Assessment of aflatoxin-related health risk for milk consumers in rural and peri-urban areas in Burkina Faso

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Objectives

1) Map the dairy value chains operating in rural areas in Burkina Faso and in peri-urban Ouagadougou.
2) Determine the presence of milk-borne pathogens in milk consumed in rural and urban settings.
3) Assess the level of aflatoxin contamination in dairy cattle feed and milk in dairy production systems.
4) Estimate the aflatoxin-related health risk for rural and urban consumers of liquid milk, with a focus on children under 5 years, and pregnant and lactating women.

Aflatoxin levels in cow's feed and milk in Burkina Faso

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Introduction

- We compared aflatoxin levels in feeds and milk from two farming systems in different locations in Burkina Faso

Methods

1. Collected 251 milk samples and 231 animal feeds from dairy farms
2. Dairy farms were peri-urban (in Ouagadougou) or rural (in Dori)
3. We tested samples for presence of Aflatoxin B1 (AFB1) in feeds and Aflatoxin M1 (AFM1) in milk (AgraQuant® ELISA tests)

Results

- Maize-based feeds have higher AFB1 concentrations. They are also the most common diet component for dairy cows in peri-urban settings.
- Milk samples from both farming systems have similar AFM1 levels

Despite differences in animal diets and aflatoxin B1 concentration in feeds (animal intake),

Aflatoxin M1 concentration in milk is similar in peri-urban and rural farms.

52% of feed and 100% of milk samples respectively met US aflatoxin standards

Table 1. Aflatoxin B1 concentration (ppb) in cow feeds from dairy farms

	Ouagadougou (semi-intensive)			Dori (smallholder and pastoralist)			
Type feed	N (%)*	Mean	(SD)	N (%)*	Mean	(SD)	% above 20 ppb
Commercial	27 (24%)	17.25	(21.74)	5 (4%)	50.38	(50.08)	34%
Cotton cake	24 (21%)	25.9	(28.77)	98 (84%)	44.74	(96.74)	39%
Maize flour	12 (11%)	86.22	(66.93)	- -			92%
Maize bran	35 (31%)	72.85	(51.91)	- -			80%
Millet bran	3 (3%)	11.63	(13.66)	9 (8%)	13.38	(11.39)	25%†
Bran (other)	4 (4%)	39.6	(5.50)	5 (4%)	9.24	(7.9)	50%†
Local shrubs/trees	6 (5%)	50.22	(87.18)	- -			33%†
Other	3 (3%)	72.7	(84.52)	- -			100%†
Total	**114**	**47.23**	**(52.16)**	**117**	**41.05**	**(89.68)**	**48%**
Overall	N = 231			**Mean = 44.1** (SD = 73.5) **Median = 16.9** (range 0.6-515.9)			

* % from total. Represents the relative importance of that product as part of the diet of dairy cows in that area; † note the small sample size; - - represents no samples available

There is a statistically significant difference in AFB1 concentration in feeds between both locations (p=0.007)

Table 2. Aflatoxin M1 concentration (ppt) in cows' milk from dairy farms

	Ouagadougou (semi-intensive)						
Type sample	N	Mean	(SD)	Median	Range	above 50 ppt*	Above 500 ppt**
Fresh milk	100	84.3	49.1	85.2	12.72-267.73	67%	0%

*Eu regulation** FDA regulation

	Dori (smallholder and pastoralist)						
Type sample	N	Mean	(SD)	Median	Range	above 50 ppt*	Above 500 ppt**
Fresh milk	151	89.3	44.9	94.9	14.3-197.1	69.5%	0%

*Eu regulation** FDA regulation

Research gaps:

- What factors drive the differences in AB1 concentration across different types of feeds and between both locations?
- Understand the relationship between AFB1 concentration in feeds and AFM1 in milk and what factors influence it.

Exposure to AM1 from milk by vulnerable groups

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Introduction

- There is limited scientific evidence on exposure to Aflatoxin M1 (AFM1) in West Africa
- Families in dairy farms are known to consume high amounts of milk
- Unknown potential health risk for children and other vulnerable groups in those households.

Methods

- Collected diet data from children <5, pregnant and breastfeeding women in dairy farms
- Compared rural & peri-urban farms
- Data from AM1 testing of milk `

Based on reported levels of milk consumption, **children and breastfeeding women** have **higher exposure** to AM1 in milk.

Table 1. Milk consumption at the farm

	Ouagadougou (semi-intensive) N visited farms = 103			Dori (smallholder and pastoralist) N visited farms = 194		
	N	Mean age	Daily milk intake (ml) mean ± SD	N	Mean age	Daily milk intake (ml) mean ± SD
Children <5yr	78	2.8	792.3 ± 449.9	81	3	1167 ± 380.7
Pregnant women	18	27.4	300 ± 0	26	24.6	762.5 ± 475
Breastfeeding women	54	27.5	575 ± 298.6	43	27.7	1128 ± 755.4

Table 2. Exposure to AM1 via milk consumption

	Ouagadougou	Dori
	Exposure	Exposure
	ng/kg bw/day	ng/kg bw/day
Children	0.009 (0.00048-0.03)	0.0126 (0.0014-0.03)
Pregnant women	0.0026 (0.00035-0.01)	0.0052 (0.0007-0.012)
Breastfeeding women	0.006 (0.00039-0.02)	0.0012 (0.001-0.03)

Results

- Individuals in rural dairy farms have higher exposure due to the higher milk intakes, compared to peri-urban dairy farms.
- Pregnant women consume less than children and lactating women

Future opportunities

- Conduct a risk assessment to measure the health risk (hepatocarcinoma) associated with AM1 intake

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