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Determination of Residual Presence of Toxic Heavy Metal in the Liver of *LABEO BATA* (HAMILTON, 1822) Using Rain Water Harvest System

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Abstract: Fish are special among vertebrates because they may absorb metal from the water through their gills and from their food through their guts (direct and trophic absorption methods). Since the fish's gills are the primary organ targeted by metal toxicity, the direct uptake route is more significant. Most research on the toxicity and accumulation of metals in fish focuses on individual metals. But in the natural world, fish are exposed to mixes of many metals, whose toxicity levels typically differ from those of individual metals because of their additive, sometimes less than additive (antagonistic) effects, or higher than additive (synergistic) effects. This article discusses the build-up of heavy metals in fish organs and tissues, particularly in relation to the intake of water-borne metals via the trophic pathway. The trophic route is important because it is related with "Biological Magnification". The fish we eat, usually comes from rivers or pond or bheri, in Kolkata. These are also contaminated with heavy metal toxicity. The rain water is contamination free from heavy metal. We collected live fish from market and kept them in "Rain Water Harvest System" for 24 hours. The accumulated heavy metal was expected to be eliminated from fish liver within 24 hours through the process of detoxification. We found that, even after 24 hours, fish liver contain certain heavy metal as residue. The model fish was Labeo bata (Hamilton,1822). Far more studies on metal interactions should be performed to reach the level of predictability.
Keywords: Labeo bata, Heavy metal, Rain Water, Residual presence, Liver

I. INTRODUCTION

Because of their toxicity, buildup, and amplification in aquatic animals, heavy metals represent a significant concern to the aquatic environment (Komjarova and Blast, 2009). Due to their toxicity, persistence, and capacity for bioaccumulation, the majority of them (Zn, Cu, Ni, Cr, Pb, Cd, Hg, etc.) are listed as priority hazardous substances (pollutants) in several nations (Clearwater et ai, 2002, Bury et al 2003, Chapman et al, 2003). It appears that strong binding to metallothioneins or other metal-binding proteins is how heavy metals accumulate in fish's gills, liver, kidneys, and muscle (Klavins et al 2009). Over the past several decades, researchers have focused a lot of emphasis on the bioaccumulation of heavy metals and other contaminants in fish. As a result, a consider-able amount of field and experimental data have been compiled and reviewed (Kamunde and McPhile, 2011). Two pathways of uptake are involved in the bioaccumulation process in fish: the aqueous uptake of chemicals carried by the water by the gills (bioconcentration) and the dietary uptake of contaminated food and sediment by the intestinal mucosa (biomagnification). Therefore, intricate interactions between the aforementioned pathways and different elimination strategies (excretion, passive release, and metabolization) lead to bioaccumulation (Ergolu et al, 2005). However, under a technical definition of the word, metals themselves cannot be metabolised; instead, they can only be excreted from the body (Ghosh et al, 2007). Generally speaking, vertebrates only have two ways to acquire metal: directly from the food through trophic channels, such as gills, and indirectly from the water through the diet (Farkas et al, 2003).

II. MATERIALS AND METHODS

The "Rain Water Harvest System" has been introduced in 2020-21 at Rammohan College ((22.582952^0N & 88.370997^0E), used for this experiment. 5 batch of 10 fish each (Weight average 30 gm) of *Labeo bata* (Hamilton,1822) were procured from "Rajendrapur Fish Seed Market" Naihati, 24 Parganas(N) and kept in the tank of "Rain water" for 24 Hours. No food was provided to the fish.

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After 24 hours, the liver of fish were collected (as detoxification organ) and dissolved in HCl for ICPMS to Director of Quality Control (Food), Government of West Bengal.

Inductively coupled plasma (ICP) mass spectrometry (MS) finds frequent application in a wide range of research domains, including the food, material, chemical, semiconductor, and nuclear industries, as well as the earth, environmental, biological, and forensic sciences. All kinds of samples and matrices introduced by a range of specialised equipment find a suitable atomizer and element ioniser in the high ion density and high temperature of a plasma. Prominent characteristics include maximum sensitivity (ppt–ppq), relative salt resistance, element response independent of compound, and optimal quantitation precision contribute to ICP MS's unrivalled ability to effectively detect, identify, and consistently quantify trace elements. The molecular identification capabilities of ICP MS hyphenated to species-specific separation techniques are expanded by the growing availability of pertinent reference compounds and good separation selectivity. ICP MS is a productive and extremely sensitive technique for target-element oriented discoveries of relevant and unknown compounds, whereas molecular ion source MS is specialised in figuring out the structure of unknown molecules.

Rain Water Harvest System & Fish Tank

Labeo bata (Hamilton,1822)

III. RESULT

Table 1. µg/gm liver tissue sample

Cr	0.11±0.02
Cu	2.91±0.009
Zn	10.8±0.07
As	0.07±0.0003
Cd	0.09±0.003
Sn	0.08±0.003
Hg	0.04±0.001
Pb	0.27±0.008

IV. DISCUSSION

This is very important finding that, all industrial and non industrial heavy metal and metalloid are present in the liver of an edible fish. Liver is the detoxification organ, through which digested materials circulated in the body. So it is obvious that, heavy metal can be found in the muscles and bone of fish. Even after 24 hours of exposure of metal free water, these heavy metals were neither excreted nor diffused.

An extensive multifactorial experimental study must be carried out using representative multimetal mixtures in various combinations at fluctuating environmentally relevant metal concentrations, a wide variety of fish species (including commercially important and bioindicator species with varying ecological status), and meaningful organs and tissues for environmental risk assessment that may be used as a foundation for the creation of ecotoxicologically relevant water quality criteria for metals.

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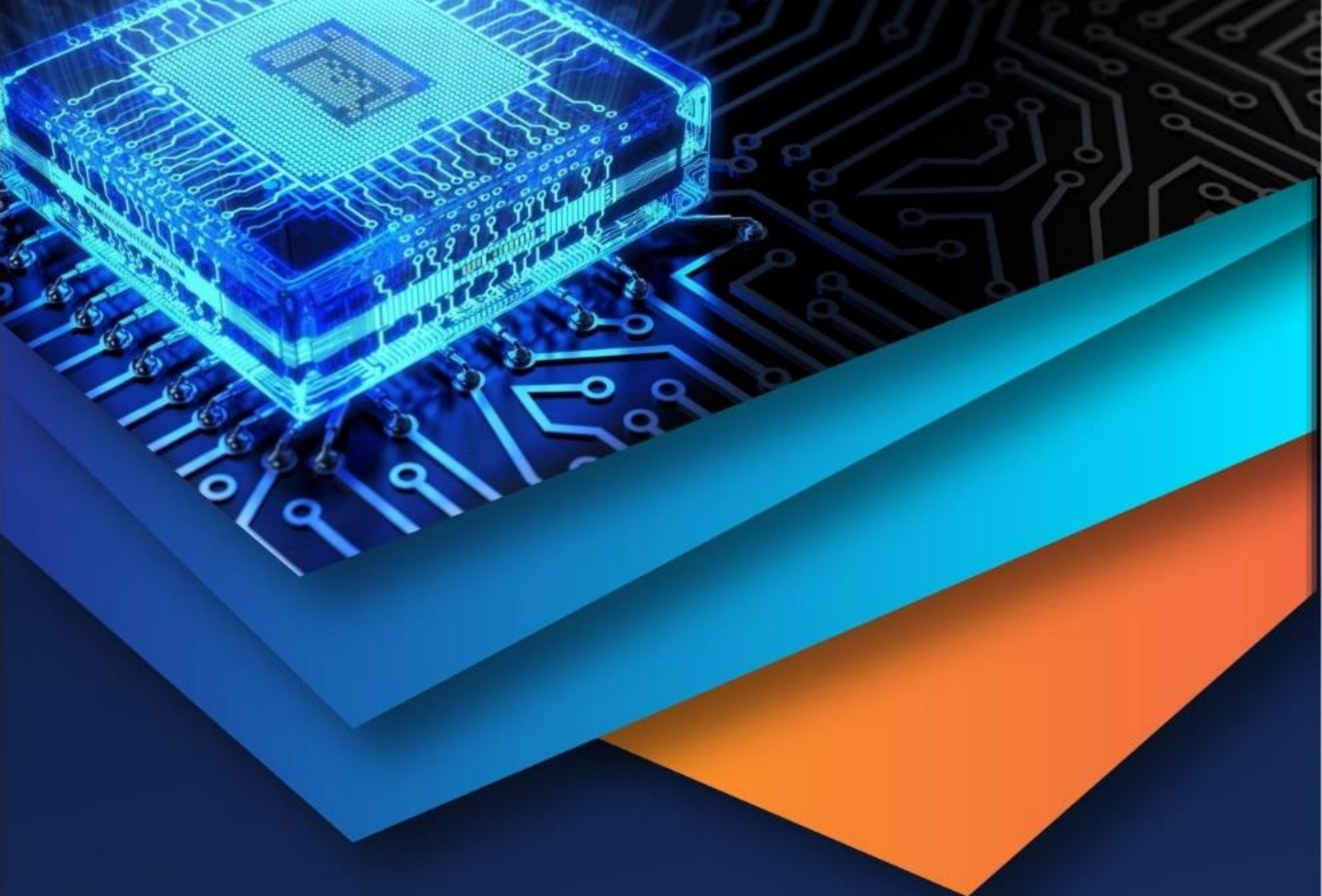

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