Veterinary Medicine and Science

WILEY

REVIEW OPEN ACCESS

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Tick-Borne Viruses in Finland: Public Health Risks, Interventions and Research Insights

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Received: 17 April 2025 | **Revised:** 18 August 2025 | **Accepted:** 18 September 2025

Funding: The authors received no specific funding for this work.

Keywords: climate change | tick-borne encephalitis | ticks | vaccination | virus

ABSTRACT

Ticks are obligate haematophagous arthropods that serve as vectors for diverse pathogens, including viruses, bacteria and protozoa. In Finland, the two primary tick species, *Ixodes ricinus* (castor bean tick) and *Ixodes persulcatus* (taiga tick), have been identified in the transmission of tick-borne viruses (TBV), notably tick-borne encephalitis virus (TBEV). This article reviews the epidemiology, public health interventions and research on ticks and TBVs in Finland over the past six decades (1960–2020), highlighting the marked increase in tick populations and the incidence of tick-borne diseases in humans. Factors contributing to these trends include climate change, shifts in land use and alterations in ecosystem dynamics, which have expanded the geographical range and seasonal activity of ticks. This evolving epidemiological landscape poses significant public health challenges, necessitating effective monitoring and intervention strategies. Current research efforts focusing on understanding the dynamics of tick populations, the distribution of TBVs, and the effectiveness of TBEV vaccination and general prevention measures are crucial for mitigating risks associated with tick-borne viral diseases in Finland.

1 | Introduction

Ticks (order Ixodida) are obligate blood-feeding arthropods that serve as vectors for various pathogens, including bacteria, protozoa and viruses (Bartíková et al. 2017; Brites-Neto et al. 2015; Kumar et al. 2019). With over 900 identified tick species, many pose significant veterinary and public health concerns due to their role in pathogen transmission (Horak et al. 2015; Jongejan and Uilenberg 2004). *Ixodes ricinus*, commonly referred to as the castor bean tick (or sheep tick), is the most widespread tick species in Europe, including Finland (Laaksonen et al. 2017; Lindgren et al. 2000). It thrives in diverse environments, ranging from dense forests to open grasslands and urban greenspaces (Klemola et al. 2019; Kulha et al. 2022; Sormunen et al. 2025; Zając et al. 2021). *Ixodes persulcatus*, or the taiga tick, has a partially overlapping distribution with *I. ricinus* but is predominantly found in Northern and Eastern Europe and Asia (A. E. Jääskeläinen et al. 2010; Laaksonen et al. 2017). *I. persulcatus* in Finland has been confined to eastern border regions adjacent to Russia, where its climate adaptations suited the cooler boreal conditions. However, over the past few decades, its range has expanded westward and northward, encroaching into areas that were previously dominated by *I. ricinus* (Kulha et al. 2022; Bugmyrin et al. 2013). Both tick species have been observed to carry a wide spectrum of pathogens, with minor interspecific differences in prevalence rates (Laaksonen et al. 2018; Sormunen et al. 2025). *Borrelia burgdorferi* s.l. is the most common pathogen detected in studies. These two species share a broad host range, parasitizing humans, livestock and wildlife (Jongejan and Uilenberg 2004; Parola and Raoult 2001) and their co-occurrence in Finland creates a complex epidemiological landscape for tick-borne viruses (TBVs) (A. E. Jääskeläinen et al. 2010).

Tick-borne diseases (TBDs) have become a growing public health concern in Europe, including Finland (Charrel et al. 2004; Mysterud et al. 2017). Over the past 60 years, Finland has witnessed a significant rise in the prevalence of TBVs (A. E. Jääskeläinen et al. 2010; Kuivanen et al. 2019). Climate change, land-use modifications and ecological shifts have facilitated the expansion of tick habitats and prolonged their seasonal activity, leading to an increased risk of tick bites (Lindgren et al. 2000; Uusitalo et al. 2022; Sormunen, Sääksjärvi, et al. 2023). Among these viruses, tick-borne encephalitis virus (TBEV) is particularly notable, with 70%–90% of infections being asymptomatic or mild, while severe cases can lead to neurological complications (A. E. Jääskeläinen et al. 2010) and can be life threatening (Chiffi et al. 2023).

The boreal climate of Finland, characterized by long winters and short summers, has limited tick activity in the past (Kulha et al. 2022). However, rising temperatures and shifting ecosystems have facilitated the northward expansion of *I. ricinus* from western Finland, while the westward and northward expansions of *I. persulcatus* have occurred from the eastern border regions with Russia (Alkishe et al. 2017; Kulha et al. 2022; Sormunen, Sääksjärvi, et al. 2023). Comparative epidemiological studies with neighbouring countries such as Sweden, Estonia and Russia suggest similar climate-driven tick range expansions (ECDC 2022; Kholodilov et al. 2022). These transboundary trends underscore the need for regional collaboration in TBD surveillance and mitigation strategies. This review synthesizes six decades of TBV research in Finland, emphasizing the dynamics of tick populations, the epidemiology of TBEV, public health responses and emerging risks.

1.1 | Ecological and Epidemiological Background

I. persulcatus and *I. ricinus* are the primary vectors of known TBVs in Finland (Table 1; A. E. Jääskeläinen et al. 2010; Charrel et al. 2004). However, a study conducted by Öhman (1961) found no evidence of *I. persulcatus* presence in Finland at the time. The study report further indicated that the research coverage was too scanty to allow a definite conclusion on its occurrence. While the exact period of *I. persulcatus* presence in Finland is not known, later observations in 1990s and 2000s indicated that *I. persulcatus* was mainly confined to the eastern parts of Finland, but occurred also patchily elsewhere (A. E. Jääskeläinen et al. 2006). For example, whereas *I. persulcatus* was observed in the western coast near the city of Kokkola (A. E. Jääskeläinen et al. 2010), *I. ricinus* dominated the western and southern regions (Laaksonen et al. 2017; Öhman 1961; Sormunen, Sääksjärvi, et al. 2023). However, recent two decades have seen an expansion of *I. persulcatus*, bringing it more into contact with human populations and increasing the potential for disease transmission (Laaksonen et al. 2017; Sormunen, Sääksjärvi, et al. 2023). Nowadays it is present in Sweden and in Norway (Cotes-Perdomo et al. 2025; Jaenson et al. 2016; Omazic et al. 2023).

Ecological shifts over the past few decades have significantly altered the distribution and population dynamics of the tick species (Lindgren et al. 2000; Semenza and Suk 2018). *I. ricinus* is still particularly abundant in coastal and southern Finland, where the climate is relatively mild and humid, providing ideal conditions for tick development and survival (Kulha et al. 2022; Laaksonen et al. 2017; Uusitalo et al. 2022). *I. persulcatus* is more adapted to colder climates and indeed was initially mainly found in the eastern parts of Finland, near the Russian border (A. E. Jääskeläinen et al. 2010; Laaksonen et al. 2017), but nowadays it dominates certain areas in western coast, mid-Finland and northern parts of the tick distribution (Kulha et al. 2022; Laaksonen et al. 2017; Sormunen, Sääksjärvi, et al. 2023).

1.2 | Tick-Borne Encephalitis Virus

TBEV, a Flavivirus (Flaviviridae), is the most significant TBV in Finland. Figure 1 illustrates the rising trend in TBE cases from 1995 to 2024, demonstrating a marked increase over time. Between 2020 and 2024 alone, the disease incidence increased from 1.65 to 3.57 per 100,000 individuals (THL: Finnish National Infectious Diseases Register, Accessed online 7th August 2025), whereas in 2024, The Finnish Institute for Health and Welfare (THL) reports approximately 200 cases (i.e., 3.57 per 100,000 individuals) in Finland, reaffirming TBEV as a major public health concern (Finnish Institute for Health and Welfare (THL) 2024). The virus is primarily transmitted through the bite of infected *I. ricinus* and *I. persulcatus* ticks, the main vectors in Finland (Alekseev et al. 2007; A. E. Jääskeläinen et al. 2006, 2010; Tonteri et al. 2011).

TBEV was first identified in Finland in the late 1950's when it was isolated from *I. ricinus* ticks in the southwest archipelago (Kumlinge in the Åland Islands between Finland and Sweden) (Saikku and Brummer-Korvenkontio 1975). The virus can cause a spectrum of symptoms, from asymptomatic infections to severe neurological conditions such as meningitis, encephalitis and meningoencephalitis, with rare fatal outcomes. Of the three known TBEV subtypes (European, Siberian and Far Eastern), the European and Siberian subtypes have been detected in Finland (A. E. Jääskeläinen et al. 2006; Kuivanen et al. 2018).

The Åland Islands have previously been a TBE hotspot, with the highest recorded number of 26 cases in 2002, but the virus is now detected in southern and central Finland as well (Kuivanen et al. 2018; Smura et al. 2019). Recent data from the THL indicate a levelling off in TBE cases in the Åland Islands since 2005, while disease incidence is increasing in most other regions in Finland, (see Table 2). These trends highlight the changing epidemiology of TBEV in Finland and the need for continued surveillance and preventive measures, especially vaccination (see below). Moreover, the decline in TBE cases in the Åland Islands could be attributed to effective implementation of Finland's national vaccination program and increased awareness since the mid-2000 (A. Jääskeläinen and Åhman 2023; Wahlberg et al. 2006).

1.3 | Historical Context and Early Observations of TBEV and TBE in Finland (1960s–1980s)

The initial recognition of human TBDs in Finland dates to the 1960s, a time when such infections were relatively rare and geographically confined (Saikku and Brummer-Korvenkontio 1973; Wahlberg et al. 1989). The early cases of TBE were reported in

TABLE 1 | Overview of reported tick-borne viruses in Finland, their vectors, host range and public health relevance. Some viruses, like TBEV, have clear clinical significance, while others, such as UUKV and KEMV, require further investigation regarding their impact on human health.

TBE Cases by Region	1995–2000	2001–2005	2006–2010	2011–2015	2016–2020	2021–2025
Åland	56	84	33	34	43	43
Southwest Finland	11	12	20	44	76	90
East Uusimaa	1	1	4	10	12	29
City of Helsinki	8	5	12	26	60	83
Central Uusimaa	1	2	1	3	6	13
West Uusimaa	5	7	8	37	91	182
Kymenlaakso	0	0	2	7	5	12
Kanta-Häme	0	0	3	1	4	6
Päijät-Häme	0	0	0	2	2	6
South Karelia	4	4	14	22	20	28
Satakunta	2	3	0	4	3	13
Pirkanmaa	2	5	2	3	8	15
South Savo	2	1	0	2	4	3
Central Finland	0	1	0	1	2	7
North Karelia	0	0	0	5	8	21
Ostrobothnia	1	0	6	5	5	12
South Ostrobothnia	0	0	0	1	1	2
North Savo	3	0	5	5	6	32
Central Ostrobothnia	4	7	6	1	1	4
North Ostrobothnia	1	0	4	7	13	40
Kainuu	0	0	0	0	1	3
Lapland	1	0	4	15	14	21
All areas	**102**	**132**	**124**	**235**	**385**	**665**

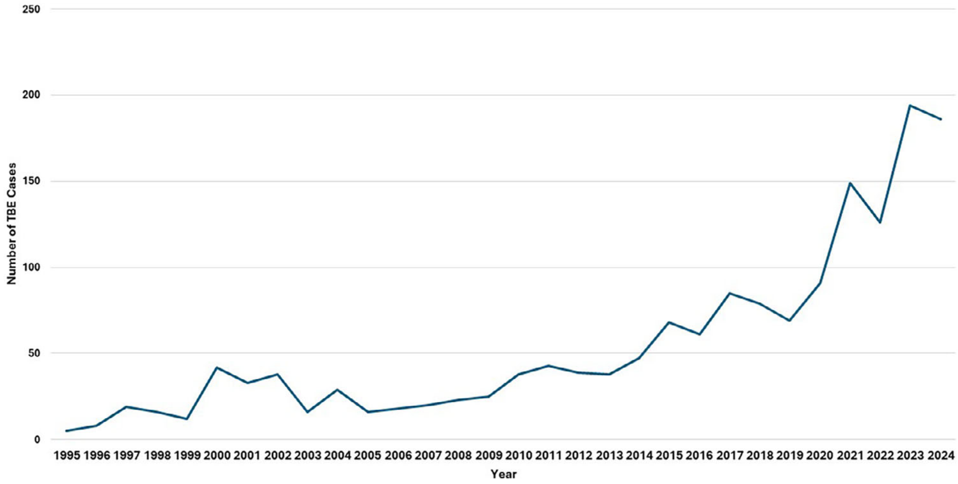

FIGURE 1 | Trends in yearly TBE cases reported in Finland since 1995 to 2024. The data is based on Finnish National Infectious Diseases Register records available at the Finnish Institute for Health and Welfare (THL). The register was accessed on 7th August 2025.

TABLE 2 | Summary table for reported TBE cases in Finland between 1995 and 2025. The data for the current year, 2025, is not complete. The data is based on Finnish National Infectious Diseases Register records available at the Finnish Institute for Health and Welfare (THL). The register was accessed on 7th August 2025.

Virus name	Virus type	Primary tick vector(s)	Host species	Disease in humans	Other relevant information
Tick-borne encephalitis virus (TBEV)	Flavivirus (Flaviviridae)	*Ixodes ricinus*, *Ixodes persulcatus*	Humans, rodents, livestock, wild mammals	Tick-borne encephalitis (TBE): Neurological illness, meningitis, encephalitis or mild flu-like symptoms	Most significant TBV in Finland; endemic in the Åland Islands and southern Finland; vaccination available
Uukuniemi virus (UUKV)	Phlebovirus (Phenuiviridae)	*Ixodes ricinus*	Birds, small mammals	Generally mild febrile illness, rarely documented in humans	First isolated in Finland in the 1960s; mainly of veterinary importance
Kemerovo virus (KEMV)	Coltivirus (Reoviridae)	*Ixodes persulcatus*	Rodents, birds, possibly humans	Mostly asymptomatic; may cause mild febrile illness in humans	Antibodies detected in Finland, indicating exposure, but no confirmed human cases
Alongshan virus (ALSV)	Flavivirus-like segmented virus	*Ixodes ricinus*, *Ixodes persulcatus*	Humans, livestock, wildlife	Flu-like symptoms, fever, fatigue; potential neurological complications in rare cases	Recently detected in Finland in 2019; emerging tick-borne virus of concern

the Åland Islands in the 1940s, a region with a temperate climate conducive to tick survival (Saikku and Brummer-Korvenkontio 1975, 1973; Wahlberg et al. 2006). Most cases of TBE were sporadic, and there was little public or medical awareness of the disease. Diagnostics for TBEV have been available in Finland since at least the late 1970s. Between 1959 and 1987, 126 patients in the Åland Islands and mainland Finland had serologically verified infections with the TBEV, also known as Kumlinge disease according to the location of the first cases. The haemagglutination inhibition-IgM (HI-IgM) test was identified as the most useful method for specific virological diagnosis during this period (Wahlberg et al. 1989). The lack of advanced diagnostic tools may have also contributed to underreporting and misdiagnosis, with many cases of TBE likely being attributed to other viral infections (Oker-Blom et al. 1964). Despite the low incidence, these early cases prompted some initial public health responses. The Finnish public health system began to monitor TBDs, albeit in a limited capacity, focusing primarily on the Åland Islands (Wahlberg et al. 1989, 2006). The medical community started to document and study the disease, though research was hampered by limited resources and the relatively small number of cases (Saikku and Brummer-Korvenkontio 1975). Public awareness was minimal, with no significant campaigns to educate the population about TBDs or preventive measures.

1.4 | Expansion of Tick Populations and Rising TBE Cases in Finland (1990s–2000s)

The 1990s marked a significant turning point in the epidemiology of TBDs in Europe, with a total of 157,584 reported cases for TBE alone between 1990 and 2007 (Süss 2008). During this decade, the effects of climate change began to manifest more clearly, with warmer winters and longer growing seasons creating more favourable conditions for tick survival and reproduction (Lindgren et al. 2000). As a result, tick populations expanded northward (Uusitalo et al. 2022; Sormunen, Sääksjärvi, et al. 2023), and the incidence of tick-borne viral diseases, particularly TBE, began to rise (Table 2, Figure 1). The prevalence of TBEV in analysed ticks between 1996–1997 in southern Finland, in Åland and Isosaari (a recreational island in the Helsinki archipelago), was reported to be 0.2% and 0.7%, respectively (Han et al. 2001); whereas in 2004 the prevalence was 1% in mid-western Finland, in the Kokkola archipelago (A. E. Jääskeläinen et al. 2006, 2010).

Meanwhile, systematic surveillance of TBE cases in Finland began in 1995 (Tonteri et al. 2015) and enhanced surveillance to identify and monitor cases was introduced in 2007 by the Finnish Institute for Health and Welfare (Dub et al. 2020). Studies conducted during this period, including those by Professor Olli Vapalahti and his research team at the University of Helsinki, have documented the changing distribution of ticks and the rising incidence of TBE, providing valuable data for public health planning (A. E. Jääskeläinen et al. 2006, 2010). In response to the rising incidence of TBE, public health authorities introduced vaccination programs in high-risk areas, with the implementation of the national vaccination program in the Åland in 2006 (https://www.thl.fi). The Åland Islands have implemented widespread vaccination campaigns, with residents and visitors encouraged to receive the TBE vaccine. It is also important to note that knowledge on the exact vaccine coverage in Åland or other areas within the free vaccination program is still lacking despite the effort, making it problematic to evaluate the effect of the effort (THL_TBE_Raportti 2013). Moreover, public awareness campaigns also began to gain traction, with efforts to educate the public about the risks of TBDs, the importance of tick checks, and the use of protective clothing and insect repellents when spending time outdoors. Tick researchers in the University of Turku launched nationwide citizen science campaigns in 2014 (web questionnaire): and in 2015 (tick sampling; Laaksonen et al. 2017, 2018) receiving high media coverage that substantially increased general awareness of ticks and TBDs in Finland. Finally, a real-time monitoring and information system (see below) was established in early 2020s (Sormunen, Sääksjärvi, et al. 2023; www.punkkilive.fi/en).

1.5 | Other TBVs Reported in Finland

The changing climate and environment have facilitated the spread of other tick-borne viral pathogens previously not found in Finland. (Kuivanen et al. 2019; Oker-Blom et al. 1964; Saikku and Brummer-Korvenkontio 1973). Table 1 provides a summary of the various TBVs identified in TBD related studies. The following is an overview of the major TBVs discussed in research literature in Finland:

1. *Uukuniemi Virus (UUKV)*: Uukuniemi virus belongs to the *Phlebovirus* genus of the family Phenuiviridae and is primarily transmitted by *I. ricinus*. Detection of the virus was made from cattle sera in areas dominated by *I. ricinus* ticks. The incidence of the virus was also reported with increased antibodies in passerine birds (7% to 16.5%) between June and August, coinciding with the peak period of *I. ricinus* (Saikku and Brummer-Korvenkontio 1975). The virus strain S23 was originally isolated in the early 1960s from *I. ricinus* ticks collected from southern Finland (Saikku and Brummer-Korvenkontio 1973). UUKV infections are typically mild, with symptoms that include fever and general malaise. However, there is no or limited evidence of UUKV infection in humans in Finland, though antibodies were reported in countries such as Lithuania and former Czechoslovakia (Palacios et al. 2013; Saikku and Brummer-Korvenkontio 1975).
2. *Kemerovo Virus (KEMV)*: Kemerovo virus belongs to the *Coltivirus* genus of the family Reoviridae and is transmitted by *I. persulcatus*. The disease agent has not been isolated in Finland. However, antibodies detection has been reported in Finland in the past (Table 1). Moreover, the presence of disease vectors, *I. persulcatus* and *I. ricinus* arriving from Russia or Central Europe on migratory birds (Sormunen et al. 2022; Saikku and Brummer-Korvenkontio 1975), gives indication that new tick-borne pathogens could emerge in Finland including KEMV. Kemerovo virus infection is usually asymptomatic but can cause mild flu-like symptoms in some cases (Chumakov et al. 1964).
3. *Alongshan virus (ALSV)*: The virus belongs to the *Flavivirus* genus of the family Flaviviridae like TBEV. *I. persulcatus* and *I. ricinus* ticks are the known primary vectors. In Finland, the virus was first detected in two *I. ricinus* ticks collected in 2011 and 2017, but no evidence of human infection was acquired based on antibody (304 samples) and RNA screening (974 samples) of human sera (Kuivanen et al. 2019). Initial symptoms include fever, headache, fatigue and muscle pain. While most cases are mild and patients recover fully, neurological symptoms may occur in rare situations. ALSV has also been found in China, and Russia, though specific geographical distribution is still lacking (Jia et al. 2019). To understand the prevalence of ALSV in Finland will require more surveillance and screening.

1.6 | Climate Change and Environmental Factors

Climate change has played a crucial role in the spread of TBDs in Finland. Over the last six decades, Finland has experienced warmer winters and extended growing seasons, directly influencing tick distribution and host interactions (Sormunen, Sääksjärvi, et al. 2023). Warming has been most pronounced during spring and autumn, extending the activity period of ticks from early spring to late autumn and widening the transmission window for tick-borne pathogens (Jylhä et al. 2004). This longer active season allows ticks more time to seek hosts and complete their development, as development speed is nearly zero outside the activity period. Warmer summer months accelerate developmental rates, potentially shortening tick life cycles and increasing population sizes (Sonenshine and Roe 2014). Earlier beginnings and extended durations (later endings) of thermal growing seasons were observed in a recent study covering changes during the past three decades in Northern Europe (Aalto et al. 2022). As a concrete example of changes due to warming in Finland, during the past decade, positive temperature anomalies have been reported during most winters (8/10 years), springs (9/10) and autumns (8/10) in the capital region, Helsinki (https://en.ilmatieteenlaitos.fi/statistics-from-1961-onwards).

Milder winters enhance the survival of host animals, which in turn supports higher tick survival and contributes to increased population densities by reducing starvation-related mortality. Hosts include small mammals (e.g., voles, mice, shrews), medium- and large-sized mammals (e.g., raccoon dogs, hares, roe deer) and migratory birds that aid tick dispersal (Lindgren et al. 2000; Zając et al. 2021). Since the 1950s, raccoon dogs have spread from southeastern Finland to the western coast and the Swedish border in the north (Helle and Kauhala 1991), while roe deer have expanded both in numbers and range beyond their historical northern limits (Danilov et al. 2017). Both species are important hosts for all life stages of ticks and can transport them over considerable distances. As a result of these climatic and ecological changes, *I. ricinus* and *I. persulcatus*, the primary tick vectors in Finland, have expanded northward into previously uncolonized regions, increasing the risk of disease transmission (Kulha et al. 2022).

1.7 | Interventions and Public Health Responses

Over the past six decades, Finland has implemented multiple strategies to mitigate the public health risks of TBVs, particularly TBEV. These interventions include vaccination programs, public awareness campaigns and enhanced surveillance efforts.

1.7.1 | Vaccination Programs

Vaccination remains the most effective preventive measure against TBEV. In Finland, the vaccine is recommended for individuals living in high-risk regions, including the Åland Islands and coastal areas of southern and central Finland (ECDC 2022; Finnish Institute for Health and Welfare (THL) 2024). The Finnish national TBE vaccination program has expanded to cover several at-risk regions, achieving high vaccination rates among permanent residents (Wahlberg et al. 2006). However, compared to other TBEV-endemic European countries, Finland's vaccination coverage among tourists and newly settled residents remains suboptimal, highlighting the need for improved outreach and accessibility (Erber and Schmitt 2018).

1.7.2 | Public Awareness Campaigns

Public awareness initiatives emphasize preventive measures such as protective clothing, insect repellents and regular tick checks. Information is distributed via schools, healthcare centres, outdoor recreation areas and conventional and social media. A notable example is the Punkkilive platform, a collaboration between the University of Turku and Pfizer, which provides real-time tick presence data to Finnish citizens (Punkkilive.fi; Sormunen, Kulha, et al. 2023).

1.7.3 | Surveillance and Monitoring of Disease Cases

Surveillance and monitoring efforts have been significantly enhanced over the past few decades. In Finland, THL coordinates nationwide surveillance of TBDs, tracking the incidence of TBE and Lyme borreliosis. These efforts are complemented by clinical and epidemiological studies that monitor tick populations, their distribution and infection rates. Clinicians and laboratories inform THL about disease cases, and the results are transmitted to the Finnish National Infectious Diseases Register (Sampo.thl.fi). These surveillance data are crucial for identifying new areas of risk, guiding public health interventions and informing research priorities Tonteri et al. 2015).

1.8 | Research and Future Directions

As TBEV continues to pose a significant public health challenge, current research efforts focus on four key areas:

1. *Climate Change and Tick Ecology*: Researchers are using climate models to predict changes in tick distribution and disease risk, helping prioritize public health responses (Kulha et al. 2022; Sormunen, Sääksjärvi, et al. 2023; Uusitalo et al. 2022).
2. *Genomics and Pathogen Diversity*: Advances in next-generation sequencing allow researchers to identify emerging pathogens and diseases and analyse genetic variation in TBEV strains, improving diagnostic and surveillance methods (Smura et al. 2019).
3. *Vaccine Development*: Research is focused on improving vaccine efficacy, broadening protection across TBEV subtypes and exploring combined vaccines for multiple TBDs (Kubinski et al. 2020; Kunze et al. 2022). In addition, efforts are being made to develop antivirals and immunotherapies for TBEV treatment (Ruzek et al. 2019).
4. *Public Health Strategies*: Evaluating the effectiveness of current awareness campaigns and vaccination programs to improve vaccine uptake and tailor interventions for vulnerable populations (Erber and Schmitt 2018; Süss 2003).

1.9 | Outlook and Challenges

The future of TBDs in Finland is closely tied to the ongoing impact of climate change and other environmental factors. As temperatures continue to rise, tick populations are expected to expand further north, bringing an increased risk of TBDs to previously unaffected areas. This expansion presents a major challenge for public health authorities, requiring extended surveillance, monitoring and intervention efforts (Rocklöv and Dubrow 2020; Sormunen, Sääksjärvi, et al. 2023; Uusitalo et al. 2022). While TBEV remains the primary focus of public health efforts in

Finland, the emergence of other TBVs such as Jingmen virus (Qin et al. 2014), Powassan virus (POW) (Campbell and Krause 2020) and Crimean–Congo haemorrhagic fever virus (CCHF) (Bente et al. 2013), pose additional concerns as potential cases may emerge in the future. This might be possible because rapid environmental changes may introduce new tick species capable of carrying undetected viruses, complicating diagnosis, treatment and prevention (Kuivanen et al. 2019).

International collaboration will be crucial in addressing these challenges. Since TBDs transcend national borders, Finland actively participates in global research initiatives and surveillance networks (ECDC 2022). Strengthening these partnerships will be essential in coordinating public health responses, sharing data and developing effective prevention strategies. Examples of such networks include Emerging Viral Diseases-Expert Laboratory Network (EVD-LabNet) (https://www.ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/evd-labnet), of which Prof. Olli Vapalahti from the University of Helsinki (Finland) is a management team member; and ECDC's network for medical and veterinary entomology (VectorNet) (https://www.ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/vector-net).

Furthermore, investment in research and public health infrastructure remains critical for Finland's ability to respond to emerging TBD threats. Continued efforts to enhance diagnostic capabilities, develop novel vaccines and improve public health education will help Finland stay ahead of the evolving risks associated with TBVs.

2 | Conclusion

The increasing incidence of human tick-borne viral diseases in Finland over the past 60 years reflects broader ecological and environmental shifts that have significantly impacted public health. The expansion of tick populations and the rising burden of diseases such as TBE present ongoing challenges. However, Finland's proactive response, vaccination programs, public awareness initiatives, enhanced surveillance and cutting-edge research has been instrumental in mitigating these risks. Moving forward, the emergence of new pathogens, continued climate change and evolving tick ecology underscore the need for sustained investment in research, public health infrastructure and international collaboration. By remaining adaptable and evidence-driven, Finland can continue to protect public health against the growing threat of TBDs.

Author Contributions

Theophilus Yaw Alale: conceptualization, literature search, writing. **Tero Klemola**: supervision, review and editing. **Jani J. Sormunen**: expertise on tick ecology and surveillance data, supervision, review. **Heli Harvala** and **Laura Kakkola**: validation, article search, review. **Jessica Tikkala**: validation, search, review. **Eero J. Vesterinen**: conceptualization, supervision, review. All authors read and approved the final manuscript.

Acknowledgement

We would like to thank members of the Tick-borne Diseases Turku consortium (TBD-Turku; https://www.tbd-turku.fi) for their immense support in helping us search for some of the articles reviewed in this paper. Many thanks to Professor Jykka Hytönen of the Institute of Biomedicine, University of Turku, for the privilege to discuss the content of the article and providing expert virologist from his research group to review the article.

Data Availability Statement

The data that support the findings of this study are available in National infectious disease register at https://sampo.thl.fi/pivot/prod/en/ttr/cases/fact_ttr_cases?row=nidrreportgroup-877823&column=yearmonth-878344. These data were derived from the following resources available in the public domain:—Finnish Institute for Health and Welfare, https://sampo.thl.fi/pivot/prod/en/ttr.

Peer Review

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1002/vms3.70638.

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