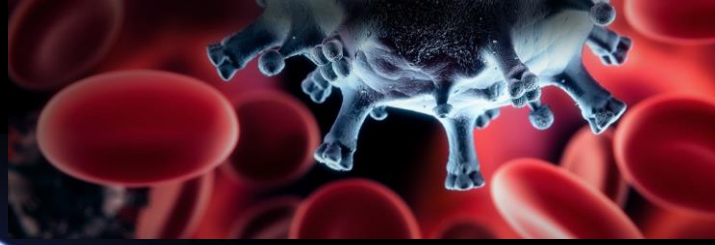

ZOONOSES IN A GLOBAL CHANGES CONTEXT: THE CASE OF TICK-BORNE ENCEPHALITIS VIRUS (TBE) IN THE AUTONOMOUS PROVINCE OF TRENTO, ITALY

Valentina Tagliapietra, Arnoldi D, Manica M, Rosà R, Delucchi L, Rosso F, Alfano N, Rizzoli A

Dept. of Biodiversity and Molecular Ecology, Applied Ecology Unit

Fondazione Edmund Mach, San Michele all'Adige (TN) – ITALY

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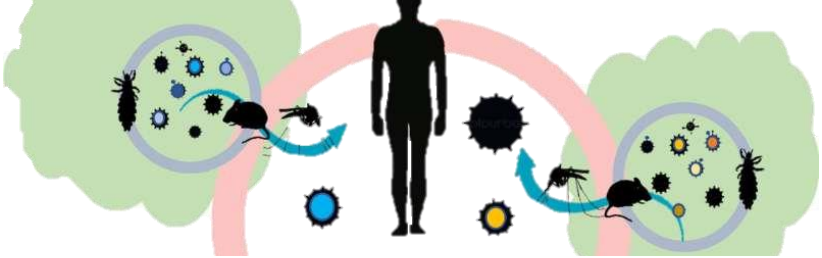
CLIMRISK19 GISC 7th Annual Conference

Trento, 23-25 October 2019

Climate Risk: Implications for Ecosystem Services and Society, Challenges, Solutions



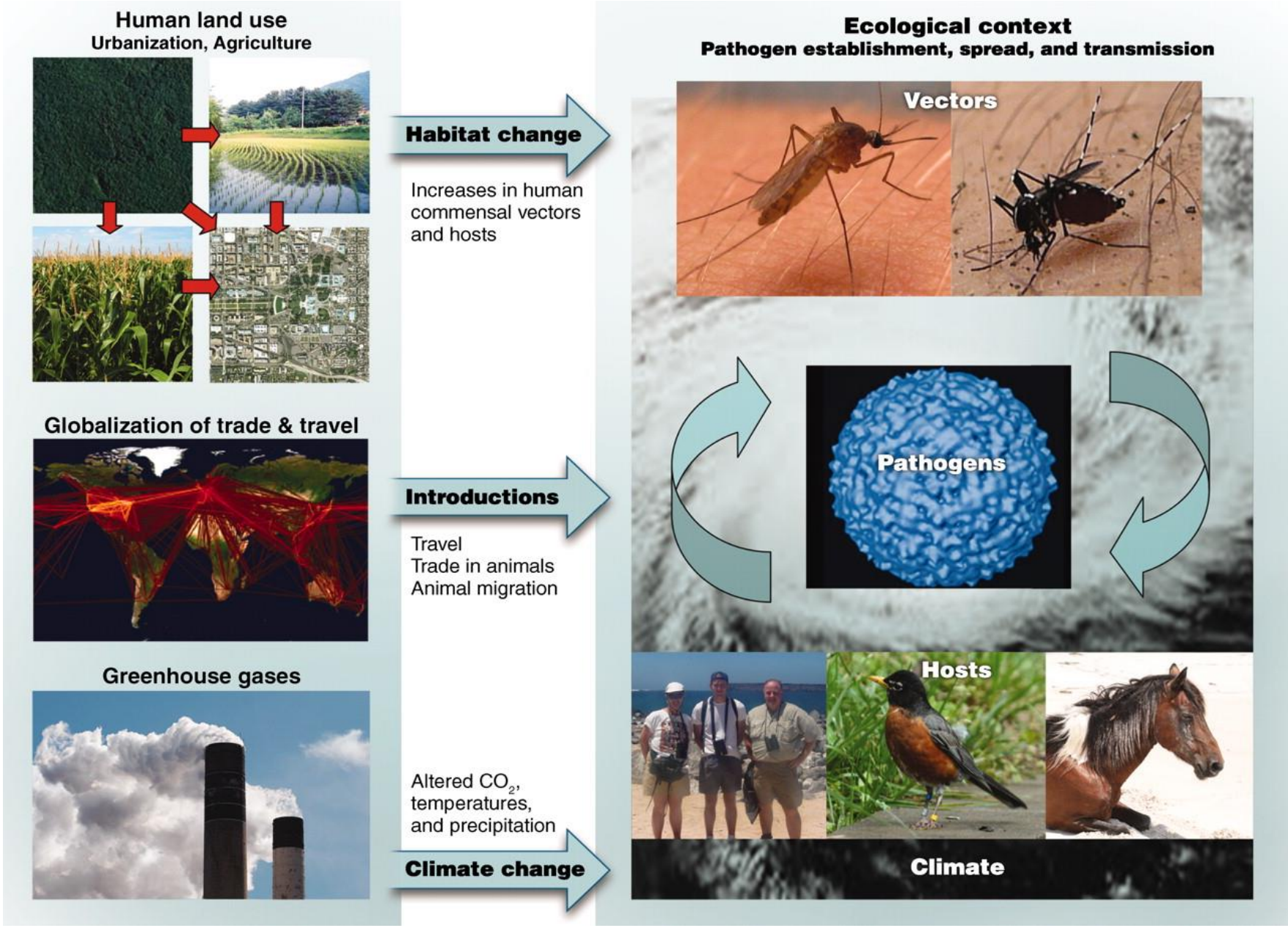
PUBLIC HEALTH THREATS

Products of animal origin may carry pathogens that cause infectious diseases in animals.

There are strict procedures and veterinary controls on the introduction of products of animal origin into the European Union.

*Other than those arriving with small quantities for personal consumption from: Andorra, the Faroe Islands, Greenland, Iceland, Liechtenstein, Norway, San Marino and Switzerland

From: Kilpatrick 2011, Science 334(6054):323-327



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Zoonoses in numbers

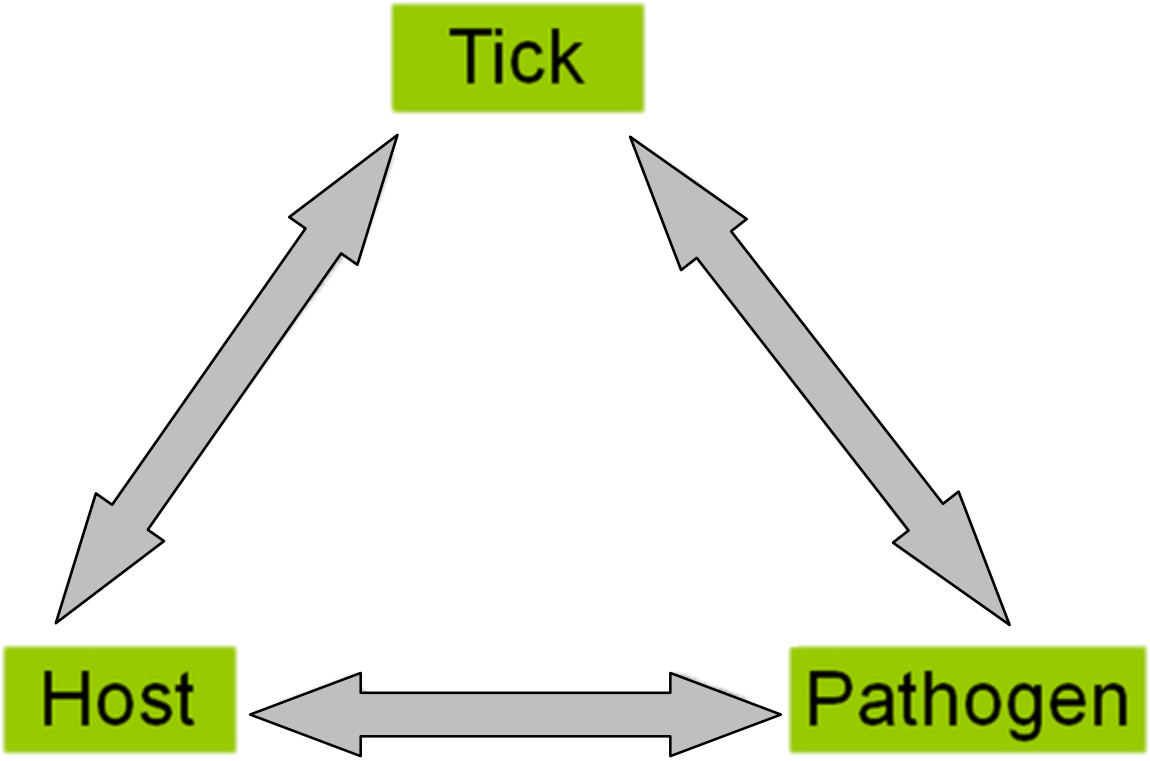
60% of existing human infectious diseases are zoonotic

At least 75% of emerging infectious diseases of humans (including Ebola, HIV, and influenza) have an animal origin

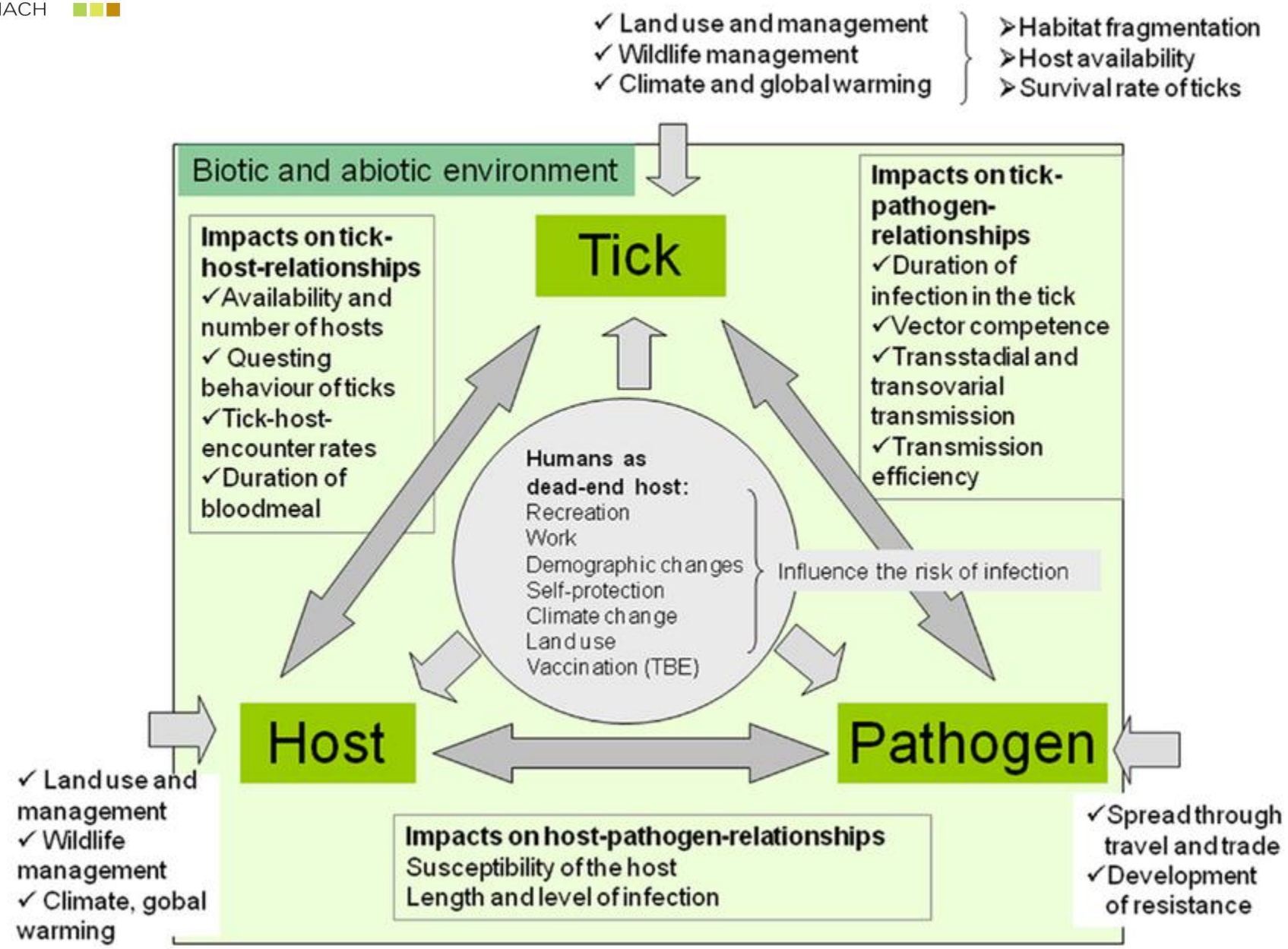
5 new human diseases appear every year. Three are of animal origin

80% of agents with potential bioterrorist use are zoonotic pathogens

Source: OIE



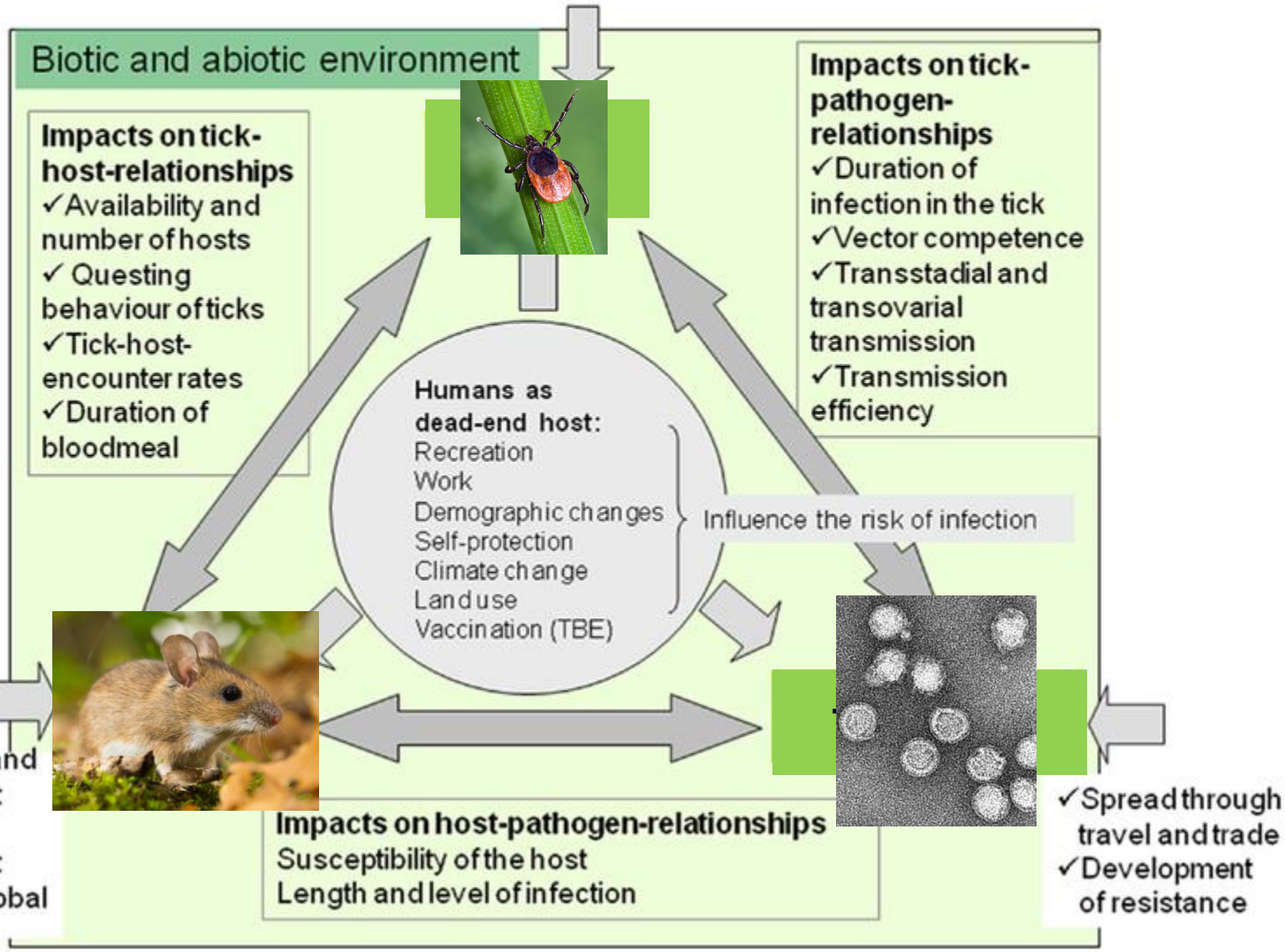
From: Rizzoli et al 2014, Frontiers in Public Health 2(251):251



From: Rizzoli et al 2014, Frontiers in Public Health 2(251):251

- ✓ Land use and management
- ✓ Wildlife management
- ✓ Climate and global warming

→
- ➢ Habitat fragmentation
- ➢ Host availability
- ➢ Survival rate of ticks



From: Rizzoli et al 2014, Frontiers in Public Health 2(251):251

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Ixodes ricinus - current known distribution: June 2018

Legend

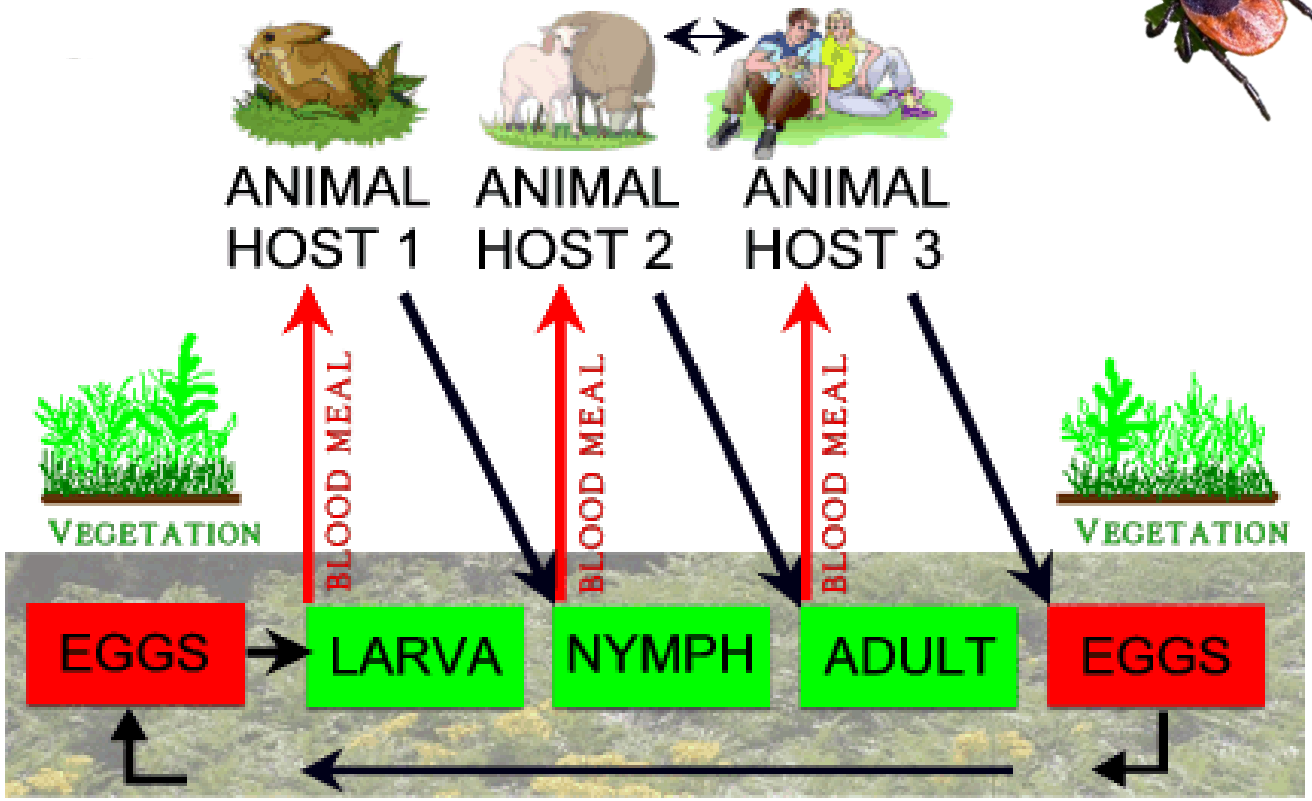
- Present
- Introduced
- Antic. Absent
- Obs. Absent
- No data
- Unknown

Countries/Regions not viewable in the main map extent*

- Malta
- Monaco
- San Marino
- Gibraltar
- Liechtenstein
- Azores (PT)
- Canary Islands (ES)
- Madeira (PT)
- Jan Mayen (NO)

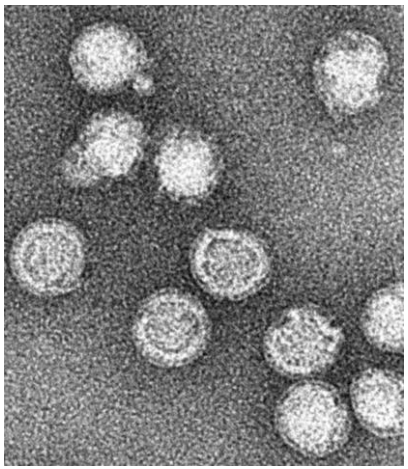
ECDC and EFSA. Map produced on 1 Jun 2018. Data presented in this map is collected through the VectorNet project. The maps are validated by designated external experts prior to publication. Please note that the data do not represent the official view or position of the countries. * Countries/Regions are displayed at different scales to facilitate their visualization. Administrative boundaries: ©EuroGeographics; ©UN-FAO; ©Turkstat.

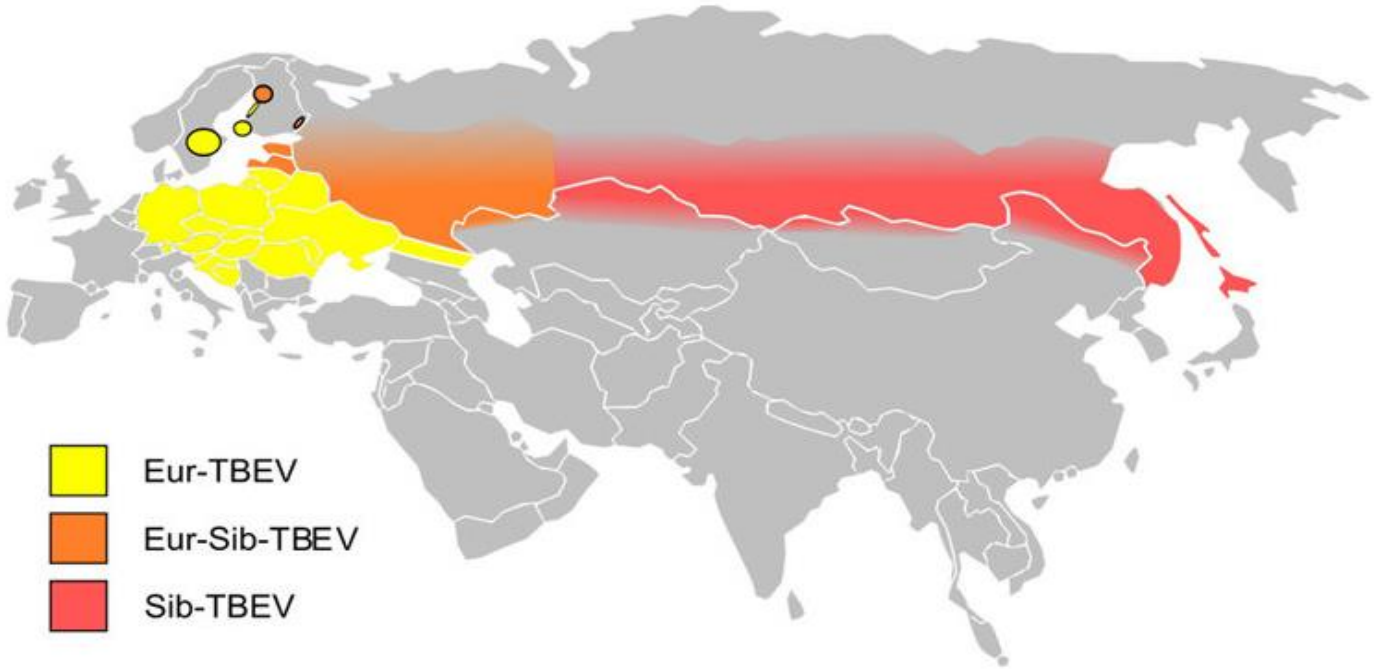
THE LIFE CYCLE OF A TICK

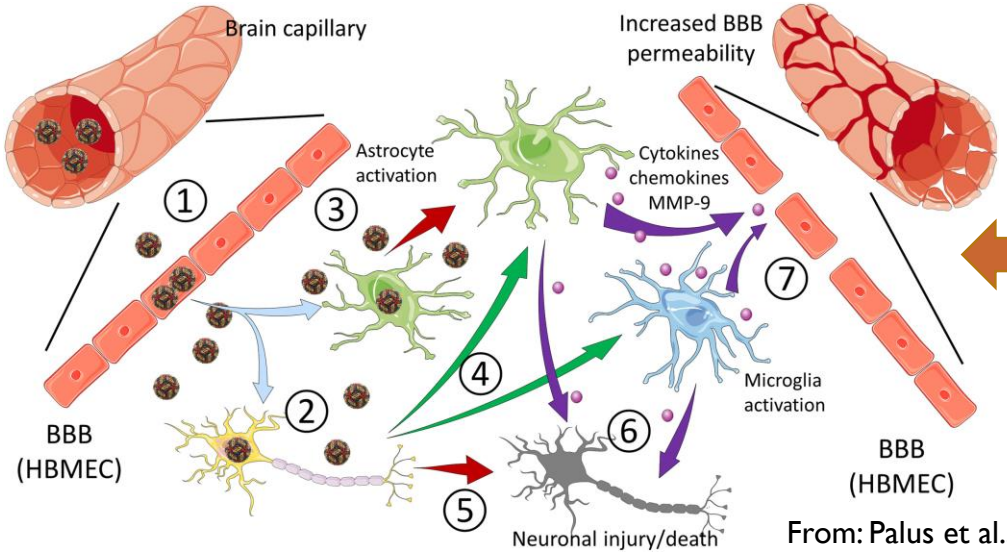


- Obligate hematophagous ectoparasite.
- 2-3 years to complete the life cycle.
- Tick activity and life cycle depend on climatic factors (temperature, soil moisture and relative humidity).
- Two peaks of activity of *I. ricinus* have been observed in May/June and in September/October
- Up to 1400 m a.s.l.

Tick-borne encephalitis virus (TBEV)







Possible mechanism of TBEV entry into the brain

From: Palus et al., 2017, *Virology*

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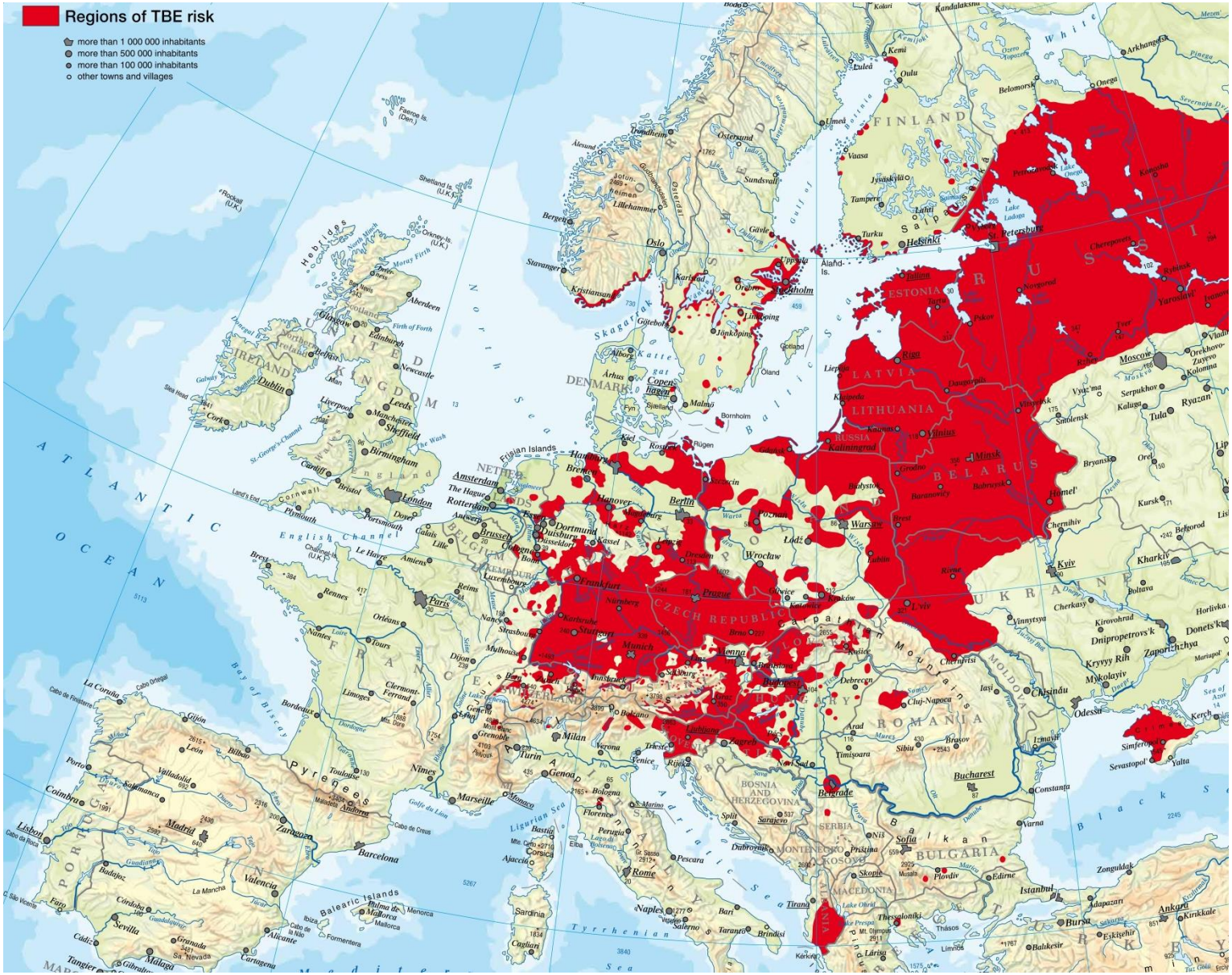
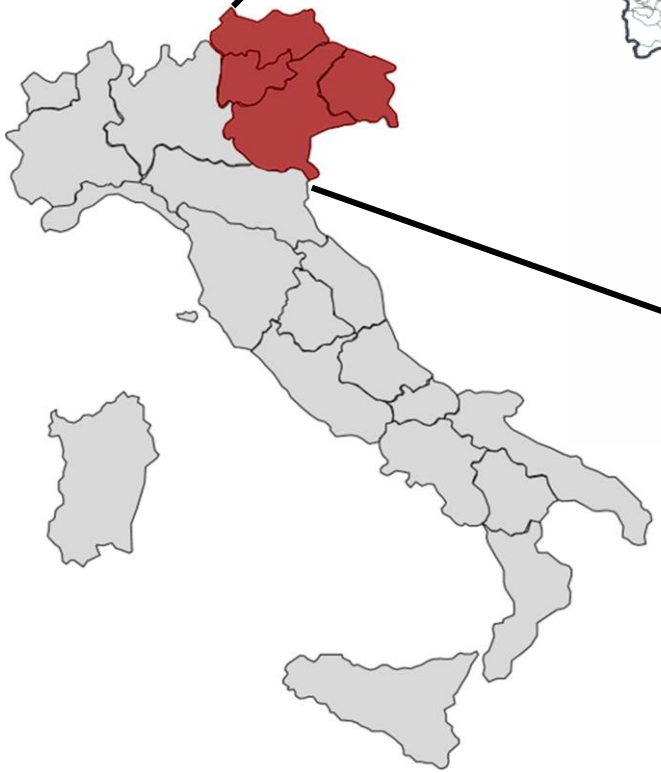
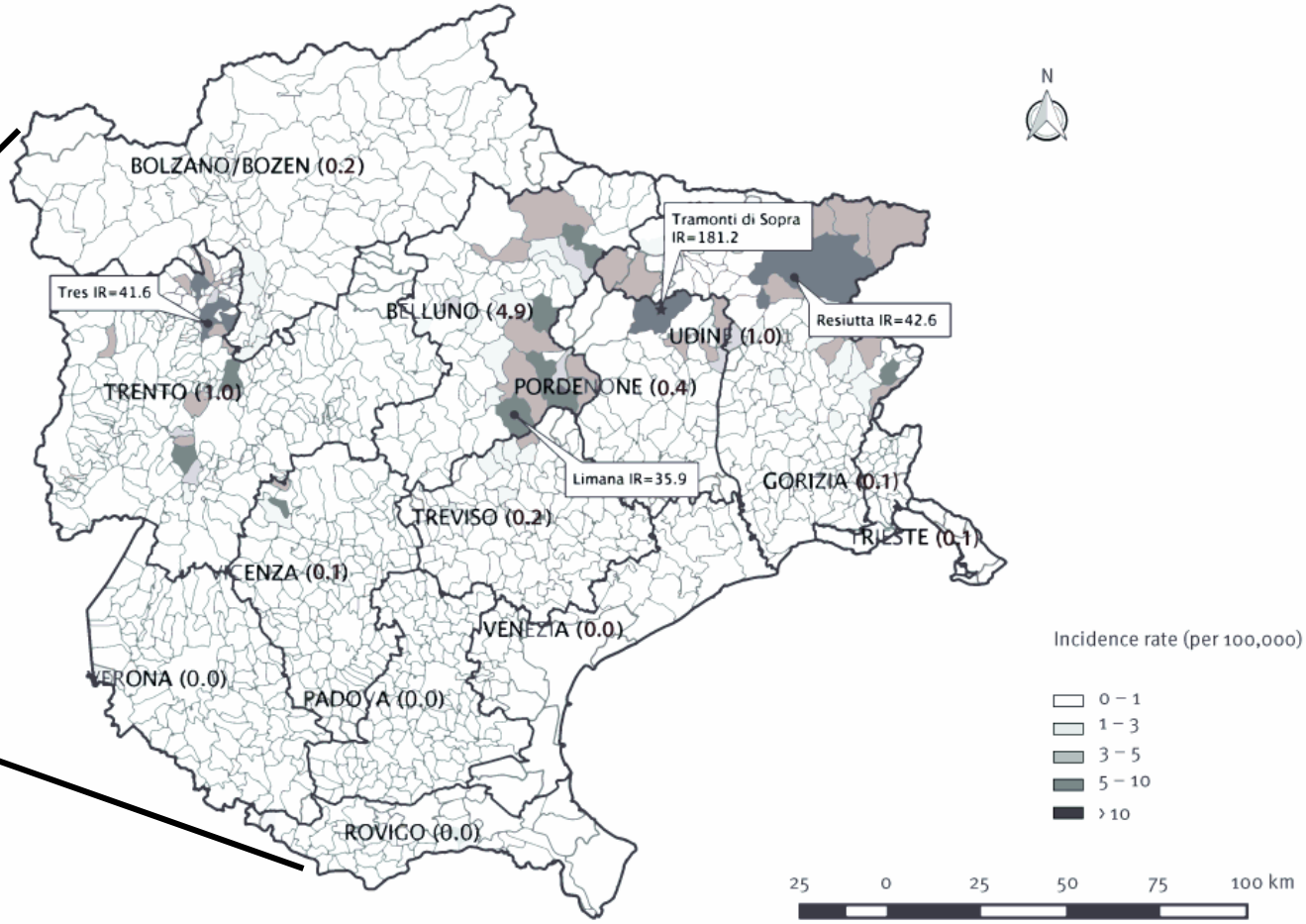
TBEV distribution in Europe



TBEV distribution in Italy

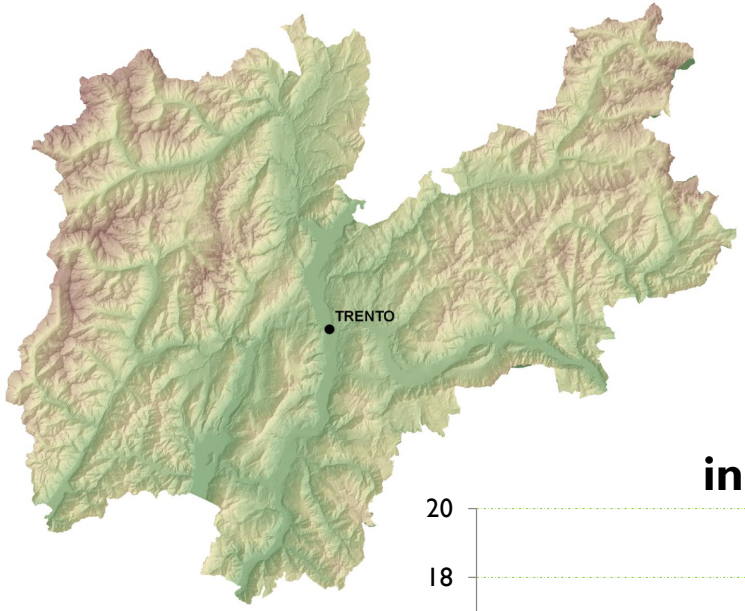
IR 2000-2018=
0,5/100.000 inhabitants





Annual incidence rates (per 100,000 inhabitants) of tick-borne encephalitis cases by municipalities of residence in north-eastern Italy, 2000–2013
From: Rezza et al., 2015, *Eurosurveillance*

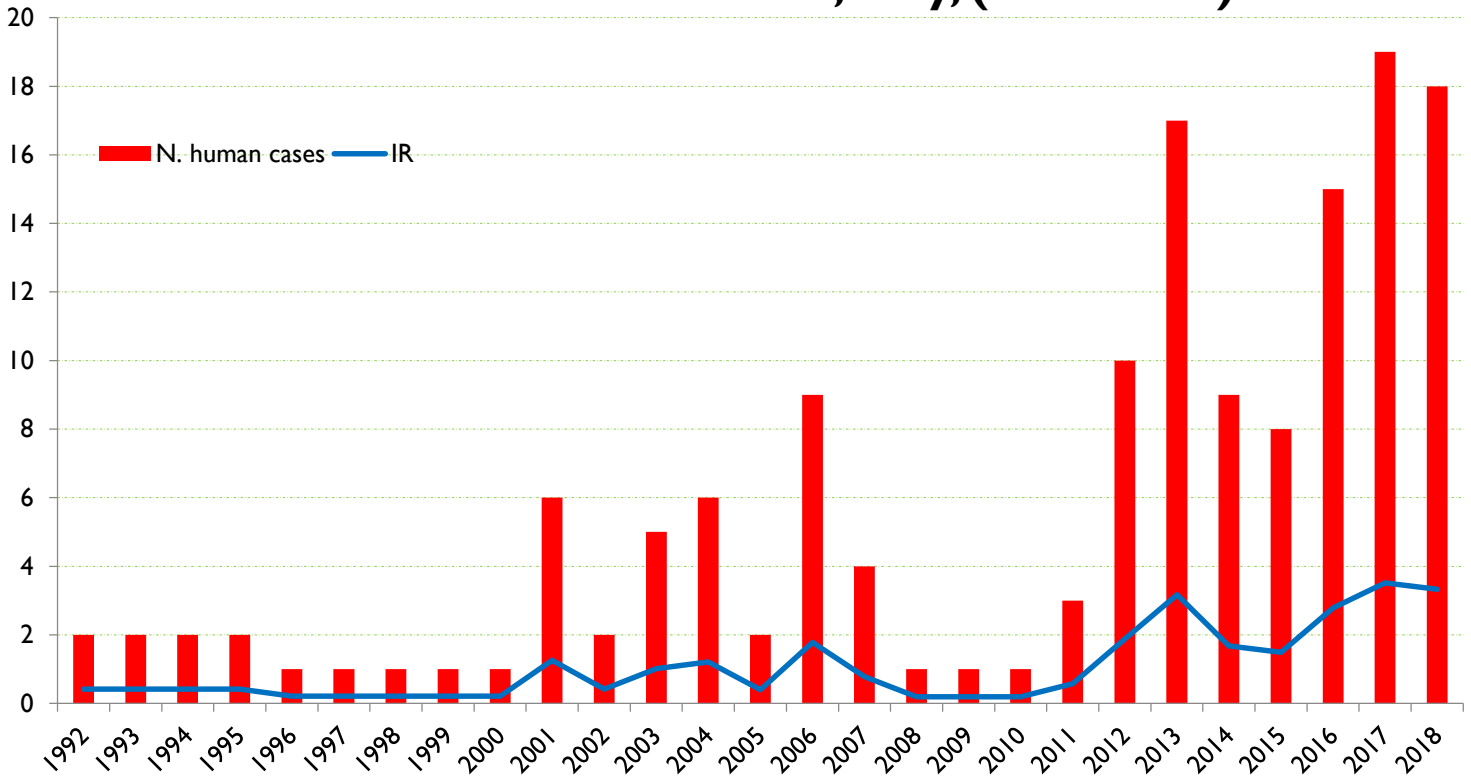
TBEV human cases distribution in the Province of Trento



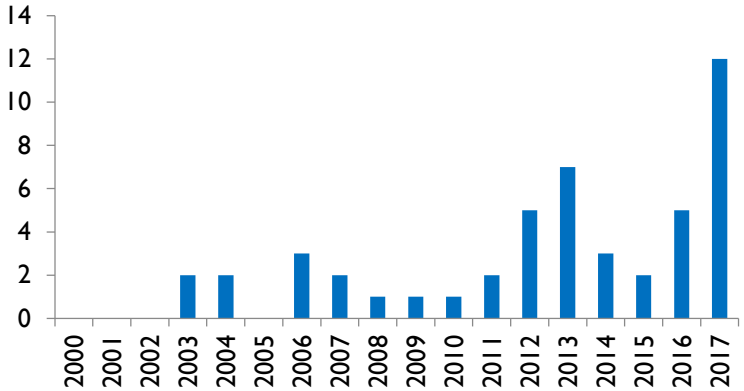
In the Province of Trento (Italy) the number of cases showed a sharp increase in the period 2012-2018, compared to the 20 years before (1992-2011).....

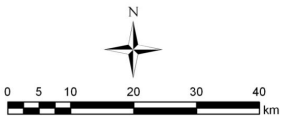
Tot. n. cases:
164
(1992-2019)

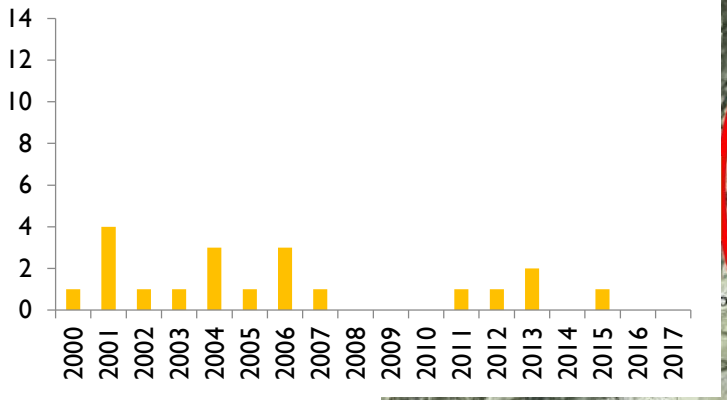
TBE incidence and n. of cases in the Province of Trento, Italy, (1992-2018)

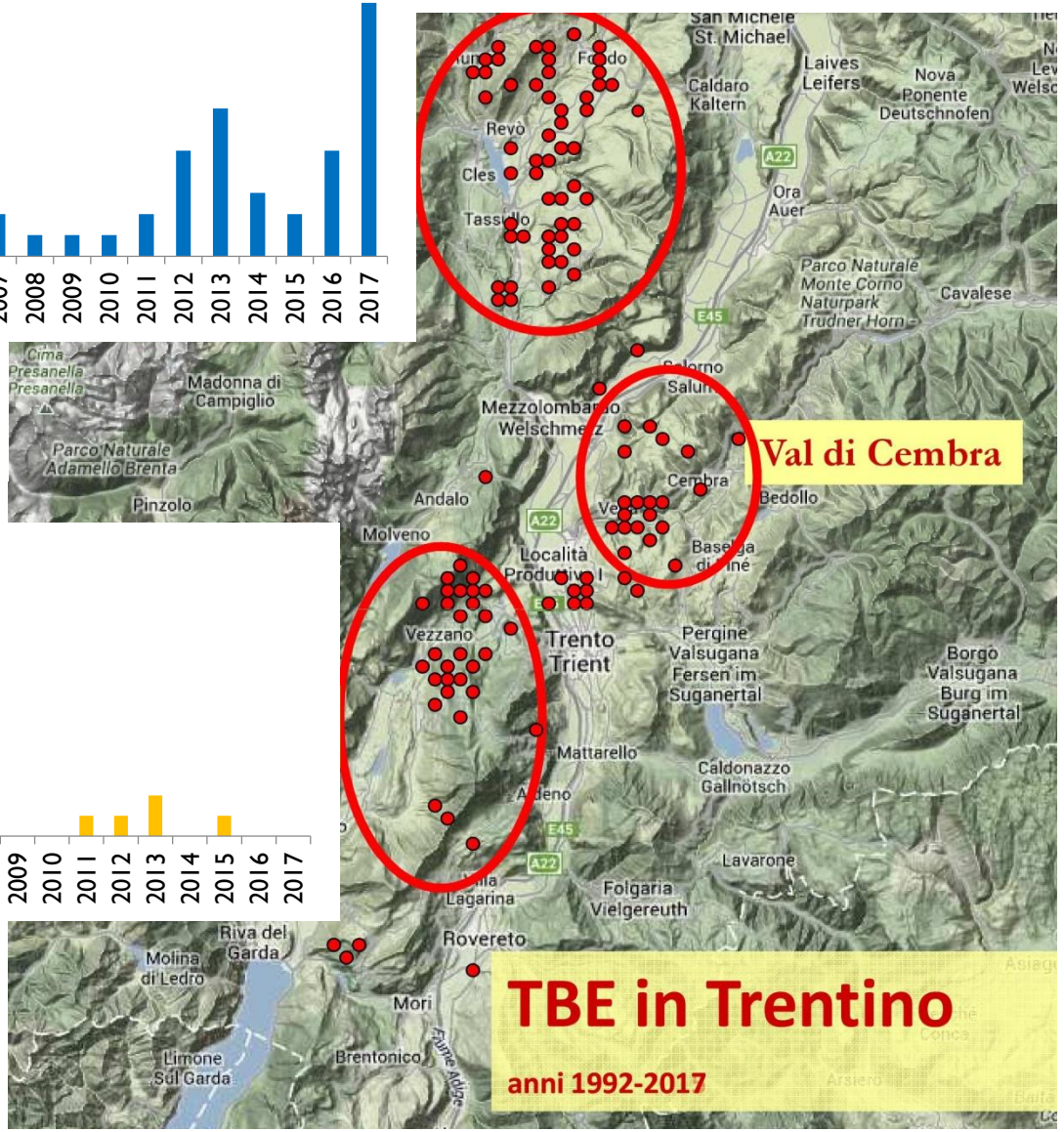


TBEV human cases distribution in the Province of Trento





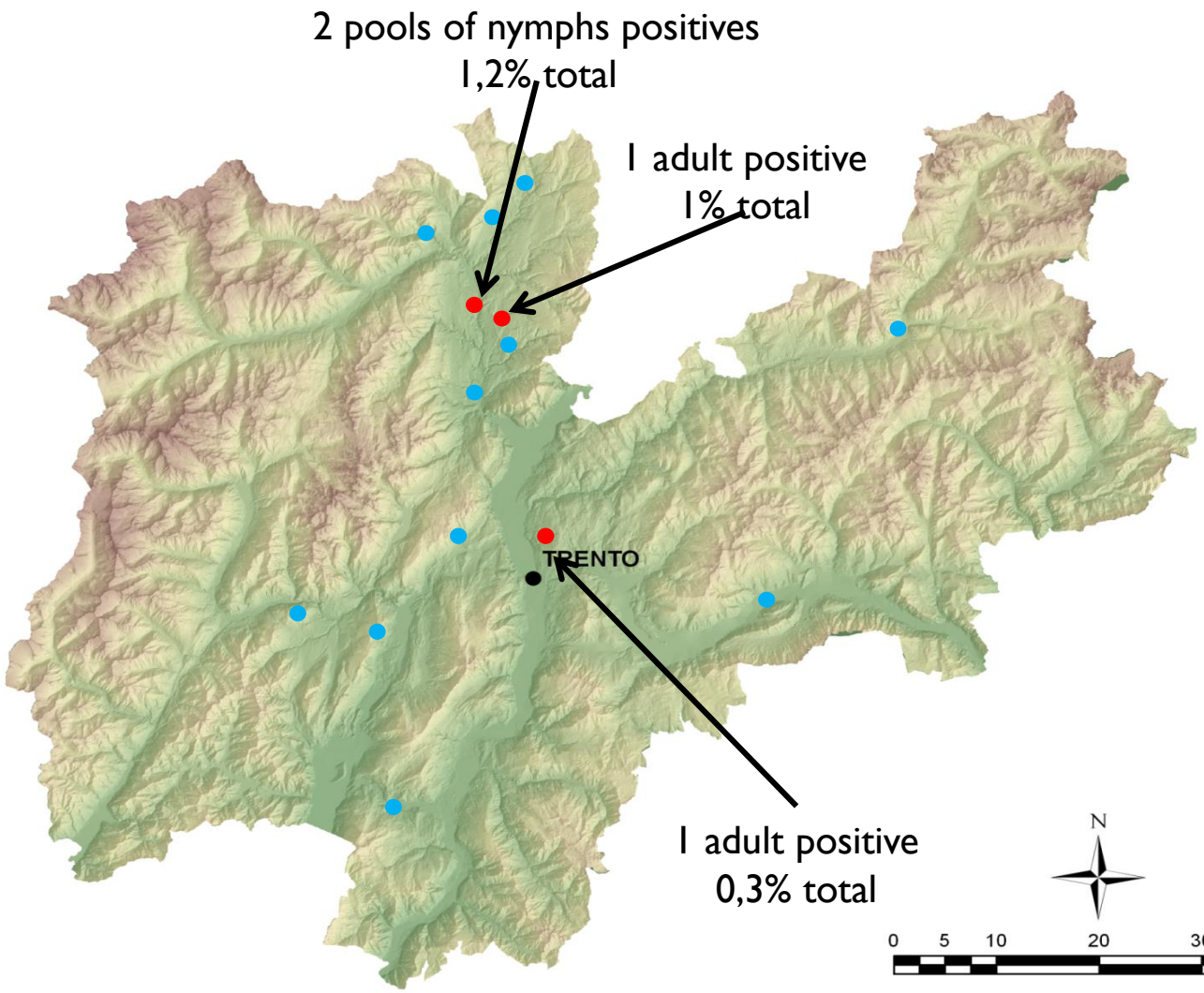




.....and also the geographical distribution of local foci experienced a northward shift.

- What is the prevalence of the virus in the vectors? And in the hosts?
- Which virus is present in the territory?
- Why foci moved northward?

Prevalence of TBE virus in questing ticks, Province of Trento, Italy - 2018



2413 questing ticks collected
297 adults
2116 nymphs

TOTAL PREVALENCE (MIR):

0,16% total

0,5% adults
0,1% nymphs

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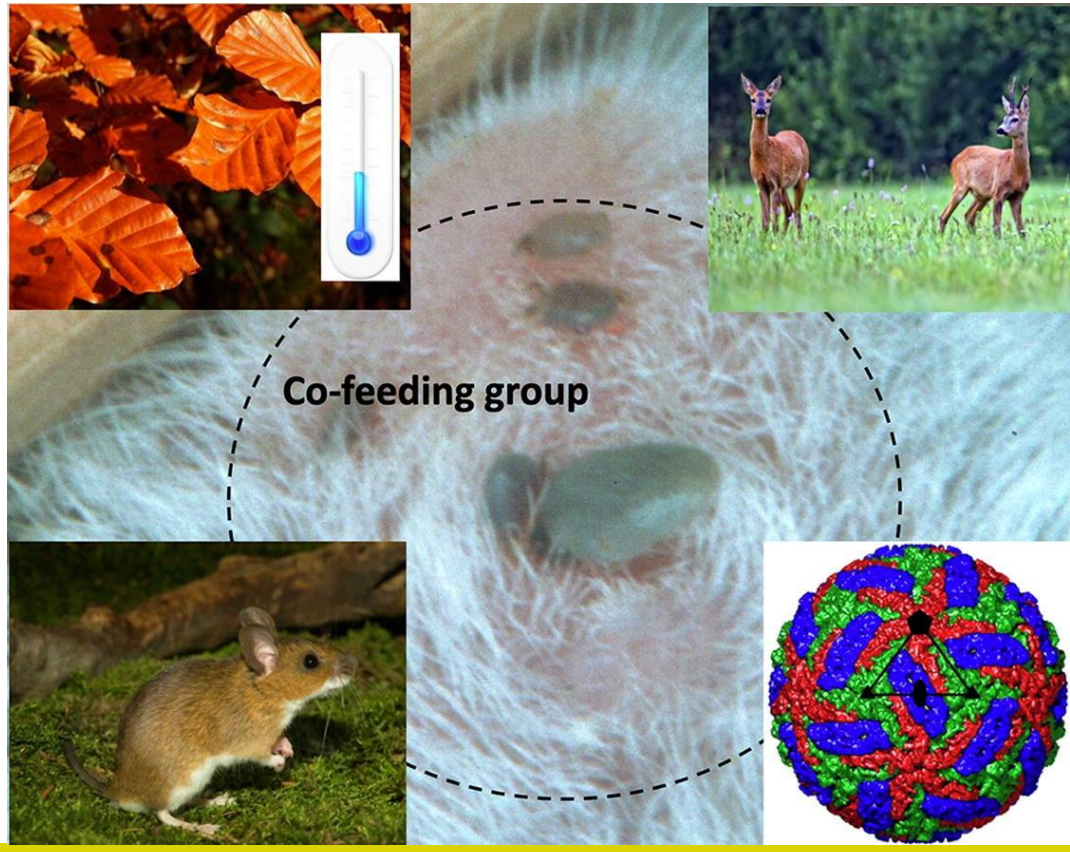
ELSEVIER

International Journal for Parasitology
Volume 49, Issue 10, September 2019, Pages 779-787

Changes in host densities and co-feeding pattern efficiently predict tick-borne encephalitis hazard in an endemic focus in northern Italy

Roberto Rosà [a, b, 1], Valentina Tagliapietra [a] [1] ✉, Mattia Manica [a], Daniele Arnoldi [a], Heidi Christine Hauffe [a], Chiara Rossi [a], Fausta Rosso [a], Heikki Henttonen [c], Annapaola Rizzoli [a]

- Ungulate presence affects tick abundance.
- Rodent hosts abundance and characteristics affect tick abundance and virus persistence.
- Rodent TBE seroprevalence (2001-2014) 3.5%.
- Abiotic factors (autumnal cooling) affect tick seasonality and synchronicity.



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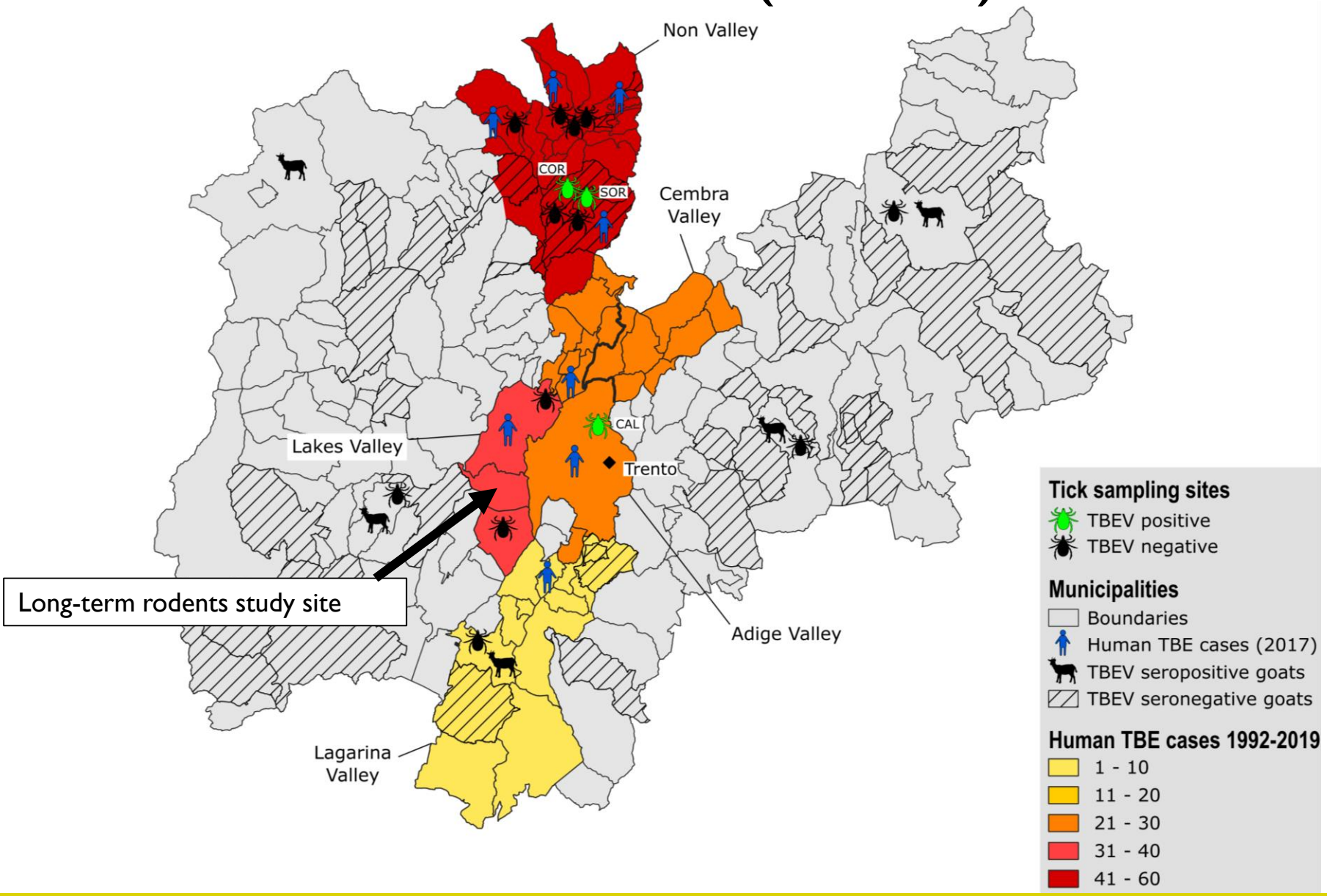
TBEV in ticks, goats and humans in the Province of Trento (2017-2018)



- What is the prevalence of the virus in the vectors? And in the hosts?

  Very low

- Which virus is present in the territory?

  TBEV European subtype

- Why foci moved northward?

  In progress…..

THANK YOU

*'a **world** capable of preventing, detecting, containing, eliminating, and responding to animal and public health risks attributable to **zoonoses** and animal diseases with an impact on food security through **multi-sectoral cooperation and strong partnerships**'.*