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Health Research Governance for Evidence Informed Decision Making and Implementation in Nepal

From Food Security to Public Health: Assessing Emerging Mycotoxin Contamination across Nepal's One Health Landscape

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Background

Mycotoxins

- Aflatoxins (AF)
- Fuminosins (FUM)
- Ochratoxins (OT)
- Deoxynivalenol (DON)
- Trichothecenes
- Zearalenone (ZEA)

Causative agents

- *Aspergillus* spp.
- *Fusarium* spp.
- *Penicillum* spp.
- *Alternaria* spp.

- Contaminate agricultural commodities throughout the food supply chain, from pre-harvest to processing.
- Can cause acute and chronic health effects and may be fatal in severe cases.
- Aflatoxins - Group 1 carcinogens (carcinogenic to human) (*IARC 2012*)
- Fumonisin B1 and B2- Group 2B (possible human carcinogens) (*IARC 2002)*

Objectives

- To map existing evidence on mycotoxin contamination in Nepal from a One Health perspective
- Identify emerging threats, and
- Highlight gaps in research, surveillance, and policy.

Research Methodology

Review was conducted using the scientific literature published between Jan 2000 – Dec 2025

Literature search (n=2469)

- PubMed
- Google Scholar
- Web of Science

Set exclusion criteria (n=2446)

- Systematic reviews
- Meta-analyses
- Experimental studies
- Studies outside Nepal

Set inclusion criteria (n=23)

- Focused on mycotoxin contamination in Nepal
- Primary studies
- OH: human, animal and food-feed

Screen & select studies (n=19)

- Based on title, abstract, and full-text review
- Studies having quantitative value of mycotoxins

Synthesize relevant data

- Synthesis of key findings

Conclusion and recommendations

- Organize by thematic areas, present gaps, implications
- Key points

Findings

- Human studies showed near-universal chronic aflatoxin exposure
- **AFB1-lysine - 85% of children** had detectable label of (0.4 – 128 pg/mg albumin)
- **OTA and UFB1 - 100%** (0.02 – 44.5 ng/ml) and (6.57 – 132,373.1pg/mg creatinine) respectively
- **DON - 87%** (90 – 130 ng/mg creatinine)
- **AF** significantly associated to most anthropometric outcomes (lower weight, stunting)
- Child AFB1-lysine adduct concentrations increased with age.
- About 94% breastfeeding mothers had detectable AFM1 in breast milk and AFB1-lys adducts in serum.
- Significant association between serum AFB1-lys adduct conc. in pregnant women and small for gestational age.

Findings Continued…

Mycotoxins Level in various foodstuffs

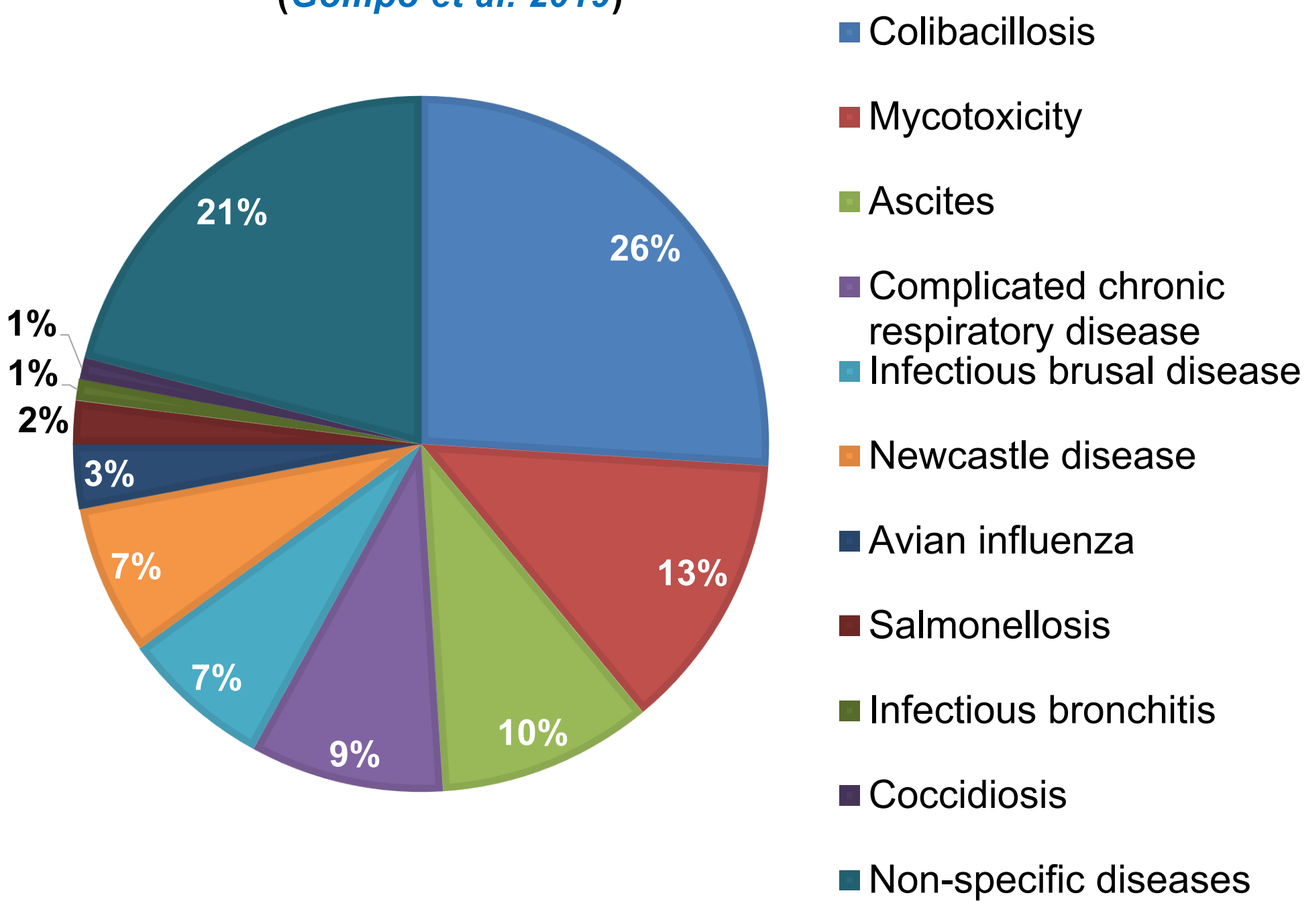
Mycotoxin Types	Food stuffs	Mycotoxin Level (ppb)	References
AFM1	Raw Milk	0.026-0.138	*Kafle et al 2012*
	Pasteurized Milk	0.025-0.127	
FUMs	Maize	2.3	*Desjardins et al 2000*
DON		2.5	
8-ketotrichothecenes		3.2	
FUMs	Rice	<1000	*Desjardins et al 2000*
NIV/DON		<1000	
AF	Maize	1.52-91.24	*Joshi et al 2022*
OT		1-3.22	
ZEA		11.12-69.52	
FUM		200-1480	
DON		110-520	
AFB1	Paddy	1.43	*Acharya 2022*
	Rice	1.41	
	Rice Product	1.64	
AFB1	Wheat	20 to 130	*Maharjan et al 2003*
AFB1/B2	Poultry Feed	Traces- 366	*Aryal and Karki 2009*
AFB1	Poultry Meat and Meat Product	3.72	*Sedai 2005*
AFs	Maize	<20-30	*Poudel et al 2020*
FUM1	Maize	140–13658	
NIV		776–6414	
DON		61–1413	
ZEA		484–8236	
AFB1/B2	Food-feed	4-1560	*Koirala 2005*
AFs	Feed	5-123	*Shrestha et al 2019*

Findings Continued…

- Mycotoxicosis is one of top 10 diseases in poultry diseases with prevalence of around 13%
- Mycotoxicosis was seen mostly during pre-monsoon and monsoon

Major poultry disease in Nepal diagnosed at Central Vet. Laboratory/CVL

(*Gompo et al. 2019*)



Findings Continued…

For Detection of Biomarkers of Mycotoxins

- HPLC with fluorescence detection
- Isotope dilution mass spectrometry

For Direct Detection of Mycotoxins

- Competitive ELISA
- TLC
- HPLC
- HPLC/MS
- LC-MS/MS

Conclusions: Takeaway message

- Mycotoxin remain significant but under-recognized threat to food safety and public health.
- One Health approach is essential to address their complex, cross-sectoral impact.
- Collaborative, multidisciplinary efforts can effectively reduce exposure and health risks.
- Strengthening regulatory frameworks, laboratory capacity, and integrated food-feed surveillance is critical.
- Evidence-based policies is urgently needed.

Recommendations

1. Educate farmers on good agricultural practices (GAP) to reduce mycotoxin exposure at source.
2. Monitoring soil health and climate variables to predict fungal growth pattern.
3. Feed-to-food traceability to prevent carry-over of toxins into food items.
4. Adopt holistic approach for coordinated risk assessment and management.
5. Establish and enforce clear national and international regulatory limits other than Afs.
6. Align local MPL with International Codex Alimentarius standards to protect both consumers and trade.
7. Transitioning to multi-toxin screening methods to detect co-occurrence of multiple mycotoxins.
8. Incorporate nutrition-sensitive strategies to reduce mycotoxin exposure and health impacts.
9. Prioritize mycotoxins as a key public health and food security concerns in national policies.

Acknowledgement

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Thank You All! Q&As…