Tick-borne infections in a population at risk

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Title: Tick-borne Infections in a Population at Risk

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 VlsE/IgG and Anti-TBE/FSME Virus (IgG, IgM) on the BEP2000 system, Siemens Healthcare A/S).

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</td>
<td>340 (100.0)</td>
<td>36</td>
<td>297</td>
<td>7</td>
</tr>
<tr>
<td>IgG</td>
<td></td>
<td>(10.59)</td>
<td>(87.35)</td>
<td>(2.06)</td>
</tr>
<tr>
<td>Borrelia</td>
<td>340 (100.0)</td>
<td>73</td>
<td>258</td>
<td>9</td>
</tr>
<tr>
<td>IgG</td>
<td></td>
<td>(21.47)</td>
<td>(75.88)</td>
<td>(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.

![Antibodies against Borrelia burgdorferi in different age groups](image)

Figure 1: Results of IgG antibodies against *B. b. s.l.*, divided by age group, in 340 people with high risk of tick bites.

TBE

- 10.59 % (36/340) had IgG antibodies against TBE, 2.06 % (7/340) were inconclusive and 87.35 % (297/340) negative.

- Of the 36 positive participants only one had not been vaccinated against any flavivirus. The same were true for 2 with inconclusive results.

- 49 participants were vaccinated against TBE, but only 32 (65.31 %) had antibodies against TBE.

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 Christina Knudtzen, Nanna Skaarup Andersen, Thoger Gorm Jensen, Sigurdur Skarphedinsson; 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/cix568](https://doi.org/10.1093/cid/cix568)


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

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