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Publication date:
2016

Document Version
Peer reviewed version

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Citation (APA):

Clausen, C. G., Schou, K. K., Kirkeby, C., & Bødker, R. (2016). Spatial risk of tick borne infections – creating a ScandTick Innovation website for both the public and the health sector based on surveillance data. Abstract from NordTick 2016, Örenäs, Sweden.

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Abstract: Spatial risk of tick borne infections - creating a ScandTick Innovation website for both the public and the health sector based on surveillance data

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Introduction:

Ticks are the most important vectors of human and animal infectious diseases in Europe (Jongejan & Uilenberg 2004; Colwell et al. 2011). In recent years, several new tick-borne pathogens, known to cause disease in humans, were discovered in Denmark alone (Michelet et al. 2014; Stensvold et al. 2015). But the prevalence of the different pathogens in Denmark and in Scandinavia as well as the spatial variation in risk of each pathogen is poorly known among both risk groups and among veterinarians and general practitioners. For public health reasons it is necessary to not only improve surveillance (Michelet et al. 2014), but also increase awareness to ensure early diagnosis, and more effective prevention of these diseases.

A large amount of spatial prevalence data is available from recent surveillance of ticks and tick-borne pathogens in Denmark. Additionally the newly funded ScandTick Innovation project will conduct large scale mapping of all tick-borne pathogens in selected forest areas in southern Scandinavia. We are here using these data to developing a website to communicate quantitative and targeted information on ticks, pathogens and the risk of infection and illness. By allowing quick access to easily read material, we aim to increase people's knowledge of the risks of tick bites. Knowing the risks, we aim to make people more cautious, less frightened but aware of symptoms, and not neglect to mention potential tick-bites when visiting health-care professionals. We also aim to provide quantitative risk estimates to health professionals.

Methods and materials:

Monitoring and mapping

Questing nymphs are collected using the flagging technique (Vassallo et al. 2000). We use the BioMark™ real-time PCR system for high-throughput microfluidic real-time PCR amplification (Michelet et al. 2014). Hence, we are able to screen for 37 tick-borne pathogens and 4 different tick species in a single run. We then use environment driven spatial model techniques to provide risk estimates of tick abundance and pathogen prevalence in *Ixodes ricinus* nymphs for all tick habitats. Initially the website will only cover Denmark, but it will be expanded to southern Scandinavia during the ScandTick Innovation project period.

Website communication strategy

We aim at developing digital risk maps allowing users to zoom to specific tick habitats of interest.

- This will allow forest users take specific preventive measures for the habitat they are planning to visit
- Will allow regional and district planners to avoid putting e.g. recreational activities in risk hotspots
- And will allow medical doctors to access quantitative risk information for patients reporting tick bites during visits to forests areas in part of Denmark or Scandinavia the doctor is not familiar with.

The website will address both the public and veterinarians and general practitioners and be quickly accessible from a smartphone. It will include short, easily read sections on spatial risk, prevention and control, and also about tick identification, tick biology, tick-borne pathogens, the diseases they may cause and the symptoms one may expect when infected. To increase interest, we will continuously update the website with new information, recent case stories and archive the older stories.

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