MYCOTOXINS IN FEED – A SILENT LOSS IN PROFITS

&

THE PRACTICAL SOLUTIONS FROM OLMIX

Bangkok – THAILAND, March 24, 2018.

Mycotoxins effects on animals

Suspicion

Confirmation

Solution

Optimize solution

Must have

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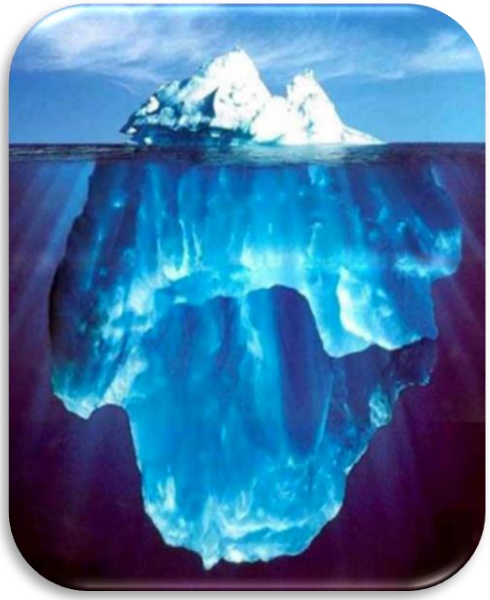
Mycotoxins effects on animals

Suspicion | Confirmation | Solution | Optimize solution | Must have



- Mycotoxins are “fungal metabolites which when ingested, inhaled or absorbed through the skin **cause lowered performance, sickness or death in man or animals, including birds”** (Pitt, 1996)

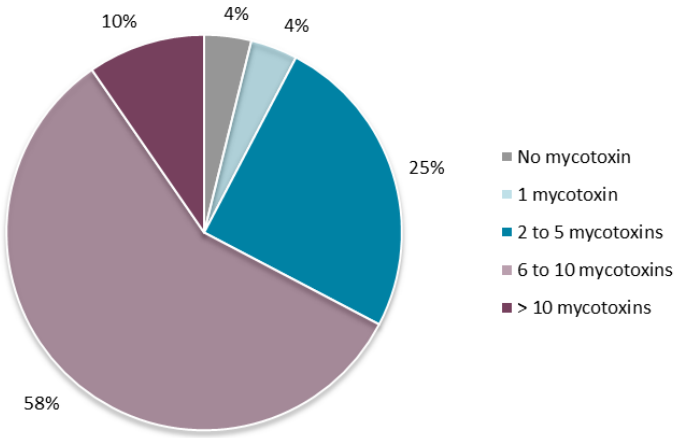
- High ability to **compromise the immune response**, consequently **reducing resistance to infectious diseases**

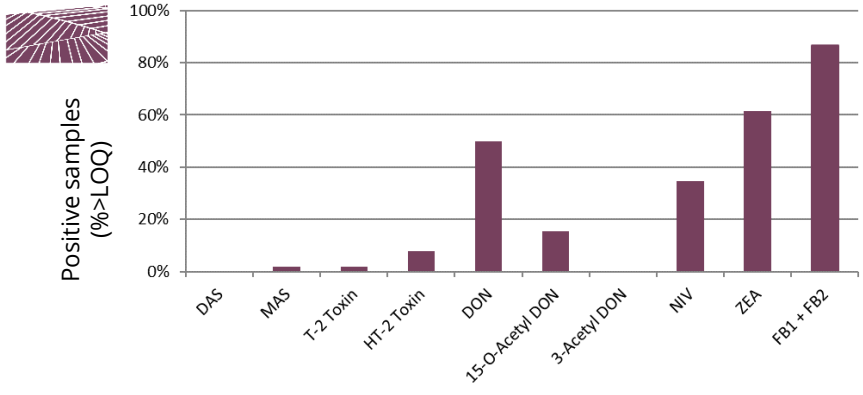
- This leads to a **higher use of antibiotics** in livestock

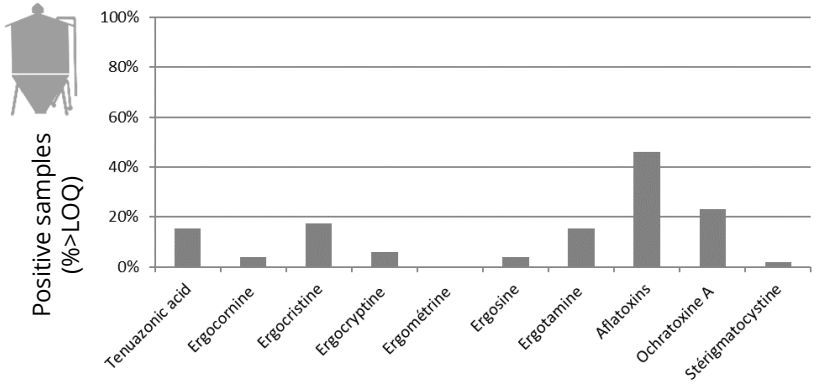
Mycotoxins effects on animals

Suspicion — Confirmation — Solution — Optimize solution — Must have

SEA MYCO'SCREEN OVIERVIEW







- 92% of the samples showed **polycontamination**
- 68% of the samples contained 6 mycotoxins or more

Mycotoxins effects on animals | Suspicion | Confirmation | Solution | Optimize solution | Must have

ACUTE MYCOTOXICOSIS

FIELD MYCOTOXINS

Fumonisins
Immune depression, gastrointestinal disturbances, high feed conversion ratio, pulmonary edema, liver toxicity.

Trichothecenes (DON, T2-HT2)
Immune depression, gastrointestinal disturbances, high feed conversion ratio, decreased feed consumption, dermal lesions.

Zearalenones
Hyperestrogenism, poor fertility/hatchability, abortions.

STORAGE MYCOTOXINS

Aflatoxins
Immune depression, limited growth, abortions, agalactia, transfer of Aflatoxin M1 to milk (carcinogenic for humans).

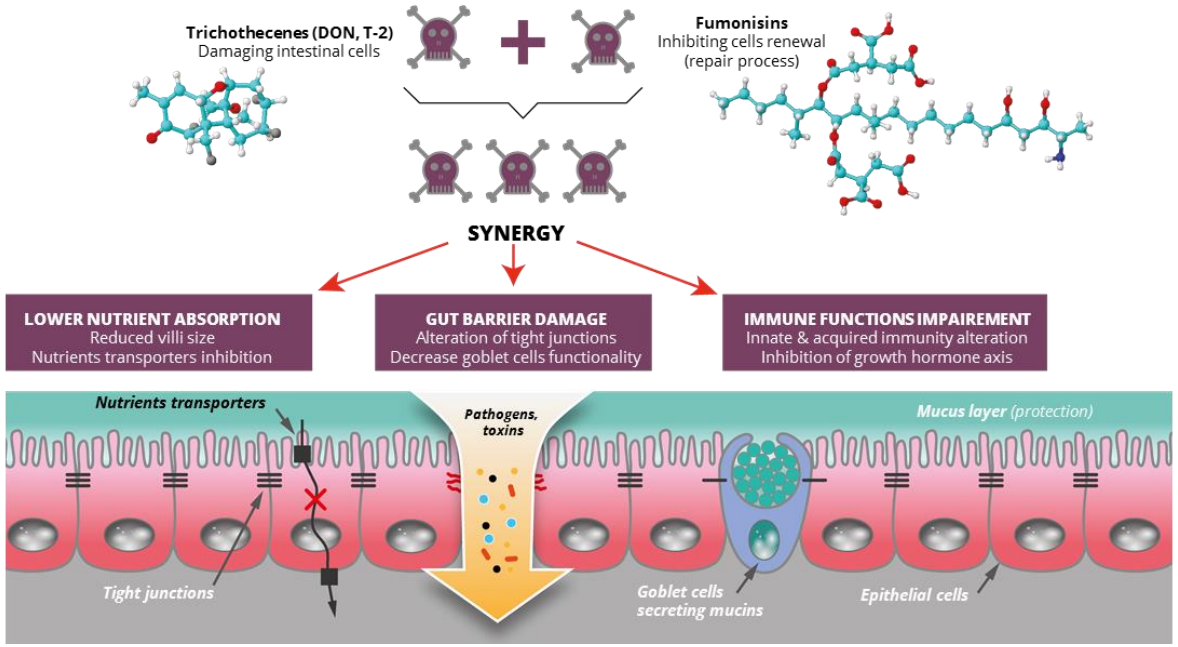
Ochratoxins
Immune depression, renal lesions, dehydration, high feed conversion ratio.

XXX = field mycotoxins
XXX = storage mycotoxins

Mycotoxins effects on animals

Suspicion — Confirmation — Solution — Optimize solution — Must have

SUBACUTE MYCOTOXICOSIS



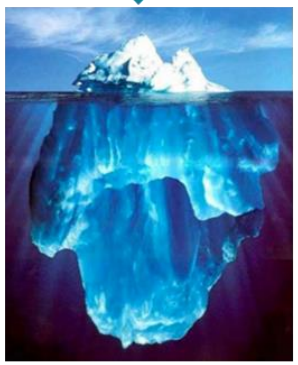
POOR PERFORMANCE

- ↘ Meat
- ↘ Milk
- ↘ Reproduction

Mycotoxins effects on animals

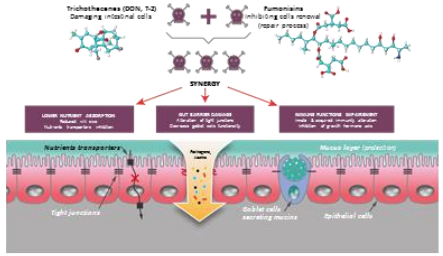
Suspicion — Confirmation — Solution — Optimize solution — Must have

Mycotoxins are everywhere



Acute mycotoxicosis

Subacute mycotoxicosis



How to protect the animals from this risk?

Mycotoxins effects on animals → **Suspicion** → **Confirmation** → **Solution** → **Optimize solution** → **Must have**

- DIFFICULTY OF DIAGNOSIS:

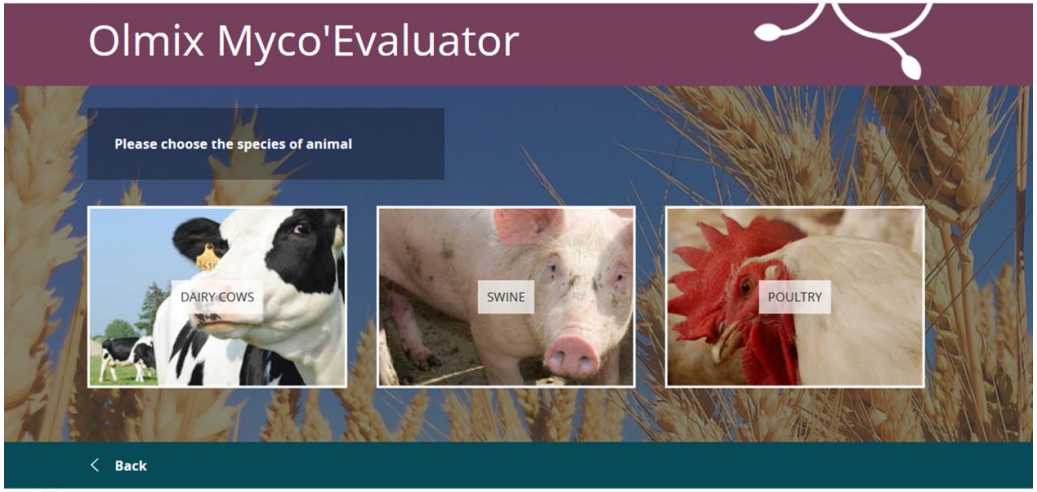
↗ sensibility to infectious diseases
Ex: FB1 reduces the recruitement of inflammatory cells and increases bacteria translocation through the epithelium
>> ↗ sensibility to *E. coli*

↗ reactivity to chronic infection
Ex: for rodent, T2 accelerate toxoplasmosis development

↘ Vaccine efficiency
Ex: AFLA and FB1 decrease humoral immunity (antibodies).

↘ Therapeutic efficiency
Ex: on broilers, T-2 toxin reduces coccidiostats efficiency

Mycotoxins effects on animals | **Suspicion** | Confirmation | Solution | Optimize solution | Must have



- Evaluate the mycotoxin risk on the farm.
- Takes into account the field and herd situation and the feed and storage characteristics.
- Rapid and easy to use.

Mycotoxins effects on animals | **Suspicion** | Confirmation | Solution | Optimize solution | Must have

Mycotoxin Risk EVALUATOR - Poultry

Evaluate the risk of mycotoxins in the feed of your animals:

Click on the statements that match your experience and calculate the probability of having a significant presence of mycotoxins in feed.

Type of animal

- None -
- None -
Laying hens
Breeder
Broiler

performances):

- Insufficient feed intake ☐
- Insufficient body weight ☐
- Liquid droppings ☐
- High water consumption ☐
- Vaccination or therapeutic failure ☐

Probability to have a significant level of mycotoxins in poultry diet:

47%

Medium risk

Olmix, specialist in mycotoxins:

Contact

Contact with our specialists in mycotoxins for customized interpretation and technical support, tailored to your situation.

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Mycotoxins effects on animals → Suspicion → **Confirmation** → Solution → Optimize solution → Must have

MYCO'SCREEN OFFER

1. SAMPLING PROCEDURE
2. MYCOTOXIN ANALYSIS
3. PERSONALIZED REPORT
4. CONTAMINATION OVERVIEW

Mycotoxins effects on animals → Suspicion → **Confirmation** → Solution → Optimize solution → Must have

The success of each analytical procedure depends on the skill in obtaining a representative sample from the overall batch!

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1 SAMPLING PROCEDURE | 2 MYCOTOXIN ANALYSIS | 3 PERSONALIZED REPORT | 4 CONTAMINATION OVERVIEW

HOW TO **COLLECT A FEED SAMPLE** FOR MYCOTOXIN ANALYSIS?

The most critical point to have an accurate analysis of the feed or raw material (RM) is to collect a representative sample from it. In fact mycotoxins are not homogenously present in feedingstuffs. As a consequence, the sample must be an accumulation of several sub-samples taken from different sites of the silo, truck, storage or feeders. It's very important to follow the below procedure in order to obtain the most accurate results.

On farm

Olmix technical team recommends to sample the complete final feed or TMR in order to have a complete view of the contamination. Specific raw materials can also be sampled in order to identify the contaminated materials in the diet.

TMR

1• Collect 20 handfuls in different places of the feeding table (cf picture).
2• Renew this operation during 3 days or once a week during 4 weeks.
3• Between each collection, samples must be stored in a fridge in order to avoid warm up.
4• Gather all samples together in a bucket or a wheelbarrow. Mix all samples and collect 1kg to be sent to the lab.

Complete Feed

1• Collect 20 handfuls at different places of the feeders.
2• Renew this operation during 3 days or once a week during 4 weeks.
3• Between each collection, samples must be stored in a fridge in order to avoid warm up.
4• Gather all samples together in a bucket or a wheelbarrow. Mix all samples and collect 1kg to be sent to the lab.

Silages

1• Collect 20 handfuls at different places of the silo front (cf picture).
2• Renew this operation during 3 days or once a week during 4 weeks.
3• Between each collection, samples must be stored in a fridge in order to avoid warm up.
4• Gather all samples together in a bucket or a wheelbarrow. Mix all samples and collect 1kg to be sent to the lab.

Cereals or cereals by-products

1• If possible, collect 20 samples of the raw material in different places of the storage.
2• In case of tower silo, collect samples during at least 3 days in a row. Between samplings, preserve samples in a fridge in case of humid raw materials. We advise to renew the analysis a few weeks later (2 or 3) in order to confirm the first result because of limited representativity of sampling.

Palmaria palmata

On feed mill

Olmix recommends to sample raw materials at their arrival in the feed mill in order to be able to adapt the formulation depending on the mycotoxin risk of each raw material. Analysis of complete feed can be run in order to confirm the final level of contamination.

Raw material:

- Collect 10 sub samples of the batch during all duration of the transfer, at regular intervals.

Complete feed:

- Collect 10 sub samples of the feed during all duration of the transfer, at regular intervals.
- In the plant: Collect 20 sub-samples once the feed is cool at regular intervals.

Samples packing

The final sample must be packed in a plastic bag (eg: freezing bag), and packed again in a second plastic bag to warranty good quality sealing. Reduce the air content as much as possible.
The final sample must be identified as follow: name of farm/feedmill – name of raw material/complete feed – date of sampling.
Samples can be frozen. **We recommend to freeze humid samples before sending them to the lab, it helps to avoid warming up during transportation.**

Adapted types of analysis

- **Chromatography (HPLC or LC-MS/MS):** All types of feed materials can be analyzed.
- **ELISA test (Strips or Microwells)**
  - Cereals and their by-products: corn grain, wheat, barley, oat, rye, triticale ...
  - Corn silage

Palmaria palmata

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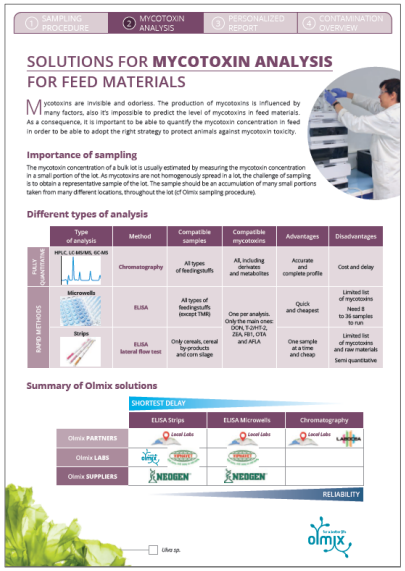
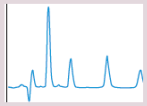


Different types of analysis

	Type of analysis	Method	Compatible samples	Compatible mycotoxins	Advantages	Disadvantages
FULLY QUANTITATIVE	HPLC, LC-MS/MS, GC-MS 	**Chromatography**	All types of feedingstuffs	All, including derivates and metabolites	Accurate and complete profile	Cost and delay
RAPID METHODS	**Microwells** 	**ELISA**	All types of feedingstuffs (except TMR)	One per analysis. Only the main ones: DON, T-2/HT-2, ZEA, FB1, OTA and AFLA	Quick and cheapest	Limited list of mycotoxins Need 8 to 36 samples to run
	Strips 	**ELISA lateral flow test**	Only cereals, cereal by-products and corn silage		One sample at a time and cheap	Limited list of mycotoxins and raw materials Semi quantitative

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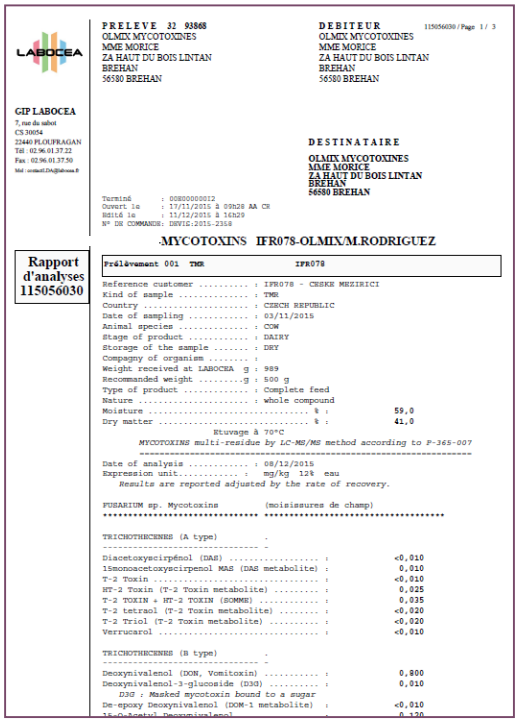

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Rapport d'analyses 115056030

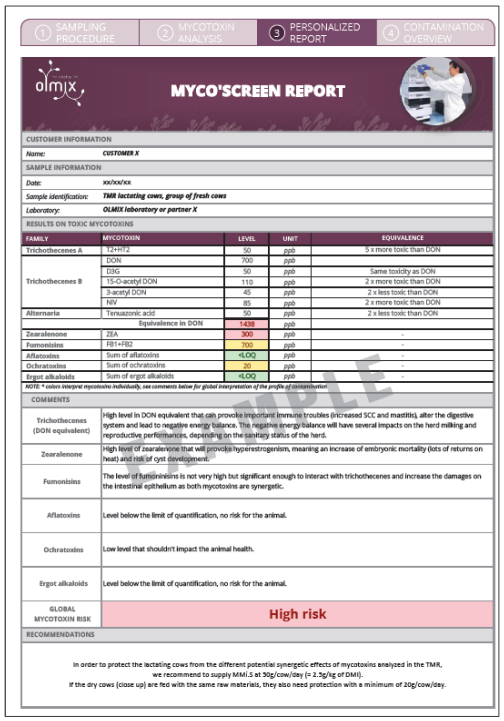
MYCOTOXINS IFR078-OLMIX/M.RODRIGUEZ

Prélèvement 001 TMR	IFR078
Reference customer	: IFR078 - CESKE MEZIRICI
Kind of sample	: TMR
Country	: CZECH REPUBLIC
Date of sampling	: 03/11/2015
Animal species	: COW
Stage of product	: DAIRY
Storage of the sample	: DRY
Compagny of organism	:
Weight received at LABOCEA g	: 989
Recommanded weight g	: 500 g
Type of product	: Complete feed
Nature	: whole compound
Moisture %	: 59,0
Dry matter %	: 41,0

Rtuvage à 70°C

MYCOTOXINS multi-residue by LC-MS/MS method according to P-365-007

Date of analysis	: 08/12/2015	
Expression unit.	: mg/kg 12% eau	
Results are reported adjusted by the rate of recovery.		
FUSARIUM sp. Mycotoxins	(moisissures de champ)	
TRICHOTHECENES (A type)		
Diacetoxyscirpénol (DAS)	:	<0,010
15monoacetoxyscirpenol MAS (DAS metabolite)	:	0,010
T-2 Toxin	:	<0,010
HT-2 Toxin (T-2 Toxin metabolite)	:	0,025
T-2 TOXIN + HT-2 TOXIN (SOMME)	:	0,035
T-2 tetraol (T-2 Toxin metabolite)	:	<0,020
T-2 Triol (T-2 Toxin metabolite)	:	<0,020
Verrucarol	:	<0,010
TRICHOTHECENES (B type)		
Deoxynivalenol (DON, Vomitoxin)	:	0,800
Deoxynivalenol-3-glucoside (D3G)	:	0,010
D3G : Masked mycotoxin bound to a sugar		
De-epoxy Deoxynivalenol (DOM-1 metabolite)	:	<0,010



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MYCO'SCREEN REPORT

CUSTOMER INFORMATION

Name: *CUSTOMER X*

SAMPLE INFORMATION

Date: *xx/xx/xx*

Sample identification: *TMR lactating cows, group of fresh cows*

Laboratory: *OLMIX laboratory or partner X*

RESULTS ON TOXIC MYCOTOXINS

FAMILY	MYCOTOXIN	LEVEL	UNIT	EQUIVALENCE
Trichothecenes A	T2+HT2	50	ppb	5 x more toxic than DON
Trichothecenes B	DON	700	ppb	
	D3G	50	ppb	Same toxicity as DON
	15-O-acetyl DON	110	ppb	2 x more toxic than DON
	3-acetyl DON	45	ppb	2 x less toxic than DON
	NIV	85	ppb	2 x more toxic than DON
Alternaria	Tenuazonic acid	50	ppb	2 x less toxic than DON
	Equivalence in DON	1438	ppb	
Zearalenone	ZEA	300	ppb	-
Fumonisins	FB1+FB2	700	ppb	-
Aflatoxins	Sum of aflatoxins	<LOQ	ppb	-
Ochratoxins	Sum of ochratoxins	20	ppb	-
Ergot alkaloids	Sum of ergot alkaloids	<LOQ	ppb	-

*NOTE * colors interpret mycotoxins individually, see comments below for global interpretation of the profile of contamination*

COMMENTS

Trichothecenes (DON equivalent)	High level in DON equivalent that can provoke important immune troubles (increased SCC and mastitis), alter the digestive system and lead to negative energy balance. The negative energy balance will have several impacts on the herd milking and reproductive performances, depending on the sanitary status of the herd.
Zearalenone	High level of zearalenone that will provoke hyperestrogenism, meaning an increase of embryonic mortality (lots of returns on heat) and risk of cyst development.
Fumonisins	The level of fumonisins is not very high but significant enough to interact with trichothecenes and increase the damages on the intestinal epithelium as both mycotoxins are synergetic.
Aflatoxins	Level below the limit of quantification, no risk for the animal.
Ochratoxins	Low level that shouldn't impact the animal health.
Ergot alkaloids	Level below the limit of quantification, no risk for the animal.
GLOBAL MYCOTOXIN RISK	**High risk**

RECOMMENDATIONS

In order to protect the lactating cows from the different potential synergetic effects of mycotoxins analyzed in the TMR, we recommend to supply MM1.5 at 50g/cow/day (= 2.5g/kg of DMI).
If the dry cows (close up) are fed with the same raw materials, they also need protection with a minimum of 20g/cow/day.

for a better life

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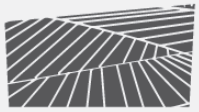
IN THE FIELD



- Single-crop farming
- Non-plowing
- Sensitive variety
- Inefficient phytosanitary treatments

AT HARVEST

- Cereal ripeness
- Poor harvesting conditions

IN STORAGE

- Temperature variation
- High humidity
- Pest infestation

DURING PROCESSING

- Inefficient cleaning
- Processing at risk

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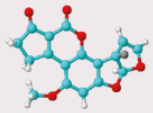
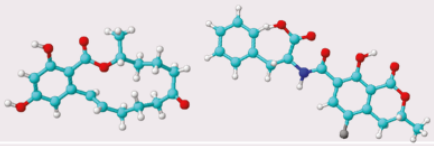
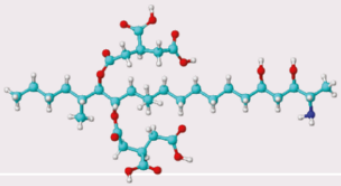
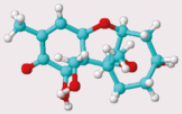
Use a broad spectrum toxin binder to avoid depression of the immune system caused by mycotoxins and prevent mycotoxicosis.

	**Aflatoxins** - Planar molecules, rigid - Medium polarity	Easily adsorbed by aluminosilicates (clays), especially the Montmorillonite type
	**Zearalenone and Ochratoxins** - Larger molecules and very flexible - Medium polarity	Not adsorbed by unmodified clays
	**Fumonisins** - Much larger molecules, very flexible - More polar	Due to their size and structural configuration, they are the most difficult mycotoxins to adsorb
	**Trichothecenes** - Larger volume, globular shape, epoxy ring = **VERY rigid** - Medium polarity	

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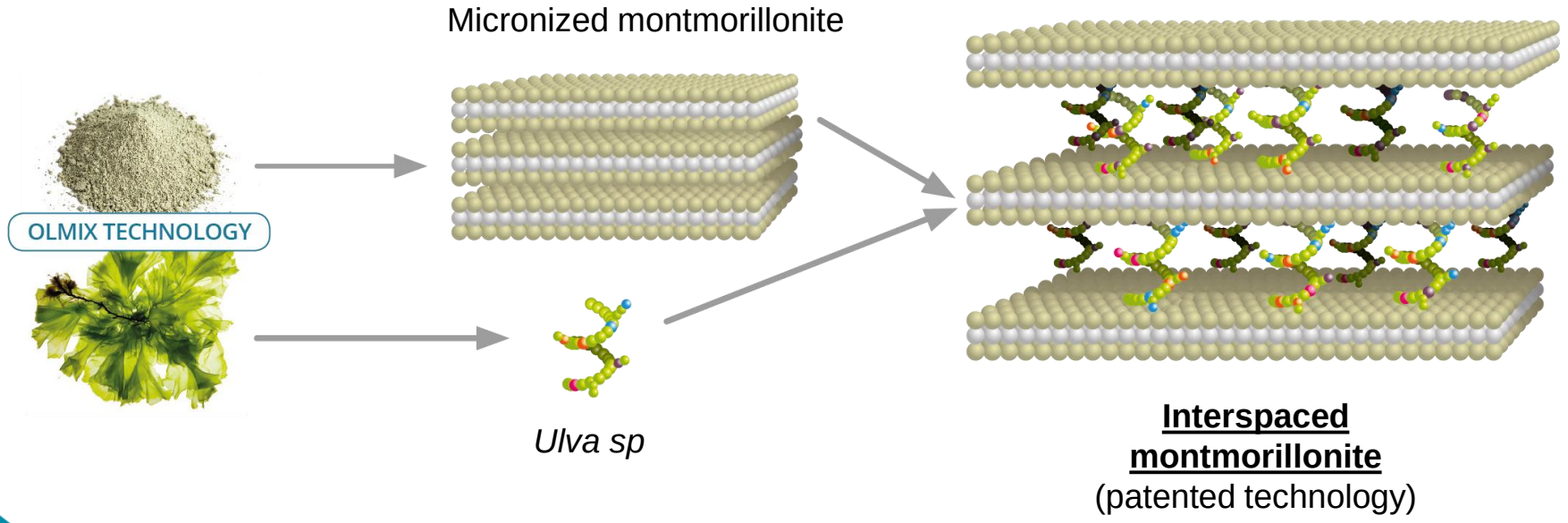

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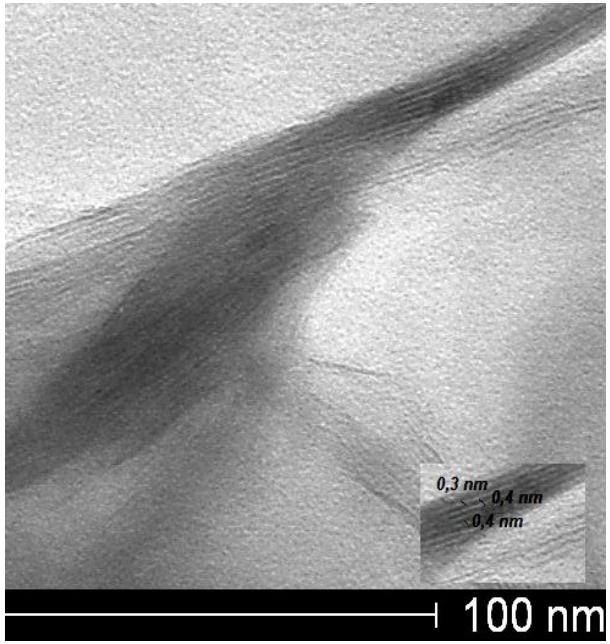
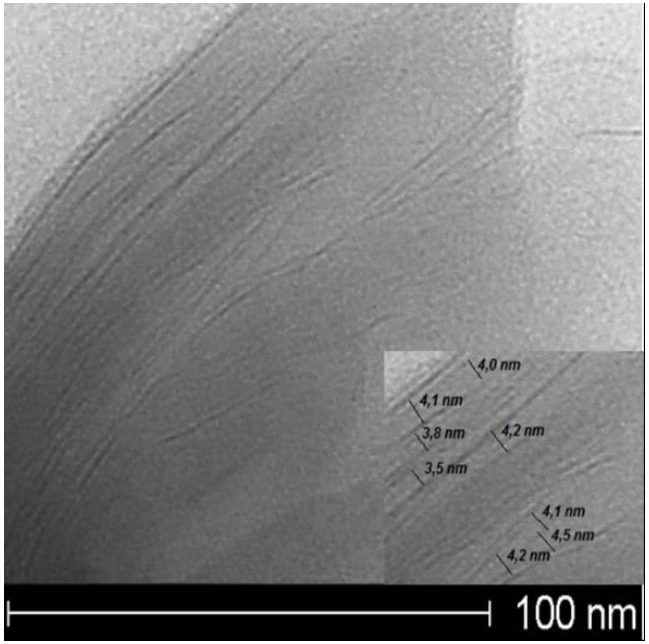


Standard Montmorillonite



Interspaced Montmorillonite

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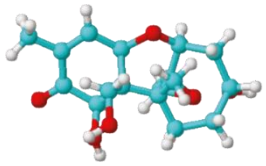
Measurement of the availability for absorption (bioaccessibility) of mycotoxins in the jejunum thanks to the simulation of gastrointestinal conditions in the TIM-1 system.

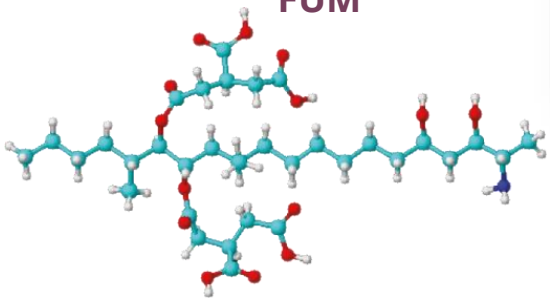
DON



Use of **complete feed** contaminated with both:

- DON (1 ppm) and,
- Fumonisin B1 (2 ppm),

FUM



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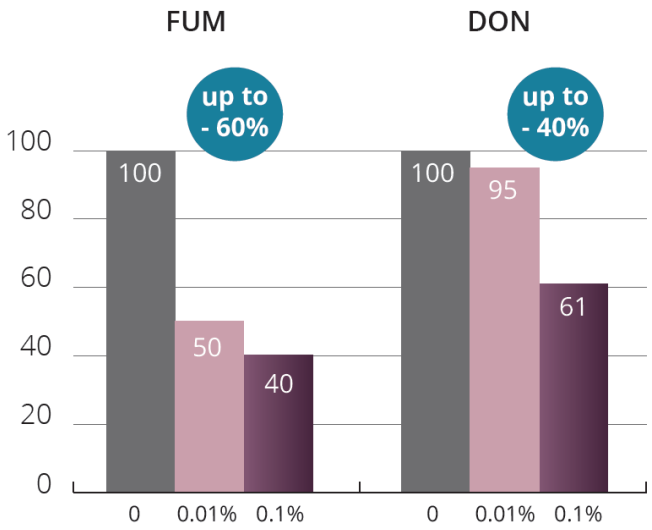
Reduction of the intestinal absorption of mycotoxins relative to control



Results

- DON bioaccessibility was reduced by 40% with 0.1% Interspaced MMT
- A strong reduction of fumonisin absorption was measured with 0.01% Interspaced MMT
- Fumonisin bioaccessibility was reduced by 50 to 60%

Reminder! 2% of active carbon – considered to be the reference binder for DON – reduces the bioaccessibility of DON by 45% in TIM-1. (Avantaggiato *et al*, 2004)

MT.X+ EFFICACY ON BROILERS (SAMITEC, Brazil – 2016)

MEASUREMENTS

- **Performance:** Feed intake and body weight (D7, D14 and D21), FCR.
- **Liver parameters:**
  Individual relative liver weight (RWL = liver weight/100g of BW) – all trials
  Sphinganine to Sphingosine ratio – FUM trial
  Lamic/Samitec Index (LSI), considering RWL and liver color – AFLA trial
- **Clinical biochemistry:** Total plasma proteins (TPP) – all trials.

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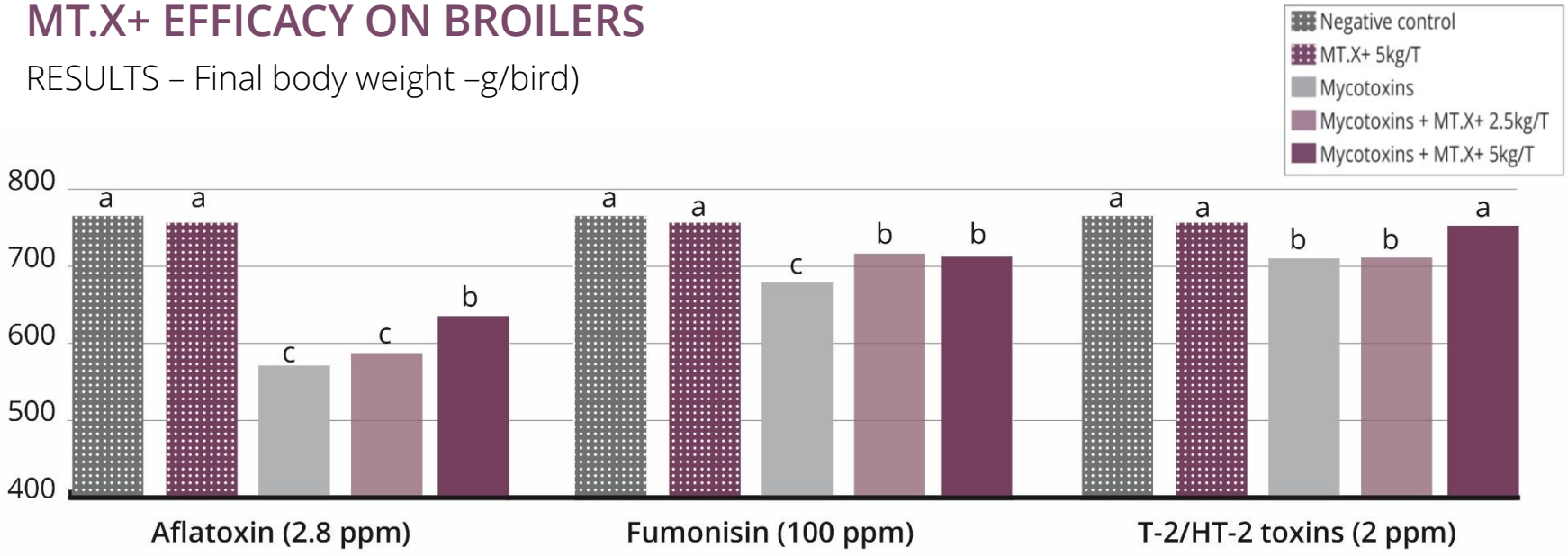
MT.X+ EFFICACY ON BROILERS

RESULTS – Final body weight –g/bird)



- Significant improvement of body weight with 5kg/T in all trials
- Full compensation in T-2 trial

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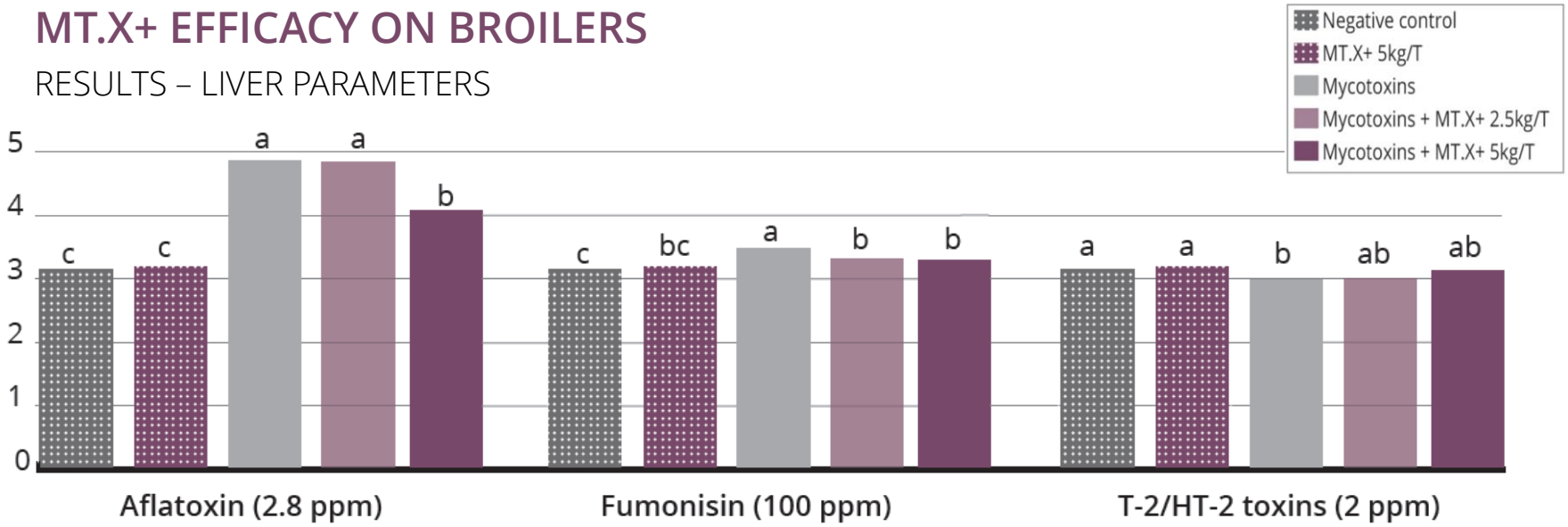
MT.X+ EFFICACY ON BROILERS

RESULTS – LIVER PARAMETERS



- AFLA increased RWL and LSI >> hepatotoxicity, typical enlargement
- FUM increased RWL and Sa/So >> hepatotoxicity, enzymatic dysfunction
- T-2/HT-2 toxin decreased RWL >> may be linked with cell injury

MT.X+ inclusion significantly limited all these effects in the 3 trials.

Mycotoxins effects on animals | Suspicion | Confirmation | **Solution** | Optimize solution | Must have

MT.X+ EFFICACY ON BROILERS

CONCLUSION

- According to the evaluated parameters, the use of MT.X+ (5kg/T) significantly decreased the deleterious effects caused by very high levels of mycotoxin (2.8 ppm of aflatoxin, 2 ppm of T-2/HT-2 toxins or 100 ppm fumonisin) added to the broiler chicken feed during the experimental period of 21 days ($P \leq 0.05$).

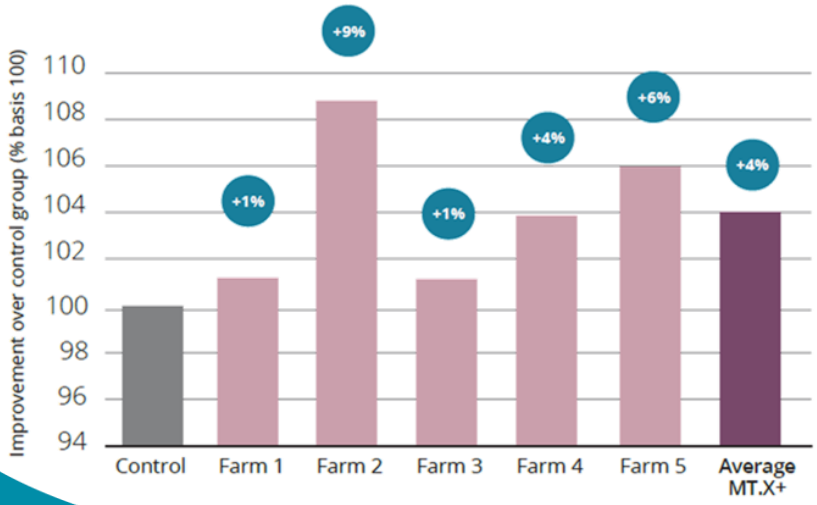
Mycotoxins effects on animals | Suspicion | Confirmation | **Solution** | Optimize solution | Must have

MT.X+ EFFICACY ON BROILERS

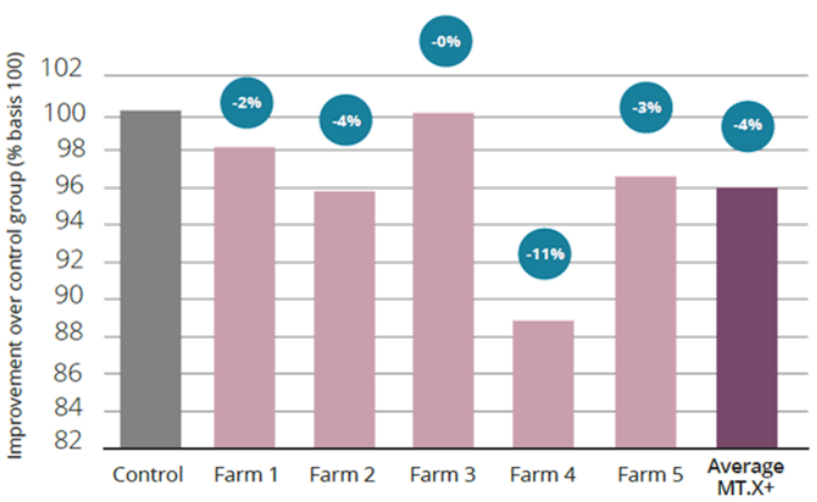
FIELD TRIAL – Brazil, 2017

- Test in 5 farms with twin buildings, under FUM natural contamination, comparison to a competitor product using enzymes and yeast extracts

→ ADG



→ FCR



olmix for a better life

Mycotoxins effects on animals — Suspicion — Confirmation — **Solution** — Optimize solution — Must have

MT.X+ EFFICACY ON BROILERS

FIELD TRIAL – Brazil, 2017

Financial performance *(calculation for 1000 chickens, under local conditions at the time of the trial)*

Parameters	Control	MT.X+	Difference
Final body weight (kg)	2.714	2.825	+ 0.111
Livability (%)	94.94	96.27	+ 1.33
Total liveweight sold (kg)	2577	2720	+ 143
Income (€)	2011	2123	+ 112
Feed consumption (kg)	4756	4787	+ 31
Feed cost (€)	1730	1738	+ 8
Return over feed cost (€)	282	385	+ 104
Increase of the return over feed cost in MT.X+ group compared to control group			**+ 36%**

olmix for a better life

Mycotoxins effects on animals → Suspicion → Confirmation → **Solution** → **Optimize solution** → **Must have**

Premix of additives
Powder form

MTX+

Complementary mineral feed
Microgranulated form

MMI.S

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Mycotoxins effects on animals

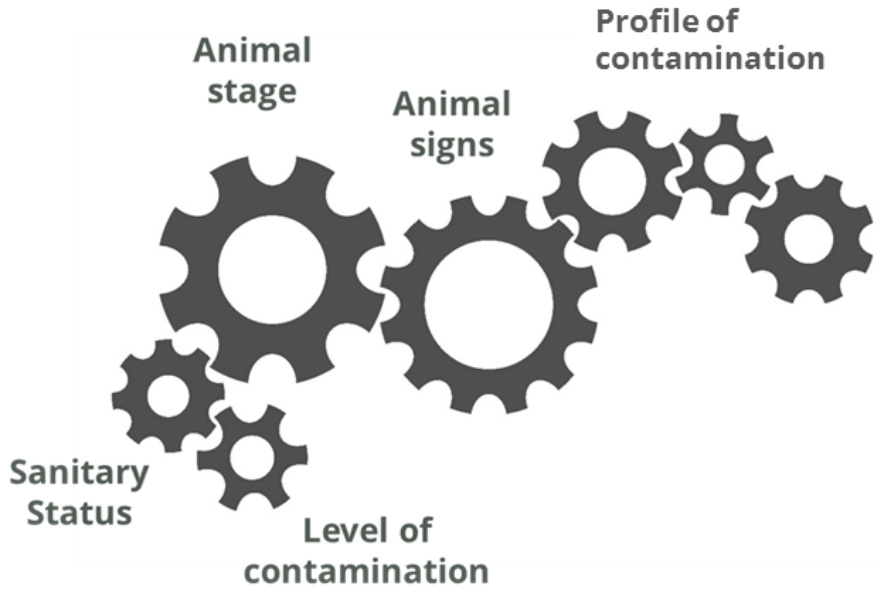
Suspicion

Confirmation

Solution

Optimize solution

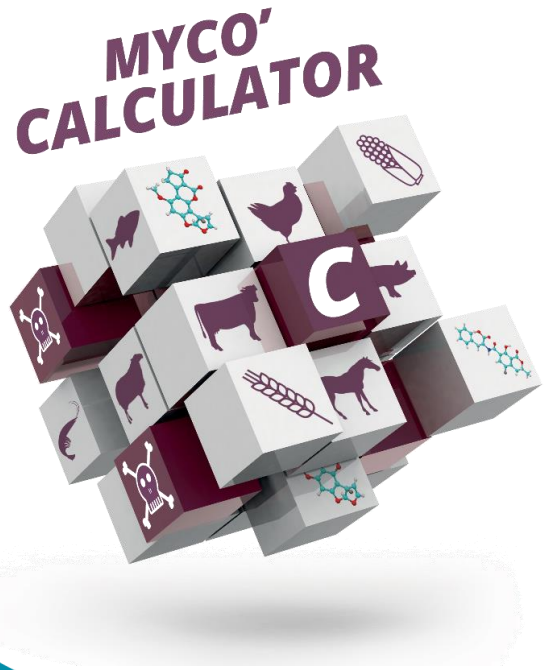
Must have



➔ ? kg of MT.X+/ton

Contact Olmix Technical Service

Mycotoxins effects on animals → Suspicion → Confirmation → Solution → **Optimize solution** → Must have



Provides dosage recommendation considering:

- Mycotoxin level
- Mycotoxins interactions (up to 13 mycotoxins)
- Method of analysis (Elisa vs chromatography)
- Animal species and stage
- Health status on farm

100 g/T precision for optimum cost-effectiveness!

Mycotoxins effects on animals → Suspicion → Confirmation → Solution → Optimize solution → **Must have**

OLMIX MYCO'NEWS

- **Quarterly Newsletter**
- Information on mycotoxins based on **scientific sources**
- 2 topics per edition
- Very **quick to read**

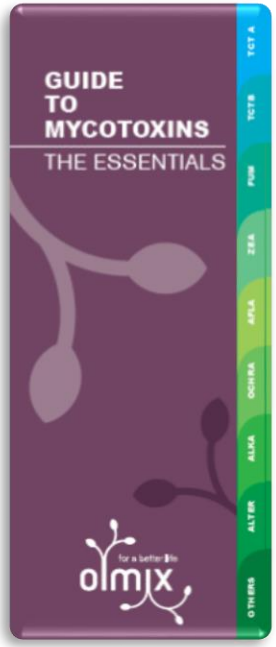

OLMIX MYCO'NEWS

New data on mycotoxins occurrence and correlations depending on the type of raw materials

This week, Winnipeg will hold the 9th conference of the World Mycotoxin Forum, in which Olmix has been participating since 2006 and submitting interesting information on its research and developments. This year Olmix has 4 communications, including 2 posters co -published with LABOCEA (French public lab), comparing different profiles of contamination between grains and corn materials. These studies permit to better understand the different types of polycontamination depending on the type of material, mode of harvest and storage conditions.

➔SUBSCRIBE

Mycotoxins effects on animals → **Suspicion** → **Confirmation** → **Solution** → **Optimize solution** → **Must have**



EXPERTISE TOOLS

Olmix Mycotoxins

● RISK EVALUATOR

Risk Evaluator is an interactive tool to evaluate the mycotoxin risk on the farm.

▶ Calculate a percentage of risk to have a significant level of mycotoxins in the feed.

Olmix

● MYCOSCREEN:

expertise on Mycotoxins Analysis

Olmix provides customized advices on mycotoxins analysis in order to better handle the risk in feed mills and farms.

▶ An overview of over 40 mycotoxins and metabolites. Olmix experts give you the keys to interpret the analysis and turn it into practical actions.

Olmix

● CALCULATOR

Optimizes toxin binder dosage

Depending on each situation, Olmix helps you to determine the most suitable dosage of MT.X+/MMi.S.

Olmix Mycotoxins

● ESSENTIALS

Olmix kwowledge

The Guide to Mycotoxins, The Essentials, helps you to better understand each mycotoxin specificity.

● Olmix **Myco'News** (newsletter) provides you the latest scientific findings about mycotoxins.

for a better life olmix


ขอบคุณครับ
Cảm ơn!
SALAMAT PO!
danke
謝謝
ngiyabonga
teşekkür ederim
спасибо
thank you
gracias
dank je
tapadh leat
bedankt
dziękuję
obrigado
sukriya
kop khun krap
go raibh maith agat
arigatô
dakujem
terima kasih
grazie
merci
Cảm ơn!
ขอบคุณครับ


Thank You