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**Chromium Induced Histological Changes in the Body Wall of the Earthworm
*Eudrillus eugeniae***

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Abstract

In Sri Lanka, documented evidence indicates that the Chromium (Cr) content in water and soil is high, reaching upto 0.60 mg l^{-1} in water and 103 mg kg^{-1} in soil and sediment. Cr is one of the most toxic heavy metals, which is capable of inducing adverse effects in exposed organisms even in trace amounts. Of the two valency states, Cr^{3+} and Cr^{6+} , the latter is potentially more toxic than the former. In the present study we examined the histological alterations in the body wall of *Eudrillus eugeniae*, a commonly occurring species of earthworm, exposed to hexa-valent Cr.

Adult earthworms were collected from a culture facility in Talawakalle, and acclimatized for two weeks. Worms with a well-developed clitellum and of $0.29 \pm 0.009 \text{ g}$ weight were used for standard chronic exposure trials of 28 days. For the trials, the animals were placed in suitably prepared clay pots containing banana piths soaked in five different concentrations ($0.002 - 20 \text{ mg l}^{-1}$) of Cr^{6+} . At the end of the 28 days, the worms were fixed in Zenker fixative, washed, dehydrated, embedded in paraffin wax and the tissue sections taken at $7 \mu\text{m}$ were stained using hematoxylin-eosin. Histological alterations in the outer epithelium were then recorded in detail.

It was evident that Cr^{6+} induced alterations in the outer epithelium of the earthworm at all test levels. A reduction in the thickness of the epithelium was noted (Control – $61.6 \pm 6.1 \mu\text{m}$, 0.02 mg l^{-1} – $28.0 \pm 1.5 \mu\text{m}$). Another observation was the reduction in the number of nuclei (Control – 31.3 ± 2.8 , 0.02 mg l^{-1} – 7.4 ± 0.4) and the increase in the number of pyknotic nuclei in a given area of epithelial tissue (Control – 2.3 ± 0.4 , 0.002 mg l^{-1} – 10.5 ± 1.0). Epithelial cells were neatly compacted with distinct cell margins in earthworms that were not exposed, whilst those exposed showed disintegration of cell margins even at 0.002 mg l^{-1} of Cr^{6+} . Mucous cells, which are generally apparent, were not distinct in Cr^{6+} treated worms. Epithelial sloughing was more pronounced in treated earthworms than in the controls. The space between the epidermis and muscle layers were greater in treated worms than in the controls (Control – $0.7 \pm 0.5 \mu\text{m}$, 0.02 mg l^{-1} – $23.6 \pm 1.0 \mu\text{m}$). The muscle layers of the body wall of the Cr^{6+} treated worms showed loss of structural integrity and increased intercellular spaces with the damage being more severe in those exposed to 20 mg l^{-1} . This study provides evidence that histopathological alterations are possible in the earthworm at levels of Cr recorded in Sri Lanka's natural ecosystems.

Keywords: Chromium, *Eudrillus eugeniae*, Histology, Toxicity