Veterinary Public Health - Aspects of Milk

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Veterinary Public Health (VPH) and milk
Aspects of concern

<table>
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<th>Contaminants</th>
<th>Microbial Contamination*</th>
<th>Allergic Potential / Intolerance</th>
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<td>Carry over</td>
<td><em>Campylobacter</em> spp.</td>
<td>Allergic Potential</td>
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<td>- Pesticides</td>
<td><em>Salmonella</em> spp.</td>
<td>-depends on processing</td>
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<td>- Dioxine</td>
<td>pathogenic <em>E. coli</em> (EHEC)</td>
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<td>- Mycotoxines</td>
<td><em>Brucella melitensis</em></td>
<td>Intolerance</td>
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<td>- Heavy metals</td>
<td><em>Mycobacterium bovis</em></td>
<td>- Germany 20-25%</td>
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<td><em>Listeria monocytogenes</em></td>
<td>- China 93%</td>
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<td>Residues</td>
<td><em>Yersinia enterocolitica</em></td>
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<td>- Antibiotics</td>
<td><em>Staphylococcus aureus</em></td>
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<tr>
<td>- Pesticides</td>
<td><em>Cronobacter sakazakii</em></td>
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* Most important pathogenic microorganisms
Milk-process chain and critical points

- Seed / Crop production
- Feed industry / Feed
- Animal Husbandry
- Transport
- Processing in dairy plant, additives
- Transport
- Distribution/Trade
- Consumer

**contaminants/residues**
(stable contamination)

**allergic potential**

**microbial** contamination
(prevalence changes)

Anja Buschulte, 06.11.2015, Joint German-French Workshop on Dairy Food Safety Systems, Beijing
Reported **notification rates** (and cases) of zoonoses in humans in the EU, 2013

- **Campylobacteriosis** (N = 214.779)
- **Salmonellosis** (N = 82.694)
- **Yersiniosis** (N = 6.471)
- **VTEC infections** (N = 6.043)
- **Listeriosis** (N = 1,763)
- **Echinococcosis** (N = 794)
- **Q fever** (N = 648)
- **Brucellosis** (N = 357)
- **West Nile fever(a)** (N = 250)
- **Tularemia** (N = 279)
- **Trichinellosis** (N = 217)
- **TB caused by M. bovis** (N = 134)
- **Rabies** (N = 1)
Distribution of **foodborne outbreaks** per agent, **EU**, 2008 - 2013

2013:
- 5,196 food-borne outbreaks
- 43,183 human cases
- 5,946 hospitalisations
- 11 deaths
Distribution of **foodborne outbreaks** per agent, **Germany**, 2008 - 2013
Role of milk / milk products in food borne outbreaks in Europe

Strong-evidence outbreaks by food vehicle, 2014 (n=829)

15.4% = 129 other foodstuff
- incl. 11 milk
- incl. 11 cheese
- incl. 7 other dairy products

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Other foodstuffs (N=129) include: canned food products (3), cereal products including rice and seeds/pulses (nuts, almonds) (7), cheese (11), dairy products (other than cheese) (7), drinks (3), fruit, berries and juices and other products thereof (10), herbs and spices (4), milk (11), and other foods (73).
Percentage of confirmed outbreaks by food category, Germany (2009-2014; n= 239)

- meat, meat products
- ready meals, prepared foods
- fish, fish products
- dough, bakery products
- gourmet salads, sauces
- desserts, ice cream
- milk and milk products
- fruits and vegetables
- others

BfR, 2015
What kind of agents in milk?
Relevant bacterial pathogens in milk

*Bacillus cereus*  
*Brucella abortus*  
**Brucella melitensis**  
*Campylobacter jejuni*  
*Campylobacter coli*  
*Coxiella burnetii*  
*Cronobacter sakazakii*  
**Pathogenic Escherichia coli** *(0157:H7)*  
*Listeria monocytogenes*  
*Mycobacterium tuberculosis*  
*Mycobacterium paratuberculosis*  
*Mycobacterium bovis*  
*Salmonella enterica* serotypes  
*Staphylococcus aureus*  
*Streptococcus agalactiae*  
*Streptococcus pyogenes*  
*Streptococcus zooepidemicus*  
*Yersinia enterocolitica*
Microbial risks milk and milk products – *Campylobacter*

- Zoonotic agent responsible for Campylobacteriosis
- Symptoms: diarrhoeal disease mostly self delimiting
- In rare cases late sequelae such as arthritis and Guillen-Barré syndrome
- Implicated foodstuff: raw milk

**Recommendations:**
pasteurisation of milk and dairy products

Reported cases of campylobacteriosis, EU/EEA, 2009-2013
Microbial risks milk and milk products – *Listeria monocytogenes*

- Zoonotic agent responsible for Listeriosis of humans
- Symptoms: encephalitis, meningitis
- extremely tolerant to high temperature (multiply between -2°C and 45°C) and pH variations and survive at pH 4.5 and 9.
- Implicated foodstuffs: - smeared soft cheese,  
  - semi-solid and hard cheeses,  
  - raw milk (rarely)

**Main Problem:** contamination of cheese plants („hospitalism“)

**Recommendations:**

consumption of raw milk or raw milk products  
should be avoided by YOPIS especially pregnant
Microbial risks milk and milk products – *E. coli* (O 157) in raw milk

- Responsible agent for HUS (haemolytic uremic syndrome)
- Several outbreaks in Europe in the last years
e.g. Germany: after visiting an animal cattle farm and consuming raw milk, 49 children from one kindergarden get gastroenteritis
- Low infectious dose (e.g. *E. coli* O157 < 100)
- Humans can get infected through the consumption of contaminated food or water, by direct transmission from person to person or from contact with carrier animals
- Implicated foodstuff: soft cheese, raw milk

**Main Problem:** consumption of raw or not heat processed milk and milk products as possible cause
Microbial risks milk and milk products – *Cronobacter* spp.

- Detection of *Cronobacter* spp. (former *Enterobacter sakazakii*) in food for infants
- In spite of high hygienic requirements for these foodstuffs contamination is still likely to occur
- Symptoms may include bacteraemia, meningitis, necrotising enterocolitis

**Problems:**
- infections in spite of routine based tests
- high responsibility of consumers
- vulnerable subpopulation (infants)
- high public perception
Microbial risks milk and milk products – *Brucella spp.*

- Germany is free for cattle-, sheep- and goat-brucellosis
- Every year 20-40 „imported“ (africa, asia and eastern europe) human cases caused by food and direct contact with a special focus on milk
- In China increased occurrence of *Brucella melitensis* (goat, sheep)

**Main Problem:**
Consumption of raw or not heat treated milk and milk products

**Combatting** of Brucella:
- test and slaughter
- vaccination programs
- improvement of production processes

Anja Buschulte, 06.11.2015, Joint German-French Workshop on Dairy Food Safety Systems, Beijing
Foodborne outbreak caused by raw milk – example 1

A primary school excursion to a dairy farm resulted in a fulminant outbreak with:

**Enterohemorrhagic *Escherichia coli* O157:H7**

- general outbreak
- 23 human cases
- 2 persons hospitalized *(hemolytic uremic syndrome (HUS))*
- raw milk as vehicle
- cause: consumption of raw milk at dairy farm
- evidence:
  - analytical epidemiological evidence
  - diagnostic evidence: detection of causative agent in cow faeces

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Foodborne outbreak caused by raw milk: example 2

*Campylobacter jejuni*

- general outbreak
- 45 human cases (mainly children)
- 0 hospitalization
- raw milk as vehicle
- cause: consumption of raw milk at dairy farm
- evidence:
  - analytical epidemiological evidence
  - diagnostic evidence: laboratory characterization and detection of causative agent in bulk milk
Foodborne outbreak caused by Quargel cheese

Multinational outbreak of listeriosis

Agent: Listeria monocytogenes

- Listeria monocytogenes serotype 1/2a (clone 1)
  - Austria: 12 cases; 3 fatal
  - Germany: 2 cases; 2 fatal
- Listeria monocytogenes serotype 1/2a (clone 2)
  - Austria: 13 cases; 2 fatal
  - Germany: 6 cases; 1 fatal
  - Czech Republic: 1 case
- Source of infection: acid curd cheese „Quargel“

Outbreak cases of listeriosis by onset of illness, Austria, Germany and Czech Republic, 2009-2010 (n=34)

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Sources for bacterial contamination of milk

**Farm: Primary Production**
- Udder
  - Mastitis
  - Environmental contamination
- Milking equipment
- Milk transport and storage on farm

**Transport**

**Milk processing plant**
- Storage
- Processing
- Packaging

**Transport / Retail**

**Consumers household**

And measures to avoid contamination

- Good Agriculture Practice (GAP)
- Cleaning & Desinfection
- Cleaning & Desinfection
- Cold chain management
- Good Hygienic Practice (GHP)
- Processing techniques
  - Heat treatment
  - Fermentation
  - Ripening
  - Preservatives
- Cold chain management
- Appropriate cooling / preparation

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Conclusions

Safety of milk and milk products

• ensured by a preventive approach
• implementation of good hygienic practice
• application of quality assurance procedures, based on hazard analytical and critical control point principles (HACCP-system)
• establishment of microbiological criteria
  • process hygienic criteria defining the acceptability of a process
  • food safety criteria setting a limit above the product is unacceptably contaminated

**correct application ensures production of safe products**

Precautionary consumer protection

**avoidance of consumption of raw milk and certain raw milk products**
Prevention by adequate risk communication

Vulnerable persons include:
• Children up to the age of 5
• Elderly people (especially if their immune system is weakened)
• Pregnant women
• Persons whose body’s defences are weakened by a previous illness or intake of medication

= YOPI: young, old, pregnant, immunosuppressed

Recommendation of not serving the following food to YOPI:
• Dairy produce (e.g. butter, mixed milk drinks and desserts) made from or containing raw milk and not sufficiently heated subsequently
• Soft cheese made from raw milk
• Soft cheese varieties made from pasteurized milk which are produced with a surface smear (yellow and/or red smear)
• Ice-cream manufactured in the institutional catering facility
• and some other types of food ...
Thank you for your attention

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