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EVALUATION OF USING TERRARICH-ANTITOX ON BROILER PERFORMANCE DURING MYCOTOXICOSIS

Feeding chickens with experimentally contaminated ration with fungal toxins (aflatoxin B1, T-2 toxin, deoxynivalenol, zearalenone, ochratoxin, fumonisins) leads to the development of chickens postovarial hypotrophy, significant morphological changes in the liver and kidneys the most expressed in the 29-36 days of age. immunization of chickens with strain of IBD virus vaccine "Vinterfild 2512" on the background of experimental chronic combined mycotoxicosis increases severity of pathological changes in these organs. Using of chickens enterosorbent "TERRARICH-ANTITOKS" prophylactic effects of malnutrition, structural changes in the liver and kidney parenchyma.

Key words: *enterosorbent, mycotoxins, clinical signs, pathomorphological changes, liver, kidneys, chicken, vaccination, infectious bursal disease.*

A problem statement

Mycotoxins are chemical substances produced by several fungi, particularly by many species of Aspergillus, Fusarium, Penicillium and Alternaria. They comprise a group of several hundreds of chemically different toxic compounds. The most common mycotoxins are aflatoxins, ochratoxin A, trichothecenes, zearalenone and fumonisins [12]. Some other researchers has estimated that worldwide about 25% of crops are affected annually with mycotoxins and since it was estimated that 25 % of the feed production per year has been contaminated with mycotoxins [5]. Surveys reveal sufficiently high occurrences and concentrations of mycotoxins to suggest that they are a constant concern [11]. Chronic and low level mycotoxin contamination through naturally contaminated grains often causes reduced production efficiency and increases susceptibility to many immune related infectious diseases. It has been reported that

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feeding mycotoxins in combinations could result in pronounced adverse effects in avians [6], considering the increasing food price indices. The inactivation of mycotoxins from contaminated feed becomes an important economic aspect to back up the use of new strategies for improving growth performance [13].

The analysis of recent publications

The best procedure to prevent the effect of mycotoxins is the minimizing of the mycotoxin production itself, e.g. by harvesting the grain at maturity and low moisture and storing it at cool and dry conditions which is difficult to perform in countries with a warm and humid climate. Feed additives like antioxidants, sulphur-containing amino acids, vitamins and trace elements can be useful as detoxicants. Biological methods are not yet used in practice though the number of corresponding patents increases continuously [10].

Chemically, some mycotoxins can be destroyed with calcium hydroxide monoethylamine [1]. The addition of mycotoxin binders to contaminated diets has been considered the most promising dietary approach to reduce effects of mycotoxins. The theory is that the binder decontaminates mycotoxins in the feed by binding them strongly enough to prevent toxic interactions with the consuming animal and to prevent mycotoxin absorption across the digestive tract. Therefore, this approach is seen as prevention rather than therapy [7]. Even though food is often contaminated with more than one mycotoxin, most studies are limited to the toxicology of a single mycotoxin. The aim of this search was studying the effect of mixed mycotoxin in chicken body weight and some bioavailability parameters and searching the effect of using TERRARICH-ANTITOX in keeping chicken performance.

Purpose, objects and methods of research

This experiment was conducted to determine the effect of dietary supplementation of TERRARICH-ANTITOX (lignin derivative, synthesized in Republic of Belarus) on detoxification of mycotoxin in broilers ration. The chicks were reared from 1 to 36 days in the condition of clinic of epizootology department and pathanatomy and histology department, Vitebsk State Academy of Veterinary Medicine, Republic of Belarus. A total of 100 chicks, one day old were used. Birds were fed starter diet during the third week of age (beginning date of experiment; 22,6 % crude protein and 2870,4 kcal/kg of diet) and finisher diet (20,5 % crude protein and 2920 kcal/kg of diet) until the marketing age (36 days of age). Chicks were randomly divided into 5 treated groups, 20 birds for each. First group (G1) fed a contaminated ration with mycotoxin and supplemented with TERRARICH-ANTITOX 5g/kg of diet and vaccinated with IBD vaccine at 15 and 22 days of age. Second group (G2) was fed a ration contaminated with mycotoxin and vaccinated with IBD vaccine at 15 and 22 days of age without TERRARICH-ANTITOX. Third group (G3) was fed a contat broiler ration and vaccinated with IBD vaccine at 15 and 22 days of age. Fourth group (G4) was only fed a contaminated ration with mycotoxins. Fifth group (G5) was fed

intact clean ration as a control group. The strain of vaccine was interfield 2512 that produced in Russian Federation, the vaccine was supplemented manually intra crop for every chick with one dose. The mycotoxins analyzed in Central Research Laboratory of grain products by ELISA (ridaskrin fast) and the final level of mycotoxins were as follows: Aflatoxin B1 0,001 mg/kg, Dezoxivalenol 1,24 mg/kg, Zearalenon 0,068 mg/kg, Ochratoxin 0,005 mg/kg, T2 toxin 0,09 mg/kg, Fuminisen B1 0,2 mg/kg. Body weights, clinical signs, morbidity rate and mortality rate per group were recorded weekly. At the end of experiment, five birds per group were sacrificed to determinate the changes in liver and kidney in all groups. All data are analyzed by statistical program for study variation statistics, based on the significance ($P<0,05$) («Microsoft Excel» 2003).

Results and discussion

After seven days of the first IBD vaccine, Dietary mycotoxins and IBD vaccine group (G2) and (G4) significantly ($P<0,01$) depressed body weight in comparison with control group (G5), but the body weight of TERRARICH-ANTITOX group (G1) is not effected in comparison with the control ($P>0,05$). The effect of mycotoxins with or without vaccine was very clear after 7 days of second IBD vaccine in (G2) and (G4) which recorded decrease in bodyweight ($P<0,05$) in comparison with control group. The weight of TERRARICH-ANTITOX group (G1) is not effected in comparison with the control ($P<0,05$), (tab. 1).

Table 1. **The effect of TERRARICH-ANTITOX in protecting chickens body weight in comparison with the other groups that fed mycotoxins contaminated ration**

Age / Groups	7 days after first IBD vaccine	7 days after second IBD vaccine	14 days after second IBD vaccine
Group 1	510,00 ± 53,37 $P_{1-2}>0,05$ $P_{1-3}>0,05$ $P_{1-4}>0,05$ $P_{1-5}>0,05$	750,00 ± 70,23 $P_{1-2}>0,05$ $P_{1-3}>0,05$ $P_{1-4}>0,05$ $P_{1-5}>0,05$	1145,00 ± 70.23 $P_{1-2}<0,05$ $P_{1-3}>0,05$ $P_{1-4}>0,05$ $P_{1-5}>0,05$
Group 2	480,00 ± 44,94 $P_{2-3}>0,05$ $P_{2-4}>0,05$ $P_{2-5}<0,01$	720,00 ± 19,66 $P_{2-3}>0,05$ $P_{2-4}<0,05$ $P_{2-5}<0,05$	947,05 ± 53,37 $P_{2-3}<0,01$ $P_{2-4}>0,05$ $P_{2-5}<0,001$
Group 3	527,50 ± 53,37 $P_{3-4}>0,05$ $P_{3-5}>0,05$	795,00 ± 70,23 $P_{3-4}>0,05$ $P_{3-5}<0,05$	1197,50 ± 50,56 $P_{3-4}>0,05$ $P_{3-5}>0,05$
Group 4	515,00 ± 42,14 $P_{4-5}<0,05$	775,00 ± 14,05 $P_{4-5}<0,05$	1007,50 ± 106,74 $P_{4-5}<0,05$
Group 5	635,00 ± 22,47	1000,00 ± 84,27	1295,00 ± 22,47

- The values represent mean of body weight (grams) ± SE

After 14 days of the second IBD vaccine the weight of most experimental groups were less than control group, at the same time, addition of TERRARICH-ANTITOX in G1, was very effective in keeping the body weight to that of control one.

The influence of mycotoxin in body weight is very clear in (G4) that recorded weight less than the control. This could be attributed to reduced protein and energy utilization which impaired nutrient absorption and reduced pancreatic digestive enzyme production [14] and consequently reduced appetite. The body weight of chickens did not differ significantly ($P<0,05$) between vaccinated group (G3) and the control throughout the period of the experiment. The differences in body weight between the groups narrowed down and towards the end of the experiment, were not statistically significant ($P< 0,05$). These results agree with data of other investigators, who refer that the body weight of vaccinated group with IBD vaccine was less than the control. On the other hand, the most decrease in body weight was in vaccinated group that fed a ration with mycotoxins (G2) along the period of experiment in comparison with control group which recorded ($P<0,05$) in first week after first vaccination and ($P<0,05$) after second vaccination, that may be reveal the synergistic effect of both (vaccine and mycotoxin) which causes very clear effect in performance and weight gain.

The effect of mycotoxins was very clear in (G4) which revealed reductions in appetite and, reduction of growth, poor feathering, loss of coordination and inability to stand, these clinical signs agreed with C.R. Parkhurst, P.B. Hamilton [9]. On the other hand, the high morbidity rate was recorded in (G2) and (G4) because of the influence of mycotoxins, but (G1) not recorded any mortality rate and that may be due to the supplementing of antitoxicant TERRARICH-ANTITOX in ration of this group which negated the effects of mycotoxins, these results agreed with Reams et al. [2]. Furthermore (tab. 2), the mortality rate was very high in (G2) with 25 % and (G4) 20 %, but the TERRARICH-ANTITOX group not recorded any mortality (0 %), and that may be due to the supplementing of antitoxicant TERRARICH-ANTITOX in ration of this group which negated the effects of mycotoxins, these results agreed with Bennett et al. [3]. On the other hand it was obvious that mycotoxins had a negative effect on the liver parenchyma of broiler chicks in groups G2 and G4, when compared with that of control group (G5), by changing liver color from mahogany (Figure 2), to that which characterized by enlarged muddy or even to yellowish discoloration, with friable consistency and sub capsular hemorrhages (Figure 3, 4). The addition of TERRARICH-ANTITOX to the diet of broilers in group (1), was effective in restoring the normal red brown liver color to that of chicks in treatment 5 (Figure 5). Kidney was also affected by feeding mycotoxins (G2 and G4) in obvious manner when compared with all other treatment groups (Figure 6). They were enlarged, swollen and pale in color, that may be due to liver and kidney function is detoxification of mycotoxins, therefore it is may indicate less detoxifying capacity or damage of functions to some extent, these results agreed with J.P. Jouany [8]. The results of this experiment clearly

indicated that mycotoxicosis in broiler chickens can be influenced by supplementation the TERRARICH-ANTITOX to the contaminated diet. Supplementing of TERRARICH-ANTITOX with a dose 5g/kg ration essentially negated the effects of mycotoxins.

Table 2. **The effect of TERRARICH-ANTITOX in clinical signs, morbidity rate, mortality rate and post mortem findings of liver and kidney**

Groups	Birds number	Clinical signs	Morbidity Rate	Mortality Rate	Changes in liver and kidneys
G1	20	reduction in appetite and growth	50 %	0%	normal red-brown liver and normal kidney
G2	20	reductions in appetite and growth, poor feathering, nervousness, loss of coordination, inability to stand, and mortality	100%	25 %	changing liver colour from mahogany to that which characterised by enlarged muddy or even to yellowish discolouration, with friable consistency and subcapsular haemorrhages, Kidney enlarged, swollen and pale in colour
G3	20	Reduction in appetite for some days	0 %	0 %	normal red-brown liver and normal kidney
G4	20	reductions in appetite and, reduction of growth, poor feathering, nervousness, loss of coordination, inability to stand, and mortality	100%	20 %	changing liver colour from mahogany to that which characterised by enlarged muddy or even to yellowish discolouration, with friable consistency and subcapsular aemorrhages, Kidney enlarged, swollen and pale in colour
G5	20	no clinical signs	0%	0%	normal red-brown liver and normal kidney

Conclusion

The results of this experiment clearly demonstrated that mycotoxicosis cause loss of body weight in broiler chickens and decreasing the chicken performance. Furthermore, mycotoxicosis can be influenced by supplementation the TERRARICH-ANTITOX to the contaminated diet. Supplementing of TERRARICH-ANTITOX with a dose 5g/kg ration essentially negated the effects of mycotoxins.

Figure 1. **Clear difference in size and body weight between control group (G5) and vaccinated with mycotoxin group (G2).**

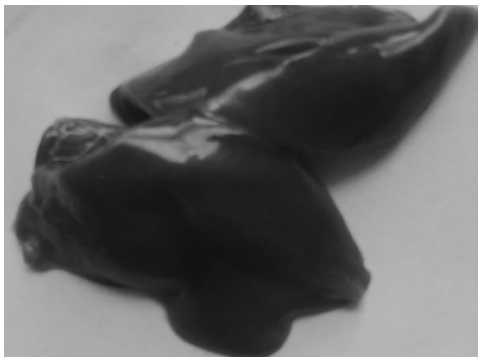

Figure 2. **Mahogany normal liver of 36 days old chickens in G5.**

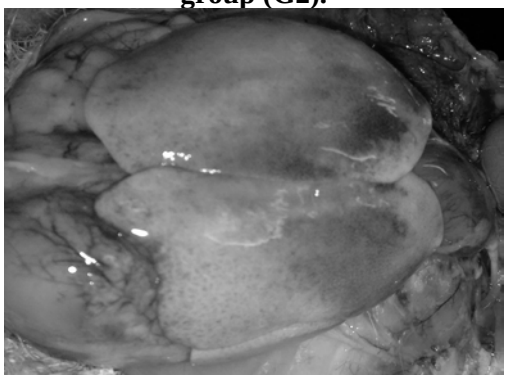

Figure 3. **Enlarged muddy yellowish discoloration, with friable consistency and sub capsular hemorrhages in the liver of 36 days old chickens in G2.**

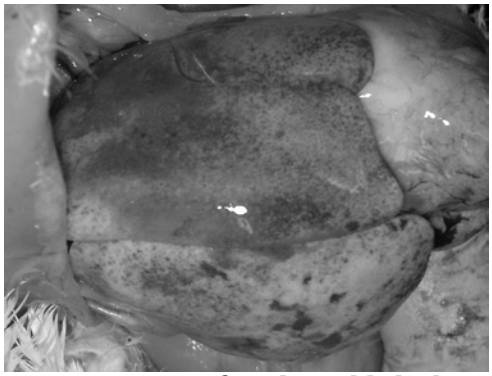

Figure 6. **Liver of 36 days old chickens in G4. Alterative hepatitis.**

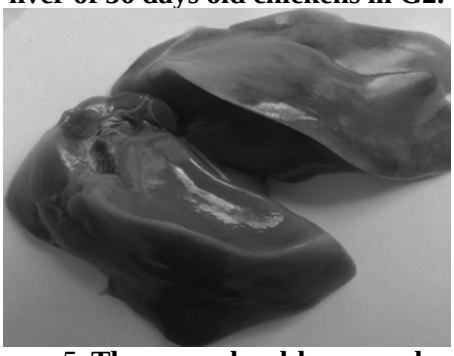

Figure 5. **The normal red-brown colored liver of 36 days old chickens in G1 with TERRARICH-ANTITOX.**

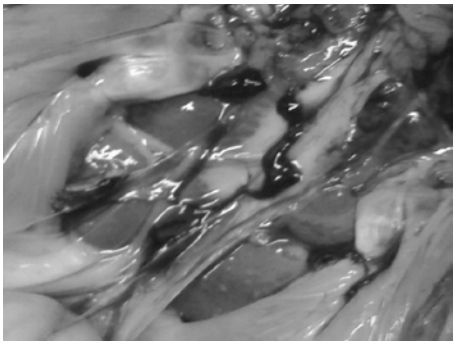

Figure 6. **Swollen, pale and enlarged kidneys of 36 days old chickens in G4.**

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