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Mycotoxins in Poultry Feed

Presentation Outline

- What are Mycotoxins?
- What causes Mycotoxin Contamination?
- Key Mycotoxins for Poultry
- Legal Limits vs Guidance Values
- Current Legislation and proposed changes
- Indications of contamination
- Detection
- Mitigation

What are Mycotoxins?

- Mycotoxins are chemical compounds produced naturally by moulds.
- Mould growth can occur either before harvest or after harvest, during storage, on/in the feed itself often under warm, damp and humid conditions.
- Grains are a major source of mycotoxins
- Mycotoxins are not unique to specific moulds
- Mycotoxin contamination is a worldwide challenge that poses a constant threat to poultry production.
- There are around 400 known types of mycotoxins with Aflatoxins (AFL), Fumonisins (FUM), Ochratoxin A (OTA), Deoxynivalenol (DON), T-2/HT-2 and Zearalenone (ZEN) regarded as the most significant with regards to animal health and performance.

What causes mycotoxin contamination?

Fungal infection and consequently mycotoxin production can occur at several stages – growing, harvesting, drying and storage, processing and compound feed storage

Pre-Harvest Field Fungi (Fusarium)

- Climate factors such as warmer temperatures and high moisture
- Environmental factors such as Insects, rodents, adverse weather
- Agronomic Practices – Crop rotation, Soil Cultivation, Crop Variety

During Harvest – Harvesting when wet, Insufficient drying.

Post-Harvest Storage Fungi (Aspergillus, Penicillium)

- Insufficient drying
- Warm temperatures
- Pests in storage
- Long periods of feed storage

Ideal conditions for mycotoxin formation will depend on the fungal species but in general high temperature and moisture are required for growth. Moulds are generally aerobic organisms that develop above the surface of the medium.

Key Mycotoxins for Poultry

- Poultry are susceptible to hundreds of mycotoxins.
- The most important mycotoxins at present include:
    - Aflatoxin B1 – *Aspergillus* spp.
    - Ochratoxin A – *Penicillium* spp. & *Aspergillus* spp.
    - T2 + HT2 – *Fusarium*
    - Fumonisins – *Fusarium*
    - Deoxynivalenol – *Fusarium*
    - Zearalenone – *Fusarium*
- The effect of mycotoxins on poultry is dependent on the specific mycotoxin involved, life stage, species, level and duration of exposure and health status of the birds.

Legal Limits vs Guidance Values

02002L0032 — EN — 28.11.2019 — 022.001 — 1

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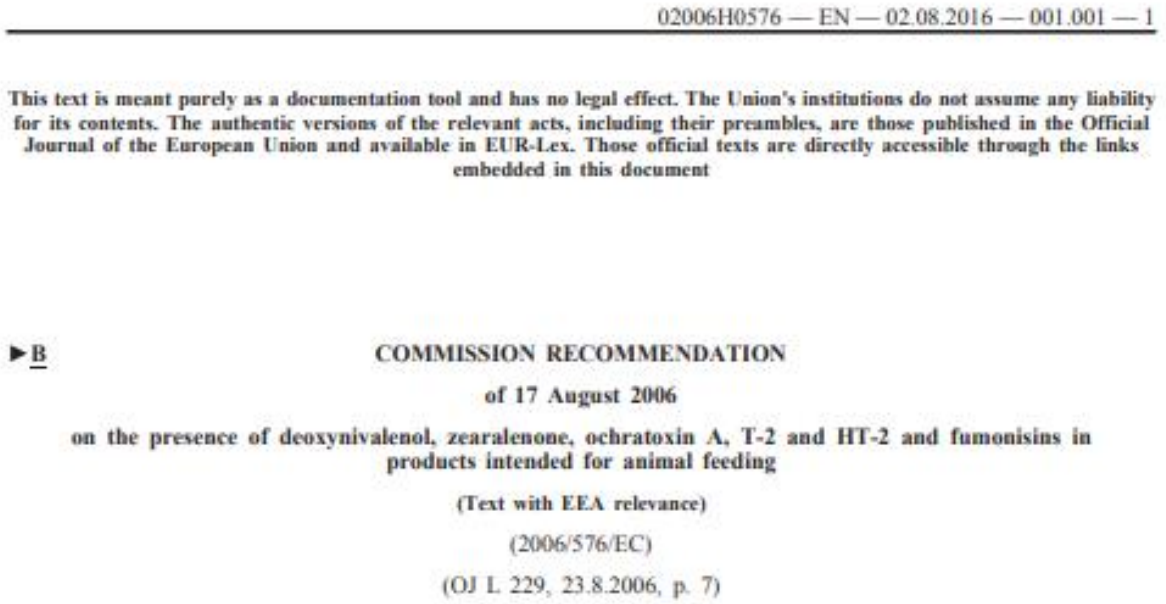
►B DIRECTIVE 2002/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 7 May 2002

on undesirable substances in animal feed

(OJ L 140, 30.5.2002, p. 10)

- Directive – legally binding
- Feed containing undesirable substances exceeding legal limits cannot be placed on the market
- No dilution permitted



02006H0576 — EN — 02.08.2016 — 001.001 — 1

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►B COMMISSION RECOMMENDATION

of 17 August 2006

on the presence of deoxynivalenol, zearalenone, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding

(Text with EEA relevance)

(2006/576/EC)

(OJ L 229, 23.8.2006, p. 7)

- Recommendation – not legally binding
- Used to judge acceptability of feed
- Determined for the most tolerant species

Current Legislation and Proposed Changes

- Aflatoxin B1 – maximum limit set in EU Directive 2002/32
- Guidance values have been recommended for a further five mycotoxins:
    - Deoxynivalenol
    - Ochratoxin A
    - T2 HT2
    - Fumonisins
    - Zearalenone

These mycotoxins pose a risk to animal health and can affect livestock production for several species, but the risk to public health is considered low.

Aflatoxin B1 (AFB1)

- Avian species especially chicks, goslings, ducklings and turkey poults are most susceptible to AFB1 toxicity.
- Negative impact on the liver and kidney
- Chronic toxicity is characterized by loss of weight, decline in feed efficiency, drop in egg production and increased susceptibility to infections.
- Carryover into meat and eggs possible
- Aflatoxins responsible for the first major outbreak – Turkey X disease

Aflatoxin B1	Max Limit mg/kg
All Feed Materials	0.02
Complete Feed	0.01
Young Poultry	0.005
Poultry (except young poultry)	0.02

Ochratoxin A (OTA)

- Poultry are at greater risk from Ochratoxin A than other mycotoxins.
- It leads to impaired feed conversion, poor eggshell quality and is detrimental to kidney function.
- It has also been shown to carry over into eggs making it dangerous for human consumption.

Ochratoxin A	Existing Guidance Level mg/kg	Proposed Guidance Level mg/kg
Cereals and cereal products	0.25	0.05
Oil seeds, oil fruits, and products		0.05
Horse bean		0.05
Lucerne		0.05
Complete Feed		0.02
Poultry	0.10	0.03

T2 + HT2

- Poultry more sensitive to T2 than other species
- Turkeys and ducks are extremely sensitive.
- T2 is an inhibitor of protein synthesis, which affects the lining of the gastrointestinal tract, skin, and immune cells.
- The consequences include poor weight gain, diarrhoea, skin and beak lesions, and decreased production.

T-2 and HT-2 toxin	Existing Guidance Level mg/kg	Proposed Guidance Level mg/kg
Oats (with husk)	1.0	1.5
Cereals other than oats (with husk)	0.2	0.2
Oat milling products (including husk)	2.0	3.0
Cereal products other than oat milling products	0.5	0.5
Complete Feed	0.3	0.2
Laying Hens		0.5
Poultry other than Laying Hens		0.1

Fumonisins

- Fumonisins can disrupt gut health even at very low levels as their absorption interacts with other toxins and interferes with gut bacteria, including those affecting immunity.
- Lower productivity is expected in animals exposed to even low levels of this toxin.

Fumonisin B1 + B2	Existing Guidance Level mg/kg	Proposed Guidance Level mg/kg
Maize and maize products	60.0	10.0
Cereals and cereal products		2.5
Soybean and soybean products		1.0
Complete feed		5.0
Poultry except Turkeys and Ducks	20.0	2.0
Turkeys and Ducks		10.0

Deoxynivalenol (DON)

- Deoxynivalenol (DON) is highly prevalent
- In poultry, it is related to gut lesions and alterations in the immune response which leads to lower productivity and feed efficiency.
- DON is also known as vomitoxin, as it causes nausea and loss of appetite.
- This can result in feed refusal and reduced daily weight gain. In laying flocks, this can result in fewer, lower quality eggs.

Deoxynivalenol	Existing Guidance Level mg/kg	Proposed Guidance Level mg/kg
Cereals and cereal products	8.0	4.0
Maize	8.0	8.0
Maize products	12.0	8.0
Sugar beet products		4.0
Soybean and products		2.5
Oil seeds and products		0.5
Complete Feed	5.0	5.0
Chickens for fattening & Turkeys		1.0

Zearalenone (ZEN)

- Poultry less sensitive to Zearalenone
- Zearalenone is linked with immune cell and organ damage in animals.
- The risk of adverse health effects of feed containing ZEN is low for poultry.
- ZEN mimics oestrogen and so is related to reproductive issues such as fertility, egg shell thickness, and hatchability.

Zearalenone	Existing Guidance Level mg/kg	Proposed Guidance Level mg/kg
Cereals and cereal products	2.0	1.0
Maize	2.0	2.0
Maize products	3.0	2.0
Sugar beet products		2.0
Oilseeds and derived products		0.5
Green silage, forage meal, hay and lucerne		1.0
Complete feed		2.0

Indications of Mycotoxin Contamination

1. Visible mould in feed
2. Other physical signs – dust, caking, poor flow, musty smell, darkening colour.
3. Reduced feed intake
4. Reduced performance
5. Enteritis and diarrhoea
6. Decreased fertility
7. Increased susceptibility to diseases
8. Oral and gizzard lesions

Diagnosis of Mycotoxicoses

1. Definitive diagnosis of mycotoxicosis involves detection and quantification of the specific toxins.
2. Laboratory Analysis – sample correctly taking account of heterogenous distribution
3. Multi-detection Analysis recommended
4. Ensure levels detected are below legal limits and within guidance levels.

Mitigation

- Pre-harvest

Good agricultural practices (crop rotation, pest control), selecting resistant varieties

- Post-harvest

Improving sorting, drying and storage conditions

- Good Hygiene and management practices
    - Cleanliness – clean bins and feeding equipment, run bins empty once a month and check for mould, check for condensation regularly
    - Humidity, Temperature and Ventilation
    - Dietary - Limit inclusion of contaminated feed materials, improve dietary variety and use of approved binders.

English

Search

Search

Food and Feed Information Portal Database

European Commission > Food > Food and Feed Information Portal > Feed Additives > Search Feed additives

SEARCH OPTIONS

Category/Functional Group

1 m) Technological addi...

Status

All

Authorisation to be phased out

All

Expiry date from

DD/MM/YYYY

Expiry date to

Feed Additives (5 matching records)

Filter results...

Search

Cat./Grp	Code	Additive name	To be phased out
1 m	1m558	Bentonite	No
1 m	1m03	Fumonisin esterase EC 3.1.1.87 produced by Komagataella pastoris DSM 26643	Partially
1 m	1m03i	Fumonisin esterase EC 3.1.1.87 produced by Komagataella phaffii (DSM 32159)	No
1 m	1m01	Micro-organism strain DSM 11798 of the Coriobacteriaceae family	No

Summary

• Mycotoxins have posed a danger to human & animal health for millennia and they are not going to go away.

• Mycotoxins occur frequently in animal feed worldwide

• The complete elimination of mycotoxin contamination is impossible and despite regulations, animals can still suffer adverse health effects

• Mycotoxin management involves a broad spectrum of activities including cleaning and hygiene on farm, caution with formulations and ingredients and use of appropriate interventions after consultation with a nutritionist.

Thank you