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Full Length Research Paper

Gross and histopathological studies of Diclofenac, Ibuprofen and Nimesulide induced toxicity in broilers

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The present experimental work was conducted to elucidate the gross and histopathological studies in broiler chicks when treated with Diclofenac sodium, Ibuprofen and Nimesulide. For this study, 120 apparently healthy broiler chicks of either sexes were randomly divided into 10 groups comprising of 10 birds in 9 groups and 30 birds in control group. The broilers of Diclofenac groups were given 10, 20 and 30 mg/kg body weight of Diclofenac sodium for 5 days. Similarly the broilers of Ibuprofen groups were administered 15, 30 and 45 mg/kg body weight of Ibuprofen with feed for 5 days. On the other hand the birds of Nimesulide groups were also given 10, 20 and 30 mg/kg Nimesulide for 5 days. The Nimesuldie groups did not show any lesions of gout but the birds intoxicated with Diclofenac and Ibuprofen revealed mild to moderate lesions of gout characterized by deposition of white chalky urates on the organ surface.

Key words: Diclofenac, Ibuprofen, Nimesulide, broiler, toxicity.

INTRODUCTION

Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used as anti-inflammatory, antipyretic and analgesic. They produce their action by inhibiting the activities of cyclooxygenase enzymes (COX-1 and COX-2) which mediates the production of prostaglandins from arachidonic acid. Nimesulide with its anti-inflammatory, analgesic and antipyretic effects was first launched in Italy in 1985. Ibuprofen is originally marketed as Brufen and used as an analgesic, especially where there is an inflammatory conditions. Diclofenac is anti-inflammatory, antipyretic and analgesic in nature as it has an ability to inhibit the activities of cyclooxygenase enzymes. Diclofenac was found to be causing pathological changes in the kidneys of the vultures, which ultimately lead to the gout (Oaks and Khan, 2004 and Shultz et al., 2004). Depletion of vulture population due to visceral gout is now linked with consumption of flesh of carcass with Diclofenac residue. Keeping the above facts in view, the investigation was designed to study the gross and histopathological changes in broilers which are intoxicated with diclofenac, nimesulide and Ibuprofen.

MATERIAL AND METHODS

Experimental design

A total number of 120 day old broiler chicks of both sexes were procured form college poultry farm. The chicks irrespective of their groups were maintained on the same type of chick starter mash. All the chicks were vaccinated against Marek's disease on the first day

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Table 1. Dose and duration

Groups	Drug name	Dose and duration (5days)	Dose and duration (5 days)	Dose and duration (5 days)
Control C	No drug	No drug	No drug	No drug
D(Treatment)	Diclofenac	(D1)10 mg/kg b.wt	(D2)20 mg/kg b.wt	(D3)30 mg/kg b.wt
B(Treatment)	Ibuprofen	(B1)15 mg/kg b.wt	(B2)30 mg/kg b.wt	(B3)45 mg/kg b.wt
N(Treatment)	Nimesulide	(N1)10 mg/kg b.wt	(N2)20 mg/kg b.wt	(N3)30 mg/kg b.wt

b.wt: body weight.

of hatching whereas F1 (Lasota) vaccination against Ranikhet disease was carried out to all chicks on 6th day of age. Bifuran medication at 1 tablet/4 liters of drinking water was used to prevent coccidiosis in chicks. .

Dose and duration

The chicks were divided into 4 major groups and within each major group the chicks were divided into 3 sub-groups having 10 chicks in each sub group (Table 1).

Gross pathology

All the surviving experimental birds were killed on day 12 of age and each organ was critically examined for macroscopic lesions. The lesions were recorded and compared at the end of the experimental period.

Histopathology

All the dead and killed birds were subjected to necropsy examination. At necropsy table, pieces of different organs were collected and fixed in 10% buffered formalin for histopathological examination. De Galantha's Stain was used for examination of urates crystals (De Galantha, 1935).

RESULTS AND DISCUSSION

Pathomorphological observation

Liver

Grossly, the liver from intoxicated birds in Nimesulide groups did not reveal any significant gross lesion. The birds sacrificed or dead in Diclofenac and Ibuprofen groups revealed deposition of chalky white urates on the capsule of liver. Microscopically the succumbed birds revealed severe sinusoid dilatation and multifocal areas of coagulative necrosis due to deposition of tophi. At places adjacent to necrotic foci there is presence of several apoptotic bodies characterized by basophilic mass enclosed by eosinophilic membrane.

Kidneys

The birds in Numesulide groups did not reveal any significant gross lesion in kidneys. The succumbed birds in diclofenac and Ibuprofen groups revealed marked gross lesions of gout characterized by deposition of white chalky materials on capsular surface of kidneys giving frosty appearance. Histopathologically, the birds sacrificed or died revealed moderate lesions in kidneys characterized by interstitial nephritis, variable degree of congestion and degeneration of glomeruli with increased periglomerular spaces. De Galantha sections revealed presence of black colour crystals of urates in clusters at different locations.

Heart

Grossly, the heart from intoxicated birds of Nimesulide groups did not reveal any significant lesion. The sacrificed or dead birds in Diclofenac and Ibuprofen groups revealed moderate to marked gross lesion with deposition of white chalky material on the pericardium of the heart. Microscopically endocardium, myocardium and epicardium did not reveal any significant lesion except mild degenerative changes in cardiac myofibre. The perital layer of pericardium showed proliferation of mesothelial cell with deposition of tophi appearing as pink colour radiating amorphous structure.

Proventriculus

The birds of Nimesulide groups did not reveal any significant gross lesion in proventriculus. The succumbed birds due to Diclofenac toxicity showed mild degree of chalky white materials deposited on the serosal surface of the proventriculus**.** Microscopically, the succumbed birds in Diclofenac and Ibuprofen group showed degeneration and desquamation of epithelium lining of the mucosal folds with presence of cellular debris in the lumen of proventriculus. The mucosa of proventriculus showed hyperplasia of the parietal cells.

Lungs

The bird in Diclofenac and Ibuprofen groups shows oedma formation. The succumbed birds in Diclofenac groups revealed pneumonia, congestion and mild deposition of urate crystals on the pleural surfaces. The

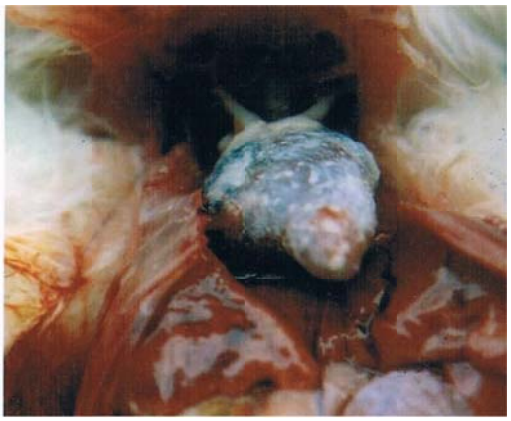

Figure 1. Photograph showing deposition of urate crystals on peritonium and serosa of visceral organ in chick of D1 group.

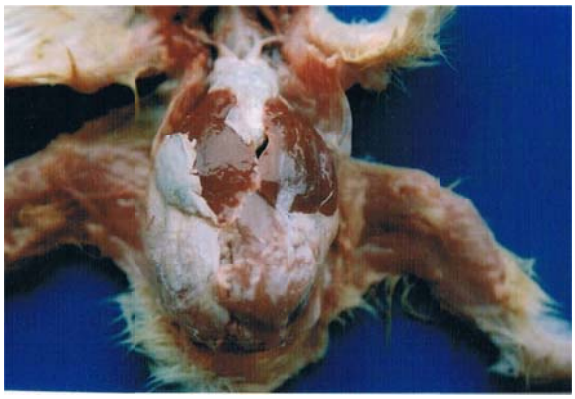

Figure 2. Photograph showing extensive deposition of urates in the peritoneal layer of abdominal cavity and liver in chick of D2 group.

These are seen in Figures 1 to 6.

large linear areas of necrotic foci were evident with lesions of bronchitis characterized by infiltration of heterophils and macrophages around the lumen of parahronchi and air vesicles.

Intestine

The succumbed birds due to Ibuprofen toxicity showed mild degree of chalky white materials deposited on the Intestine. Microscopically there was necrosis of the mucosa of the intestine.

Thymus

There was mild degree of chalky white materials deposited on the Thymus of the Diclofenac intoxicated birds. Microscopically, the succumbed birds due to Diclofenac and Ibuprofen toxicity showed the degeneration of Thymus.

Bursa

The succumbed birds of Diclofenac and Ibuprofen groups showed mild degree of chalky white materials deposited on the surface of the Bursa. Microscopically, the birds of toxicity group, revealed depletion of lymphocytes in lymphoid follicles of bursa.

Brain

Microscopically, the succumbed birds in Diclofenac toxicity groups showed leptomeningial congestion along with perivascular and perineuronal edema in cerebral cortex of the brain.

Joints

The succumbed birds in Diclofenac and Ibuprofen toxicity groups showed swollen hock and toe joints. Microscopically, the succumbed birds in toxicity groups showed mild degree of chalky white materials deposited on the articular surfaces.

Gross lesions

These are seen in Figures 1 to 6.

Mcroscopic Lesions

These are seen in Figures 7 to 12.

Kidney

The succumbed birds showed severe lesions of gout with marked interstitial nephritis. More or less similar type of lesions in the kidneys have also been observed in diclofenac toxicity by Nayak and Chakarbarti (1999), Meteyers and Oaks (2005) and Chandra and Singh, (1980)

Liver

The intoxicated birds showed dilatation of sinusoid, variable degree of degenerative fatty changes in hepatocytes, focal areas of caogulative necrosis. These lesions are in accordance with the lesion observed in Diclofenac toxicity in poultry by Runnells and Molise (1965), Oaks and Khan (2004) in Oriental white blacked Vultures and by Ramesh and Narayanan (2002) in

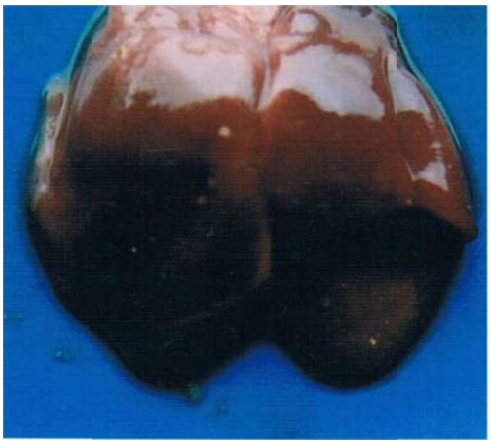

Figure 3. Photograph showing deposition of large amount of urates on capsule of liver in chick of D3 group.

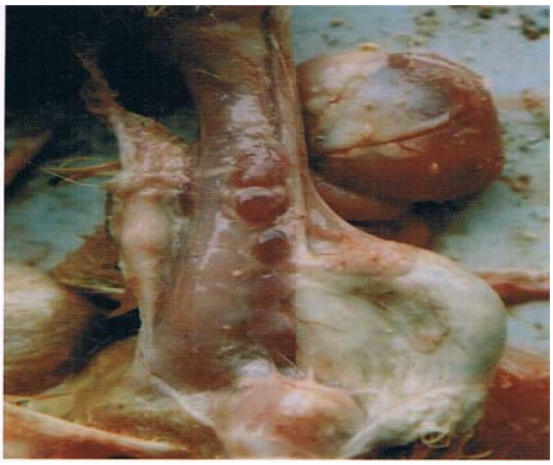

Figure 6. Photograph showing enlarged lobes of thymus in treated birds of B3 group.

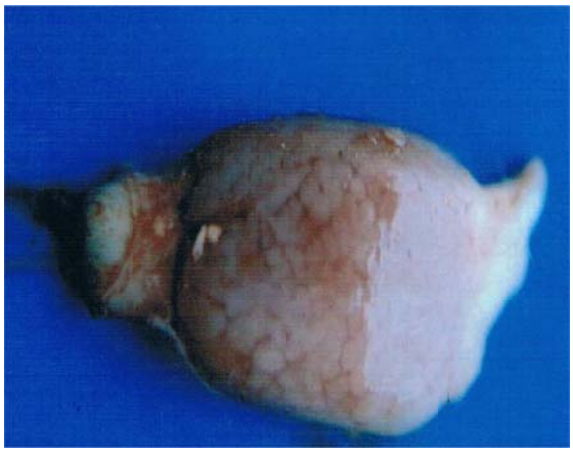

Figure 4. Photograph showing white chalky deposits on serosal layer of proventriculus in chick of B1 group.

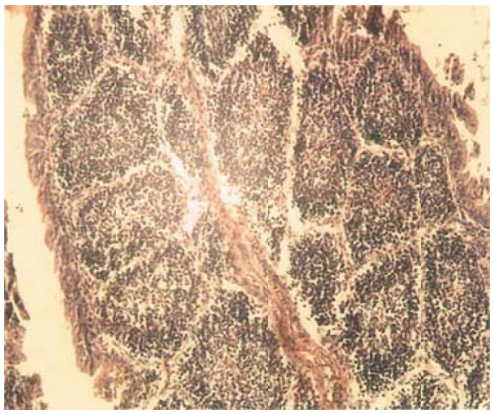

Figure 7. Photomicrograph showing section of bursa with depletion of lymphocytes in lymphoid follicles of bursa in D1 group. (Hematoxylin and Eosin staining).

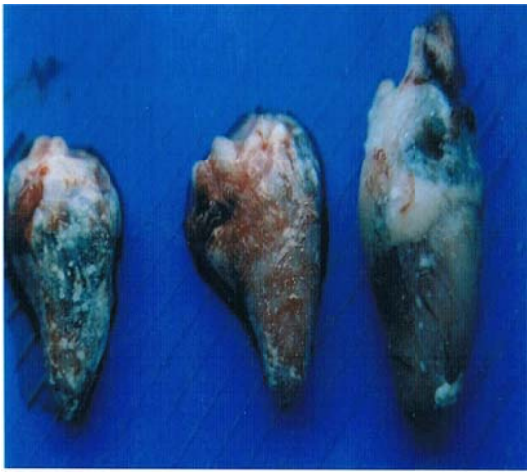

Figure 5. Photograph showing heavy deposition of urates on pericardium of heart suggesting visceral gout in chick of B2 group.

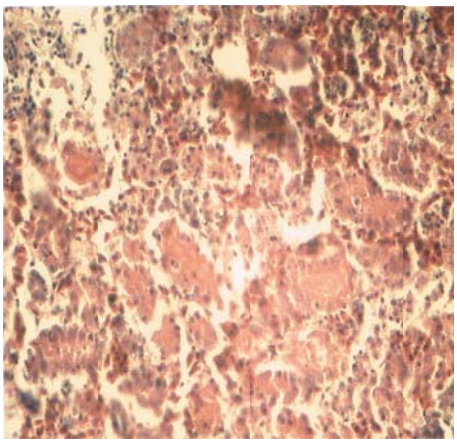

Figure 8. Photomicrograph showing degenerative changes and deposition of urates and infiltration of inflammatory cells in heart of D2 group. (Hematoxylin and Eosin staining).

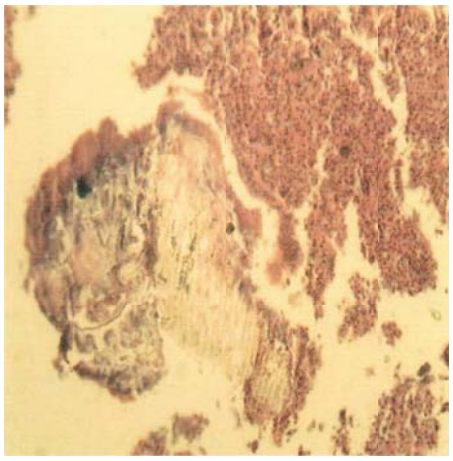

Figure 9. Photomicrograph showing deposition of urates in proventriculus in the form of Tophi, extensive necrosis and sloughing of mucosa in birds of D3 group. (Hematoxylin and Eosin staining).

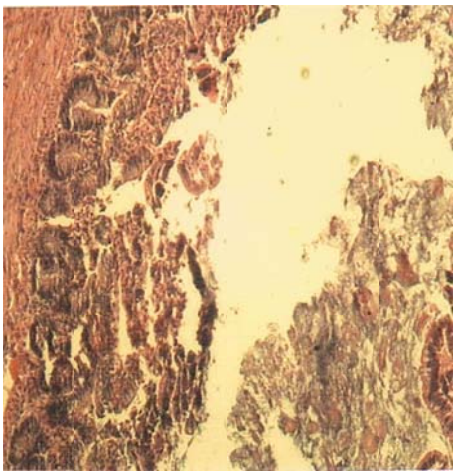

Figure 10. Photomicrograph showing extensive necrosis of intestinal mucosa and debris in the lumen in birds of B1 group. Hematoxylin and Eosin staining).

Mongrel dog.

Lungs

The succumbed birds revealed lesions of pneumonia characterized by infiltration of heterophils and mononuclear cells in the large parabronchi and secondary bronchi. Necrotic foci were also observed in birds which were intoxicated with diclofenac. Similar lesions in the lungs have been reported in Diclofenac toxicity in poultry by Reddy and Sudhakar (1984), Mir and Darzi (2005) in poultry.

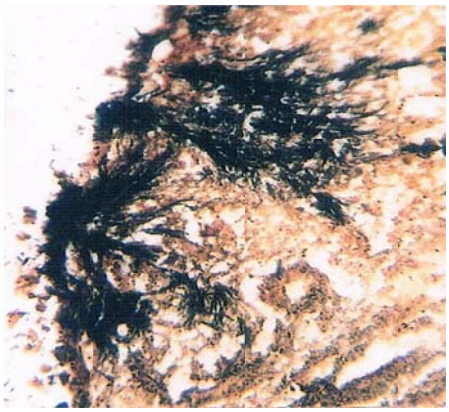

Figure 11. Photomicrograph showing deposition of urates in kidney positive for De Galanthas stain in B2 group. (Hematoxylin and Eosin staining).

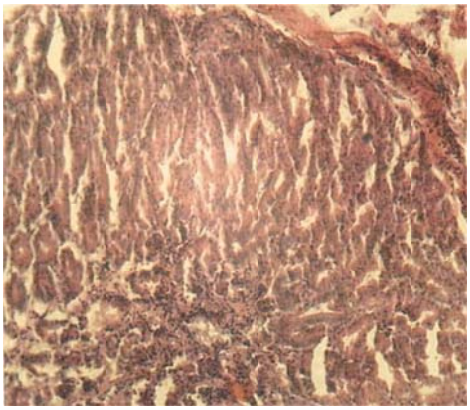

Figure 12. Photomicrograph showing necrosis and infiltration of inflammatory cells in lobules of proventriculus in birds of B3 group. (Hematoxylin and Eosin staining).

Heart

Deposition of chalky white urates on the pericardium of heart was observed in the succumbed birds. More or less similar lesions in the heart have been observed in Diclofenac toxicity in poultry by Uma and Rao (1999), Arun and Azeej (2004) in Oriental white blocked vultures and Patel (2005) in poultry.

Proventriculus

The mucosa of proventriculus of succumbed birds proventriculus shows the hyperplasia of the parietal cells which secretes acid for digestion of the food as early observed by Gajera (2006) in diclofenac toxicity of poultry.

Bursa

The succumbed birds showed moderate depletion of lymphoid tissue which was previously observed by Rao and Sharma (1993) in Ibuprofen toxicity in Poultry and in Diclofenac toxicity in poultry by Uma and Rao (1999).

Joints

The succumbed birds showed mild degree of chalky white materials deposited on the articular surfaces around the area of soft tissue along with the tendon sheath of the joints. More or less similar types of lesions in the jonts have been observed in Diclofenac toxicity in poultry by Mir and Darzi (2005) and Nayak and Chakarbarti (1999).

Conflict of Interest

The authors have not declared any conflict of interest.

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