Tick-borne infections in a population at risk

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Introduction
The tick, *Ixodes ricinus*, is common in most of Denmark. It can carry several pathogenic microorganisms. The most important, from a public health perspective, are *Borrelia burgdorferi* sensu lato (*B. b. s.l.*) and Tick-borne encephalitis virus (TBEV), since these can cause infection of the nervous system and in some cases, result in lasting sequelae (1,2). The aim of this study was to determine the seroprevalence of these two pathogens in a population at risk.

Method
In the early spring of 2017 hunters, forest workers, and people with frequent recreational activities in nature were invited to participate in this study, supplying a blood sample and afterwards answering an electronic survey on, i.e., vector exposure, vaccination status and whether they had fallen ill after a tick- or insect bite. Serum was tested for IgG antibodies against *B. b. s.l.* and TBEV by ELISA tests (Enzygnost® Lyme link VI/ES/IgG and Anti-TBE/FSME Virus (IgG, IgM) on the BEP2000 system, Siemens Healthcare Diagnostics, Marburg, Germany). The participants primarily consist of hunters. Antibody results are shown in table 1.

Results
591 participants were included in the study, of these 340 completed the survey, of these 310 are men. The results of these 340 are presented here. The participants primarily consist of hunters. Antibody results are shown in table 1.

<table>
<thead>
<tr>
<th>IgG antibodies in plasma</th>
<th>No. (%) of participants</th>
<th>Positive</th>
<th>Negative</th>
<th>Inconclusive</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBE IgG</td>
<td>340 (100.0)</td>
<td>36 (10.59)</td>
<td>297 (87.35)</td>
<td>7 (2.06)</td>
</tr>
<tr>
<td>Borrelia IgG</td>
<td>340 (100.0)</td>
<td>73 (21.47)</td>
<td>258 (75.88)</td>
<td>9 (2.65)</td>
</tr>
</tbody>
</table>

Illness after tick bite
- 13.9 % (45/324) reported illness after a tickbite. 16 did not answer. 42 of these contacted their GP and 7 were hospitalized of whom 3 were diagnosed with Lyme neuroborreliosis, 1 with Murine typhus, 1 with viral meningitis and the last two were never diagnosed.
- Of these 45 only 13 had antibodies against *B. b. s.l.* and 1 had antibodies against TBE, 4 had antibodies against both TBE and *B. b. s.l.*. This results in 68.8 % (31/45) reporting illness without detectable antibodies.

*Borrelia*
- 21.47 % (73/340) had IgG antibodies against *B. b. s.l.*, 2.65 % (9/340) were inconclusive and 75.88 % (258/340) negative. But only 17.8 % (13/73) reported illness after tickbite.
- There are significantly more participants above 50 years of age with IgG antibodies against *B. b. s.l.* (P = 0.04), figure 1.

Conclusion
This is the first national Danish cross-sectional study of IgG antibodies against *B. b. s.l.* and TBEV in a population at increased risk of tick bites.
- We found a surprisingly high seroprevalence of *B. b. s.l.* increasing with age.
- Many reported illness after a tickbite with no detectable antibodies and at the same time many had antibodies without recognized illness.
- It seem the seroprevalence of TBE in unvaccinated participants is almost zero.

REFERENCES:
1. Fredrikk Christin Knudtzon, Nanna Skaarup Andersen, Theger Gorm Jensen, Sigurdu Skarphédinsson; Characteristics and Clinical Outcome of Lyme Neuroborreliosis in a High Endemic Area, 1995–2014: A Retrospective Cohort Study in Denmark, Clinical Infectious Diseases, 2017. https://doi.org/10.1093/cid/cix4568

Note: Since the submission of the abstract the results have been updated to 340 participants.