A dietary tolerance study on the use of a magnesium bentonite for swine

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Introduction:

Mycotoxins are metabolites produced by molds (*fungi*) that are toxic when consumed in significant amounts by livestock. Moreover, residues of mycotoxins can appear in animal products destined to human consumption (e.g., aflatoxin M1 in milk). Accumulation of residues in edible animal products, however, depends on absorption and elimation kinetics, which differ between toxins and animal species.
Growing swine fed mycotoxin-contaminated diets grow more slowly, consume less feed, and have higher feed conversion ratios than controls
The dietary addition of clays and other binding agents has been shown effective to prevent intestinal absorption of mycotoxins, and many of the negative, toxin-induced effects.
ATOX™ is a magnesium bentonite, which is composed of a natural combination of a magnesium smectite, a silicate with laminar structure, and a sepiolite, a hydrated magnesium silicate with capillary structure. It is manufactured by Tolsa (Madrid, Spain), and it has been shown effective in adsorbing aflatoxin B1 and zearalonone in *in vitro* as well as in animal research studies.
Tolerance studies for feed additives require an evaluation of performance together with an in depth haematological and histopathological characterisation.

Objective:

To evaluate the effect of ATOX on growth performance, haematological profile, blood enzyme activities and lesions of internal organs, when it is added to the diet at a 10-fold recommended dosage.
To establish the tolerance and the suitability of ATOX™ as feed additive for swine

Material and methods:

96 four-week old male and female weanling piglets (LR*DUxPI), *ad libitum* fed during the 35 days of experiment
4 diets corresponding to 4 experimental treatments:

T1 – control; T2 – 0.2% ATOX™, T3 – 0.5% ATOX™, T4 – 3.0% ATOX™.

The ATOX™ was added on top of the basal diet (13.5 MJ ME and 1.2 digestible lysine) inducing a dilution effect on energy contents of diets, in particular on treatment T4.
At the end of the experiment, blood samples were taken for haematological and enzymatic determinations and 30 piglets were slaughtered for internal organ examination.
Data were statistically analysed with GLM procedure of SAS.

Results:

There were no gross pathological abnormalities or lesions of internal organs (liver, kidneys, spleen, heart, lungs, pancreas, stomach, small and large intestine) detected in any piglet.

Table 1. Piglet growth performance during the 35 days of the experiment.

Treatments	**T1** Control diet	**T2** ATOX 0.2%	**T3** ATOX 0.5%	**T4** ATOX 3.0%	*P*	RSD
Bodyweight at start (kg)	6.67	6.79	6.71	6.70	0.66	0.34
Weight gain (g/d)	413	426	436	398	0.51	87.3
Feed intake (g/d)	543	545	543	494	0.47	62.2
Feed conversion ratio (kg/kg)	1.32	1.29	1.24	1.26	0.30	0.07
Final bodyweight (kg)	20.94	21.47	21.75	20.45	0.52	3.12

ATOX™ was added on top of the basal diet

Table 2. Pig haematological profile after the 35 days of the experiment.

Treatments	**T1** Control diet	**T2** ATOX 0.2%	**T3** ATOX 0.5%	**T4** ATOX 3.0%	*P*	RSD
PCV (%)	35.4	38.8	34.12	35.8	0.46	4.47
RBC ($x10^6/mm^3$)	6.7	6.6	6.6	6.8	0.83	0.67
MCV ($?l^3$)	52.8	59.2	53.0	53.2	0.31	5.92
Haemoglobin (g/100ml)	10.3	11.8	10.0	10.5	0.20	1.32
MCH (pg)	16.5	18.0	15.4	15.5	0.51	2.94
CHC (g/100ml)	29.1	30.4	29.1	29.2	0.18	1.00
WBC ($x10^3/mm^3$)	16.4	nd	nd	11.6	0.28	7.37

PCV: Packed cell volume, RBC: Red blood cells, MCV: Mean corpuscular volume, MCH: Mean corpuscular haemoglobin, CHC: Corpuscular haemoglobin concentration, WBC: White blood cells

Table 3. Blood enzyme activities after the 35 days of the experiment.

Treatments	**T1** Control diet	**T2** ATOX 0.2%	**T3** ATOX 0.5%	**T4** ATOX 3.0%	*P*	RSD
AST (IU 37ºC)	36.4	60.2	44.8	43.2	0.15	19.0
GGT (IU 37ºC)	37.2	42.7	38.5	38.0	0.84	11.8
ALP (IU 37ºC)	685.1	688.0	567.2	721.6	0.62	224.4
AAT (IU 37ºC)	38.8	46.5	34.2	38.6	0.26	10.6

AST: aspartate aminotransferase, GGT: gamma glutamyltranspeptidase, ALP: alkaline phosphatase, AAT: alanine aminotransferase

Conclusion:

Addition of ATOX™ to diets, even at 10-fold the recommended dosage, did not affect feed intake, growth performance, haematological and enzyme parameters nor any anatomic or pathological lesions were observed.
So, the magnesium bentonite ATOX™ is a suitable and safe feed additive for swine.