Chapter 12b

TBE in Belarus

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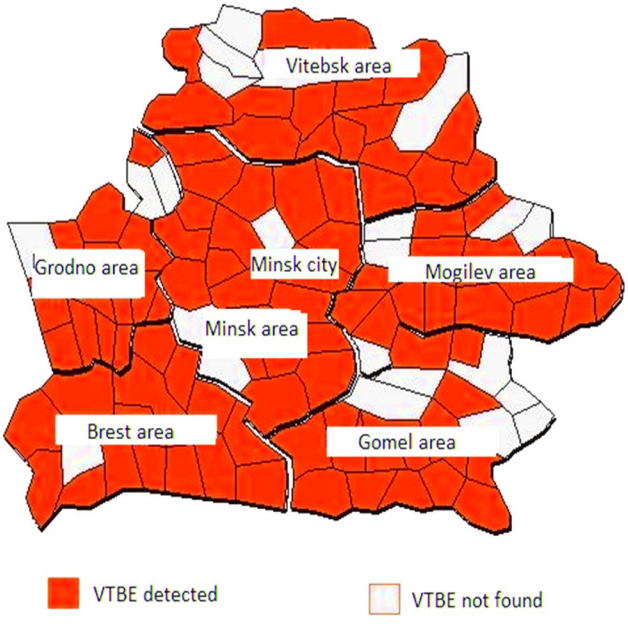
E-CDC risk status: endemic (data as of end 2022)

History and current situation

Belarus is a landlocked country of eastern Europe with a population of 9.4 million, of which 78.4% reside in urban areas bordered by Lithuania and Latvia to the north west, by Russia to the north and east, by Ukraine to the south, and by Poland to the west. The country of Belarus is divided into six administrative districts (Brest, Gomel, Grodno, Minsk, Mogilev, Vitebsk regions) each centered around a major city (Minsk). Much of the country consists of flat lowlands separated by low-level topped hills and uplands; the highest point is Dzyarzhynskaya Hill, being only 1135 feet (346 meters) above sea level. Over half of the surface area of Belarus lies below 660 feet (200 meters), and about 40% of the country is forested. The most common tick species in Belarus are *Ixodes ricinus* and *Dermacentor reticulatus*.[1,2,3]

Almost the entire territory of Belarus is believed to be endemic for tick-borne encephalitis virus (TBEV), with the Central European subtype, also known as TBEV-EU (Figure 1). In all, 96 counties (i.e., 71.5% of all administrative districts) are considered to be risk areas for tick-borne encephalitis (TBE).[1] The most intensive natural foci have been found in the western part of the country Tick-borne encephalitis virus circulation is detected in 15 out of 16 administrative territories of Brest region, among which 5 districts are defined as endemic (where the disease has been formed and maintained for a long period of time): Berezovsky, Ivatsevichy, Kamenetsky, Malorita and Pruzhany districts, and most of administrative territories of Grodno region.[4]

Figure 1: Administrative territories of the Republic of Belarus where circulation of tick-borne encephalitis virus (TBEV/VTBE) causal agents were identified, 1998–2007[5]



To determine whether or not changes in the TBEV infection rates in ticks followed a trend over time, joinpoint regression was estimated for annual percentage of infected ticks group by using the Joinpoint Trend Analysis Software, Version 4.5.0.1 (Statistical Research and Applications Branch, National Cancer Institute; https://surveillance.cancer.gov/joinpoint/). Same analysis was performed for TBE incidence of population of Belarus.

In brief, by using the TBE incidence rate per 100,000 and population of Belarus data for TBE and annual percentage of infected ticks rate data for TBEV in the transmitters as inputs, this method identifies the year(s) when a trend change occurs. One can therefore calculate the annual percentage change (APC) in rates between trend-change points, and also estimate the average annual percentage change (AAPC) in the whole period studied (Figure 2).[6,7]

To estimate the APC, the following model was used:

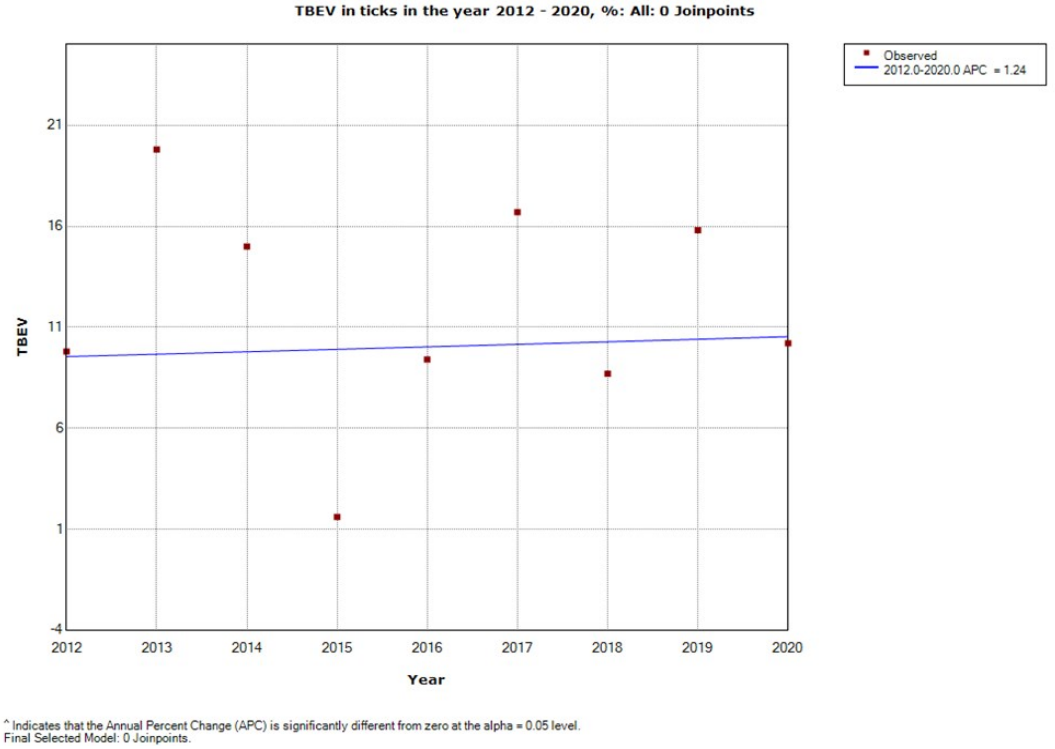
$$\log(Y_x) = b_0 + b_1 x, \text{ where } log\,(Y_x)$$, where log (Yx) is the natural logarithm of the rate in year x.

Then, the APC from year x to year x + 1 is:

$$APC = \frac{e^{b_0+b_1(x+1)} - e^{b_0+b_1 x}}{e^{b_0+b_1 x}} \times 100 = (e^{b_1} - 1) \times 100$$

When there are no join points (i.e., no changes in trend), APC is constant, so it equals the AAPC.[2, 3]

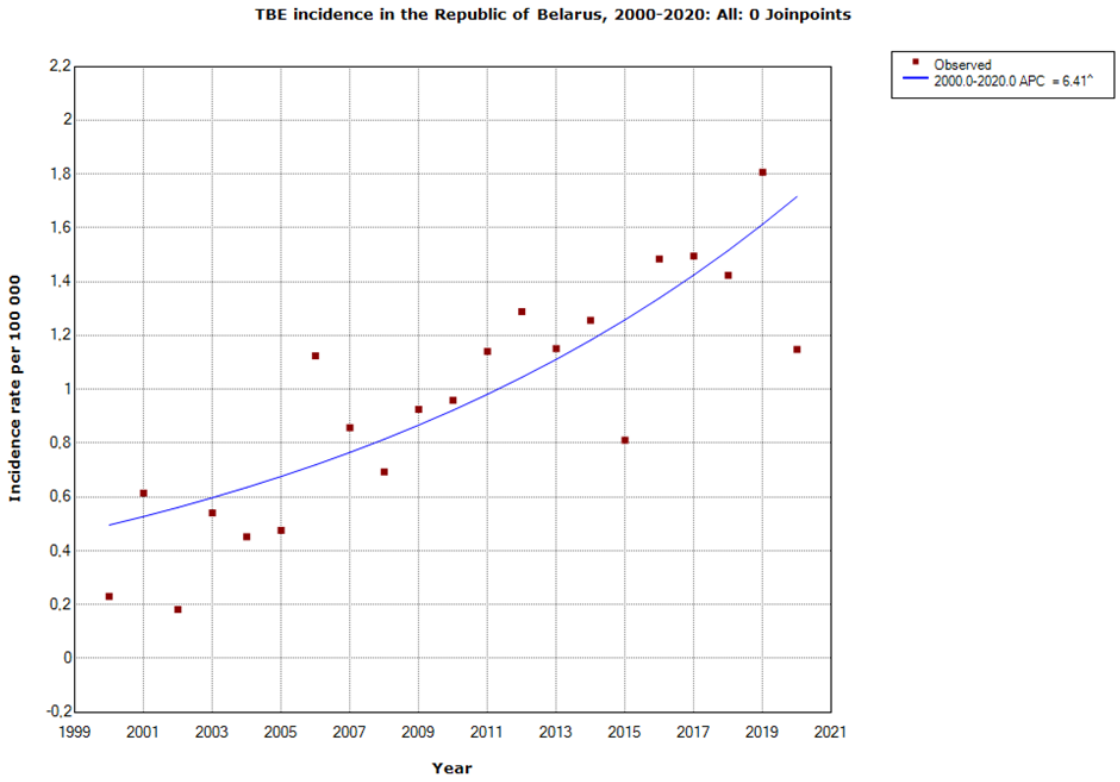
Figure 2: Joinpoint regression model of TBEV in ticks in Belarus, 2012-2020



Source Data: Appendix—Figure 2

In the decades from 2000 to 2020, the number of registered human TBE cases ranged from 18 in 2002 (incidence rate, 0.2 per 100,000) to 171 in 2019 (1.8 per 100,000). Overall, 1912 cases were registered in that period, which corresponds to a mean annual case number of 91. Figure 3 displays the increasing trend of TBE incidence by 6.41% every year that was significantly different from zero at a = 0.05 (Figure 3).[8]

Figure 3



Source Data: Appendix—Figure 3

Given the presence of high numbers of TBEV-infected ticks, the number of reported cases appears to be low and the true burden of TBE is likely underestimated.

Children aged 7–14 years represented 10%–15% of the total number of TBE cases.[5]

Two alimentary outbreaks have been reported, one in 2006 and one in 2007, with a total number of 16 persons infected.[5]

Overview of TBE in Belarus

Table 1: Virus, vector, transmission of TBE in Belarus	
Viral subtypes, distribution	Central European subtype (TBEV-EU) has been detected in almost the entire country.[5]
Reservoir animals	Information not available
Infected tick species (%)	In Belarus the main vectors for TBE are *Ixodes Ricinus Dermacentor reticulatus.*[5] Since 2005, surveillance of TBE in ticks started. A medium direct correlation was established ($r = 0.7$ with $P \leq 0.05$) between the incidence rate of tick-borne encephalitis and the natural foci intensity rate.
Dairy product transmission	Cases of alimentary TBE 2006–2007: 16 cases reported due to the consumption of raw goat milk.[5]

Table 2: TBE reporting and vaccine prevention in Belarus	
Mandatory TBE reporting	Registration of people with tick bites seeking medical advice and/or primary diagnosis of TBE according to clinical signs and epidemiological anamnesis. From counties, reports are sent to higher healthcare organizations.
Other TBE surveillance	No information available
Special clinical features	Biphasic disease
Available vaccines	EnceVir, Tick-E-Vak (Клещ-Э-Вак), TBE-vaccine Moscow
Vaccination recommendations and reimbursement	Recommended for high-risk population living in endemic areas
Vaccine uptake by age group/ risk group/general population	Information not available
Name, address/website of TBE National Reference Center	Republican Centre of Hygiene, Epidemiology and Public Health (Ministry of Health) of Belarus http://rcheph.by/en/

Age and gender distribution of TBE in Belarus: No data available

TBEV-isolation in Belarus: No data available

Appendix

Source data: Figure 2 — Prevalence of TBEV in ticks in Belarus in year 2012–2020, %

Year	Observed	Modeled Crude Rate
2012	9.8	9.55
2013	19.8	9.66
2014	15	9.78
2015	1.6	9.9
2016	9.4	10.03
2017	16.7	10.15
2018	8.7	10.28
2019	15.8	10.4
2020	10.2	10.53

Source data: Figure 2 — Annual Percent Change (APC) TBEV in ticks, 2012–2020

Segment	Lower Endpoint	Upper Endpoint	APC	Lower CI	Upper CI	Test Statistic (t)	Prob > |t|
1	2012	2020	1.2	-20.7	29.2	0.1	0.9
*Indicates that Annual Percent Change (APC) at significantly different from zero at a=0.05							

Source data: Figure 3 — Annual Percent Change (APC)

Segment	Lower Endpoint	Upper Endpoint	APC	Lower CI	Upper CI	Test Statistic (t)	Prob > |t|
1	2000	2020	6.4^	4.1	8.8	5.9	0
*Indicates that Annual Percent Change (APC) at significantly different from zero at a=0.05							

Source data: Figure 3 — TBE case numbers and incidence in Belarus in year 2000–2022

Year	Number of cases	Incidence/10^5
2000	23	0.2
2001	61	0.64
2002	18	0.2
2003	53	0.5
2004	44	0.4
2005	46	0.5
2006	108	1.1
2007	82	0.8
2008	66	0.7
2009	88	0.9
2010	91	1
2011	108	1.1
2012	122	1.3
2013	109	1.2
2014	119	1.3
2015	77	0.8
2016	141	1.5
2017	142	1.5
2018	135	1.4
2019	171	1.8
2020	108	1.1
2021	108	1.17
2022	No data	

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