Protective Effect of Cholestyramine and Oxihumate against some Mycotoxins in Broiler Chickens

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List of Abbreviations

Abbr.	Description
AFB1	Aflatoxin B1
OTA	Ochratoxin A
CH	Cholestyramine drug.
CYP	Cytochrome P450 enzymes
B.wt	Body weight.
AOAC	Association Official Analytical Chemists
MP	malt peptone
HPLC	High performance liquid chromatography
FAO	Food and agriculture organization
IARC	International Agency for Research on Cancer.
CAST	Council for Agricultural Science and Technology.
EFSA	European Food Safety Authority.
JECFA	Joint FAO/WHO Expert Committee on Food Additives.
Fig	Figure
ppm	Part per million
PPb	Part per billion
gp	group
IHC	Immunohistochemical

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SUMMARY

This work was done to study the clinical signs and pathological changes in some organs (liver, kidney, spleen, Bursa of Fabricius and intestine) of broiler chickens (Cubb breed) fed on contaminated ration with aflatoxin B1 (AFB1) or ochratoxin A (OTA) for 36 day. Study the protective effects of either cholestyramine or oxihumate in ameliorating the toxicity via evaluation the pathological lesions, some immunohisto-chemistry markers and tissue residues of both AFB1 and OTA). So in this aspect, the work was conducted on using one hundred and forty-four healthy, one-day-old commercial broiler chicks (cubb breed) which were purchased from Alkahira Poultry Company and kept under standard hygienic conditions. The broiler chicks equally divided into nine equal groups, each of sixteen chicks. **Group (1)**: Chicks were given ration contaminated with 2 ppm AFB1/kg ration for the whole of the experimental period. **Group (2)**: Chicks were given 2 ppm AFB1 /kg ration together with chemical detoxifying agent cholestyramine (170 µg/ mg aflatoxin in the ration) (340 µg/ kg ration) for the whole of the experimental period. **Group (3)**: Chicks were given 2 ppm AFB1/kg ration together with physical detoxifying agent oxihumate (3.5 g/kg ration) for the whole the experimental period**. Group (4)**: Chicks were given ration contaminated with 100 ppb OTA/kg ration for the whole the experimental period. **Group (5)**: Chicks were given 100 ppb OTA/kg ration together with chemical detoxifying agent cholestyramine (170 µg/mg ochratoxin) (17 µg/kg ration) for the whole of the experimental period. **Group (6)**: Chicks were given100 ppb OTA/kg ration with physical detoxifying agent oxihumate (3.5 g/kg ration) for the whole of the experimental period. **Group (7)**: Sixteen chicks were divided equally into two sub-groups with 8 chicks each and were given chemical

detoxifying agent cholestyramine. **Group (8)**: Chicks were given physical detoxifying agent oxihumate (3.5 g/kg ration) for the whole of the experimental period **Group (9)**: Control group which chicks were given the recommended ration, free from mycotoxins for all the experimental period.

Our investigation revealed that the chickens received AFB1 **(group 1)** showed severe illness in the form of reduction of body weight, feed intake, ruffling broken feather, dropping of head and wings, depression, lameness and yellowish diarrhea. The mortality rate was 25% during the whole experiment. **Macroscopically**, marked enlarged friable and yellow liver beside multifocal hemorrhage on its capsule mean while other cases showed dark color liver with presence of nodules of variable size on its surface. Congestion of kidneys was noticed in most cases and other cases showed enlargement and paleness with petechial hemorrhage. The intestinal mucosal surface showed severe hemorrhagic spots. Severe reduction in the relative size of bursa of Fabricius was recorded. Enlarged spleen was also noticed in some cases. **Microscopically**, the hepatic parenchyma showed degenerative changes and coagulative necrosis of the hepatocytes. The portal area in many cases was infiltrated with numerous leukocytic cells particularly around proliferated bile ductules. The portal blood vessels were congested with perivascular fibrosis in some cases. Kidneys showed focal area of intertubular leukocytic cells infiltrations with mild inter tubular extravasated erythrocytes and congestion. The spleen and Bursa of Fabricius showed depletion of lymphocytes, congestion and hemorrhage. Intestine showed vacuolation of glandular epithelium with severe interglandular leukocytic cells infiltration. **Group (2)** showed mild signs and lesions in comparison to group (1). Meanwhile **group (3)** showed moderate signs comparable to group (1). The previous

results in groups 2 and 3 were due addition of chemical detoxifying agent cholestyramine and physical detoxifying agent oxihumate which minimized the adverse effects of aflatoxins in the exposed chicks of these groups.

The chickens received OTA in **group (4)** showed weakness, restlessness, reduce weight gain and increased water consumption. Diarrhea, poorly feathers and paleness of comb and wattles were detected in some cases. Many degree of anorexia was also noticed. The mortality rate was 31.4%. **Macroscopically**, severe congested and enlarged kidneys were observed in majority of cases. Enlargement of liver size with yellowish coloration were detected. Hyperemic mucosal surface of intestine was noticed in some cases. Some chicken showed thickening of intestinal wall with excessive amount of mucous.Reduction in both bursa of Fabricius and Spleen size were detected. **Microscopically**, kidneys showed severe congestion of peritubular capillaries with mild degeneration of some renal tubules. Focal intertubular lymphocytic cells infiltration with intertubular extravasated erythrocytes together with degeneration of some renal tubules was also noticed. Some renal tubules in some cases showed urates deposition. Liver showed severe perivascular fibrosis with congestion of hepatic blood vessels in most cases. Other cases revealed dissociation of hepatocytes with severe congestion of hepatic blood vessels and diffuse von kuppfer cells proliferation in addition to severe perivascular leukocytic cells infiltration. Spleen and bursa of Fabricius showed depletion of lymphocyte. Intestine of most chickens showed congestion of intestinal blood vessels with vacuolation of the intestinal gland. Other cases showed necrotic area beneath submucosa. Fusion of intestinal villi was seen in some cases.

Chickens of **group (5)** showed mild clinical signs, macroscopic lesions and microscopic lesions comparable to group (4) also moderate clinical signs, macroscopic lesions and microscopic lesions were seen in **group (6)** in comparison to group (4).The addition of chemical detoxifing agent cholestyramine and physical detoxifing agent oxihumate minimized the adverse effects of ochratoxin in the exposed chicks of these groups.

Mild side effects were associated with oxihumate in chicks of **group (8)** while milder effects of cholestyramine were encountered in chicks of **group (7).**

Immunohistochemical results showed strong expression in both intoxicated groups with AFB1 and OTA while mild to moderate expression were noticed in treated group by chemical and physical detoxifier.

Higher residual level were recorded in liver then kidney and finally muscle in aflatoxicated chicken while in ochratoxicated chickens higher level were in muscle than liver and finally kidney.

Finally, it could be concluded that ochratoxicosis occur less frequently in poultry than aflatoxicosis but is more lethal because of its acute toxicity. The use of both chemical detoxifying agent cholestyramine and physical detoxifying agent oxihumate alleviated the adverse effects of AFB1and OTA. The use of chemical detoxifying agent cholestyramine was more effective with a minimal side effect.