

Animal welfare, etológia és tartástechnológia



Animal welfare, ethology and housing systems

Volume 9

Issue 3

Különszám/Special Issue

Gödöllő

2013

Ultrastructural changes in kidneys of newly hatched chicks exposed to cadmium during embryogenesis

Dżugan M.¹, Lutnicka H.², Lis M.², Droba M.¹, Niedziółka J.²

¹Department of Chemistry and Food Toxicology, University of Rzeszów, Ćwiklińskiej 2, 35-601 Rzeszów, Poland, e-mail: mdzugan@univ.rzeszow.pl

²Department of Poultry and Fur Animals Breeding and Animal Hygiene, University of Agriculture in Kraków, Al. Mickiewicza 24/28, 30-059 Kraków, Poland

Cadmium, an important environmental toxic agent has the kidney as its most important target organ. It is concentrated mainly in the renal cortex. In humans, excessive renal accumulation of cadmium causes well defined morphological and ultrastructural, pathological changes in the proximal tubules. In this study, the effect of cadmium (Cd) injected *in ovo* on ultrastructural alterations of kidney of chicken embryos were studied using transmission electron microscopy. Cadmium (3 and 6 µg per egg) was injected, on the 4th day of incubation, to broilers eggs (n=50 per group) with live embryos whereas control group (n=50) was injected with saline solution. After hatching, kidneys were taken and fixed in glutaraldehyde solution for electron microscopic observations.

Ultrastructural changes in kidney of chicks exposed to cadmium were observed in all organelle and cytoplasm of the epithelial cells in renal tubules. Moreover strong adverse effect with increasing cadmium dose was observed. The most advanced ultrastructural changes were observed in mitochondria. Part of them was completely destroyed. Many of them were swollen. Their external and internal membranes were locally destroyed. Mitochondrial inner structure was partially damaged. The most characteristic pathological change in mitochondria was dilation of the space between mitochondrial crests and these places had lower electron density in relation to other matrix. The membranes of other organelle were locally destroyed. The rough endoplasmic reticulum (RER) was observed rarely as well as its ribosomes. The strong process of RER fragmentation was observed. The ends of the cisterns of Golgi apparatus were dilated. The structure of brush border of the epithelial cells was slightly and locally destroyed. Some lysosomes were observed. The nuclear membranes of the epithelial cells of the renal tubules were locally damaged. The lysis of cytoplasm of some cells was seen.

It was established that cadmium was toxic for kidney and caused structural damage. Cadmium injected *in ovo* resulted mainly in severe damage of mitochondria, but other organelle and cytoplasm were damaged too. The pathological alterations were depended on Cd dose.

Key words: cadmium, chicken embryos, kidney, pathological alterations, electron microscopy