

APLICACIONES ESPECIALES DEL VALLES, S.L.

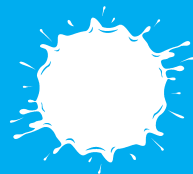
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Classification of Mycotoxins



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THE FUNGUS AND ITS MYCOTOXINS

INTRODUCTION.

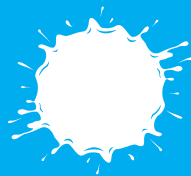
- What are Mycotoxins? Mycotoxins are toxic compounds made by different fungus. The exposure to the Mycotoxins (Mycotoxicosis) can generate an acute and chronic toxicity. Moreover, the results can generate the death or other damages hazardous to the central nervous system, cardiovascular, respiratory and to the human gastrointestinal tract. The most important effect caused by Mycotoxins is the obstruction of the immune response and therefore the reduction of the resistance to infectious injuries.



Foto: Corn with fungus.

The influence of different mycotoxins in feed and fodder can produce different mixtures of mycotoxins in the same feed, specially in cereals, and affect the level of production of mycotoxins and the level of toxicity of the contaminated material too.

Mycotoxins affect the efficiency of the livestock reducing the productivity, the growth and it can even cause animals' death. Consequently, different compounds with positive effects to Mycotoxins have been created recently. These products are called **abductors or recruiter of Mycotoxins**. They are some Products or Mixtures of other products. Their immediate effect is to abduct different Mycotoxins and to reduce their negative effects to the animal. The main products in order to fight the Mycotoxins are the Phyllosilicates, it is because they are three-dimensional and they have a big contact area, porosity and ionic interactions too.



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Table 1 shows. **Mycotoxins** found as contaminating for the food and its effects.

<i>Mycotoxin</i>	<i>Effects</i>	<i>Fungus product</i>	<i>Grup IARC*</i>	<i>Tolerance limit</i>
Ochratoxin A	Neurotoxics Nefrocancerígens	Penicillium verrucosum Aspergillus ochraceus	2B	3 mg/kg (cereals)
Zearalenone (F-2 o ZEN)	Estrogens Genotoxics	Fusarium graminearum F. culmorum	3	1 mg/kg (cereals)
Patulin	Few experimental or clinic Evidences about its effects with humans	Penicillium expansum	3	50 mg/l (apple juice)
Trichothecene	Cytotoxics	Fusarium graminearum	3	0.5 mg/kg (cereals)
Deoxinivalenol (DON)	Immunosuppressives	F. verticillioides F. culmorum		0.75 mg/kg (flour)
Fumonisin (FB1, FB2 y FB3)	Leucoencefalomalacia in equines Pulmonary edema in porcines Cancer in humans	Fusarium verticillioides F. proliferatum	2B	1 mg/kg per FB1 i FB2 (corn)
Aflatoxins AFB1, AFB2, AFG1 y AFG2	Carcinogenic Mutagens Teratogens	Aspergillus flavus A. parasiticus	1	20 mg/kg per aflatoxins 5 mg/kg per AFB1 in cereals

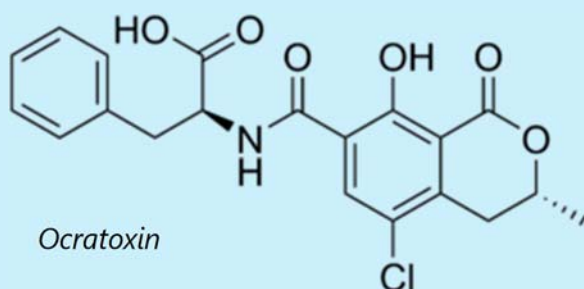
* International Agency for Research on Cancer.

Types of Mycotoxins:

- **OCHRATOXIN**. Mycotoxins which affect the central nervous system and can cause kidney cancer. These Mycotoxins are caused basically by *Penicillium verrucosum* in cold areas, by other species of *Aspergillus* and in some areas with Tropical climate too. Usually it happens naturally in most of the cereals but it depends on the weather conditions and the conditions of the harvest and post-harvest.

These are stable molecules and they tend to resist most of the process of products' elaboration. *

* Boiled, toasted, baked, fried and fermented.

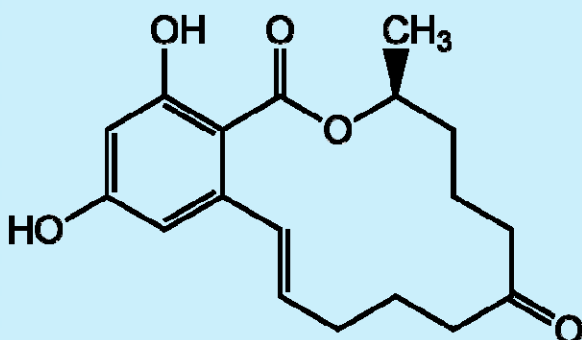


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- **ZEARALENONE (F-2 o ZEN)**. Mycotoxins which affect the reproductive system, they cause an excess of production of Estrogens to the sows. There is not high evidence of their capacity of causing cancer but there is high evidence of their capacity of causing mutations. Usually it happens naturally in most of the cereals and we can find them in other products too.

These Mycotoxins are molecules partially degraded due to the effect of the temperature (120 a 140 ° C). Consequently, there will be remains in the processed products.

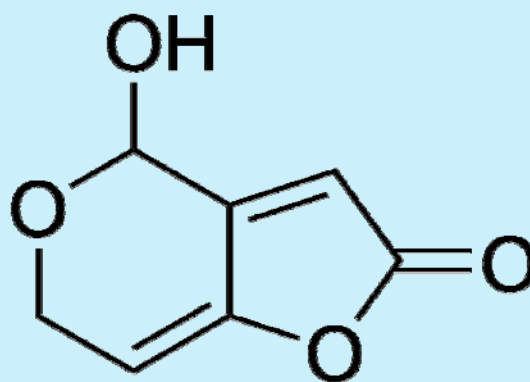


Zearalenone F2

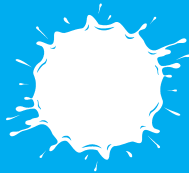


- **PATULIN**. It is a toxic compound caused by a big variety of mushrooms of Aspergillus and Penicillium. The most important one is the P. expansum which contaminate apples and other fruits. It is highly irritating for the stomach and it normally causes nausea and vomits.

It is degraded with dioxide of sulphur. (SO₂).



Patulin



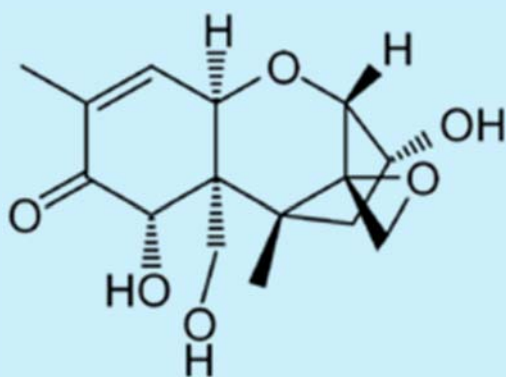
- **TRICHOTHECENE.** They are toxic compounds caused by a big variety of mushrooms of *Fusarium graminearum*, *F. verticillioides* and *F. Culmorum*. They are characterized by gastrointestinal alterations, like vomits or diarrhoea; moreover they are extremely toxic in cellular levels. (cytotoxics).

They are classified into 2 groups.

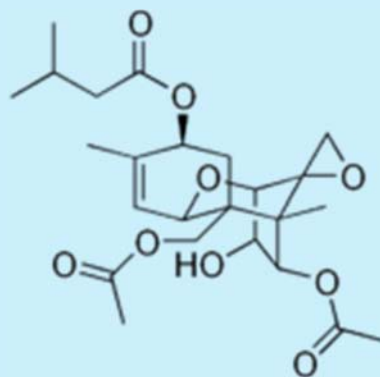
- Group **A**, it includes toxin T-2 and HT-2.
- Group **B**, it includes deoxynivalenol (DON) or vomitoxin, nivalenol and fusarenon X.

Usually it happens naturally in most of the cereals but it depends on the weather conditions and the conditions of the harvest and post-harvest.

Deoxynivalenol (DON) or Vomitoxin, one of the most important mycotoxins, it is characterized for causing vomits and diarrhoea, it can even cause necrosis to the lymphoid texture and to the gastrointestinal tract. It is thermally stable (*), still soluble in water, it can be eliminated by different processes of cleaning.



Deoxynivalenol



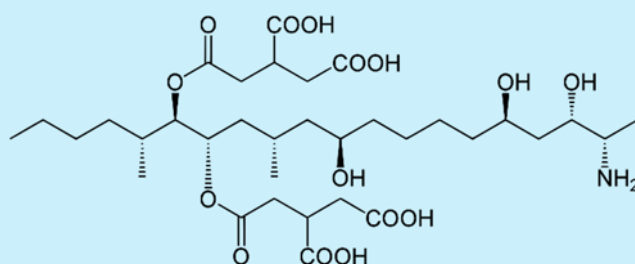
Toxin T-2

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- **FUMONISINS.** These are mycotoxins caused basically by *Fusarium verticillioides* and *F. Proliferatum*. It exists at least three fumonisins, FB1, FB2 and FB3, ordered from less abundant to more abundant. These mycotoxins produce a big variety of negative effects to the animals; Leucoencefalomalacy in equines, pulmonary edema in porcines, toxicities in the kidney and cancer in the liver of rats.

Usually it happens naturally in cold areas in which corn is harvest. They are stable in areas where the climate is moderately warm and their degraded products are toxics too.

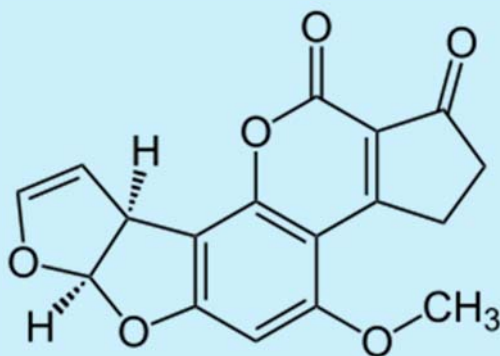


Fumonisin, FB1

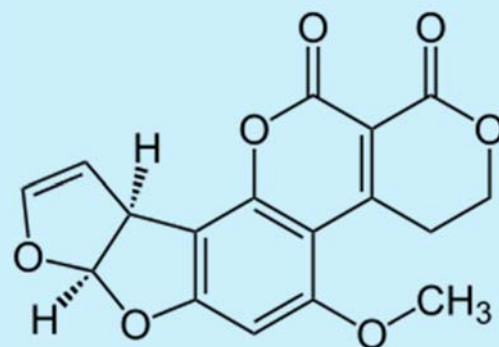


- **AFLATOXINS.** The 4 main mycotoxins are subdivided into 2 groups, B and G, with a fluorescent base of Blue-Blue or Green-Green which are shown with Ultraviolet light. These are AFB1, AFB2, AFG1 and AFG2. Caused by some core of *Aspergillus Flavus* and *A. parasiticus*.

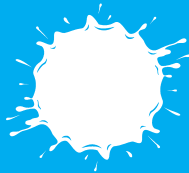
They are produced in the field, like their storage space. Associated with a big quantity of products. The investigation of these mycotoxins had determined their carcinogenic power and the products are almost impossible to eliminate.



Aflatoxin B1



Aflatoxin G1



How we can battle against the mycotoxins.

The best preventive measure in order to reduce the contamination of agricultural products is using toxigenic mushrooms. Nowadays different studies are being done in different varieties of crops, different kinds of agricultural techniques, etc... It is also important in order to reduce the impact of these effects to the animals and human beings. The fact is that with the international business there is a big incoming of new products and they are not controlled hundred per cent. Therefore, in order to avoid problems different products have been created, these products are called abductors, recruiter or sensors of Mycotoxins. Furthermore, their aim is to eliminate the mycotoxins.

Chelators Mycotoxins or
Absorbent Micotoxines or
Catchers Micotoxines

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1.- Product:

Set of phyllosilicates treated physically and chemically in order to acquire a large catchment area.

2.- Company and commercial name:

The company **APLICACIONES ESPECIALES DEL VALLES S.L.** is registered in the Register of establishments in the sector of feeding stuffs according to Regulation 183/2005 and with the number **ESP08301442** in Catalonia.

3.- Application:

Innotox is a mycotoxins binder of mineral origin and with litter capacity, suitable for use in animal feed and additives for livestock sector.

It is able to operate in any medium, either in acid, neutral and alkaline. However, it is not able to operate as other conventional products with limited capacity in acidic media. It protects animals effectively against mycotoxins avoiding productive and reproductive disorders, different damages, etc... It can be combined with other products with no risks.

4.- Results:

(*) Analysis of 2 different samples as mycotoxin binders

- Aflatoxin B1	95,1 - 95,5%
- Fumonisin B1	77,2 - 78,1%
- Zearalenone	79,8 - 80,5%
- Vomitoxin	69,8 - 70,2%
- T2-toxin	77,3 - 78,2%
- Ochratoxin A	67.5 - 67,9%



(*)Two randomized trials of 2 different batches.



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5.- Dosage:

The recommended dose for the manufacture of animal feed is 0.1% approximately, although in difficult conditions the dose could be up to 0.3%.



CHEMICAL ANALISI (% referred to dry weight)

SiO ₂	55.90
Al ₂ O ₃	9.32
Fe ₂ O	37.12
MgO	3.26
CaO	1.62
Na ₂ O	1.52

ANALYSIS OF HEAVY METALS (mg/Kg)

Chrome (Cr)	70.3
Nickle (Ni)	24.9
Lead (Pb)	0.8
Cadmium (Cd)	< 0.2
Copper (Cu)	28.7
Zinc (Zn)	50.3
Mercury (Hg)	< 0.1

6.- Storage:

In 25 Kg bags on 1200 Kg pallets, or in 1250 kg Big Bags.

Keep in dry and cool places, avoiding humid and sunny places.



This information corresponds to our present knowledae and experience, without being considered exhaustively. If the product is applied under specific conditions and in case you do mixers or combinations with other substances be careful because there can be some risks. The fulfillment of our information does not relieve the user of the product of the respect to the set of regulations, regulatory and administrative texts, in relation to safety, hygiene and the environment.

INNOTOX FNE

INNOTOX FNE



1.- Product:

Mix of phyllosilicates physically and chemically treated with extracts of beer yeast's cell wall, rich in mannan oligosaccharides (MOS) and Beta-Glucans.

2.- Company and commercial name:

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3.- Application:

Innotox Special is a mycotoxins binder based on a mineral, which it is a supplement with a balanced mixture of yeast's cell wall.

It is to improve the uptake of certain mycotoxins in acidic and alkaline phase. Moreover, their prebiotic and immunostimulant action improve the natural resistance to pathogens and the health of the intestinal flora for better growth and feed conversion too.

Innotox Special is rich in mannan-oligosaccharides and beta-glucans, proteins of high digestibility and amino acids, which are absorbable in the small intestine. In addition to stimulate appetite, it is used in young animals and it helps the immune system improving intestinal health and the growth.





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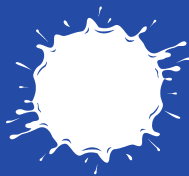
25 kg



1250 kg

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INNOTOX SPECIAL



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