MRSA in relation to Food Safety

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Conference on MRSA – FVE – Brussels – 8 April 2008
EFSA main themes of work

1) Providing scientific opinions
2) Assessing risk of regulated substances
   (food additives, pesticides, GMOs)
3) Monitoring risk factors and animal diseases
   (BSE, zoonoses, food-borne hazards)
4) Investing in food science
   (EFSA’s scientific colloquia)
5) Nutrition (health claims)
EFSA today

- Based in Parma, Italy
- Over 190 scientific experts
- Nearly 550 scientific opinions
- 320 staff
9 Scientific Panels – soon 10

- Food additives, flavourings, processing aids, materials in contact with food (AFC) Will now Split
- Animal health and welfare (AHAW)
- Biological hazards (BIOHAZ): identify in terms of qualitative risk, the extent to which food serves as a source for the acquisition, by humans, of antimicrobial resistant bacteria or bacteria-borne antimicrobial resistant genes
- Contaminants in the food chain (CONTAM)
- Additives and products in animal feed (FEEDAP)
- Genetically modified organisms (GMO)
- Dietetic products, nutrition and allergies (NDA)
- Plant health (PLH)
- Plant protection products and their residues (PPR)
Study from pre-antibiotic era (n=122):
Letality of *S. aureus* Bacteriaemia: **82%**

< 10yr. ca. 90% of all *S. aureus* penicillin resistant

Skinner et Keefer. 1941. Arch Int. Med; 68:851-75
MRSA in hospitals

- HA-MRSA: Long known problem
- Indicator for hospital acquired infections
- Increase in (estimates)
  - morbidity (prolonged length of stay / pneumonia/sepsis, 3 million/yr HCAI in EU)
  - mortality (50,000 attributable deaths/yr in EU; 44,000-98,000 deaths annually in the US / 2000 data),
  - Costs (estimated healthcare cost for EU €6.75 billion not incl. productivity loss)
Proportion of MRSA
Source EARSS annual report 2006
• CA-MRSA: more and more reports of Community acquired strains
• Panton-Valentine Leukocidin (PVL) producers in particular populations (MSM, inmates, drug users, sport)
• PVL-negatives: relation to food?, Farming / Pig holders
<table>
<thead>
<tr>
<th></th>
<th>Pigs</th>
<th>Open population</th>
<th>Vets / pig farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BE</strong></td>
<td>26-71% (sows to fattening pigs)</td>
<td>1,6%</td>
<td>37,8%</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>24,9%</td>
<td>2,7%</td>
<td>20%</td>
</tr>
<tr>
<td>272</td>
<td>participants</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>conference on pig health</strong></td>
<td></td>
<td></td>
<td>12%</td>
</tr>
</tbody>
</table>
Numbers and the origin of MRSA in NL


2006: 14% NT that showed to be ST398
MRSA-Isolates in the EUREGIO

EUREGIO NL: Laboratorium Microbiologie Enschede
UKM: University Hospital Münster

Koeck et al. Emergence of MRSA spa type t011 in the Dutch-German border region EUREGIO Twente/Münsterland, DGHM 2007, Göttingen

09/05-02/07
t011 und t034 as emerging spa types in the EUREGIO
## Resistance patterns of MRSA in pigs

<table>
<thead>
<tr>
<th>agent</th>
<th>spa type</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>t011 (n=127)</td>
<td>t034 (n=9)</td>
<td>t108 (n=1)</td>
<td>t1451 (n=6)</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>55(43.3)</td>
<td>9 (100)</td>
<td>1 (100)</td>
<td>0 (0)</td>
<td>23 (88.5)</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>55(43.3)</td>
<td>9 (100)</td>
<td>1 (100)</td>
<td>0 (0)</td>
<td>23 (88.5)</td>
</tr>
<tr>
<td><strong>Tetracycllin</strong></td>
<td><strong>127 (100)</strong></td>
<td><strong>9 (100)</strong></td>
<td><strong>1 (100)</strong></td>
<td><strong>6 (100)</strong></td>
<td><strong>26 (100)</strong></td>
</tr>
<tr>
<td>Gentamycin</td>
<td>45 (35.4)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (3.8)</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (100)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Also in all other studies: 100% tetra resistant referring to link with usage
### Does t011 cause disease

<table>
<thead>
<tr>
<th>Source</th>
<th>UKM</th>
<th>EUREGIO NL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasopharyngeal Screenings</td>
<td>36 (80%)</td>
<td>10 (83%)</td>
</tr>
<tr>
<td>Wounds</td>
<td>4 (9%)</td>
<td>1 (8.5%)</td>
</tr>
<tr>
<td>Respiratory fluids</td>
<td>2 (4%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Blood cultures</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>others</td>
<td>3 (7%)</td>
<td>1 (8.5%)</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td>45</td>
<td>12</td>
</tr>
</tbody>
</table>
Does MRSA ST 398 cause disease?

- Several cases of infections in humans (including severe infections) have been documented in:
  - The Netherlands (Huijsdens et al., 2006),
  - Germany and Austria (Witte et al., 2007),
  - Denmark (Robert Skov, unpublished results)
  - EID 2008:14;3:479 NL working party surv. & research of MRSA
MRSA in food – previous studies

- Kluytmans ’95: first food-associated MRSA outbreak with several fatalities
- Jones ’02: reported small outbreak
- Normanno ’07: Italian study 2003-5. 3.75% MRSA in food isolates (4 in bovine milk, 2 in dairy products)
- Van Loo ’07: NL study 2.5% MRSA (in 37 S. aureus isolates from 79 samples)
• MRSA present around 11% (of 1300 raw meat samples).
• 84% of MRSA non-typable (NT), type found in animals and farmers
• Nr. MRSA bacteria very low (mostly <10 colony-forming units/gr)
• Unlikely that NT-MRSA spreads in the population via foodstuffs:
  – Unlikely this would go unnoticed
  – Numbers so low that risk of colonisation is considered slight.
  – Geographical distribution of NT-MRSA among population correlates strongly with that of the animal species in which bacterium has been found. If food contributed substantially to the spread, NT-MRSA would be spread far more evenly across the Dutch population.
• Based on current data, it is unlikely that meat contributes significantly to the spread of MRSA bacteria among humans.
• Route would be rather through transmission than through ingestion
Conclusions

• Currently apparently no high risk from food
• Increasing rates of MRSA in animals important:
  – Seems new (since 2003), how will it develop further
  – Discover always new sequence types / risk of virulent strain
  – Demonstrated to cause disease in humans (animal data lacking)
  – Risk of introduction into hospitals
  – Low prevalence countries: costs of search & destroy
  – Possible concerns for media-attention and pig trade
• Need to understand magnitude
Baseline study breeding pigs

- How wide-spread is MRSA in food animals
- Which types occur in animals
- Which type of pig farms are affected
- EFSA proposed specifications to monitor the prevalence of MRSA in breeding pigs (also slaughter pigs)
- Collaboration with CRL in Copenhagen
- Baseline survey for *Salmonella* spp in breeding pig extended to MRSA (January to December 2008)
Renewed website
http://www.efsa.europa.eu

Register of scientific opinions