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"HAZARDOUS EFFECT OF ARSENIC TRIOXIDE ON FRESH WATER CAT FISH *CLARIAS BATRACHUS* AT GARGA DAM, BOKARO"

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Abstract: Arsenic trioxide contamination has increased due to anthropogenic activities such as urbanisation, industry, and transportation. As is contaminated by mining and mountain erosion. In this study, numerous changes were observed in the blood serum protein of catfish (*Clarias batrachus*) in the biochemical parameter of the fish caused by As_2O_3. By monitoring *Clarias batrachus*in As_2O_3contaminated water inside the allotted period, arsenic trioxide has lowered its protein content, indicating that As_2O_3decreases content of protein.

Keywords: *Clarias batrachus,* As_2O_3, anthropogenic, serum protein

I. INTRODUCTION

Inhalation, diet, and manual handling are all ways that causes heavy metal toxicity, which describes a more than normal required concentration or it is undesirable which were found biologically on our planet and become i concentrated as a result of anthropogenicactivitie, enters the tissues of plants, animals, and people. The majority of heavy metals are found scattered in rock formations. Arsenic pollution in the biosphere is a result of development and industrialisation. As metals and their numerous compounds may cause problems in haematology and biochemistry as well as

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physiology and metabolic activity in (Mohan Raj, 2021)

Proteins play a significant role in many physiological processes; hence measuring the protein level can be used as a diagnostic technique to pinpoint an organism's physiological stages. Proteins are extremely vulnerable to the toxicity of As_2O_3. Animals under toxic stress must diversify their sources of energy to meet upcoming energy demands, which causes the protein levels to drop(Neff, 1985). Heat-shock proteins, and other known stress protein families, are well known to get induced by As and its different derivatives in both in vitro as well as in vivo model systems. With a rapid dose-dependent response to acute exposure, arsenate is among the most effective inducers among the majority of the Heat-shock proteins in numerous organs and their organ-systems. By directly damaging phosphate or thiol groups, which results in damaged proteins, as well as by indirectly producing reactive O_2 species and free radicals that cause oxidative stress damages to both protein and DNA, arsenic and its components can be harmful (Angeline S Andrew, 2003). Extremely toxic effects of aristonite Arsenate: As +3 results from its enhanced affinity with sulfhydryl, rather than +5 attaching straight to the sulfhydryl group to deploy its toxicity: groupings of biomolecule, or SH (Siew Hong Lam 1, 2006). Arsenic interacts with sulfhydryl groups on a variety of proteins and enzymes, and it also acts as a phosphorus substitute in metabolic processes to produce harmful effects. The As_2O_3 induced biochemical alterations (protein) in *Clarias batrachus*were the main focus of the current investigation.

As we know the Earth's crust contains naturally occurring metalloid arsenic. All rocks, the air, the water, and the soil all contain trace amounts of arsenic. A substance that is not a metal yet has several characteristics in common with metals is called a metalloid.In other areas of the world, arsenic concentrations could be higher. This might be the result of human activities, such as pesticide use or metal mining. A greater concentration may also result from environmental factors. Various chemical compounds contain it together with additional elements. Arsenic also contains carbon in its biological forms, but not in its inorganic ones. Water cannot dissolve arsenic.Arsenic compounds can be more hazardous when they are inorganic. They are more likely to interact with bodily cells, remove certain components from the cell, and alter the way the cell functions.For example, phosphate is used by living cells for the production of energy and to send signals to the system, but one form of As known as arsenate can mimic and getreplaced instead of phosphate in cells. The cell's capacity to produce energy and

communicate with other cells is hampered as a result.

Anthropogenic activities are the main cause of increased Arsenic concentrations in the environment. Soil and water contamination are primarily the result of mining activity. However, other human activities that use As, like as forestry, agriculture, and industry, have also caused localised soil and water contamination. Arsenic-containing rocks, processing plants,mining waste, and industrial waste can all leach into the soil and be carried by wind, water, runoff, and other means of transportation.

Table: chemical identity of Arsenic compounds

S no.	Chemical name	Chemical formula	Common name
1	Arsenic	As	Arsenic-75, metallic As, As black,
2	Arsenic trioxide	As_2O_3	Arsenic oxide, white arsenic,
3	Sodium arsenate	Na_2HAsO_4	Disodium arsenate
4	Arsenic acid	H_3AsO_4	Arsoric acid
5	Arsine	AsH_3	Arsenic hydride, arsenic trihydride
6	Sodium dimethyl arsenate	$(CH_3)_2NaAsO_2$	Sodium cacodylate

Table: chemical and physical state of Arsenic compound

S.no	Chemical name	Physical state	Molecular wt.	Oxidation state	Water solubility
1	**Arsenic**	**Solid**	**74.92**	**0**	**Insoluble**
2	**Arsenic trioxide**	**Solid**	**197.82**	**+3**	**Slightly soluble**
3	**Sodium arsenate**	**Solid**	**85.91**	**+5**	**Very soluble**
4	**Arsenic acid**	**Solid**	**141.95**	**+5**	**Freely soluble**
5	**Arsine**	**Solid**	**85.91**	**+3**	**Freely soluble**
6	**Sodium dimethyl arsenate**	**Solid**	**159.98**	**+5**	**Readily soluble**

OBJECTIVE

To study the impact caused by anthropogenic waste which contains heavy metals and their compounds like As on Cat fish *Clarias batrachus.*

MATERIALS AND METHODS

Experimental Animal: The experiment used a healthy catfish named Clarias batrachus. It was procured from Chas, Bokaro fish market and given a week to adapte in the lab of VKM College, Visthapitchawk, Bokaro steel city.

Test substance:

Analytical-grade arsenic trioxide (As2O3) with a purity of 98% (CAS No. 1327-53-3) (Anhydrous) was used for the experiment.It was obtained from Spectrum Chemical Manufacturing Corporation in India.

Blood Sample Collection:

Blood was drawn using a disposable syringe and needles to puncture the heart of a *Clarias batrachus*. The blood was then stored in disinfected vials and processed for various biochemical assays.

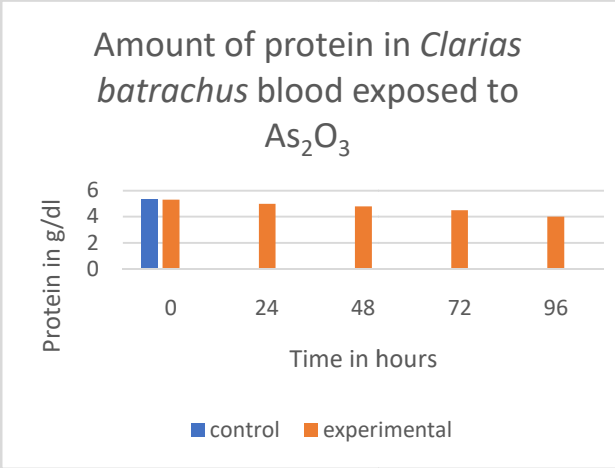
Fish were separated into two groups for the purposes of the current investigation: the control group and the As_2O_3treated group. Fifty (50) fish were kept in the experimental group, whereas ten (10) fish in the control group were kept in regular normal water and the experimental group of fishes were exposed to concentrations of arsenic trioxide at various times. Fish in the experimental group and the control group

were each exposed for a maximum of 96 hours (Pichhode M).

Biochemical Analysis (Estimation of Total Protein): The Biuret method was used to estimate total protein. G/dL units were used to express the total serum protein.

RESULTS

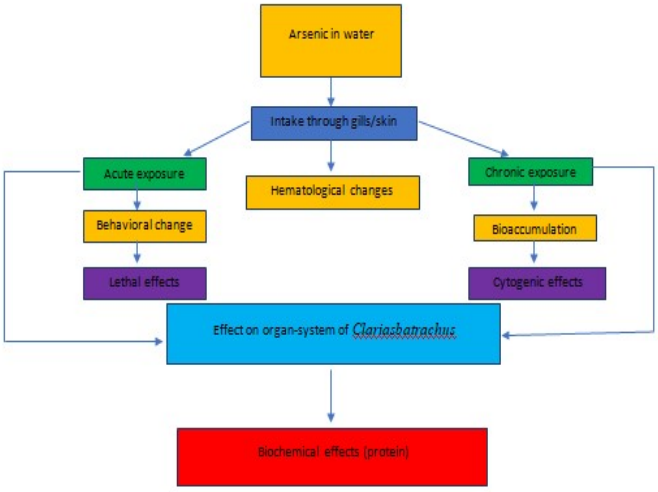
Biochemical Estimation: In the current study, fish treated with arsenic trioxide (LC_{50} value: 84 mg/L) and the control group underwent biochemical estimate. 5.30 g/dl of total protein was found in the control fish.



Total Protein in Blood (TP):

Researchers found that the arsenic trioxide-treated group of experimental fish had lower levels of total protein in their blood serum. After 96 hours, the total protein concentration in the blood of the experimental fish had fallen by 22.35%.After 24, 48, and 72 hours, the blood's protein value had reduced by 3.84, 4.23, and 11.53%, respectively. Total protein in the current experiment decreased over time relative to the control value at 24, 48, 72, and 96 hours as a result of the action of arsenic trioxide (84 mg/L)\

DISCUSSION



Changes in the activity of enzymes involved in protein production, liver cirrhosis, or kidney nephrosis could all contribute to the drop in plasma protein levels.(P L R M Palaniappan 1, 2009)Changes in the total protein content of different tissues in fish subjected to different heavy metals, such as As, Cd, Pb, Hg, etc (Pazhanisamy, 2002). Fishes protect themselves in various ways by slime that is secreted from their skin and gills. It provides a substantial barrier layer that stops different toxicants from penetrating into interior layers. Fish eventually lose protein from their skin and gills as a result of exposure to toxicns because the process of slimy secretion is subsequently sloughed off. (Hsp 70), Several species of fish, including tilapia, rainbow trout, magur, and medaka, have had their heat-shock proteins sequenced. As a result of exposure to arsenic, the gills,

liver, olfactory rosette, and epidermis of Zebra fish produced heat-shock protein 70. The tissueand dosedependent expression pattern of heat-shock protein 70 was observed.(Arsenic trioxide and lead acetate induce apoptisis in adult rat hepatic,rat cells., 2009)

CONCLUSION

The current study has shown the harmful effects of As_2O_3 (84 mg/L) on catfish (*Clarias batrachus*). The blood of *Clarias batrachus* had a much lower protein content due to arsenic trioxide, which is plainly hazardous to aquatic life.

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