Editorial

TGlobal climate changes and the changing perspective of tick-borne diseases

Volume 2 Issue 2 - 2016

Johannes Delport

[1]Division of Microbiology, Pathology and Laboratory Medicine, London Health Sciences, Canada
[2]Department of Microbiology and Immunology, Schulich School of Medicine, Western University, Canada

Correspondence: Johannes Delport, Department of Microbiology and Immunology, Western University, London, Ontario, Canada, Email jdeldoc@gmail.com

Received: April 28, 2016 | **Published:** May 06, 2016

Editorial

The northern hemisphere will soon be experiencing a well-deserved summer, however 2016 may well see an increase in tick populations and associated diseases. Temperature changes around the globe has changed the spread, abundance and seasonality of ticks, affecting their impact on human health.[1–3] The relationship between tick development rates and temperature increases has been found to be nonlinear due to the many other factors at play including but not limited to precipitation and atmospheric pressure.[1,2,4] Climate change acts synergistically with other components associated with human behavior including expanding urbanization, deforestation, population growth and livestock movement.[3]

Tick-borne diseases have globally increased over the last thirty years.[1,5] An increase of tick borne diseases has been reported globally but colder countries like Canada has reported startling increases with reported numbers of 128 in 2007 increasing to over 700 in 2015.[6] A general increase in all tick-borne diseases has been occurring with the re-emergence of diseases like tick-borne encephalitis and babesiosis. North America, Europe, and Northern Asia have been reporting significant increases.[2,5]

Each tick species has certain ecological requirements for survival, but temperature is known to be the greatest predictor of tick distribution.[1,5] Questing will take place between 7°C and 10°C for adults and nymphs respectively. As the temperature gradually increases the distribution of ticks is expanding northwards as the environmental temperature is more amenable for tick survival and feeding. Multiple reports show the expansion of tick distribution in North America and Europe[1–3] with reports by Materna et al.,[7] that the 1.4°C increase in the Krkonose Mountains between 1960 and 2005 has led to a higher prevalence of *Ixodes ricinus* at levels above eight hundred meters above sea level, these ticks are now found at 1,100m above sea level.

The tick usually enters a dormant cycle during winter[3] with a normal life cycle development from nymph to adult ranging from two to six years.[1] This development depends on environmental conditions, in areas where ticks were dormant during winter ticks have been observed actively questing. This raises the concern that the tick will be able to mature faster, it has now been observed that this phenomena is associated with an acceleration in the growth and development of ticks, as well as egg production.[1,2]

The life stages of the larvae and nymphs are usually offset, Levi and associates[7] have concluded by studying *Ioxdes scapularis* that nymph and larval feeding periods may increase by between eight and 14days by 2050 in correlation to increases in global temperatures. As the progression from life stage to the other is dependent on completion of one blood meal the concern arises that the molting cycle may actually progress far enough in one year to create synchronicity between the larval and nymphal stages. This will lead to an increased transmission of pathogens like *Borrelia burgdorferi*,[7,8] another concerning observation is co-feeding of different ticks with an increased transmission of tick-borne encephalitis and rickettsioses, the higher degree of synchrony, the greater the transmission of the pathogens.[5,8] Synchrony has long been associated with milder winter climates,[8] thus climate change has the potential to lead to the prevalence of more virulent pathogens and pathogenic strains. The transovarial spread of rickettsioses and the spread of *R. rickettsii* between male and female ticks have been associated with an accelerated life cycle.[5] Thus global warming is not only enhancing the spread of ticks, but likely also the prevalence of pathogens within their populations.

It is apparent that the incidence of tick-borne diseases are increasing globally, many of these diseases are difficult to diagnose, have few preventative measures other than avoidance, and significant associated mortality or morbidity. It appears likely that global climate change has already begun to effect the distribution of ticks by allowing them to survive in colder northern climates. Indeed, there have been documented increases in the tick populations of Canada[3] along with an increased distribution and associated population numbers. The impact of global warming is undeniable if the increased rates of tick-borne diseases and increased prevalence of ticks are taken into account. Considering the continuing climate changes the potential health impact of tick-borne diseases will certainly be intertwined with new and additional environmental challenges.

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

References

1. Süss J, Klaus C, Gerstengarbe FW, et al. What makes ticks tick? climate change, ticks, and tick–borne diseases. *J Travel Med*. 2008;15(1):39–45.
2. Estrada Pena A, Ayllon N, Fuente J. Impact of climate trends on tick–borne pathogen transmission. *Front Physiol*. 2012;3:64.
3. Dantas Torres F. Climate change, biodiversity, ticks and tick–borne diseases: The butterfly effect. *Int J Parasitol*. 2015;4(3):452–461.

4. McMichael AJ, Woodruff RE, Hales S. Climate change and human health: present and further risks. *Lancet*. 2006;367(9513):859–869.

5. Parola P, Paddock CD, Raoult D. Tick–borne rickettsioses around the world: emerging diseases challenging old concepts. *Clin Microbiol Rev*. 2005;18(4):719–756.

6. Materna J, Daniel M, Metelka L, et al. The vertical distribution, density and the development of the tick *Ixodesricinus* in mountain areas influenced by climate changes. *International Journal of Medical Microbiology*. 2008;298(1):25–37.

7. Levi T, Keesing F, Oggenfuss K, et al. Accelerated phenology of blacklegged ticks under climate warming. *Philos Trans R Soc Lond B Biol Sci*. 2015;370(1665):1–8.

8. Altizer S, Ostfeld RS, Johnson PT, et al. Climate change and infectious diseases: from evidence to a predictive framework. *Science*. 2013;341(6145):514–519.

Citation: Delport J. Global climate changes and the changing perspective of tick-borne diseases. *J Bacteriol Mycol Open Access*. 2016;2(2):37–38.
DOI: 10.15406/jbmoa.2016.02.00018