Feed storage practices and awareness of aflatoxins in the Greater Addis Ababa milk shed

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Aflatoxins

- Toxic metabolites of *Aspergillus* fungi
- Contaminate a variety of food and animal feeds
  - Grains (maize), oil seeds (peanuts)
- Highly carcinogenic and cause stunting and immunosuppression
- Significant association between impaired child growth and aflatoxin exposure has been reported from several countries in Sub-Saharan Africa
- Reduced growth and productivity in livestock
  - Significant economic losses

Photo: Alison Robertson, Iowa State University
Aflatoxins and cancer

- Aflatoxins may play a causative role in up to 30% of the cases of liver cancer globally each year (WHO)
- AFB1 is highly carcinogenic and widespread in crops
- When consumed, AFB1 is converted to AFM1 in mammals and excreted in milk of lactating animals
- Both AFB1 and AFM1 are classified by the International Agency for Research on Cancer (IARC) as class I carcinogens
- Studies have indicated aflatoxin contamination in Ethiopia in staple cereals, red chili pepper and ground peas
The Greater Addis Ababa milk shed

- Located in the Central Highlands
- Includes Addis Ababa, Debre Zeit, Sebeta, Sululta and Sendafa
- Major milk supplier to residents of the capital city
The Greater Addis Ababa milk shed

• Largest market-oriented milk producing area in Ethiopia
  – Smallholder and commercial dairy farms

• Specialized inputs are commonly used
  – Improved breeds, early weaning, concentrate feeding
  – This sector receives training on dairy development
The Greater Addis dairy value chain involves the production, processing and marketing of dairy feed as well as milk and milk products that are channeled to consumers in Addis Ababa.
Methods

• Study participants:
  • 100 dairy farmers
  • 10 milk collectors
  • 10 feed producers and processors
  • 9 feed traders
  • Selected randomly from a list compiled by our research partners using government records and business directories

• A semi-structured questionnaire was administered to all study participants
• Bulk milk and/or feed samples were collected for analysis
Dairy farm characteristics

- Total daily milk production ranged from 4.5 to 2675 litres (median = 50 litres)
- On average, 87% of all milk produced on farms was sold
- Half of producers sold at least 45 litres of fresh milk daily
Milk collector characteristics

- All collectors received raw milk directly from farmers
  - Minimum of 70 litres to maximum of 9000 litres per day
- Quality control of milk was limited
  - Alcohol test for acidity and lactometer for relative density
- Smaller collectors served as milk processors to individual customers
  - Traditional yoghurt and cheese
- Larger collectors catered to supermarkets
  - Pasteurized milk, yoghurt, butter and cheese
# Feeding practices

<table>
<thead>
<tr>
<th>Feed types</th>
<th>Percent feeding n=100</th>
<th>Common types</th>
<th>Percent feeding n=100</th>
<th>Main source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial by-products</td>
<td>52</td>
<td>Brewer's dry yeast</td>
<td>52</td>
<td>Beer factory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Molasses</td>
<td>9</td>
<td>Sugar factory</td>
</tr>
<tr>
<td>Concentrates</td>
<td>100</td>
<td>Noug cake</td>
<td>88</td>
<td>Feed producers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wheat bran</td>
<td>100</td>
<td>Feed producers</td>
</tr>
<tr>
<td>Crop residues</td>
<td>51</td>
<td>Wheat straw</td>
<td>33</td>
<td>Crop farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maize stover</td>
<td>16</td>
<td>Crop farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barley straw</td>
<td>9</td>
<td>Crop farmers</td>
</tr>
<tr>
<td>Grains</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maize grain</td>
<td>17</td>
<td>Feed producers</td>
</tr>
<tr>
<td>Forages</td>
<td>97</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Native grass</td>
<td>97</td>
<td>Crop farmers</td>
</tr>
<tr>
<td>Hulls (husks)</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pea hulls</td>
<td>41</td>
<td>Crop farmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bean pods</td>
<td>11</td>
<td>Crop farmers</td>
</tr>
</tbody>
</table>
Feeding practices

- All dairy farmers used concentrates every day to feed cattle of all ages
- Ingredients in concentrate feeds include:
  - Wheat bran
  - Noug seed cake
  - Pea hulls
  - Maize grain
Noug (Guizotia abyssinica)

In addition to its use as oil seed and animal feed, noug is sold in the local market for consumption.

Source: Forest Knowledge information Management System (fkims.org)
The fate of wheat bran and noug cake in the peri-urban dairy value chain

- **Crop Farmer**
  - Grain producers (wheat)
  - Oil seed producers (noug)

- **Factory**
  - Flour factory (wheat bran)
  - Oil factory (noug cakes)

- **Processor**
  - Mixed dairy feed including wheat bran and noug cake

- **Dairy Farmer**
  - Fed to cattle of all ages daily

(Traders)
Feed storage practices

Storage conditions are conducive to the accumulation of moulds and aflatoxins

- In general, feed is kept indoors in plastic bags
- Preventive measures such as raised platforms are uncommon
- Quality assessment is limited to visual inspection
- Feed is often stored for up to 6 months
  - Particularly noug cake
Awareness of aflatoxins and moulds along the value chain

<table>
<thead>
<tr>
<th>Statement (percent agreeing)</th>
<th>Feed producers and processors (n=10)</th>
<th>Feed traders (n=9)</th>
<th>Dairy farmers (n=100)</th>
<th>Milk collectors (n=10)</th>
<th>Overall (n=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has heard of aflatoxins</td>
<td>60%</td>
<td>11%</td>
<td>5%</td>
<td>30%</td>
<td>12%</td>
</tr>
<tr>
<td>Moulds are harmful to health</td>
<td>100%</td>
<td>100%</td>
<td>71%</td>
<td>100%</td>
<td>78%</td>
</tr>
<tr>
<td>Drinking milk from cows fed mouldy feed is unsafe</td>
<td>90%</td>
<td>22%</td>
<td>62%</td>
<td>10%</td>
<td>64%</td>
</tr>
</tbody>
</table>

- Most farmers were aware of the harmful effects of mould on human and animal health
- Most farmers avoided feeding mouldy feed intentionally to their cattle
Milk hygiene along the value chain

- Milking is done by hand
- Milk safety and quality testing is limited
- No chilling of milk except the largest collection centres
- 66% believed that milk safety could be judged by sight
- Less than 20% knew that chemicals may be present in milk and that boiled milk may still be unsafe
Recommendations

• There is a need to increase awareness of aflatoxins and to support simple risk mitigation practices along the dairy value chain
  • Elevated platforms; measuring grain moisture content

• Messages on Good Manufacturing Practices (GMPs), focused particularly on food safety and milk hygiene, should be included in the training packages that development organizations are delivering to the dairy sector in Ethiopia
Acknowledgements

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