Safety of animal source foods: why it matters

Animal-source foods and options for achieving optimal diets in resource-limiting settings

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Delia Grace, ILRI and CRP A4NH
FOOD SAFETY AND INFORMAL MARKETS
Animal Products in Sub-Saharan Africa

Edited by
Kristina Roesel and Delia Grace

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Overview

- Why food safety matters for development
- Foodborne disease: causes, foods implicated, trends
- Food safety solutions
- Evidence gaps and take home messages
Foodborne disease matters for development

- Developing country consumers show high concern over FBD
- The huge health burden of FBD is borne mainly by developing countries
- FBD has high economic costs: health, agriculture & economy-wide
- FBD limits access of poor farmers to export markets and threatens access to domestic markets
- FBD discriminates: the YOMPI are most at risk
Why food safety matters

31 hazards
- 600 mio illnesses
- 420,000 deaths
- 33 million DALYs

Havelaar et al., 2015
<table>
<thead>
<tr>
<th>Product</th>
<th>Production</th>
<th>Processing</th>
<th>Marketing</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (cow)</td>
<td>men (x Nairobi)</td>
<td>women</td>
<td>women (x Abidjan)</td>
<td>both</td>
</tr>
<tr>
<td>Milk (goat)</td>
<td>men (w milk)</td>
<td>women</td>
<td>women</td>
<td>both</td>
</tr>
<tr>
<td>Beef/goat</td>
<td>men (w assist)</td>
<td>men</td>
<td>men</td>
<td>both</td>
</tr>
<tr>
<td>Poultry</td>
<td>women</td>
<td>women</td>
<td>women</td>
<td>both</td>
</tr>
<tr>
<td>Pigs</td>
<td>women</td>
<td>men</td>
<td>men</td>
<td>both</td>
</tr>
<tr>
<td>Fish, crabs</td>
<td>men</td>
<td>women</td>
<td>women</td>
<td>both</td>
</tr>
</tbody>
</table>
Food safety & nutrition

- Diarrhoea a risk factor for stunting – perhaps 10-20%?
- Ingestion of faecal material on food or in the environment may contribute to environmental enteropathy
- Associations between aflatoxins and stunting
- Regulations aimed to improve food safety may decrease the availability and accessibility of foods
- Food scares decrease consumption
Food safety & market access

- Food safety standards often exclude small firms and farms from export markets
  - Kenya and Uganda saw major declines (60% and 40%) in small farmers participating in export of fruit and vegetables to Europe under Global GAP

- Farmers supplying supermarkets are richer, better educated, more likely to be male and located near cities

- When markets differentiate by quality, substandard food is targeted to the poor

But

- Quality-demanding markets still a small share

- With support smallholders can participate in demanding markets

- Benefits to those who do and (some) evidence of spillover to others
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“most of the known burden of FBD comes from biological hazards in fresh, perishable foods sold in informal markets”
Causes of FBD

Burden LMIC

- Microbes: 25,000,000
- Helminths: 5,000,000
- Aflatoxins: 1,000,000
- Other toxins: 1,000,000

Pie chart showing:
- Zoonoses: 23,000,000
- Non-zoonoses: 2,000,000
Foods implicated in FBD

Painter et al., 2013, Sudershan et al., 2014, Mangan et al., 2014; Tam et al., 2014; Sang et al., 2014; ILRI, 2016
### 2014 Food Safety Progress Report

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Healthy People 2020 Target Rate</th>
<th>2014 Rate</th>
<th>Change Compared with 2006-2008†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>8.5</td>
<td>13.45</td>
<td>13% increase</td>
</tr>
<tr>
<td>E. coli O157§</td>
<td>0.6</td>
<td>0.92</td>
<td>32% decrease</td>
</tr>
<tr>
<td>Listeria</td>
<td>0.2</td>
<td>0.24</td>
<td>No change</td>
</tr>
<tr>
<td>Salmonella</td>
<td>11.4</td>
<td>15.45</td>
<td>No change</td>
</tr>
<tr>
<td>Vibrio</td>
<td>0.2</td>
<td>0.45</td>
<td>52% increase</td>
</tr>
<tr>
<td>Yersinia</td>
<td>0.3</td>
<td>0.28</td>
<td>22% decrease</td>
</tr>
</tbody>
</table>

*Culture-confirmed infections per 100,000 population
†2006-2008 were the baseline years used to establish Healthy People 2020 targets
§Shiga toxin-producing Escherichia coli O157

For more information, visit [www.cdc.gov/foodnet](http://www.cdc.gov/foodnet)
Livestock, blue and produce revolution

Increase in per capita consumption of perishables and pulses in developing countries with 1963 as index year (FAO, 2009)
Overview

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“we do not yet have good examples of standards and approaches that can address food safety where risks are pervasive, costs of compliance are high, and enforcement capacity is weak”
Can we regulate our way to food safety?

- **100%** of milk in Assam doesn’t meet standards
- **98%** of beef in Ibadan, **52%** pork in Ha Noi, unacceptable bacteria counts
- **92%** of Addis milk and **46%** of Nairobi milk had aflatoxins over EU standards
- **36%** of farmed fish from Kafrelsheikh exceed one or more MPL
- **30%** of chicken from commercial broilers in Pretoria unacceptable for *S. aureus*
- **24%** of boiled milk in Abidjan unacceptable *S. aureus*
Can we modernise our way to food safety?

- Supermarketisation is slower than thought.
- Formal sector food is risker than thought.
- Modern business models have often run into problems
  - Co-ops, abattoirs, market upgrades
Capacity building useful if incentives in place

- Many actors are well intentioned but ill informed
- Small scale pilots show short term improvements
- Smallholders have been successfully integrated into export chains
- But domestic GAP has limited effect
  - In 4 years VietGAP reached 0.06%
  - In Thailand GAP farmers have no better pesticide use than non-GAP
- While training & legitimising vendors
  - T&C Kenya
Islands of success

- Technical: prioritisation, risk based approaches, HACCP
- Appropriate Technology: milk cans, boilers
- Programmatic: street traders, T&C
- Zoonoses: on-farm control
- Policies: enabling environment
• Branding & certification of milk vendors in Kenya & Guwahti, Assam led to improved milk safety.

• It benefited the national economy by $33 million per year in Kenya and $6 million in Assam.

• 70% of traders in Assam and 24% in Kenya are currently registered.

• 6 million consumers in Kenya and 1.5 million in Assam are benefiting from safer milk.
Take home messages

- FBD is important for health and development
- Most is due to microbes & worms in fresh foods sold in wet markets
- Hazards in wet markets are always high but risks are sometimes low and perception is a poor guide
- FBD is probably increasing
- Control & command approaches don’t work but solutions based on working with the informal sector more promising
Nairobi nutrition project

Evaluate nutritional status & dietary adequacy

Investigate determinants of LVC associated with poor nutrition & LVC potential/barriers

Assess consumer patterns, preferences & demand factors

Assess potential of ASF in ensuring dietary adequacy

Scale-up research & Intervention design

Paula Dominguez-Salas
RVC / ILRI / LCIRAH
# Dietary diversity and nutrition intakes

## Children 1-3 years (non-breastfeeding)

<table>
<thead>
<tr>
<th>Minimum Dietary Diversity</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDD (≥4 groups)</td>
<td>68%</td>
</tr>
<tr>
<td>Risk of inadequate intake</td>
<td>%</td>
</tr>
<tr>
<td>Calcium</td>
<td>52.4</td>
</tr>
<tr>
<td>Iron</td>
<td>98.7</td>
</tr>
<tr>
<td>Zinc</td>
<td>7.7</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>11.5</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>18.8</td>
</tr>
<tr>
<td>Niacin</td>
<td>33.5</td>
</tr>
</tbody>
</table>

## Non pregnant women of reproductive age

<table>
<thead>
<tr>
<th>Woman Dietary Diversity Score</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDD</td>
<td>4.2</td>
</tr>
<tr>
<td>Risk of inadequate intake</td>
<td>%</td>
</tr>
<tr>
<td>Calcium</td>
<td>93.8</td>
</tr>
<tr>
<td>Iron</td>
<td>19.6</td>
</tr>
<tr>
<td>Zinc</td>
<td>61.3</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>6.9</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>49.7</td>
</tr>
<tr>
<td>Niacin</td>
<td>70</td>
</tr>
</tbody>
</table>

Dominguez –Salas et al.
Food group intakes

- Food groups obtained from the 24-h dietary recall of women and children, based on the food groups categories proposed by the Minimum Dietary Diversity for women (MDD-W).
ASF choice drivers: Why is it (not) consumed?

Beef meat

- eat (n=163)
- not eat (n=37)

- taste
- nutrition
- price
- tradition
- access
- risk dis
- hygiene
- prod pres
- don't know

Cornelsen et al.
### Population-based diet recommendations -women

<table>
<thead>
<tr>
<th>Nutrient % covered by the recommendations</th>
<th>Vit C</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B6</th>
<th>Fol</th>
<th>B12</th>
<th>Vit A</th>
<th>Ca</th>
<th>Fe</th>
<th>Zn</th>
<th>Cost/day [KES]</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best possible individual diet</strong></td>
<td>273.4</td>
<td>166.8</td>
<td>238.5</td>
<td>145.5</td>
<td>192</td>
<td>220.7</td>
<td>869.9</td>
<td>847.7</td>
<td>100</td>
<td>81</td>
<td>427.6</td>
<td>229.2</td>
<td>11</td>
</tr>
<tr>
<td><strong>No recommendations</strong></td>
<td>9</td>
<td>69.3</td>
<td>79.3</td>
<td>54</td>
<td>62.1</td>
<td>33</td>
<td>336.1</td>
<td>30.2</td>
<td>12</td>
<td>21.7</td>
<td>150.6</td>
<td>80.1</td>
<td>3</td>
</tr>
<tr>
<td><strong>1. 7p/wk Fruit</strong></td>
<td>99.6</td>
<td>70.7</td>
<td>81.9</td>
<td>57</td>
<td>79.8</td>
<td>41.4</td>
<td>336.1</td>
<td>46</td>
<td>14.2</td>
<td>21.7</td>
<td>150.6</td>
<td>87.1</td>
<td>5</td>
</tr>
<tr>
<td><strong>2. Rec 1 + 28p/wk Vegetables</strong></td>
<td>186.2</td>
<td>81.9</td>
<td>91.9</td>
<td>64.4</td>
<td>98.8</td>
<td>50</td>
<td>336.1</td>
<td>130.9</td>
<td>18.9</td>
<td>24.3</td>
<td>154.2</td>
<td>91.9</td>
<td>7</td>
</tr>
<tr>
<td><strong>3. Rec 1 + 2 + 7 p/wk Pulses</strong></td>
<td>193.9</td>
<td>114.5</td>
<td>94.8</td>
<td>64.4</td>
<td>109.5</td>
<td>130.5</td>
<td>336.1</td>
<td>130.9</td>
<td>24.8</td>
<td>30</td>
<td>163.5</td>
<td>91.9</td>
<td>8</td>
</tr>
<tr>
<td><strong>4. Rec 1 + 2 + 3 + 28 p/wk Dairy</strong></td>
<td>198.4</td>
<td>116</td>
<td>144.4</td>
<td>64.4</td>
<td>109.7</td>
<td>132.3</td>
<td>379.9</td>
<td>177.5</td>
<td>81.6</td>
<td>30</td>
<td>176.1</td>
<td>125.4</td>
<td>9</td>
</tr>
<tr>
<td><strong>5. Rec 1 + 2 + 3 + 4 + 21 p/wk ASF</strong></td>
<td>198.4</td>
<td>116</td>
<td>148.7</td>
<td>70.8</td>
<td>114.4</td>
<td>132.3</td>
<td>404.5</td>
<td>177.9</td>
<td>81.8</td>
<td>34.1</td>
<td>186.6</td>
<td>141.6</td>
<td>10</td>
</tr>
<tr>
<td><strong>6. Rec 1 + 2 + 3 + 4 + 21 p/wk ASF (7 egg- 4 red meat- 4 poultry- 3 sausage)</strong></td>
<td>198.4</td>
<td>126.8</td>
<td>172.3</td>
<td>89.8</td>
<td>140.7</td>
<td>146.4</td>
<td>1273.6</td>
<td>227.2</td>
<td>83.6</td>
<td>46.6</td>
<td>300</td>
<td>172.9</td>
<td>10</td>
</tr>
</tbody>
</table>

- Optifood modelling predicts which recommendations can ensure dietary adequacy for most nutrients (>65% RN (Recommended Nutrient Intakes)=adequate)
- Times/week vs portion size considerations
- The cost relative to incomes to improve dietary adequacy is high

Dominguez –Salas et al. (Preliminary data)
THANK YOU!!

Funding: A4NH, ILRI, LCIRAH, Urban Zoonoses project
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