ULTRASTRUCTURAL CHANGES IN LIVER OF DUCKS IN CHRONIC AFLATOXICOSIS*

K. Latha[1], Mammen. J. Abraham[2], K. M. Ramachandran[3], P. K. Ismail[4] and K. Narayanankutty[5]

Centre of Excellence in Pathology
College of Veterinary and Animal Sciences
Mannuthy - 680 651, Thrissur

Abstract

Dietary aflatoxin was fed to four groups of four month old male desi ducks daily at a dose rate of 5,10,20 and 40 ppb per kg of feed. The ultrastructural changes noticed in the hepatocytes were intact cell nucleus with prominent nuclear pores, increased amounts of heterochromatin that appeared as clumps, dilatation and degranulation of rough endoplasmic reticulum (RER), rounded oval or elongated mitochondria and scattered lipid droplets.

Key words : *Aflatoxin, duck, ultrastructural pathology.*

Aflatoxin is a major threat to the poultry industry and ducks are extremely susceptible to the adverse effects of aflatoxin. Aflatoxin is a mycotoxin that is hepatotoxic, mutagenic, carcinogenic and immunosuppressive to poultry. The liver is the target organ for aflatoxin. Considering these effects, the present study was undertaken to find out the ultrastructural changes in the liver of ducks in chronic aflatoxicosis.

Materials and Methods

One hundred and twenty male desi ducks aged four months were divided into five groups of twenty four birds each. Group I served as control and other four treatment groups were fed with dietary aflatoxin at the daily dose rate of 5, 10, 20 and 40 ppb per kg of feed, for a period of eight months. Six birds from each of the group were sacrificed at second, fourth, sixth and eighth month of the trial. During the disposal, pieces of liver from treatment as well as control birds were collected in 3 per cent gluteraldehyde for ultrastructural studies. The gluteraldehyde fixed liver tissues were washed three times in phosphate buffer (PH 7.4) and post fixed in 1% buffered osmium tetroxide (Sigma, USA) at 4°C for two hours. They were then dehydrated in graded acetone and embedded in spur low viscosity resin (Bio Rad, Micro sciences division, USA). Sections were cut on a Reichter Jung Ultracut-R microtome. Ultra thin sections were taken on copper grids and stained with uranyl acetate and lead citrate, (Sigma USA) examined in an electron microscope (Hitachi—600A) at 75kV and electron micrographs were taken.

Results and Discussion

In this investigation, cytological alteration in the hepatocytes after feeding aflatoxin were basically the same as described earlier by George (1998). The ultrastructural changes noticed were intact cell nucleus with condensed nucleolus and prominent nuclear pores. The cytoplasm revealed rounded, oval or elongated mitochondria which were either normal or swollen containing swollen cristae along with the presence of electron dense material within the matrix. The most

** Part of M.V.Sc. thesis submitted by the first author to the Kerala Agricultural University, Thrissur ,Thrissur,*

1. PG Scholar
2. Associate Professor
3. Since deceased
4. Professor (Retd.)
5. Senior Scientist, AICRP on Poultry for Eggs, Mannuthy

conspicuous change seen in the cell was the degranulation of rough endoplasmic reticulum (RER) and extensive vacuolar changes. Rough endoplasmic reticulum (RER) also showed vesiculation and fragmentation of the membranes. Free ribosomes were found in the cytoplasm along with scattered lipid droplets (Fig.1). Smooth endoplasmic reticulum (SER) appeared as small tortuous vesiculated structures (Fig.2). The degranulation of rough endoplasmic reticulum indicated suppression of protein synthesis in the cell. This was further evidenced by the appearance of heterochromatin in large amounts forming clumps along the inner nuclear membrane (Strenger, 1970; Thomson, 1984). Further it has been shown that ribosomal detachment would be accompanied by the lipid accumulation and generalized glycogen depletion (Smuckler *et al.*, 1962). Fragmentation of the endoplasmic reticulum was the result of peroxidation of unsaturated lipids in the membranes by the free radicals generated (Cheville, 1983; Thomson, 1984). The proliferation of the smooth endoplasmic reticulum indicated attempts at detoxification. Smooth endoplasmic reticulum is concerned with the biotransformation of xenobiotics. It was reported that when there was an increased demand for biotransformation, proliferation of these membranes occurred (Smuckler *et al.*, 1962; Lavia and Hill 1971; Cheville, 1983).



Fig.1. Electron microscopy of liver hepatocyte showing intact nucleus (N) with condensed nucleolus (NU), swollen mitochondria (M), fragmented rough endoplasmic reticulum (RER), scattered glycogen particles (G) and lipid droplets (L) Group IV-Sixth month EMX 8400.

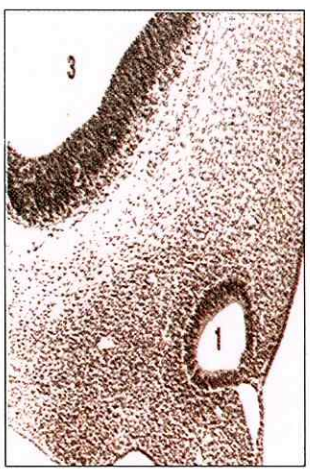


Fig.2. Electron microscopy of liver hepatocyte showing cytoplasmic cavitations and smooth endoplasmic reticulum (SER) -Group IV-Sixth month-EMX 1050.

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