

*Full Length Research Paper*

# Environmental assessment of ground water pollution by heavy metals and bioaccumulation of mercury residues in chicken tissues

Hussein Khamis Hussein<sup>1,3\*</sup>, Osama Abdullah Abu-Zinadah<sup>1</sup>, Haddad Abdel Samie El Rabey<sup>2</sup> and Mohamed Fareez Meerasahib<sup>2</sup>

<sup>1</sup>Department of Biological Sciences, Faculty of Science, King Abdulaziz University, P. O. Box: 80203 Jeddah 21589, Jeddah, Saudi Arabia.

<sup>2</sup>Department of Biochemistry, Faculty of Science, King Abdulaziz University, P. O. Box: 80203 Jeddah 21589, Jeddah, Saudi Arabia.

<sup>3</sup>Department of Zoology, Faculty of Science, Alexandria University, Alexandria, Egypt.

Accepted 10 October, 2011

The aim of this study was to investigate the relationship between the concentrations of heavy metals in well water and bioaccumulation of the most abundant metals in chicken tissues in some areas in the province of Mecca Almokaramah, Saudi Arabia. Among the heavy metals (Cd, Zn, Cr, Mn, Cu Hg, Pb and Ni) studied, mercury (Hg) revealed highest in concentration in well waters. The concentration of mercury in ground water, beside in liver, kidney, muscle and blood samples of 10 chickens from each of four poultry- production farms were estimated using atomic absorption spectrophotometer. The present results showed that the kidney followed by liver are the organs with the highest bioaccumulation of mercury in all farm samples. The level of mercury in ground water was 7.06 µg/L. There is no doubt that the relationship between mercury accumulation levels in kidney and those in liver tissues were proportionally correlated and altered with elevation in antioxidant enzyme activities such as serum enzymes aspartate aminotransferase (AST) and serum glutamate pyruvate transaminase (GPT). These elevated enzymatic activities were induced by the level of toxicity. There was a significant elevation in the level of liver and kidney malondialdehyde (MDA), while the activities of antioxidant enzymes superoxide dismutase and catalase (SOD and CAT) were significantly decreased. Biochemical observations were supplemented by histopathological examination of liver and kidney sections.

**Key words:** Environmental toxicology, ground water, heavy metals, mercury, bioaccumulation- chicken histopathology.

## INTRODUCTION

Water pollution is the contamination of water bodies (example, lakes, rivers, oceans and groundwater). Water pollution occurs when pollutants are discharged directly

or indirectly into water bodies without adequate treatment to remove harmful compounds. Water pollution affects animals and other organisms living in these bodies of water; and, in almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities (Mapanda et al., 2005; Anne et al., 2007).

Heavy or toxic metals are trace metals whose density is at least five times that of water. As such, they are stable elements (meaning they cannot be metabolized by the body) and bio-accumulative (passed up the food chain to

\*Corresponding author. E-mail: [ahssan555@yahoo.com](mailto:ahssan555@yahoo.com).

**Abbreviations:** AST, Aspartate aminotransferase; GPT, glutamate pyruvate transaminases; MDA, malondialdehyde; SOD, superoxide dismutase; CAT, catalase.