

EPIZOOTIC SITUATION OF BOVINE TUBERCULOSIS IN EUROPE IN THE PERIOD 2013-2023

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Abstract

*Bovine tuberculosis is a bacterial infection in animals with chronic character, primarily caused by *Mycobacterium bovis*, and other members of the *Mycobacterium tuberculosis* complex. This disease is of significant zoonotic concern, with cattle serving as the primary source of infection for humans. In addition, *M. bovis* also affects a range of domesticated animals, including small ruminants, equines, swine, canines and felines. Furthermore, various wildlife species, such as wild boars, deer, and antelopes, can also be susceptible to this disease. This is a disease of international health and economic importance which is under the terms of the Terrestrial Animal Health Code issued by the World Organisation for Animal Health (WOAH) and thus is subjected to mandatory reporting to the WOAH. Although the implemented strict regulations, Bovine tuberculosis continues to be reported as a threat to public and animal health in many developing countries. In order to analyze the tendencies in the epidemic distribution and prevalence of Bovine tuberculosis in Europe we used data from the Animal Disease Information System (ADIS). The generated information on the outbreaks over a decade from 2013 to 2023, showed that 12 Member States and 2 other non-EU countries have declared cases of bovine tuberculosis. The total number of outbreaks detected has decreased dramatically over the years, as in 2013 and 2014 it was 211 and 136 respectively, and in 2022 and 2023 - 144 and 163. Comparing the data from 2013 and 2023, a decrease of about 23% in the registered outbreaks in the affected countries was observed.*

Key words: bovine tuberculosis, disease control, legislation, surveillance, zoonoses.

INTRODUCTION

Transmission of different pathogens from bacterial, parasitic, viral and prion character from animals to people cause spread of many zoonotic diseases (Sohail et al., 2023) and threats to the public health (Raza et al., 2023). Wildlife and domestic animals can serve as reservoirs for many zoonotic agents (Prpić et al., 2024) but the risk is extremely high with pets, exotic animals and farm animals that could transmit the pathogens through direct contact (Elsohaby & Villa, 2023) or through foodstuffs from animal origin (Das et al., 2025).

One of the common zoonotic diseases, wide spread across the world with significant impact on public health and animal husbandry, is the bovine tuberculosis (TB), characterized by high mortality and economic losses (Shitaye et al., 2007). TB is caused by bacteria from the *Mycobacterium* spp., predominantly by *Mycobacterium bovis*, but also other representatives like *Mycobacterium caprae* and *Mycobacterium tuberculosis*. The main source of the agent are domestic animals, mainly cattle,

but other livestock (small ruminants and pigs) and pet cats and dogs can also be part of the epidemiological chain of transmission. TB is one of the globally monitored and controlled zoonotic diseases, which eradication is hindered due to the presence of the infection of wildlife as well (WOAH, 2024).

Research on the bacteria causing TB show genetic similarity which is the reason to include them into the *Mycobacterium tuberculosis* complex (MTBC). The following representatives are classified (Dib, 2025): *Mycobacterium tuberculosis* (*M. tuberculosis*), *Mycobacterium africanum* (*M. africanum*), *Mycobacterium bovis* (*M. bovis*), *Mycobacterium canettii* (*M. canettii*), *Mycobacterium microti* (*M. microti*), *Mycobacterium pinnipedii* (*M. pinnipedii*) and *Mycobacterium caprae* (*M. caprae*).

Regarding the zoonotic transmission of the disease between the species, although *M. tuberculosis* (*Mtb*) is considered human pathogen it could also infect livestock and wildlife, especially those in prolonged contact and close range with people (Ocepek et al.,

2005). Results reported on Mtb in farm animals reveal that cattle are predominantly affected, with less than 1% of the total prevalence of the bacteria. There are even reports on infection with Mtb in birds like canary and Amazon parrot (Hoop, 2002).

As TB is spread at a wide range globally, it appeared that there are some specifics regarding the pathogen prevalence in humans and animals in different geographic regions. The main representatives of the MTBC in North America that are detected as causes for infection, for example are *M. tuberculosis* and *M. bovis* (Lombard et al., 2021).

In other parts of the world, especially in the developing countries from Central and South America, Central and South Asia and Africa, TB in humans again is caused by *M. bovis* in approximately 10% of the cases (Sohail et al., 2023). The pathogen is transmitted from animals to people mainly through aerosols from coughing animals or through infected raw milk. It is argued that the incidence and outbreaks of zoonoses like tuberculosis are elevated due to poor socioeconomic conditions in the low-income countries (Lima et al., 2024).

As previous studies have proven the transmission of Mtb from infected human patients to cattle through respiratory secretions and thus having reverse zoonotic transmission (Ocepek et al., 2005), it is highly recommended to perform differential testing between Mtb and *M. bovis* infections in farm animals in those regions with registered cases/outbreaks. It was already detected that genetic similarities exist between the Mtb isolates from cattle in North Africa (Morocco) and some countries in South Europe (Spain, Portugal, France), recognizing the anthropogenic factor in the spread of the disease across continents (Yahyaoui Azami et al., 2025).

MATERIALS AND METHODS

Bovine tuberculosis, a zoonosis that causes economic losses and threats to human and animal populations and their health, has been monitored by the regulatory framework at international and European level, aiming at the eradication of the disease in the European Union. In order to evaluate the eradication programs of the member states reporting

outbreaks and all detected infections with TB through ADIS (Animal Disease Information System), an investigation was made of the electronic database for the period 2013-2023.

The study aimed to analyze the incidence of bovine tuberculosis in European countries that submit data on registered outbreaks to the European Commission's ADIS for an eleven year period. Summarized numbers of the TB outbreaks were visualized on figures in line with the detected presence of the disease despite the coordinated control measures in the European Union and the World Health Organization's Tuberculosis Strategy in force until 2035 (WHO, 2015).

RESULTS AND DISCUSSIONS

For the purpose of maintaining high standards in ensuring public and animal health in the European Union, the European Commission has published a new regulatory framework for a uniform approach by Member States in the event of an outbreak of a listed contagious animal disease in accordance with Article 5 of Regulation (EU) 2016/429, which will apply from 2021 (Rankova & Balieva, 2023).

Based on the criteria of the cited Regulation, the same requirements should apply to Bovine tuberculosis as to another significant zoonosis in the Union - brucellosis, namely: "category B+D+E disease", which according to Art. 1, item 2, 4 and 5 of Commission Implementing Regulation (EU) 2018/1882 means a listed disease which must be controlled in all Member States with the goal of eradicating it throughout the Union, as referred to in Article 9 (1)(b) of Regulation (EU) 2016/429; means a listed disease for which measures are needed to prevent it from spreading on account of its entry into the Union or movements between Member States, as referred to in Article 9 (1)(d) of Regulation (EU) 2016/429; means a listed disease for which there is a need for surveillance within the Union, as referred to in Article 9(1)(e) of Regulation (EU) 2016/429 (Rankova & Balieva, 2024).

The categorisation provided for in *Commission Implementing Regulation (EU) 2018/1882 of 3 December 2018 on the application of certain disease prevention and control rules to categories of listed diseases and establishing a*

list of species and groups of species posing a considerable risk for the spread of those listed diseases defines Bovine tuberculosis as a disease that must be controlled in all Member States with the goal of its eradication throughout the Union (category B).

For category B diseases, final reports containing information on the control measures carried out in the implementation of eradication programs for 6 year period are submitted in order to apply for “disease-free” status. Such status is acquired according to Art. 71 of Commission Delegated Regulation (EU) 2020/689 of 17 December 2019 supplementing Regulation (EU) 2016/429 of the European Parliament and of the Council as regards rules for surveillance, eradication programmes, and disease-free status for certain listed and emerging diseases (Rankova & Balieva, 2024).

Table 1. Summarised number of reported outbreaks of Bovine tuberculosis in Europe for the period 2013 – 2023 (Source: ADIS)

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total number of outbreaks per country for the entire period studied
Austria	2	11	4	17	8	4	4	6	6	3	2	67
Belgium	9		4	2	5	6		1	5	1		33
France	107	108	100	82	96	132	92	105	98	104	92	1116
Germany	24	4	4				3	10	8	4	3	60
Hungary	1		1	1		3	3	4	4	5	7	29
Italy	15	18	9	7	12	9	9	9	13	12	27	140
Netherlands	4											4
Norway										1	1	2
Poland	11	9	25	19	12	5	12	7	5	4	6	115
Slovenia		1										1
Spain									7	20		27
Switzerland	10											10
United Kingdom	5	17	13	6	9	8	9	8				75
Total number of outbreaks per year	187	168	160	134	143	167	132	150	139	141	158	1679

Following an assessment by the European Commission and entry in the annexes of Commission Implementing Regulation (EU) 2021/620 of 15 April 2021 laying down rules for the application of Regulation (EU) 2016/429 of the European Parliament and of the Council as regards the approval of the disease-free and non-vaccination status of certain Member States or zones or compartments thereof as regards certain listed diseases and the approval of eradication programmes for those listed diseases in the European Union One Health 2023 Zoonoses Report, the presented data indicated that there were 17 Member States with disease-free status. In the previous four years

(2019-2022), the number of Member States with free status was also 17, but it can be noted that there was a 10.7% decrease in infected herds compared to 2022, which is mainly due to the decrease in reported outbreaks from the United Kingdom (Northern Ireland) (EFSA, 2024).

For the study period (2013-2023), outbreaks of bovine tuberculosis were declared through ADIS in 11 Member States and 2 other countries in Europe - Austria, Belgium, France, Germany, Hungary, Italy, Netherlands, Norway, Poland, Slovenia, Spain, United Kingdom and Switzerland (Figure 1). Together with WAHIS (World Animal Health Information System) at global level, ADIS is considered as a key tool for effective control and surveillance measures preparation of the EU in the fight with the zoonotic diseases (Tanchev & Balieva, 2024).

Of the countries reporting through ADIS, France reported the most outbreaks – 1116, with a 14% decrease in the number of outbreaks over the period. Italy and Poland were next to line, reporting the largest number of infected herds, with 140 and 115, respectively. The total number of outbreaks reported in Italy each year remained almost the same, while Poland’s decreased by 45%.

The data from the analysis show that during the study period, sporadic outbreaks were reported in 4 of the 13 affected countries in Europe, or about 31% of them - the Netherlands, Norway, Slovenia and Switzerland.



Figure 1. Spatial distribution of Bovine tuberculosis outbreaks in Europe for the period 2013 – 2023 (Source: ADIS)

The disease was investigated between 1990 and 1999 in seven Central European countries (Bosnia and Herzegovina, Croatia, the Czech Republic, Hungary, Poland, Slovakia and Slovenia) and the diagnose was confirmed in a

total of 1,084 cattle herds. Compared to the current study, it was found that of the 7 countries mentioned, only 3 of them continue to report the presence of the disease (Hungary, Poland and Slovenia) with 145 total outbreaks, of which 115 were registered in Poland and 1 in Slovenia (Pavlik et al., 2022).

Between 1995 and 2008, 119 TB outbreaks were reported in Germany (Schiller et al., 2011), compared to 60 in the current study over 11 years' period which represents a 50% reduction in infected herds.

Although mandatory eradication programs have been implemented for the period 2003 to 2023, for 12 regions and 19 provinces in Italy that have been declared as "disease-free" zones still TB outbreaks continue to be reported (Giusti et al., 2024).

Regarding the total number of outbreaks of Bovine tuberculosis detected over the years, it is necessary to emphasize that it has decreased, as in 2013 and 2014 it was 187 and 168 respectively, and in 2022 and 2023 - 141 and 158. Comparing the data from 2013 and 2023, a decrease of about 16% in the registered TB outbreaks in the affected countries is observed.



Figure 2. Prevalence of Bovine tuberculosis in Europe in 2023 (Source: ADIS)

In 2023, bovine tuberculosis was still detected in 8 countries - Austria, France, Germany, Hungary, Italy, Norway, Poland and Spain, or about 62% of the countries where the disease was reported during the years of the study period (Figure 2). In Spain, where the national eradication program on TB was executed for nearly two decades, Ciaravino et al. (2024) confirmed the presence of the disease with prevalence of 1.48%. Similarly, records were given for France, which has obtained "disease-free" status since 2000, but sporadically infected

with TB herds are detected annually in different areas.

The positive trend in reporting sporadic outbreaks needs to be highlighted, as the responsibility for implementing preventive and surveillance measures lies with the individual countries.

However, for some countries the eradication of bovine tuberculosis is more difficult than in the other, as besides the cattle in the United Kingdom (Ireland) some wild animals like the European badger (*Meles meles*) are also susceptible to the infection and could participate in the epidemiological process (Allen et al., 2021). It is the contact between the wildlife and the domestic animals that has to be taken into consideration by the policy makers in the preparation and implementation of disease control and eradication programs (Ciaravino et al., 2024) for successful fight with such zoonotic threats.

CONCLUSIONS

Despite the rigorous control and eradication measures implemented in the countries in Europe, the eradication of Bovine tuberculosis is becoming a challenge to achieve, and the data obtained from the study showed that the disease is a constant threat. The main factors contributing to the difficulty of eradicating the disease are associated with the movements of infected people, animals and their products, as well as the available reservoirs in the wild - wild animals.

It is necessary to encourage more in-depth research into the complex interactions between the pathogen, hosts and the environment, which have an impact in economic and social aspects, given the zoonotic nature of the disease, as well as a wider presentation of these results to the public.

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