



*min-a-zel<sup>®</sup> Plus*

**ADVANCED  
MYCOTOXIN CONTROL**

# mycotoxins

prevention is the only solution

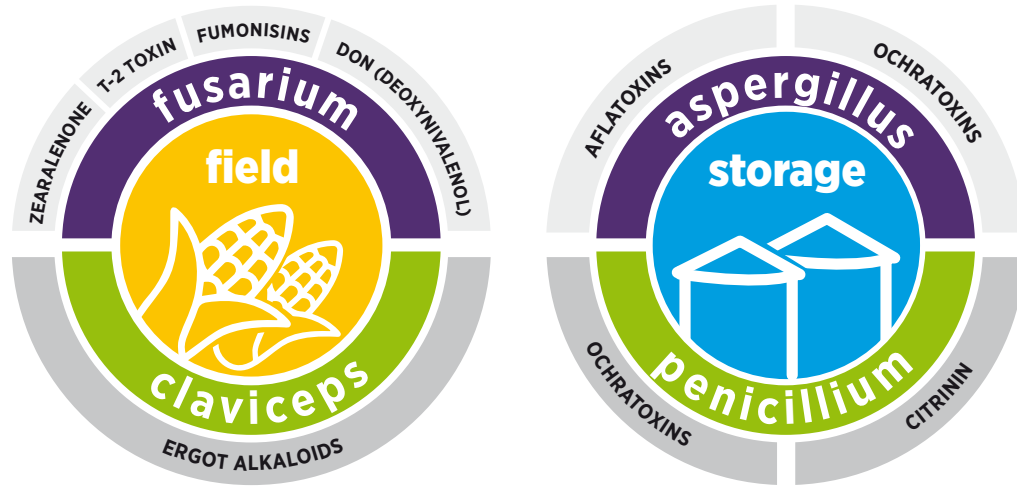


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## —mycotoxins

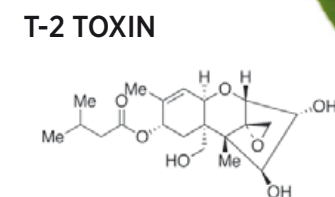
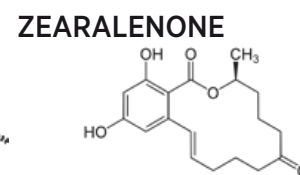
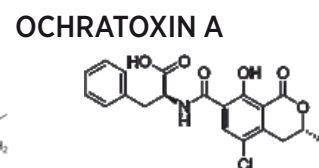
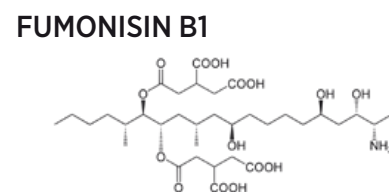
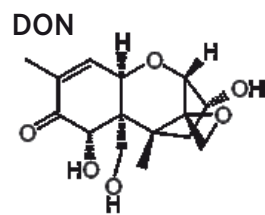
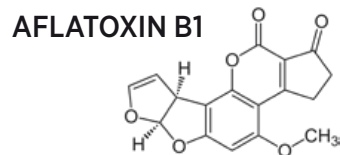
Mycotoxicosis is the group of diseases and disorders in animals and humans caused by toxic secondary metabolites (mycotoxins). Mycotoxins are produced by various fungi species. Mycotoxins can be divided into groups based on the source of origin:



**—flow**



## —most significant mycotoxins



—presence



Presence of moulds  
doesn't necessarily  
imply presence of  
mycotoxins.



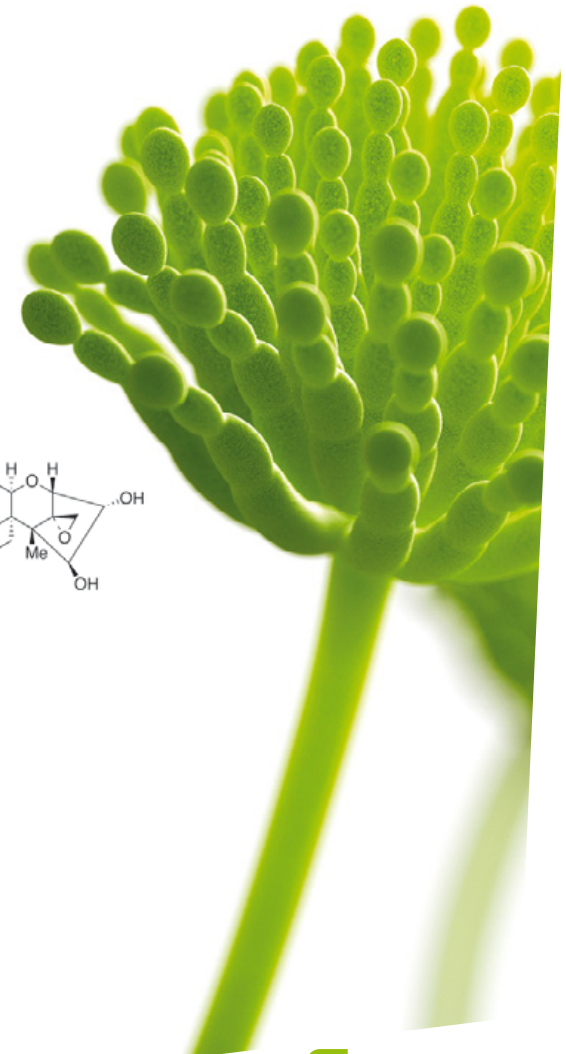
2

On the other hand, mycotoxins can be present even without visual presence of moulds.



3

At a certain stage in plant development, moulds can produce mycotoxins which persist even when the moulds are destroyed due to unfavourable conditions for development.



# Aflatoxin B1

## mycotoxycosis

### clinical signs



Liver damage  
Higher mortality  
Abortions  
Poor feed efficiency  
Reduced feed intake  
Carcinogenic effects



Liver damage  
Decrease in body weight  
Loss of appetite  
CNS disorders (ducklings and turkeys)  
Weakness of the legs and relaxed wings (chicks)  
Blood coagulation disorders  
B vitamins and amino acid metabolic disorder  
Loss of immunity



Carcinogenic effects  
Liver damage  
Decreased milk production  
Poor feed efficiency

# Zearalenone



Vulvovaginitis  
Enlargement of the uterus  
Sterility  
Testicular atrophy in boars  
Abortions  
Diarrhoea  
Body weight loss  
Splay-leg in piglets



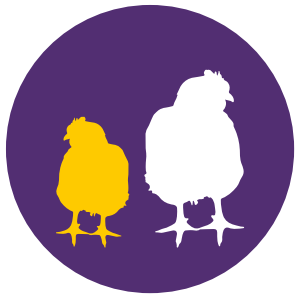
Less sensitive to Zearalenone



Decreased milk production  
Infertility  
Reproductive disorders  
Reduced feed intake

## mycotoxycosis

### visual signs



Poor growth  
- broiler -



Hepatic changes (pale)  
- pig -



Vulvovaginitis  
- sow -



Splay-leg  
in piglets

# Ochratoxin A



Severe renal failure  
Polyuria (increased urination)  
Polydipsia (increased water intake)  
Poor growth  
Impaired FCR  
Diarrhoea



Kidney damage  
Polydipsia (increased water intake)  
Poor egg-shell quality  
Decreased egg production  
Decreased feed intake  
Immunosuppression



Less sensitive to Ochratoxin A



## + synergistic effect of mycotoxins

The combined negative effects of mycotoxins on productivity and health of animals appear to be greater than the sum of their individual effects



Kidney damage  
- pig -



Blood in urine  
- pig -

# Trichothecenes



Haemorrhaging and enteritis  
Reduced feed intake  
Vomiting  
Complete feed refusal  
Immunosuppression



Oral and dermal lesions  
Decrease in egg weight  
Increased number of soft-shelled eggs  
Immunosuppression  
Decreased performance



Immunosuppression in calves  
Decreased milk production  
Reduced protein content in milk  
Reduced feed intake



Mouth lesions  
- duckling -



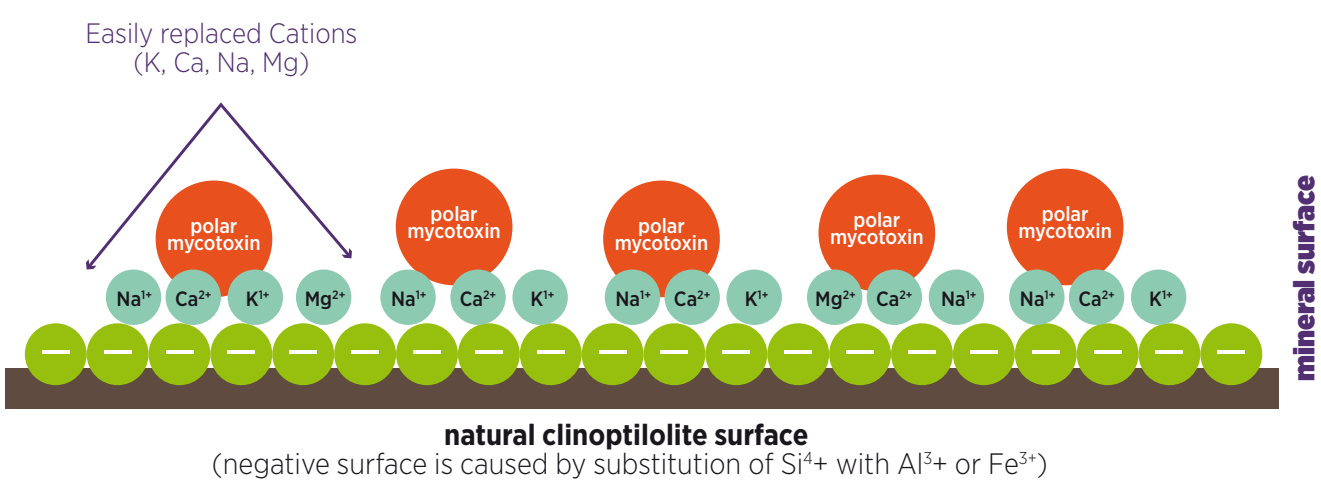
Mouth lesions  
- broiler -



# —mycotoxin binder patented technology

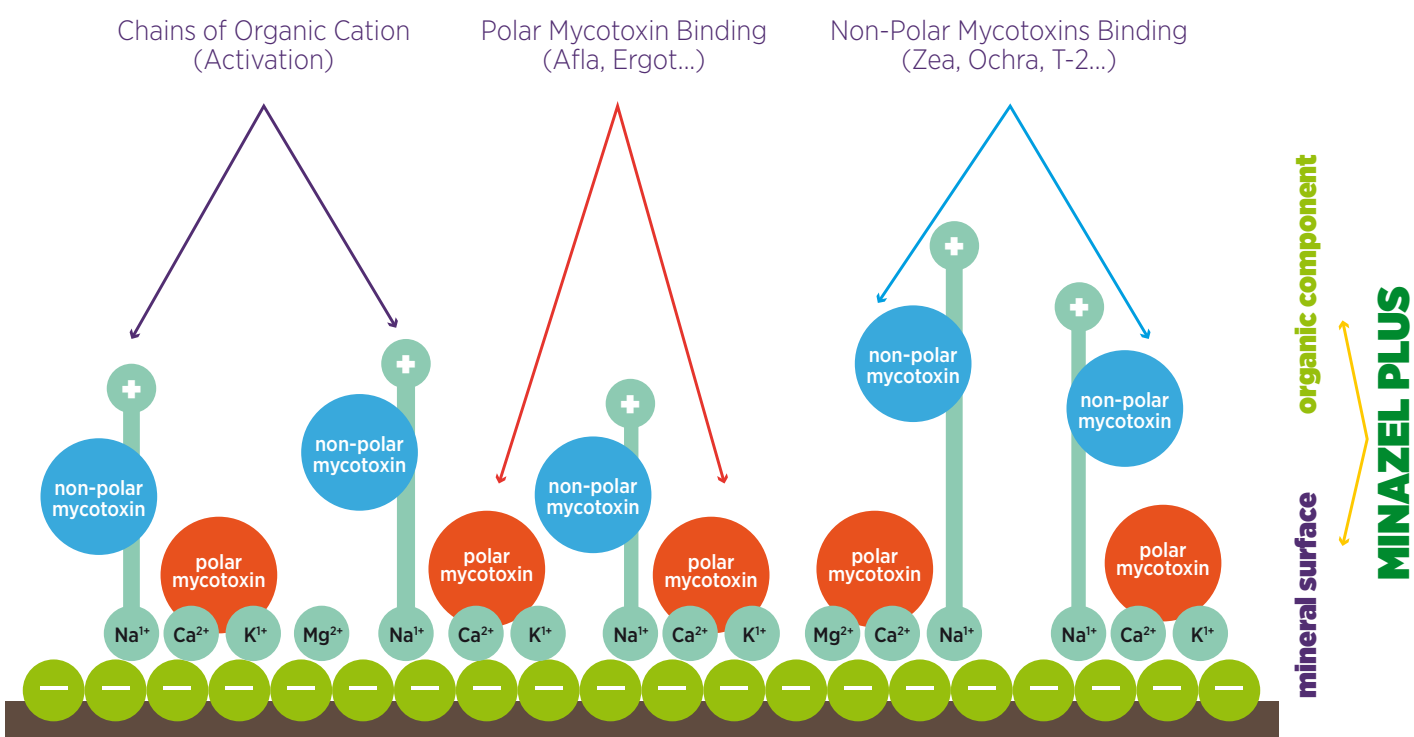
MINAZEL PLUS is a NEW COMPOUND created by patented technology, consisting of a:

- Mineral component
- Organic component



MINAZEL PLUS is the result of an ion-exchange reaction between inorganic cations on the mineral surface and organic cations.

The addition of organic cations serves to change the mineral surface. The result of this addition is not a simple mixture of mineral and organic phase, but a completely new compound, organo-mineral complex.



New active centres, which are formed on the mineral surface, ensure efficient binding (over 90%) of not only POLAR MYCOTOXINS (Aflatoxins, Ergot Alkaloids, etc.) but also of NON-POLAR MYCOTOXINS (Zearalenone, Ochratoxin A, T-2 toxin, etc.).

# —dosage [kg/MT]

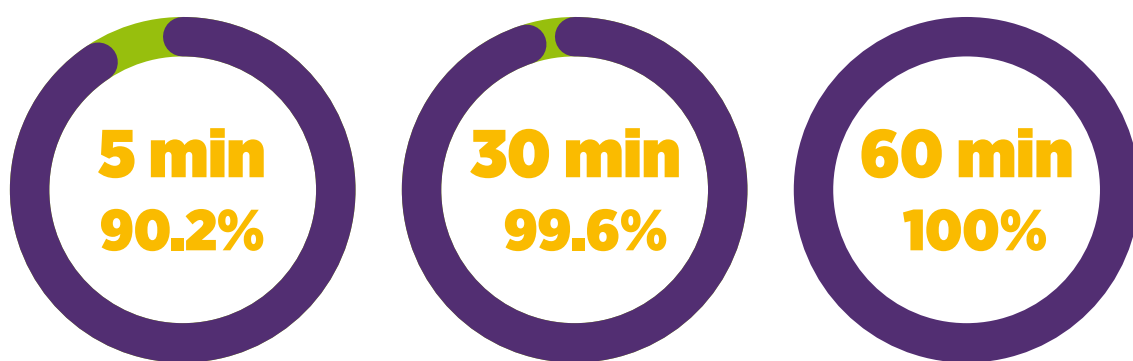


# —product characteristics

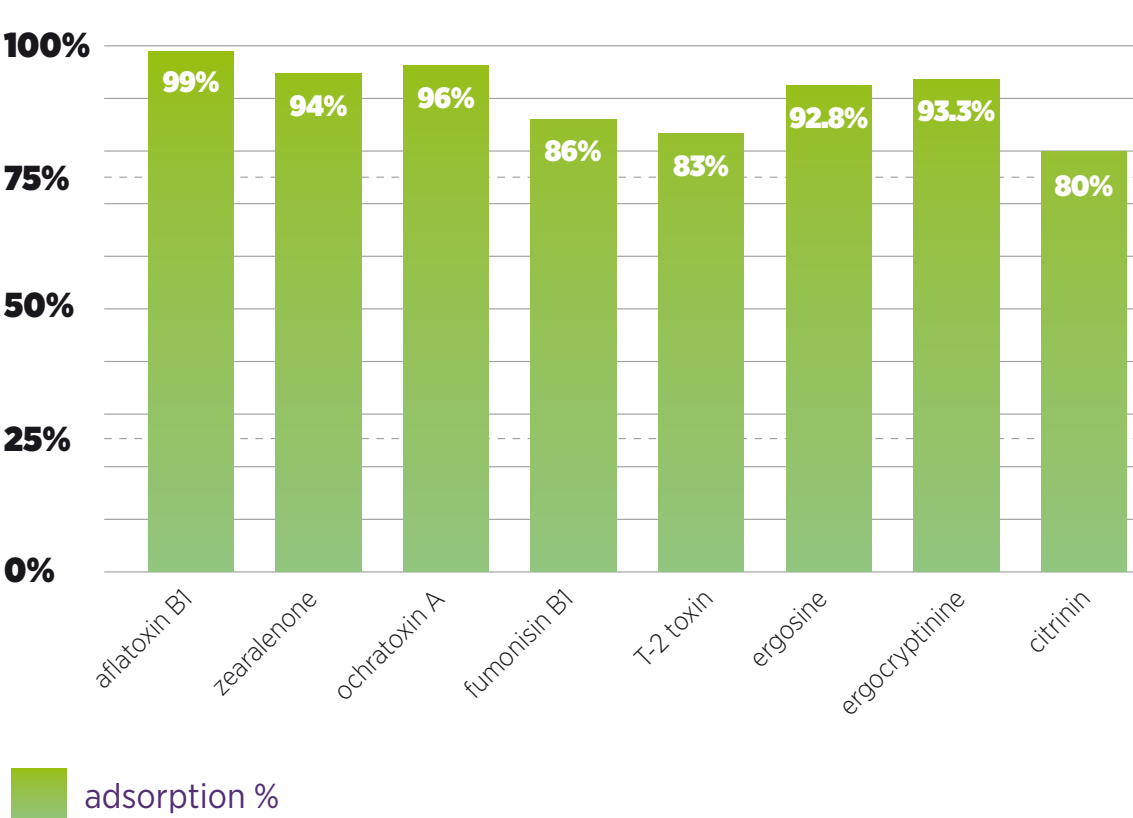
Adsorption speed is a very important characteristics of mycotoxin binders.

Some mycotoxins are quickly adsorbed after oral intake. After 30 minutes, they can be found in the blood, and after 60 minutes in the liver.

## 1 MINAZEL PLUS – adsorption speed:



## 2 MINAZEL PLUS - is highly effective (IN VITRO trial results):



## 3 MINAZEL PLUS - very selective, does not absorb nutrients (vitamins, oligoelements and amino acids)

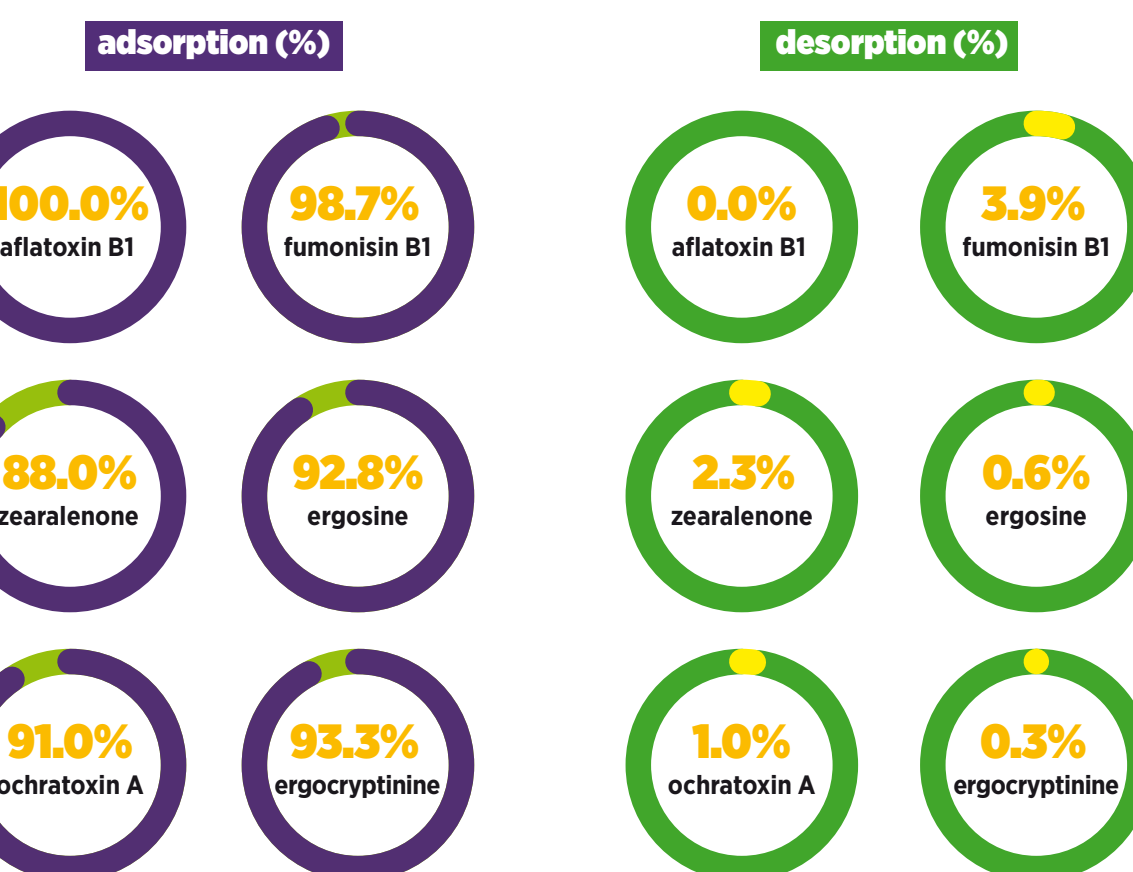
### IN VITRO ADSORPTION/DESORPTION STUDIES

#### Materials and Methods – Adsorption

- Solution was adjusted to pH 3.0
- MINAZEL PLUS concentration 0.2%

#### Materials and Methods – Desorption

- Solution pH was adjusted to 6.5



# —trials pigs

## HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF WEANED PIGLETS FED WITH FEED MIXTURE CONTAMINATED BY ZEARELENONE WITH ADDITION OF MINAZEL PLUS

M. Speranda, et al; Acta Veterinaria (Belgrade), Vol. 56, No. 2-3,121-136,2006.

GROUP	body weight start		body weight final	
	AVERAGE VALUE	SD	AVERAGE VALUE	SD
C1	13.11	1.63	16.49	1.46
C2	13.68	1.55	16.93	1.76
E1	12.56	2.18	16.64	1.52
E2	12.71	2.05	15.70	2.60

(C1) without Zearalenone and without MINAZEL PLUS  
(C2) without Zearalenone and with 2kg/MT of MINAZEL PLUS  
(E1) with 3mg/kg of Zearalenone and with 2kg/MT of MINAZEL PLUS  
(E2) with 3mg/kg of Zearalenone and without MINAZEL PLUS

HISTOPATOLOGICAL FINDINGS	GROUPS			
	C1	C2	E1	E2
Hepatitis interstitialis	0/0	0/0	1/5	4/5
Depletio lymphocitaria lienis et lymphonoduli	0/0	0/0	2/5	5/5
Many secondary oocytes	0/0	0/0	0/5	5/5
Hyperplasia glandularis uteri	0/0	0/0	1/5	5/5
Primary follicles on ovaries	2/5	2/5	3/5	5/5

## CONCLUSION:

### Piglets fed with Zearalenone contaminated feed (E2) have shown:

- Sex organ pathological changes (ovaries and uterus)
- Interstitial inflammation of liver
- Muscle inflammation
- Significantly lower Iron level in blood serum

### Piglets fed with Zearalenone contaminated feed with addition of MINAZEL PLUS (E1) have shown:

- Negligible changes to sex organs
- No pathological hepatic and muscle changes
- No effect on iron level in blood serum

## MINAZEL PLUS has successfully prevented the negative effects of Zearalenone!

## RESULTS OF MINAZEL PLUS APPLICATION IN SOWS

Djordje Avakumovic, PhD, Prof. Vitomir Vidovic, PhD, Farm in Pancevo, Serbia

DESCRIPTION	TOTAL	
	T	C
Number of farrowings	48	50
Litters with vulvovaginitis	3	48
Litters with diarrhoea	4	35
Number of dead piglets	59	133
Mortality %	11.8	25.4

### T-Trial group

Sow feed was contaminated with 1.7 mg/kg of Zearalenone with addition of 2kg/MT of MINAZEL PLUS

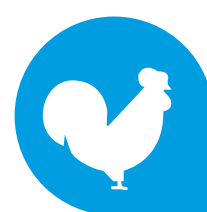
### C-Control group

Sow feed was contaminated with 1.7 mg/kg of Zearalenone without addition of MINAZEL PLUS

## CONCLUSION:

It can be concluded from the trials that the application of MINAZEL PLUS at a concentration of 0.2% in sow feed considerably reduced:

- Number of litters with vulvovaginitis
- Occurrence of diarrhoea in suckling piglets
- Mortality rate



# —poultry and ruminant trials

## RESEARCH ON THE PREVENTIVE EFFECTS OF MINAZEL PLUS ON AFLATOXIN B1 EXPOSED POULTRY

Radmila Resanovic, PhD, University of Belgrade, Faculty of Veterinary Medicine Belgrade 2000

TRIAL PHASE	GROUPS	
	C - body weight (g)	T - body weight (g)
Start	832.0	789.0
End	1836.5	1968.3

Aflatoxin B1 residues in liver			Aflatoxin B1 residues in meat		
Group	C	T	Group	C	T
Σ, %	100	0	Σ, %	70	0

### C- Control group

Broilers were fed 0.1 mg/kg of Aflatoxin B1 per os, without addition of MINAZEL PLUS

### T-Trial group

Broilers were fed 0.1 mg/kg of Aflatoxin B1 per os, with addition of 3 kg/MT of MINAZEL PLUS

## CONCLUSION:

### In broilers exposed to Aflatoxin B1 without MINAZEL PLUS (CONTROL GROUP)

- pathoanatomical and pathohistological changes were present in:
  - Liver, kidneys, spleen, stomach, muscles
- aflatoxin B1 residues were present in:
  - Liver, kidneys, spleen, stomach, muscles
- Negative effects on body weight and daily gain were noticed

In the trial group with the addition of MINAZEL PLUS no changes were seen in or residues found in broilers exposed to Aflatoxin B1! MINAZEL PLUS improved the body weight and daily gain parameters!

## EFFECT OF MINAZEL PLUS IN DAIRY COWS

Srdan Nesic\*, Goran Grubid\*\*, Milan Adamovic\*\*\*

\* PATENT CO. Belgrade, \*\* Faculty of Agriculture, University of Belgrade,

\*\*\*ITNMS, Belgrade

PARAMETER	TOTAL				
	A	B	C	D	E
Daily amount of Zearalenone per cow, mg	0.00	0.00	10.20	9.60	9.23
Amount of added MINAZEL PLUS in concentrate feed, %	0.0	0.2	0.0	0.2	0.5
Daily milk yield, kg	22.48	23.44	21.85	22.12	23.54
4% FCM, kg/day	21.18	21.09	19.17	19.86	20.72
Milk fat, %	3.32	3.33	3.18	3.32	3.2
Milk fat, kg	0.746	0.781	0.695	0.734	0.753
Proteins, %	3.09	3.08	3.01	3.11	2.97
Proteins, kg	0.695	0.722	0.658	0.688	0.699
Zearalenone concentration in milk, mg/kg	0.00	0.00	0.053	0.019	0.004
Zearalenone concentration in urine, mg/kg	0.00	0.00	0.112	0.14	0.000
Zearalenone concentration in faces, mg/kg	0.00	0.00	0.107	0.032	0.085

Group A - Feed without zearalenone contamination, without MINAZEL PLUS.

Group B - Feed without zearalenone contamination, with 0.2% MINAZEL PLUS.

Group C - Forage without zearalenone, concentrated feed with zearalenone contamination, Without MINAZEL PLUS.

Group D - Forage without zearalenone, concentrated feed with zearalenone contamination, with 0.2% MINAZEL PLUS.

Group E - Forage without zearalenone, concentrated feed with Zearalenone contamination, with 0.5% MINAZEL PLUS.

## CONCLUSION:

The trial confirmed the positive effects of MINAZEL PLUS on daily milk yields and protein content, and that it considerably decreases the level of zearalenone in milk!



### ABOUT US

**PATENT CO.** is a multinational company established in 1990 in the heart of Europe, in Serbia. Today we operate on 5 continents.

**PATENT CO.** strives to be an innovative and internationally-oriented company that is always one step ahead in introducing new technologies in animal nutrition.

### RESEARCH AND DEVELOPMENT

Every year, **PATENT CO.** invests significant resources in research and development programs in laboratories, research centers and farms. These programs facilitates the development of new products, with a view to finding optimal animal feed production solutions.

### QUALITY AND SAFETY

**PATENT CO.** invests in state-of-the-art equipment for the production of animal feed additives and premixtures, allowing us to achieve final products of a consistently high quality. This process ensures full traceability, from the reception of raw materials to delivery of the product to the customer.



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