Investigation of Q fever in Bosnia-Herzegovina, 2000: An Example of International Cooperation

JH McQuiston¹, WL Nicholson¹, R Velic², RV Gibbons¹, L Castrodale¹, SH Wainwright³, TJ Vannieuwenhoven³, EW Morgan⁴, L Arapovic², A Delilic², P Puvacic⁵, T Bajrovic⁴

¹ Centers for Disease Control and Prevention
² Veterinary Faculty, Sarajevo, Federation Bosnia-Herzegovina (FBiH)
³ United States Department of Agriculture
⁴ United States Army SFOR, Sarajevo, Bosnia-Herzegovina
⁵ Ministry of Health, Sarajevo, FBiH
Q fever

- *Coxiella burnetii*

- Zoonosis, contact with livestock (sheep, cattle, goats)

- Resistant to environmental extremes; wind-borne spread

- Worldwide distribution; previously considered common in Eastern Europe (“Balkan fever”)
BOSNIA AND HERZEGOVINA

Federation of Bosnia and Herzegovina

Republika Srpska
Banja Luka

Inter-Entity Boundary Line (IEBL)
(Dayton agreement line)

The status of BiH is determined by arbitration.

CROATIA

Montenegro
Introduction

• In June 2000, increase in Q fever cases in FBiH
  - Mostar, Kakanj
  - No diagnostic testing for humans available

• Objectives:
  - Develop laboratory capabilities within FBiH to diagnose Q fever in humans and animals.
  - To assess the occurrence of and risk factors for Q fever among humans.
  - To develop public health recommendations to control disease transmission.
Laboratory Diagnostics

• IFA, species-specific conjugate
• Specimens screened 1:16, IgG
• Human sera
  - Phase II antibody (acute)
  - Phase I antibody (chronic)
  - Geometric Mean Titers (GMT)
Epidemiologic Assessment

- Tested human and animal specimens from all over FBiH
- Mostar – descriptive epidemiology of cases
- Kakanj – descriptive epi and case-control study
Results – Animal Diagnostic Specimens by Species

<table>
<thead>
<tr>
<th>Species</th>
<th>$n$</th>
<th>No. positive</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>536</td>
<td>23</td>
<td>4%</td>
</tr>
<tr>
<td>Cattle</td>
<td>815</td>
<td>84</td>
<td>10%</td>
</tr>
<tr>
<td>Goats</td>
<td>39</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Preliminary results; specimens from all over FBiH. Specimens screened for Phase I antibody at 1:16.
Results – Human Diagnostic Specimens by Town

<table>
<thead>
<tr>
<th>Town</th>
<th>n</th>
<th>Phase I Positive (%)</th>
<th>Phase I GMT</th>
<th>Phase II Positive (%)</th>
<th>Phase II GMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostar</td>
<td>219</td>
<td>120 (55%)</td>
<td>100</td>
<td>127 (58%)</td>
<td>85</td>
</tr>
<tr>
<td>Bogodol</td>
<td>30</td>
<td>23 (77%)</td>
<td>46</td>
<td>22 (73%)</td>
<td>66</td>
</tr>
<tr>
<td>Goranci</td>
<td>55</td>
<td>30 (55%)</td>
<td>140</td>
<td>30 (55%)</td>
<td>161</td>
</tr>
<tr>
<td>Kakanj</td>
<td>151</td>
<td>42 (28%)</td>
<td>667</td>
<td>54 (36%)</td>
<td>733</td>
</tr>
<tr>
<td>Bihac</td>
<td>15</td>
<td>6 (40%)</td>
<td>256</td>
<td>7 (47%)</td>
<td>232</td>
</tr>
<tr>
<td>Kalesia</td>
<td>22</td>
<td>3 (14%)</td>
<td>81</td>
<td>3 (14%)</td>
<td>406</td>
</tr>
<tr>
<td>Konjic</td>
<td>12</td>
<td>11 (92%)</td>
<td>451</td>
<td>11 (92%)</td>
<td>796</td>
</tr>
<tr>
<td>Sarajevo</td>
<td>12</td>
<td>4 (33%)</td>
<td>64</td>
<td>5 (42%)</td>
<td>256</td>
</tr>
<tr>
<td>Tesanj</td>
<td>23</td>
<td>2 (9%)</td>
<td>23</td>
<td>2 (9%)</td>
<td>45</td>
</tr>
<tr>
<td>Travnik</td>
<td>13</td>
<td>5 (38%)</td>
<td>84</td>
<td>6 (46%)</td>
<td>102</td>
</tr>
<tr>
<td>Overall</td>
<td>749</td>
<td>272 (36%)</td>
<td>134</td>
<td>299 (40%)</td>
<td>153</td>
</tr>
</tbody>
</table>
Mostar Results

• Case: Illness (fever plus other symptoms) since 1/1/00; Phase II titer ≥ 128, and Phase II ≥ 1;
  - \( n = 7 \)
  - Phase I GMT: 105
  - Phase II GMT: 256
Mostar Cases – Illness Onset

Number of Cases

Date of Illness Onset

CDC
Kakanj Results

• Case: Illness (fever plus other symptoms) since 1/1/00, Phase II titer >= 128, and Phase II >=1;
  - \( n = 23 \)
  - Phase I GMT: 1264
  - Phase II GMT: 3631

• Control: No illness since 1/1/00, Phase II and I antibody titer < 16;
  - \( n = 22 \)
Kakanj Cases – Illness Onset

Date of Illness Onset

Number of Cases

0
1
2
3
4
5

Jan 1-7
Jan 8-14
Jan 15-21
Jan 22-28
Jan 29-Feb 4
Feb 5-11
Feb 12-18
Feb 19-25
Feb 26-Mar 3
Mar 4-10
Mar 11-17
Mar 18-24
Mar 25-31
Apr 1-7
Apr 8-14
Apr 15-21
Apr 22-28
Apr 29-May 5
May 6-12
May 13-19
May 20-26
May 27-June
June 3-9
June 10-16
June 17-23
June 24-30
July 1-7
July 8-14

July 8-14
July 1-7
June 24-30
June 17-23
June 10-16
June 3-9
May 27-June
May 20-26
May 13-19
May 6-12
Apr 29-May 5
Apr 22-28
Apr 15-21
Apr 8-14
Apr 1-7
Mar 25-31
Mar 18-24
Mar 11-17
Mar 4-10
Feb 26-Mar 3
Feb 19-25
Feb 12-18
Feb 5-11
Jan 29-Feb 4
Jan 15-21
Jan 8-14
Jan 1-7
# Kakanj Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. Cases</th>
<th>No. Controls</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handle Sheep (23/22)</td>
<td>1</td>
<td>5</td>
<td>0.15 (0.01-1.65)</td>
<td>0.10*</td>
</tr>
<tr>
<td>Handle Cattle (23/22)</td>
<td>2</td>
<td>7</td>
<td>0.20 (0.02-1.35)</td>
<td>0.07*</td>
</tr>
<tr>
<td>Milk from neighbor (17/19)</td>
<td>11</td>
<td>5</td>
<td>5.13 (1.01-28.25)</td>
<td>0.02</td>
</tr>
<tr>
<td>Outdoor activities (23/21)</td>
<td>18</td>
<td>12</td>
<td>2.7 (0.61-12.44)</td>
<td>0.13</td>
</tr>
</tbody>
</table>
Conclusions

• Evidence of widespread Q fever in FBiH

• Evidence of acute Q fever outbreak in Kakanj
  - not associated with direct livestock exposure
  - hypotheses: possible wind-borne spread or contaminated milk products

• Could not confirm an outbreak of Q fever in Mostar
  - few cases, low GMT
  - overall GMT in Mostar more consistent with endemic disease than acute infection
Recommendations

• Effective control will require long-term cooperation between veterinary and medical communities.

• To prevent future outbreaks, public education will be important.
  - consume only boiled or pasteurized milk products.
  - avoid contact with birthing materials
  - encourage better farm management practices to minimize local infections and wind-borne spread
Accomplishments

• Provided veterinary and medical staff in FBiH with laboratory supplies and expertise to conduct *C. burnetii* IFA.

• Encouraged greater cooperation between medical and veterinary communities within FBiH.

• Facilitated the first meeting between veterinary officials from FBiH and the Republic Srpska since before the civil conflict.
Special Thanks

James Childs
Sabeta Hamzic
Sabina Mahmutovic
Mufida Aljclevic
Tozo Bagaric, Asst Min. Agric.
Aijla Cerimic, Chief Vet. Insp.
Zlatko Vucina
Dr. Ian Robertson, Intl Vet Consultant
Dr. Semra Cavaljuga
Safa Durmisevic, SFOR Interpretor
Danka Zovka, SFOR Interpretor
Drago Nedic, MoA Republic Srpska
SFOR Stabiliation Forces Headquarters
Paul Converse, OHR
Elaine Patterson, World Bank
Nezahat Ruzdic, WHO
Alan Mustard, US Embassy
Joe Pennington, US Embassy

Dr. Lejla Calkic, Zenica
Dr. Drljevic Ednan, Zenica
Dr. Alickovic Ibrahim, Kakanj
Damir Stankovic, Kakanj
Dr. Senka Imamovic, Kakanj
Dr. Jelena Ravlija, Mostar
Emilija Primorac, Mostar
Slavica Mikulic, Mostar
Pero Boskovic, Mostar
Stjepan Prgomet, Mostar
Habota Adnana, Mostar
Abby McHenry
Arthur Angulo
Amra Uzikan, CDC
David Ashford, CDC
Tom Gomez, USDA
Eric Mandel, CDC