



# MYCOSORB A<sup>+</sup>

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## The Alltech Advantage

The Alltech Species Advantage programs offer a holistic approach to solving feed, health and performance issues. With natural health, nutritional solutions, and environmental responsibility, the Alltech Advantage programs target producers' profitability.

Helping farmers feed the world, raise healthy animals, and protect the environment... naturally!

For over thirty years, Alltech has researched, developed and manufactured natural animal feed supplements and ingredients. Our commitment to scientific exploration in animal nutrition has resulted in several ground-breaking solutions to serious and costly animal health and performance problems.

- Over 30 years of primacy in science: The first to identify issues in the industry and provide solutions
- More with less: Better returns on investment. Nutrigenomics allows for revolutionary nutritional programs that maximise the animals' genetic potential with precise diets without waste
- Food safety and traceability (Quality Assurance program): Enforcement of the same high standards at all manufacturing sites regardless of local requirements
- Complete programs: Address feed costs, health and performance challenges
- Natural products: Offer safe and effective alternative solutions. They support the ACE principle: The future of agriculture depends on solutions that are safe for the animal, consumer and environment

**Alltech**<sup>®</sup>  
*poultry advantage*



**Alltech**<sup>®</sup>  
*pig advantage*

**Alltech**<sup>®</sup>  
*dairy advantage*

**Alltech**<sup>®</sup>  
*beef advantage*

**Alltech**<sup>®</sup>  
*equine advantage*

**Alltech**<sup>®</sup>  
*pet advantage*

**Alltech**<sup>®</sup>  
*aqua advantage*

## Pig

Pigs are extremely sensitive to mycotoxins and their presence in feed, even at low levels, can have a serious negative impact on growth performance, animal health and reproductive performance.

### Pigs are exposed to mycotoxins in a variety of ways:

- Manufactured feed formulated with contaminated ingredients
- Liquid feeding
- Straw bedding

### On-farm assessment:

The symptoms exhibited, and the degree with which pigs are affected, largely depends on the type of mycotoxin(s) involved, their respective concentration in feed and the age of the animal. Mycotoxins are extremely resilient, therefore it is important to employ strict hygiene procedures to minimise their presence in feed lines and equipment. Watch the animals for symptoms and analyse the feed with reliable mycotoxin analytical procedures.

#### Common effects of mycotoxins:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Reduced feed intake</li> <li>• Reduced growth rate</li> <li>• Decreased feed conversion efficiency</li> <li>• Increased incidence of disease</li> <li>• Vomiting</li> <li>• Rectal or vaginal prolapse</li> <li>• Sudden death</li> <li>• Bloody faeces</li> </ul> | <ul style="list-style-type: none"> <li>• Abortions</li> <li>• Increased foetal re-absorption = return to oestrus</li> <li>• Inconsistency of sow body condition</li> <li>• Reduced libido</li> <li>• Poorer semen quality = reduced fertility</li> <li>• Higher incidence of liver and/or kidney disease</li> <li>• Pulmonary oedema</li> </ul> |
|---|---|

### Individual mycotoxins and their effects on pigs:

Fungi	Mycotoxin	Tissue affected
<i>Aspergillus flavus</i>	Aflatoxin B1, B2, G1, G2	Liver necrosis, fatty infiltration of the liver, immune-suppression
<i>Aspergillus ochraceus catum</i>	Ochratoxin A	Renal nephropathy, immune-suppression
<i>Fusarium moniliforme</i>	Fumonisin Fusaric acid	Pulmonary oedema, immune-suppression Vomiting, lethargy, loss of muscle condition
<i>Fusarium graminearum</i>	Deoxynivalenol (DON, Vomitoxin etc.)	Vomiting, intestinal lesions, immune-suppression
<i>Fusarium roseum</i>	Zearalenone	Hyper-oestrogenism, abortion, infertility, prolapses
<i>Claviceps purpurea</i>	Ergotoin	Reduced appetite, gangrene, agalactica, mammary gland failure

(Smith *et al.*, 2005)

### Recommendations:

When contaminated feedstuffs are identified or a mycotoxin challenge is perceived on-farm, Mycosorb A<sup>+</sup> should be administered at the following rate:

Feeding rate: 0.5-2 Kg/ T complete feed

## The A<sup>+</sup> Advantage

Mycosorb A<sup>+</sup> is the next generation of mycotoxin binders, offering superior binding capabilities, a broader adsorption profile and increased mycotoxin sequestration efficacy. Mycosorb A<sup>+</sup> reduces mycotoxin adsorption within the animal, thereby negating the damaging effects of mycotoxins on its health.

The unique technology behind Mycosorb A<sup>+</sup> makes it the most advanced mycotoxin binder on the market.

Alltech's continued drive for product and research development has identified this new approach to mycotoxin binding. This has helped determine the precise ingredients needed to expand the binding capabilities of Mycosorb A<sup>+</sup>.

Alltech's proprietary production ensures total control of the process, complete traceability as well as conformance to global quality standards.

Backed by 18 years of research and patent protected technology, Mycosorb A<sup>+</sup> is the successor to Europe's number one selling mycotoxin binder.

...the A<sup>+</sup> Advantage.



## A Unique Product Every Step of the Way

Mycosorb A<sup>+</sup> allows for a new and unique type of interaction with mycotoxins (broad spectrum capacity and affinity).

Glycomics research  
Broader-spectrum binding

Unique production: QC  
Low inclusion rate

Consistent mode of action  
In-feed assay

## Unique Production

Given the prevalence of mycotoxin contamination in feed, producers need to be sure of the consistency, efficacy, traceability and reliability of the mycotoxin binder they choose.

The Alltech® Quality System (AQS) is applied globally to Alltech's 31 production facilities. Building the local, regional, and global requirements into AQS ensures that all Alltech ingredients and finished products are produced to the same high standard everywhere in the world.

Alltech has full control over the production of its products, including Mycosorb A<sup>+</sup>, with ownership of all manufacturing facilities being an integral part. This control and the proprietary production techniques used, together with our understanding of glycomics, have enabled us to produce a mycotoxin binder with the capabilities of Mycosorb A<sup>+</sup>. For the quality control of Mycosorb A<sup>+</sup>, Alltech uses many analytical techniques, including in vitro binding to ensure consistent performance across batches.



## Primacy in Science

Alltech is a global leader in animal health and nutrition. The cornerstone of our business is innovation through science; a philosophy that drives Alltech to continue to develop solutions that meet the largest agricultural and food industry challenges of today and tomorrow.

Increased demand on animal performance and productivity inevitably brings new challenges and risks to modern animal production. Mycotoxins, and their impact on the health and performance of animals, are inherently linked to these demands and, if left untreated, can negatively impact the producer's bottom line.

Mycosorb A<sup>+</sup> is the result of advancing mycotoxin sequestering technology and offers producers a solution that limits the effects of more mycotoxins than ever before.

## Poultry

In poultry production, feed is the key vector for introducing mycotoxins into flocks. All plant-based ingredients can contribute one or more mycotoxins to the complete feed. As a result, mycotoxin interactions are very common, and often such interactions are synergistic in nature. Such contamination can seriously affect bird performance and result in economic losses.

### Birds are exposed to mycotoxins mainly in two ways:

- Manufactured feed formulated with contaminated ingredients
- Bedding material contamination

### On-farm assessment:

Mycotoxin symptoms can be very general and can vary greatly between mycotoxins, making accurate diagnosis difficult. Careful monitoring, recognition of symptoms and post-mortem analyses, combined with adequate feed analyses, provides the most accurate means of determining a mycotoxicosis diagnosis within large flocks of poultry.

### Common effects of mycotoxins:

- Reduced feed intake
- Pale and enlarged liver
- Kidney damage
- Bile duct hyperplasia
- Oral and intestinal lesions
- Tibial dyschondroplasia
- Reduced vaccination response
- Spiking mortality
- Wobbly gait
- 'Pale bird' syndrome
- Poor bone strength and egg shell quality

### Recommendations:

When contaminated feedstuffs are identified or a mycotoxin challenge perceived on-farm, Mycosorb A<sup>+</sup> should be administered at the following rate:

Feeding rate (includes breeders, broilers, layers, ducks, game birds, turkeys and ratites): 0.5-2 Kg/ T complete feed

Starter feed: 0.5-2 Kg/ T complete feed

Grower feed: 0.5-1Kg

Finisher/Layer feed: 0.5 Kg-1Kg/T



## Ruminant

Ruminant diets generally include both concentrates and forages, thus increasing the risk of mycotoxin exposure. Forages, fermented feeds and by-products represent an important source of contamination depending on soil contamination, forage harvesting, silage management and storage conditions.

### Dairy cows and beef cattle are exposed to mycotoxins in a variety of ways:

- Growing pasture (fungal contamination of grasses)
- Manufactured feed formulated with contaminated ingredients
- Silage contamination

### On-farm assessment:

To effectively recognise mycotoxicosis and make an accurate diagnosis, it is advisable to assess herds with the help of your veterinarian, nutritionist or feed advisor for associated symptoms, combined with a reliable feed, or feed ingredient, mould and mycotoxin analysis.

### Common effects of mycotoxins:

- Variable feed intake and inconsistent milk yield
- Compromised rumen function – poor digestibility
- Scouring
- Increased susceptibility to diseases
- Increased somatic cell count (SCC)
- Poor anti-oxidant status
- Reduced fertility

### Identification of mould in silage:

Fungus	Mould colour	Associated toxin(s)
<i>Penicillium</i>	Green-blue	Ochratoxin, Citrinin, Patulin, PR toxin
<i>Aspergillus</i>	Yellow-green	Aflatoxin, Ochratoxin
<i>Fusarium</i>	Pink-white	Zearalenone, DON, T-2 toxin, Fumonisin

(Mahanna, 2009)

### Recommendations:

When contaminated feedstuffs are identified or a mycotoxin challenge perceived on-farm, Mycosorb A<sup>+</sup> should be administered at the following rate:

Feeding rate: 10-30g/cow/day  
 Maintenance: 10g/cow/day

Step down: 30g for 2 weeks followed by lowering dose based on the response magnitude

## The Glycomics Story

Understanding the role of the different structural carbohydrates of the yeast cell wall is key in the production of a yeast-based sequestrant with unique characteristics.

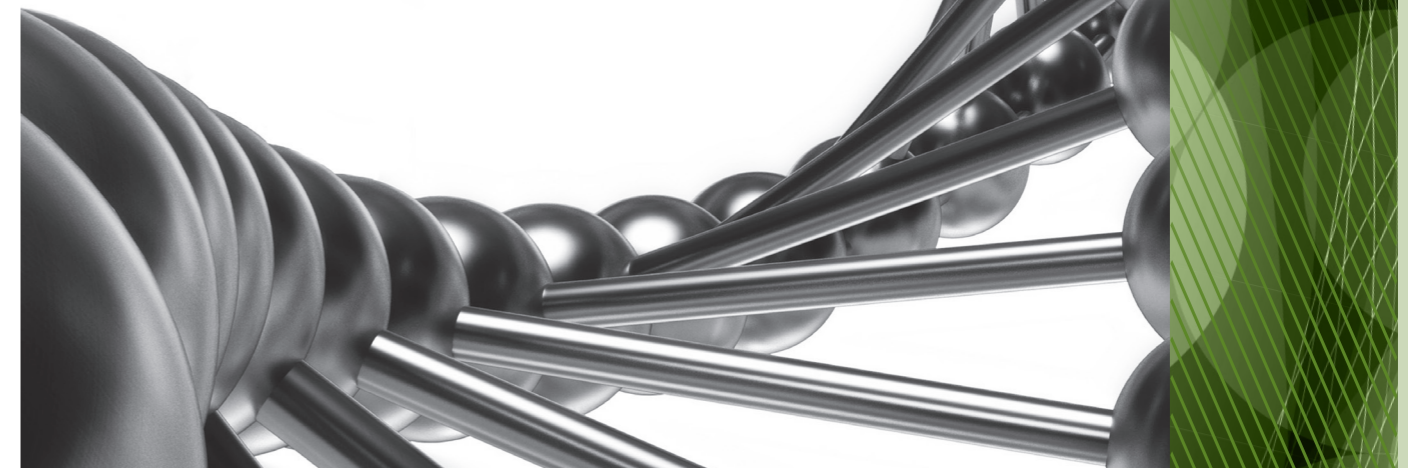
Level 1: Sensor level → Plasmic membrane receptors are able to sense the environmental conditions in terms of nutrient levels, pH, osmotic pressure and carbon sources etc.

Level 2: Signalling pathway → Phosphorylation or dephosphorylation of proteins and enzymes can trigger the activation or repression of a signalling pathway that can, in turn, condition gene expression

Level 3: At the genome level → According to the signalling pathway, transcription factors will be produced and transferred to the nucleus where they will induce a specific gene expression response

Level 4: Reorganisation of the cell wall → Depending on the genes involved, and the gene expression, RNA will be produced and will, in turn, be translated into proteins. Among these proteins are the ones involved in the construction of the intracellular oligosaccharide chains and extracellular cell wall carbohydrate network. As a result, changes in composition of the carbohydrate fraction might occur

The understanding of this mechanism allows us to positively influence the composition of the yeast cell wall and consequently, the potential sequestering ability of the yeast cell wall produced.



## Economic Impact of Mycotoxins

Animals come into contact with mycotoxins via pasture, preserved forages, grain, by-products, complete commercial feeds and bedding. Many toxins have now been classified by their impact on animal health, performance and welfare. The variety of toxins that may be present within forage, feed or bedding depends on the number and types of mould and fungal growth on these materials, which in turn dictates the symptoms that may be observed.

The toxic effects and clinical symptoms observed when more than one mycotoxin is present in feed are complex and diverse. The negative effects on productivity and health of multiple mycotoxins are considered to be greater than the sum of their individual effects.



# 37+

Alltech's 37+ program can assist with the detection of, and addressing the risks caused by, over 37 mycotoxins with confidence using a holistic approach to managing your mycotoxin challenge. Here you will find out more about our 37+ program.

### Mass Spectrometry method:

This sophisticated test has the ability to identify 37+ mycotoxins at a time in finished feeds, raw materials or forage. This multi-mycotoxin analysis will allow you to take a one-time testing approach to detect the specific cause of your mycotoxin problem and avoid the risk of dealing with masked mycotoxins. Mycotoxins analysed include:

Aflatoxin B1	Nivalenol	Roquefortine C
Aflatoxin B2	Fusarenon X	Penicillic Acid
Aflatoxin G1	T2 toxin	Wortmannin
Aflatoxin G2	HT2 toxin	Alternariol
Sterigmatocystin	Diacetoxyscirpenol	Verruculogen
Gliotoxin	Neosolaniol	2-bromo-alpha-ergocryptine
Ochratoxin A	Fumonisin B1	Ergocornine
Ochratoxin B	Fumonisin B2	Ergometrine/Ergonovine
Deoxynivalenol	Fumonisin B3	Ergotamine
3-AcDon	Zearalenone	Lysergol
15-AcDon	Patulin	Methylergonovine
DON-3-Glucoside	Mycophenolic Acid	+ 3 isotopically labeled toxins





**MYCOTOXIN**  
MANAGEMENT

It's important to realise that mycotoxins represent an unavoidable risk. What is needed are analytical tools that can work as a selective "surveillance radar" to identify the degree of mycotoxin contamination and reduce the risk through an appropriate strategy. Qualifying and quantifying mycotoxin presence is the first step to permit adequate protective methods which require accurate sampling methods and mycotoxin measurement.



**MIKO**  
MYCOTOXIN HAZARD  
ANALYSIS PROGRAM

To assist feed mills and producers, Alltech has recently launched its MIKO (Mycotoxin Hazard Analysis) program. Based on HACCP principles (Hazard Analysis Critical Control Points), the program is designed to identify the mycotoxin risks within a given farm or feed mill and create a plan to minimise the risks for the animal.

The goal of the MIKO program is to understand the level of mycotoxin challenges in the supply chain so that the right steps can be taken to try and mitigate their negative effects on animal performance and food safety. This involves establishing the correct monitoring procedures as well as identifying critical levels for the given animal species being fed. With this information, the right balance can be struck between economical feeding and optimal animal performance as it relates to mycotoxins.



## Economic Impact of Mycotoxins: Ruminant

Economic losses associated with mycotoxicosis include:

- Forage losses
- Reduced milk production
- Milk discards
- Increased vaccination costs
- Increased treatment costs
- Increased mortality rates
- Reproductive losses

Calculating the cost of mycotoxicosis in dairy cows:

- Reduction in dry matter intake (DMI) of 1.013kg
  - Reduction in 4% fat corrected milk (FCM) of 2.2kg
  - Increase in somatic cell count of 224 800 cells/ml
- Acosta et al., Unpublished*



## Economic Impact of Mycotoxins: Poultry

Economic losses associated with mycotoxicosis include:

- Poor gains → increased days to market
- Reduced egg production
- Increased egg and meat discards
- Increased cost of production
- Under utilisation of housing capacity
- Increased mortality rates
- Decrease in chick production
- Leg problems

Calculating the cost of mycotoxicosis in laying hens:

- 6% decrease in egg production due to mycotoxins
  - 13% increase in feed intake due to mycotoxins
- Chowdhury et al., 2004*

Calculating the cost of mycotoxicosis in turkeys:

- Reduced body weight gain of 430g over 12 week grow out
- Girish et al., 2008*

Calculating the cost of mycotoxicosis in broilers:

- Reduced body weight gain of 351g
  - Increased FCR of 0.26
- Raju and Devegowda, 2000*



## Economic Impact of Mycotoxins: Pig

Economic losses associated with mycotoxicosis include:

- Reduced gains
- Increased cost of production
- Increased days to market
- Poor utilisation of growing facilities
- Increased vaccination and treatment costs
- Increased mortality rates
- Abortions
- Poor conception rates
- Carcass condemnation

Calculating the cost of mycotoxicosis in gilts and sows:

- Increased stillborn piglets from 6.6 to 15.5%
  - Increased body weight loss of 0.61kg/d
  - Increased weaning to estrus from 6.3 to 15 days
- Diaz-Llano and Smith, 2006 & 2007*

Calculating the cost of mycotoxicosis in piglets:

- Reduced average daily gain (ADG) from 0-21d of 0.148kg
- Swamy et al., 2002*

