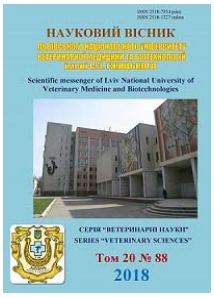

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The efficiency of using of Alfasorb in piglets feeding

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Mycotoxins cause severe diseases in organisms of human and animals. They are difficult to diagnose, cause great economic damage. Sorbents are able to effectively bind and remove from the body through the digestive tract with a therapeutic or prophylactic purpose various endogenous and ekzogenous substances, microorganisms and they toxins, supermolecular structures and cells. The aim of the work is to study the effectiveness of use of Alfasorb for the neutralization of mixed fodders affected by mycotoxins and they impact on blood's indexes and productive qualities of piglets of Large White Breed. Experience was conducted on 30 ty piglets. Animals of the control group received mixed feed that was produced in the conditions of the farm. The pigs of experimental group in addition to the basic diet received Alfasorb. We determined blood's indexes for study the effect of feed additive Alfasorb on the physiological state of animals at 4 months of age. A morphological and histological study of liver was carried out. The analysis of the average daily weight gain of piglets showed that it was higher in period of growth in the animals of experimental group. In the animals of the experimental groups there was an increase in the number of red blood cells in comparison with the control. An unreliable decrease in blood serum levels which characterize the level of intermediate metabolism of proteins in the body (content of urea, creatinine and common bilirubin) was established in the animals of the experimental group as compared to the control group respectively by 22.83% (td = 0.98, P ≤ 0.05), 7.12% (td = 1.92, P ≤ 0.05) and by 20.54% (td = 0.86, P ≤ 0.05). Most hepatocytes had large nucleus and intense color of the cytoplasm. This indicates the absence of alterative processes in the body. The results of the studies make it possible to assert that the inclusion the 0.2% Alfasorb to the compound of feed which contaminated with mycotoxins significantly reduces their negative effect on the piglets organism, has a positive effect on the growth rate, on the course of metabolic processes, also it promotes an increase in the liver of medium-sized hepatocyte nuclei, stimulates biosynthetic processes in that cells and ensures the formation of a full structure of histohematological barriers in the organism.

Key words: *Alfasorb, blood's indexes, living weight, liver, mycotoxines, piglets.*

Ефективність застосування альфасорбу у годівлі поросят

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Мікотоксини спричиняють різні захворювання в організмі людини та тварин. Вони важко діагностуються та призводять до великих економічних збитків. Сорбенти здатні ефективно зв'язувати та виводити з організму через травний тракт з профілактичною чи терапевтичною метою різні ендогенні та екзогенні субстанції, мікроорганізми та їх токсини,

складні молекулярні структури та клітини. Мета роботи – дослідити ефективність застосування альфасорбу для нейтралізації комбікормів, уражених мікотоксинами, та їх вплив на показники крові та продуктивні якості поросят великої білої породи. Дослід проводили на 30-ти поросятах. Тварини контрольної групи отримували комбікорм, що виробляється в умовах ферми. Поросята дослідної групи у додаток до основного раціону одержували альфасорб. Ми вивчали показники крові для визначення впливу кормової добавки альфасорб та фізіологічний стан тварин 4-місячного віку. Було проведено морфологічне і гістологічне дослідження печінки. Аналіз середньодобових приростів поросят показав, що вони були більшими у період росту тварин експериментальної групи. У тварин дослідної групи була більшою кількість еритроцитів, у порівнянні з контролем. Встановлено зниження у сироватці крові тварин дослідної групи показників, що характеризують проміжний обмін (вміст сечовини, креатиніну та загального білірубіну), у порівнянні з контрольною групою відповідно 22,83% (td = 0,98, P ≤ 0,05), 7,12% (td = 1,92, P ≤ 0,05) and by 20,54% (td = 0,86, P ≤ 0,05). Більшість гепатоцитів мали великі ядра та інтенсивне забарвлення цитоплазми. Це вказує на відсутність альтеративних процесів в організмі. Результати досліджень дозволяють зробити висновок, що включення 0,2% альфасорбу до складу корму, контамінованого мікотоксинами, значно зменшує їх негативний вплив на організм поросят, позитивно впливає на прирости, перебіг метаболічних процесів, також сприяє, зниженню у печінці середніх розмірів ядер гепатоцитів, стимулює біосинтетичні процеси у цих клітинах та забезпечує формування повної структури гістогематологічних бар'єрів у організмі.

Ключові слова: *альфасорб, показники крові, жива вага, печінка, мікотоксини, поросята.*

Introduction

Various toxic substances and mycotoxins can come to the organism with food. It must be remember when organizing a high-grade feeding of animals.

Mycotoxins are secondary metabolits. They are formed in process of life of moldy fungus (Trufanov, 2011; Brezvyn et al., 2018). Most mycotoxins are classified as first-class of toxicity compounds. They show the dermatonecrotic, hepatotoxic, carcinogenic, mutagenic, teratogenic and immunosuppressive action in animals organism (Dukhnytskyi et al., 2011; Kotsyumbas et al., 2016).

Mycotoxins cause severe diseases – mycotoxicoses – in organisms of human and animals (Ivanytskyi, 2004). They are difficult to diagnose, cause great economic damage. The economic loss is the reduce productivity and death of animals, as a result of feeding unsuitable products and feeds (Tremasov, 2005).

Mycotoxicoses causes the changes of metabolism. It is the main problem of mycotoxicoses. The signs of their action are manifested when it changes go beyond compensatory mechanisms. The animals stay healthy if compensatory mechanisms work effectively but functioning of that mechanisms requires additional energy and nutrients consumption. This causes an increased feed consumption for animals' productivity. There fore mycotoxicoses can't be treated by tradition medicines. It is necessary to correct metabolic disorders caused by toxins. But achievements in this direction are limited. Prevention of mycotoxicoses by using adsorbents is most common. They are added to feed for binding mycotoxins and limiting their intake into the body (Krjukov, 2011).

Sorbents are able to effectively bind and remove from the body through the digestive tract with a therapeutic or prophylactic purpose various endogenous and ekzogenous substances, microorganisms and they toxins, supermolecular structures and cells (Gusejnov, 2012). So the method of sorbtion is considered the most effective and safe for animals (Kondrahin, 1987; Antipov et al., 2007).

Awade range of feed additives of sorbents of foreign and domestic production is presented today on the market of veterinary drugs in Ukraine. They are recommended to be used for neutralization of fodder from mycotoxins and to increase the productivity of animals. They can be divided into three groups: inorganic, organic and combined (Kotsiumbas et al., 2010).

Alfasorb is one of the detoxicant feeds which has organic origin. It produces by LLC SPE "Ariadna" (Odessa). Alfasorb was obtained on the basis of isolation of cellulose biopolimers with a number of active centers from plant fodder. Such raw materials are dietary fibers of brain which subjected to multilevel processing. Due to this transformation of polymeric carbohydrate chains occurs and many active binding sites are formed with mycotoxins.

Efficiency of use Alfasorb is confirmed when it is infected in the diet of repairing pigs in the amount of 0.02% by the weight of the compound feed by previous studies. It positively influenced the digestibility of nutrients and productive qualities. The use of Alfasorb to detoxity fodder when raising young pigs was not performed (Kajsin et al., 2012).

Therefore the aim of the work is to study the effectiveness of the use of Alfasorb for the neutralization of mixed fodders affected by mycotoxins and they impact on blood's indexes and productive qualities of piglets of Large White Breed.

To achieve the goal next tasks were set: to carry out the analysis of live weight of pigs after application of Alfasorb; to study morphological and biochemical parameters of blood after application of Alfasorb; to conduct a histological examination of the liver.

Matherial and methods

Experience was conducted in conditions of the farm of Shiryaevsky district of Odessa region. 30 pigs of Large White Breed were used in the experiment. They were divided into two groups according to the principle of analogs, taking into account the live weight, age and previous energy of growth. During the experiment the animals of the control and experimental groups were kept under the same conditions. The experience lasted 60 days.

Animals of the control group received mixed feed (basic diet) that was produced in the conditions of the farm (corn, barley, wheat, soybean meal, fish flour, premix, salt). The pigs of experimental group in addition to the basic diet received Alfasorb (LLC SPE "Ariadna", Odessa, Ukraine) in quatities of 1 kg per ton of feed.

The presence of mycotoxins in feads was determined on an immune-enzyme analyzer StatFax 2100 using test-system Ridascreen (Germany).

Dynamics of changes in live weight and the growth rate of piglets were studied on the basis of monthly individual weighting data and the calculation of the average daily growth.

We determined hematologic (number of erythrocytes and leukocytes) and biochemic (the content of hemoglobin, total protein, urea, creatinine, activity of alaninaminotransferaze, aspartataminotransferaze and lactatdehydrogenaze, total calcium and inorganic phosphorus) blood's indexes for study the effect of feed additive Alfasorb on the physiological state of animals at 4 months of age (Kondrahin, 1987). Blood samples for studies were taken in the morning before feeding from the ear vein.

The slaughter was carried out for three animals from the control and experimental groups in order to determine the degree of the negative effect of mycotoxins on the organism of piglets and the effectiveness of decontamination of feeds by Alfasorb. A morphological and histological study of some internal organs was carried out (Merkulov, 1969).

Statistical processing of data was carried out on a personal computer. We used computer program "Microsoft Excel". The criteria for the reliability of differences between groups were determined by the Student's table (Lakin, 1980).

Results and discussion

Animals of control and experimental groups on live weight practically didn't differ at the beginning of the experiment (Tab. 1). The introduction of Alfasorb in the compound feed contributed to on increase in the live weight of the piglets of the experimental group. The live weight has increased in comparison with the animals of the experimental group at the and of the first month of drowing on 0.95 kg (or on 3.24%) and at the end of the second month on 2.26 kg (or on 5,32%). While the pigs of the experimental group significantly exceeded the animals of control group by live weight at the end of the second month of growing ($td = 3.79$, $P \leq 0.01$).

The analysis of the average daily weight gain of piglets showed that it was higher in period of growth in the animals of experimental group. It composed 456.33 g. It's 36.83 g more (or on 8,76%) than in animals of control group ($td = 7.37$, $P \leq 0.001$).

Table 1
Live weight of experienced piglets (M ± m, n = 15)

Group	At the beginning of the experiment, kg	At the end of the first months, kg	At the end of the second months, kg	Average daily growth for the period, g
Control	17.30 ± 0.23	29.30 ± 0.31	42.50 ± 0.39	420.00 ± 3.47
Experimental	17.35 ± 0.36	30.25 ± 0.37	44.76 ± 0.45*	456.83 ± 3.74***

Remark: * – P < 0.05; *** – P < 0.001 in comparison with the control group

Blood is one of the most important tissues of the body. It plays an important role in vital activity and fully reveals the picture of metabolic processes. It closely contacts all cells and organs due to the widely branched network of vessels and capillaries. Thus the blood provides the possibility of trofic and respiratory

A study of the blood composition of piglets at the end of the experiment showed that the blood indexes of animals of the control and experimental group were within the physiological norm (Kondrahin, 1987) (Tab. 2).

Alfasorb in the diet significantly reduced the negative effect of mycotoxins on the body of piglets. It contributed to some improvement in their morphological and biochemical blood indexes.

Table 2
Blood's indexes of piglets of experimental groups (M ± m, n = 5)

Indexes	Group	
	Control	Experimental
Erythrocytes, million/liter	7.17 ± 0.17	7.47 ± 0.29
Leukocytes, thousand/liter	5.27 ± 0.69	14.25 ± 1.45
Hemoglobin, g/l	95.27 ± 2.15	102.93 ± 1.97*
Total protein, g/l	67.30 ± 2.56	75.85 ± 2.39*
Urea, mmol/l	5.81 ± 0.71	4.73 ± 0.85
Creatinine, mcmol/l	76.43 ± 1.45	72.35 ± 1.58
Common bilirubin, micromole/l	2.23 ± 0.27	1.85 ± 0.35
Alaninaminotransferase, U/l	55.73 ± 2.58	45.3 ± 3.51
Aspartataminotransferase, U/l	67.45 ± 2.86	57.53 ± 3.86
Laktatdehydrogenase, U/l	633.80 ± 13.86	697.55 ± 23.35
Total calcium, mmol/l	2.57 ± 0.37	2.70 ± 0.25
Inorganic phosphorus, mmol/l	1.87 ± 0.23	2.35 ± 0.17

Remark: * – P < 0.05 in comparison with the control group

In the animals of the experimental groups there was an increase in the number of red blood cells by 4.18%, hemoglobin by 7.52% and total protein by 9.73% in comparison with the control. The piglets of the experimental group respectively td = 2.62 and td = 2.44 ($P < 0.05$) for protein metabolism parameters (hemoglobin, total protein).

The content of total protein in the serum of pigs is an important diagnostic parameter. It is associated with changes in metabolism in the body. The increased content of total pritein in the experimental group in comparison with the control indicates an increase in oxidation-reduction and plastic processes in the organism of animals in connection with the use of Alfasorb. Decrease in the total protein content in the blood serum of piglets from the control group is due to the fact that the mycotoxins were introduced into the body of the pigs. They caused inhibition of protein synthesis in the liver.

An unreliable decrease in blood serum levels which characterize the level of intermediate metabolism of proteins in the body (content of urea, creatinine and common bilirubin) was established in the animals of the experimental group as compared to the control group respectively by 22.83% (td = 0.98, $P \leq 0.05$), 7.12% (td = 1.92, $P \leq 0.05$) and by 20.54% (td = 0.86, $P \leq 0.05$).

A decrease in the activity of transamination enzyms revealed in animals from experimental group by 16,43% (td = 1.93, $P > 0.05$) and by 17.24% (td = 2.26, $P \leq 0.05$). This indicates a favorable effect of Alfasorb on the functional activity of the liver. An increase in the activity of these enzymes is observed in hepatitis, muscular dystrophies, injuries of animals. But these enzymes are not strictly specific.

The activity of lactatdehydrogenase in pigs from experimental group increase by 10.05% (td = 2.36, $P > 0.05$) relative to control. It indicates the intensification of glycolitic way of catabolism of glucose. This is indirect evidence of activation of bioenergetics processes in organism of pigs with the use of Alfasorb.

The study of mineral metabolism showed that the content of total calcium in blood serum in the animals of the control group was on 5.06% (td = 0.52, $P > 0.05$) higher in comparison with the animals in the control group. The animals of the control group were inferior to the pigs of the experimental group by 25.67% (td = 1.68, $P > 0.05$) by the content in the serum of inorganic phosphorus at the same time.

Histological examination is the only and decisive method of diagnosis in many cases regardless of the etiology (Ivanytskyi, 2004). A well-defined lobular girdle structure of the liver was established in experimental group of piglets. Most hepatocytes had large nucleus and intense color of the cytoplasm. Cells of the mononuclear phagocyte system showed less activity. This indicates the absence of alterative processes in the body.

The signs of hemodynamic disorders were less pronounced in the vessels of the microcirculatory organ in experienced piglets with a sharp decrease in the permeability of the vascular wall. This was evidenced by low parasinusoidal spaces and practically complete absence of perivascular edema along the portal tract.

Congestive hyperemia, discomplexation of beams and hepatocytes, granular and fatty dystrophy, necrosis of some hepatocytes were observed in the liver of piglets of the control group. The liver was characterized by a large variety of volumes of hepatocyte nuclei, the presence of a large number of light cells that had a reduced level of glycogen content and small foci of macrophage proliferation.

Conclusions

The results of the studies make it possible to assert that the inclusion the 0.2% Alfasorb to the compound of feed which contaminated with mycotoxins significantly reduces their negative effect on the piglets organism, has a positive effect on the growth rate, on the course of metabolic processes, also it promotes an increase in the liver of medium-sized hepatocyte nuclei, stimulates biosynthetic processes in that cells and ensures the formation of a full structure of histohematological barriers in the organism.

Prospects for further research. In the future it is planned to conduct a study of the effect of Alfasorb on the organism of chicken.

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