Flood Preparedness and One health consequences

Johan Waldner
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Global warming makes extreme conditions more common

• Heat waves
• Droughts
• Forrest and grass fires
• Hurricanes
• Heavy rainfalls
• Snow storms
• Floods
Different types of floods

- Fluvial - from rivers, lakes and from the sea
- Pluvial - from heavy rainfalls
- With great force or slowly running
- Major floods
- Minor floods
- High water saturation of the soil
Preparedness

- EU "Floods directive" 2007
- National authorities
- Regional authorities
- Local communities

Operative units
- Local emergency service, "the Fire brigade"
- Farmers organisation
- Volunteers
The river Dalälven

The River "Dalälven"
Close up map
Vulnerable objects

- Animals on pasture and in stables
- Growing crops, pastures and stored feed
- Buildings with advanced equipment
- Infrastructure as roads and electrical supply
- People on farms and common citizens
Microbial hazards

1. Water transmitted contagions with a fecal-oral pathway
   • Cryptosporidium – parvum/hominis, increasing
   • VTEC/EHEC – regionally important
   • Salmonella – can survive on pastures
   • Campylobacter,
   • Giardia lamblia, Hepatitis E, Yersinia enterocolitica, Listeria monocytogenes

2. Spores of Bac Anthracis - rare but dangerous

3. Mouldy feed - can give mycotoxins in milk
## Zoonotic mikrobes that spread through water

<table>
<thead>
<tr>
<th>Organism (in order of probability for transmission to people through water)</th>
<th>Animal-reservoirs</th>
<th>Prevalence</th>
<th>Spreading of agents from animals</th>
<th>Disinfection</th>
<th>Infectious dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Campylobacter</em></td>
<td>Many</td>
<td>High</td>
<td>Moderate</td>
<td>Sensitive</td>
<td>Low</td>
</tr>
<tr>
<td>VTEC/ EHEC</td>
<td>Cattle</td>
<td>High in some areas</td>
<td>Moderate</td>
<td>Sensitive</td>
<td>Low</td>
</tr>
<tr>
<td><em>Cryptosporidium parvum</em></td>
<td>Young calves, lambs</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Chlorine resistant, UV-sensitive</td>
<td>Moderate/ Low</td>
</tr>
<tr>
<td><em>Giardia lamblia</em></td>
<td>Many</td>
<td>Low</td>
<td>High</td>
<td>Chlorine resistant, UV-sensitive</td>
<td>Low</td>
</tr>
<tr>
<td>Hepatitis E virus</td>
<td>Young pigs</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate/Sensitive</td>
<td>Probably low</td>
</tr>
<tr>
<td><em>Salmonella spp</em></td>
<td>Many</td>
<td>Low</td>
<td>Moderate</td>
<td>Sensitive</td>
<td>High</td>
</tr>
<tr>
<td><em>Yersinia Enterocolitica</em></td>
<td>Pigs</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Sensitive</td>
<td>Probably high</td>
</tr>
<tr>
<td><em>Listeria Monocytogenes</em></td>
<td>Many</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Sensitive</td>
<td>High</td>
</tr>
</tbody>
</table>

Ottosson, J, SVA Dricksvatten och mikrobiologiska risker från lantbrukets djur, LRF 2012
Some very large outbreaks

- Walkerton, Ontario, Canada 2000
  - 4800 (48%) got infected 7 people died
  - VTEC/EHEC and *Campylobacter jejuni*
  - Heavy rains contaminated a water catchment with manure from a farm

- Milwaukee, Wisconsin USA 1993
  - 403,000 (67%) got ill 50-70 people died
  - *Cryptosporidium parvum* (or *hominis*)?
  - Heavy rains and melting snow washed away manure from farms and a slaughter house or from "drowned" sewage plants

- Galway, Ireland 2007
  - Approx. 5000 got infected
  - Cryposporidia from both animals and people
  - Heavy rains and insufficient water cleaning
But...there are more to it than infections

- Large inundations cause limited amounts of infected people
- More modest floods can make people use contaminated wells and feed mouldy silage.

- Evacuation
  - People won’t move without their animals
  - Find proper shelters! Record all movements!
  - Not all animals are movable

- The main damages following larger floods causes physical destruction and harm on electrical equipment, mouldy feedstuff, washed-away fences, hypothermia or hyperthermia of animals, dairy cattle that can't get milked or fed etc...
The flood is coming

...are we prepared?