavlik *et al.*, 2001). In the years 1989, 1990, 1993 and 1996 however, no bovine tuberculosis was reported in cattle at all. In Slovakia the post-elimination epizootic condition of the disease in cattle and wild ruminants was analogous to the Czech Republic (Tanuska, 1982; Vasilova, 1990; Hanzlikova a Vilimek, 1992).

Despite the fact that these low incidences occurred sporadically, other species of animals were found to harbour the infection relatively at low rate as compared to cattle. With regard to the distribution of the disease in other species of animals than cattle, higher incidence was observed especially in zoological gardens (Pavlik *et al.*, 1998).

From member states of the European Union Countries, a high prevalence of bovine tuberculosis was reported in 1991 only in Spain (10.8%), France (0.37%), Greece (0.31%), Ireland (8.8%) and Italy (3.71%) (Caffrey, 1994). Member states have developed a procedure which enables them to declare “officially tuberculosis free status of bovine herds in certain member states and regions of member states” based on the Commission’s decision of 17 December 1996 (Anonymous, 1997). According to this decision, member states and regions of member states are free of bovine tuberculosis if at least 99.9% of the bovine

herds have been declared officially tuberculosis free for the least 10 years. In 1999 only six of member states (Denmark, Finland, Germany, Luxembourg, Sweden, The Netherlands) were able to fulfil these conditions (Anonymous, 1999). According to the definition of International Animal Health Code OIE (Office International Des Epizooties), any member state is said to be free of bovine tuberculosis only if the prevalence of the disease does not exceed 0.2% of the total herd size.

The purpose of this work was to analyse the incidence of bovine tuberculosis in the years 1990 to 1999, and evaluate the potential risk of this disease in the study countries.

MATERIAL AND METHODS

Territorial characterisation of the study countries

The study was undertaken in seven Central European Countries (Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Poland, Slovakia and Slovenia). These countries, laying between the Baltic and the Adriatic seas, cover an area of 661 635 km² with 72.030 million of inhabitants. Until 1995, a total of 13.040 million head of cattle have been kept in this area, of which 6.001 million were cows (FAO-OIE-WHO, 1997; OIE, 1999, 2000). Only four countries, Czech Republic, Hungary, Poland and Slovakia (Tables 1 and 2), were able to provide official report on the herd number (OIE, 1998). A herd with the size of 10 cows was considered as small herd where a large herd comprised more than 10 cows.

Pasture rearing system of cattle was early practised especially in Poland, in mountainous and hilly areas of Bosnia and Herzegovina and in Slovakia. In the Czech Republic and Hungary however, pasture rearing has entailed after 1989 where transformation of agriculture has taken place.

Sources of statistical data

Data about the incidence of bovine tuberculosis in cattle, from 1991 to 1999, were obtained from the National Reference Laboratories for bovine tuberculosis of each country. Bosnia and Herzegovina was the only country from which data were received from Veterinary Faculty in Sarajevo after the end of the war in the year 1995.

Intravital and *post mortem* diagnosis in cattle

All animals to the age of two years were subject to intravital skin test at least once in every two years in all study countries, except Bosnia and Herzegovina where this test was performed after the year 1995. Six to eight weeks later, all reactor animals to the first single intradermal skin test were further tested by a simultaneous intradermal inoculation of bovine and avian tuberculin. Consequently, animals with a repeated positive skin test results to bovine tuberculin were slaughtered and direct microscopy, histological and culture examinations were performed. The same diagnostic procedure was applied to examine tuberculous lesions found during routine abattoir meat inspection.

Isolated *M. bovis* strains were identified by biochemical tests and biological trial on guinea pigs (Wayne and Kubica, 1986).

RESULTS

During the study period (1990 to 1999), bovine tuberculosis was diagnosed in 1 084 cattle herds. In small herds 975 (89.9%) outbreaks of infection were found, while in large herds this number reached 109 (10.1%). The incidence of bovine tuberculosis has reached its maximum peak (16.3%) in 1992; nevertheless this surge of infection has decreased in the following years and the incidence of the 1999 (3.4%) attaining the minimum rate (Table 2).

In the Czech Republic, Hungary, Poland and Slovakia, the incidence of bovine tuberculosis in the cattle herd was between 0% and 0.219%. These countries, except Slovakia in 1993, have fulfilled the criteria of OIE required to qualify for the bovine tuberculosis free status (Table 2).

Bosnia and Herzegovina. Based of the information obtained form 1996 to 1999, bovine tuberculosis was found only in two small cattle herds (Table 2).

Croatia. A total of 31 herds of cattle were found positive for bovine tuberculosis, small herds representing the predominant infection 30 (96.8%). However, in the immediate 1999 the infection was not diagnosed in any herd (Table 2).

Czech Republic. Bovine tuberculosis in cattle has been diagnosed in the years 1991, 1992, 1994 and 1995 in seven outbreaks, the later being the last incidence so far registered (Table 2).

Hungary. With the exception of the year 1995, during which any case was not reported, the incidence of bovine tuberculosis in cattle has been diagnosed

Table 2. Bovine tuberculosis in cattle herds in Central European countries

Country	Number of herds	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
Bosnia and Herzegovina	small ¹	n	n	n	n	n	n	1	0	1	0	2
	large ²	n	n	n	n	n	n	0	0	0	0	0
	total	n	n	n	n	n	n	1	0	1	0	2
	%	n	n	n	n	n	n	n	n	n	n	
Croatia	small ¹	n	3	1	7	4	6	3	1	3	0	31
	large ²	n	0	0	0	0	0	1	0	0	0	1
	total	n	3	1	7	4	6	4	1	3	0	32
	%	n	n	n	n	n	n	n	n	n	n	
Czech Republic	small ¹	n	0	0	1	0	1	0	0	0	0	2
	large ²	n	0	2	1	0	0	0	0	0	0	5
	total	5 410 ³	0	2	2	2	1	0	0	0	0	7
	%	100	0	0.036	0	0.036	0.018	0	0	0	0	
Hungary	small ¹	n	0	3	3	2	0	2	5	3	5	28
	large ²	n	2	3	3	2	0	4	3	3	0	23
	total	50 936 ³	2	6	6	4	0	6	8	6	5	51
	%	100	0.004	0.012	0.012	0.008	0	0.012	0.016	0.012	0.010	
Poland	small ¹	n	134	101	142	126	134	61	54	51	32	905
	large ²	n	21	14	17	11	7	2	0	0	0	75
	total	1 373 500 ³	155	115	159	137	141	63	54	51	32	980
	%	100	0.011	0.008	0.012	0.010	0.010	0.005	0.004	0.004	0.002	
Slovakia	small ¹	n	0	0	1	2	0	0	0	0	0	3
	large ²	n	2	1	1	1	0	0	0	0	0	5
	total	1 369 ³	2	1	2	3	0	0	0	0	0	8
	%	100	0.146	0.073	0.146	0.219	0	0	0	0	0	
Slovenia	small ¹	n	1	0	1	2	0	0	0	0	0	4
	large ²	n	0	0	0	0	0	0	0	0	0	0
	total	n	1	0	1	2	0	0	0	0	0	4
	%	n	n	n	n	n	n	n	n	n	n	
Total number of	small ¹	n	138	105	155	135	143	67	60	58	37	975
	large ²	n	25	20	22	14	12	7	3	3	0	109
	herds	n	163	125	177	149	155	74	63	61	37	1 084
	%		15.0	11.5	16.3	13.8	14.3	6.9	5.8	5.6	3.4	

Explanations:

¹small cattle herd (≤ 10 cows), ²large cattle herd (≥ 10 cows), ³No. of establishments in 1997 (OIE, 1998), n = official data not available

within the whole study period in two to eight outbreaks every year (Table 2).

Poland. As compared to the rest of the study countries, with the highest number of bovine tuberculosis foci, Poland has occupied the first place in the number cattle herds (980) contracting bovine tuberculosis infection. Nevertheless, a pronounced decline of the incidence of the disease occurred since 1994. In the years 1990 and 1999, for example, the number of herds with bovine tuberculosis incidence was reported to be 155 and 32, respectively. The ratio of small and large cattle herds infected with bovine tuberculosis was 2 : 1. Since 1997, bovine tuberculosis was not diagnosed in any large cattle herd. According to the OIE definition and the Directive 64/432 EEC Poland with 1 373 500 cattle herds and 980 foci of bovine tuberculosis fulfils the condition to be free from bovine tuberculosis during the last 10 years (Table 2).

Slovakia. Between 1990 and 1993, similarly to the other countries, bovine tuberculosis was diagnosed only in eight cattle herds, and since 1994 no case of *M. bovis* has been reported in cattle (Table 2).

Slovenia. In the years 1990, 1992, and 1993, bovine tuberculosis was diagnosed only in four small cattle herds (Table 2). Moreover, bovine tuberculosis was diagnosed in quarantine in Slovenia in 37 fattening bulls imported from two European countries before releasing animals to target farms.

DISCUSSION

All countries included in this study have successfully applied a national bovine tuberculosis control programme, which has taken place until the late 1980s (Table 1). Except Bosnia and Herzegovina, from which complete data were not available, the disease has prevailed relatively similar course and incidence (Table 2). Despite the fact that bovine tuberculosis has been eradicated from cattle population in Central Europe, during the national campaign against the disease, it should be kept in mind that a post elimination sporadic detection of *M. bovis* may occur in domestic and wild animals held in captive (Pavlik *et al.*, 1998) or in free living wild animals (Krul, 1962; Kalensky, 1992; Hanzlikova and Vilimek, 1992).

From the epizootiological point of view, however, it is worthwhile to keep in mind that post-elimination resource of bovine tuberculosis may happen as a result of introduction of new animals into the herd by importation like in Slovenia (Table 2) or contraction of

new infection from wild animals which could act as a natural reservoirs of the disease like badger in United Kingdom (Cheeseman *et al.*, 1985, 1989).

As to Bosnia and Herzegovina the war which occurred between 1992 and 1995 seems to put a negative influence on the epidemiology of bovine tuberculosis in cattle, in other animal species and in humans. Considering the pre war favourable condition of the country however, it is hardly likely to conclude whether a new surge of incidence of the disease might happened. Under such extraordinarily hard situation the endeavour paid to take control of the health of cattle and other domestic animals was very difficult (Fejzic *et al.*, 2000).

CONCLUSIONS

The possible risk factors for new infection of cattle with *M. bovis* and the formation of new outbreaks in general can be viewed as follows:

1. Cattle kept on pasture in an extensive farming condition may acquire infection from natural reservoirs by direct or indirect contact with infected wild animals.
2. Import of animals from countries with prevalence of bovine tuberculosis and uncontrollable shift of infected animals from farm to farm without the knowledge of veterinary services personnel and failure to perform required bovine tuberculosis tests may account for the hazardous source of new infections. Animal auction centres and artificial insemination cites, where animals from different herds interact, are places where animals may contract infection.
3. Attendants who are involved in the management practice of caring for animals should be tuberculin test free.
4. The impairment of the immune system of animal caretakers, at advanced age, with a chronic lesions of bovine tuberculosis may lead to overt tuberculosis. And these individuals are the potential source of infection for food producing animals via the sputum, urine and direct exhalation.

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