Risk factors for Lyme borreliosis: a German case-control study May-Dec. 1999

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Lyme borreliosis

- Most frequent tick-borne disease in Europe
- *Borrelia burgdorferi*:
  - *B. burgdorferi sensu stricto*, *B. garinii*, *B. afzelii*
- Chronic disease possible
- Erythema migrans (EM):
  - Acute infection
  - Pathognomonic
Study background

• Most studies from the USA
  – Only one of three *B. burgdorferi* species
  – Other ticks

• In the study area (Landkreis Oder-Spree, LOS)
  – Lyme borreliosis notifiable since 1996
  – 10-50/100000 in surrounding districts
  – 48/100000 in LOS

=> Case-control study for risks of Lyme borreliosis in this area
Methods: Case-control study

- **Cases**
  - Patients with erythema migrans $\geq 5$ cm
  - Notified between May-Dec. 99
  - Living in study area
  - Written consent

- **Controls**
  - Enrolled by random digit dialling
  - Person with the next birthday in the family
  - No reported EM in 99
  - Living in study area
  - Oral consent
Methods: Case-control study

- Standard telephone interviews
  - Household environment
  - Leisure activities
  - Work exposure
  - Pets
- Exposure in a 4-week interval
  - Cases: 4 weeks before EM
  - Controls: 4 weeks before interview
Methods: Prevalence of *Borrelia* in ticks

- 969 ticks from 4 different locations within the area were collected
- 455 from 3 locations tested with immunofluorescence test (IFT) for *Borrelia burgdorferi*
- 514 from 4 locations tested with polymerase chain reaction (PCR)
## Results: included cases/controls

### Case recruitment
- EM patients between May and Dec. 1999: 63
  - No consent for the interview: 13
  - Not reached by phone: 2
- **Cases included**: 48

### Control recruitment
- Interviewed: 148
  - With EM lesion 1999: 2
  - Not living in LOS: 2
  - Interviewed in November: 26
- **Controls included**: 118
### Results: case-control

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cases (n=48)</th>
<th>Controls (n=118)</th>
<th>OR</th>
<th>CI95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 50 years</td>
<td>29</td>
<td>48</td>
<td>2.2</td>
<td>1.1 – 4.7</td>
</tr>
<tr>
<td>Visited garden close to wood</td>
<td>31</td>
<td>54</td>
<td>2.2</td>
<td>1.1 – 4.6</td>
</tr>
<tr>
<td>Weeding</td>
<td>34</td>
<td>62</td>
<td>2.2</td>
<td>1.0 – 4.8</td>
</tr>
<tr>
<td>Deers at/in the garden</td>
<td>13</td>
<td>15</td>
<td>2.6</td>
<td>1.0 – 6.4</td>
</tr>
<tr>
<td>Skin contact with bushes in nature</td>
<td>18</td>
<td>34</td>
<td>1.9</td>
<td>0.9 – 4.2</td>
</tr>
<tr>
<td>Skin contact with bushes in garden</td>
<td>27</td>
<td>49</td>
<td>1.8</td>
<td>0.9 – 3.8</td>
</tr>
<tr>
<td>Dog or cat</td>
<td>24</td>
<td>66</td>
<td>0.8</td>
<td>0.4 – 1.6</td>
</tr>
<tr>
<td>Pets with tick</td>
<td>16</td>
<td>20</td>
<td>2.5</td>
<td>1.1 – 5.7</td>
</tr>
</tbody>
</table>
Results: case-control
Multiple regression model

- Garden close to wood: aOR* 4.3 (1.3-12.0)
- Skin contact with bushes in nature: aOR 3.6 (1.5-9.0)
- Age > 50 years: aOR 3.3 (1.5-7.4)
- Pets with ticks: aOR 1.5 (0.6-3.6)

* adjusted OR
## Results: case-control

### Preventive Measures

<table>
<thead>
<tr>
<th>Item</th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Always</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing long trousers when outside</td>
<td>50%</td>
<td>47%</td>
</tr>
<tr>
<td>Wearing light coloured cloth</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Never</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tucking trousers in socks when</td>
<td>88%</td>
<td>90%</td>
</tr>
<tr>
<td>outside</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using repellent</td>
<td>81%</td>
<td>80%</td>
</tr>
<tr>
<td>Checking for ticks</td>
<td>54%</td>
<td>70%</td>
</tr>
</tbody>
</table>
Prevalence of *Borrelia burgdorferi* s.l. in ticks

- **IFT:**
  - 22% (100/455) of the ticks were positive for *Borrelia*
  - No difference in the 3 locations

- **PCR:**
  - 12% (62/514) of the ticks were positive for *Borrelia*
  - Prevalence differed from 2 to 23% between areas
Summary

- Risk factors were:
  - Age >50 years
  - Visiting garden close to the woods
  - Skin contact with bushes or grass in nature
- Preventive measures were not done routinely by cases and controls
- Prevalence of *Borrelia burgdorferi* in the ticks varied from 12 to 23% depending on laboratory method
Recommendations

• Inform public about risks for Lyme borreliosis
  – Garden (especially close to the woods)
  – Skin contact with bushes
• Teach about preventive measures
• Need to further standardize laboratory methods
Acknowledgements

- Physicians in the study area
- Frau Lukas, Health department of LOS
- Susanne Behnke, RKI
- Dr. Bonita Brodhun, RKI
### Results: case-control

#### Skin contact with bushes or grass in nature

<table>
<thead>
<tr>
<th>times</th>
<th>cases</th>
<th>controls</th>
<th>OR</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>23</td>
<td>81</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>1-14</td>
<td>12</td>
<td>27</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>&gt; 14</td>
<td>6</td>
<td>7</td>
<td>3.1</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**stratified**

<table>
<thead>
<tr>
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<th>cases</th>
<th>controls</th>
<th>OR</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>not visited a garden close to woods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>7</td>
<td>47</td>
<td>Ref</td>
<td></td>
</tr>
<tr>
<td>1-14</td>
<td>4</td>
<td>15</td>
<td>1.8</td>
<td></td>
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<tr>
<td>&gt; 14</td>
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<td>2</td>
<td>13.4</td>
<td>0.005</td>
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<tr>
<td>visited a garden in close to woods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
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* Chi square for trend