Human Cutaneous Anthrax Outbreak Associated with Livestock Contact Georgia, 2012 a Case-Control Study

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Anthrax in Georgia

- Anthrax is endemic in Georgia
- All human cases reported from 2000 to 2012 were cutaneous form
- Livestock anthrax cases were reported 3 to 10 times less frequently than human cases
Human anthrax cases
Georgia, 1980-2012

Cases

USSR collapse
Human anthrax incidence (per 100,000) by regions, Georgia, 2012

- 0 - 0.3
- 0.4 - 0.7 Turkey
- 0.8 - 2.1
- No information

- Russia
- Armenia
- Azerbaijan

Map values:
- 0.09
- 0.07
- 0.02
- 0.04
- 0.02
- 0.2
- 2.03
- 0.69
Goals of investigation

- Confirm outbreak
- Identify risk factors
- Recommend control measures
Surveillance case definitions

- **Suspect** – patient with painless ulcer (black eschar), with surrounding edema

- **Probable** – suspect case with
  - Same source as confirmed case, or
  - B. anthracis in environmental samples

- **Confirmed** – suspect or probable case with positive PCR or culture from clinical sample
Study design

- Matched case-control study

- Cases were identified from routine surveillance
  - April 1 to October 31, 2012
  - Confirmed or probable anthrax
  - Living in two regions with highest rates

- Two controls per case
  - Matched by sex

- Age of eligibility: 18 years and older
Questionnaire

- Demographic information

- Risk factor information:
  - Contact with livestock or related products
  - Contact with soil
  - Insect bite

- Exposure data within 30-day period prior to onset of disease in case-patient
Data analysis

- Matched analysis
- Conditional logistic regression
Confirmation of outbreak

- 4-fold increase in human anthrax cases in 2012 compared to average since 2000

- Significant increase in cases in 2012 reported from the same two regions
Characteristics of cases

- 70 cases (81% confirmed, 19% probable)
- 87% male
- 18 - 72 years of age (median 40)
- 51% worked in animal-related occupations
## Matched analysis results

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Percent of Cases</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispose of dead animal</td>
<td>17</td>
<td>20</td>
<td>2.6 - 156</td>
</tr>
<tr>
<td>Contact with sick animal</td>
<td>24</td>
<td>14</td>
<td>3.2 – 62</td>
</tr>
<tr>
<td>Participate in animal slaughter</td>
<td>43</td>
<td>7.3</td>
<td>3.0 – 18</td>
</tr>
<tr>
<td>Own animals</td>
<td>77</td>
<td>6.3</td>
<td>2.6 – 15</td>
</tr>
<tr>
<td>Contact with animal products</td>
<td>50</td>
<td>4.2</td>
<td>2.0 - 8.8</td>
</tr>
<tr>
<td>Care for animal</td>
<td>70</td>
<td>4.0</td>
<td>1.9 - 8.1</td>
</tr>
<tr>
<td>Use meat from their own farm</td>
<td>31</td>
<td>3.9</td>
<td>1.5 - 10</td>
</tr>
<tr>
<td>Buy meat from butcher shop</td>
<td>51</td>
<td>0.4</td>
<td>0.2 - 0.8</td>
</tr>
</tbody>
</table>
Multivariate conditional logistic regression

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<tr>
<td>Contact with sick animal</td>
<td>9.7</td>
<td>2.0 – 47</td>
</tr>
<tr>
<td>Animal owner</td>
<td>6.1</td>
<td>2.1 – 18</td>
</tr>
<tr>
<td>Contact with animal products</td>
<td>3.4</td>
<td>1.5 - 7.9</td>
</tr>
<tr>
<td>Buying meat from butcher shop</td>
<td>0.3</td>
<td>0.12 - 0.75</td>
</tr>
</tbody>
</table>
Discussion

- All identified risk factors were related to livestock or their products
- Low number of animal anthrax cases may suggest underreporting
- Lack of direct links between human and animal cases suggests weakness in surveillance
- Consuming meat from butcher shops was associated with decreased risk of anthrax
Limitations

- Differential recall bias
- False reporting
Conclusions

- Significant increase in human cases in adjacent regions indicates an existence of local outbreak
- All identified risk factors were related to livestock or their products
- Human anthrax can be prevented by:
  - Minimizing contact with sick livestock and their products
  - Controlling anthrax in livestock
Recommendations

- Prevent illegal slaughtering
- Carry out mass public education
- Use protective equipment
- Vaccinate livestock against anthrax
Acknowledgements

- South Caucasus Field Epidemiology and Laboratory Training Program
- US Centers for Disease Control and Prevention
- Georgian National Center for Disease Control and Public Health
Factors not associated with disease

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<tr>
<td>Contact with soil</td>
<td>33</td>
<td>0.5</td>
<td>0.2 - 1.3</td>
</tr>
<tr>
<td>Insect bite</td>
<td>5</td>
<td>3.2</td>
<td>0.6 - 17</td>
</tr>
</tbody>
</table>
Types of contact with animal

- Cleaning - 54%
- Herding - 46%
- Milking - 23%
- Shearing - 15%
Types of contact with animal products

- Preparing meat for cooking - 37%
- Contact with hide/skin - 24%
- Contact with leather - 17%
- Contact with bones, horns - 13%
- Contact with wool - 4%
Types of livestock involved

- Cattle - 73%
- Sheep - 24%
- Goat - 13%
- Pig - 7%
Probable Cases

- contact with the same source as confirmed case - 62%
- B. anthracis in environmental samples - 38%
Livestock vaccination and human cases
Georgia, 1995-2012

Human cases
Number of vaccinated animals
Prevention Activities

- Livestock vaccination against anthrax
- Follow up vaccination campaign
- Public health messaging
Thank you for your attention