PDF - THE EFFECT OF CALCIUM TAINTED WATER ON CADMIUM INDUCED LIVER DAMAGE - researchcub.info**ABSTRACT**

Cadmium is recognize has a toxicant to both human and it's environment and recent investigations have shown its level of toxicity in association in liver damage. The aim of study is to determine the effect of calcium tainted water on cadmium induced liver damage have been examine in this studies, 20 female wistar rat were used in this study the rats divided into four groups each containing 5 rats per group . The group one was maintained on normal feed and water only, the group 2 were exposed to cadmium only while the group three were exposed to calcium only and the group four were exposed simultaneously to cadmium and calcium. Each of the animal was given treatment based on their body weight (0.9 mg per kg body weight). The treatments were administered to the animals once a day for two weeks. At the end of two weeks the animals were sacrificed and the following biochemical markers were measured; Alkaline phosphatase, total protein, alanine amino transferase, total bilirubin and direct bilirubin. All the biochemical markers were negatively affected by cadmium with exception to Albumin and total protein. The study reveal that cadmium has the potential to induce hepatotoxicity and calcium tainted water offer little ameliorating affect to cadmium induce liver damage.

CHAPTER ONE

1.0 INTRODUCTION AND LITERATURE REVIEW

Heavy metals are toxic agent. They are toxic to humans and animals. Heavy metals which establishes toxic actions to humans include; cadmium (Stohs and Bagchi,1995), lead (Ferner, 2001) and mercury (Hawkes, 1997). Each of these has been studied in isolation for toxicity (Huton and Symon, 1986; Nriagu and Pacyna, 1988; Nriagu, 1989). But, in the eco-system, be it air, atmosphere, land, and water where they occur, they do not exist in isolation. They occur in close association with other metal and non-metallic elemental pollutants. Among the metallic pollutant could be calcium, copper, zinc, magnesium, manganese, iron and others. Metals are known to interact with one another. The interaction can bring two elements together in close proximity or it could cause out right displacement of one another. When ingested together in food and water, they antagonize each other. When it comes to intestinal and pulmonary absorption, it is therefore conceivable that the presence of other elements can the toxic potential of each of the heavy metals that have been studied in isolation.

Eborge (1994) reported that warri river has an unacceptable high cadmium level, 0.3 mg cadmium per liter of water which was 60 folds above the maximum allowable level of 0.005 mg per liter. This report prompted our earlier studies on the hepato, nephro and gonadial toxicity of cadmium. In rats exposed to this high dose via water and diet, the diet was formulated with feed exposed to 0.3 mg cadmium per water. In the ambient water as protein source and the toxic effect investigated and reported (Asagba and obi 2000; Asagba and Obi 2001; Obi and Ilori 2002; Asagba and Obi 2004a; Asagba and Obi 2004b; Asagba and Obi 2005).The study focus on cadmium without taking into consideration the fact that other metals were also present in the river water, and as such were co-consumed by the communities using the river water for cooking drinking and for other domestic purposes. Hence, it is desirable to know if the presence of other metals would enhance or diminish the toxic potential of cadmium or indeed if any other heavy metals such as lead that was mentioned above. Therefore, the aim of the present study was to re-examine the toxic potential of cadmium in the presence of other metals such as calcium and magnesium.

The objectives set out to achieve were;

Re-examination of toxicity of using established and those for liver toxicity namely; blood alanine amino transferase and aspartate amino transferase, alkaline phosphatase, bilirubin, albumin and total protein.

Re-examine the status parameter in the absence of cadmium but in the presence of calcium or magnesium or both.

Re-examine this parameters in the presence of cadmium, calcium and magnesium.

1.1 CADMIUM

Cadmium is a chemical element with symbol Cd and atomic number 48. This soft, bluish-white metal is chemically similar to the two other stable metals in group 12, zinc and mercury. Like zinc, it prefers oxidation state +2 in most of its compounds and like mercury it shows a low melting point compared to transition metals. Cadmium and its congeners are not always considered transition metals, in that they do not have partly filled d or f electron shells in the elemental or common oxidation states. The average concentration of cadmium in Earth's crust is between 0.1 and 0.5 parts per million (ppm). It was discovered in 1817 simultaneously by Stromeyer and Hermann, both in Germany, as an impurity in zinc carbonate. Cadmium occurs as a minor component in most zinc ores and therefore is a byproduct of zinc production. It was used for a long time as a pigment and for corrosion-resistant plating on steel, whereas cadmium compounds were used to stabilize plastic. The use of cadmium is generally decreasing due to its toxicity (it is specifically listed in the European Restriction of Hazardous Substances (Morrow, 2010)) and the replacement of nickel-cadmium batteries with nickel-metal hydride and lithium-ion batteries. One of its few new uses is in cadmium telluride solar panels. Although cadmium has no known biological function in higher organisms, a cadmium-dependent carbonic anhydrase has been found in marine diatoms.

1.1.1 PHYSICAL PROPERTIES

Cadmium is a soft, malleable, ductile, bluish-white divalent metal. It is similar in many respects to zinc but forms complex compounds (Holleman *et al*., 1985). Unlike other metals, cadmium is resistant to corrosion and as a result it is used as a protective layer when deposited on other metals. As a bulk metal, cadmium is insoluble in water and is not flammable; however, in its powdered form it may burn and release toxic fumes (CSEM, 2011).

1.1.2 CHEMICAL PROPERTIES

Although cadmium usually has an oxidation state of +2, it also exists in the +1 state. Cadmium and its congeners are not always considered transition metals, in that they do not have partly filled d or f electron shells in the elemental or common oxidation states (Cotton, 1999). Cadmium burns in air to form brown amorphous cadmium oxide (CdO); the crystalline form of this compound is a dark red which changes color when heated, similar to zinc oxide. Hydrochloric acid, sulfuric acid and nitric acid dissolve cadmium by forming cadmium chloride ($CdCl_2$), cadmium sulfate ($CdSO_4$), or cadmium nitrate ($Cd(NO_3)_2$). The oxidation state +1 can be reached by dissolving cadmium in a mixture of cadmium chloride and aluminium chloride, forming the Cd_2^{2+} cation, which is similar to the Hg_2^{2+} cation in mercury(I) chloride (Holleman *et al*., 1985).

$Cd + CdCl_2 + 2\ AlCl_3 \rightarrow Cd_2(AlCl_4)_2$

The structures of many cadmium complexes with nucleobases, amino acids and vitamins have been determined (Carballo *et al*., 2013).

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