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SGOT AND SGPT LEVELS IN, CLARIAS BATRACHUS UNDER STRESS CONDITIONS OF LEAD NITRATE

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Abstract

Under sublethal settings in the laboratory, the effect of lead nitrate, a very poisonous chemical, on the SGOT and SGPT levels in the serum of the fish *Clarias batrachus* was investigated in the present work. The effect of lead nitrate on SGOT (u/l) was found to be 35, 38.66, 45.20, and 49 after 24, 48, 72, and 96 hours of exposure, respectively, and the influence on SGPT (u/l) was found to be 57.99, 61, 64.58, and 70.53 after 24, 48, 72, and 96 hours of exposure, respectively. The findings indicate that the heavy metal combination lead nitrate has a very toxic effect on fish and other aquatic species in our ecosystem, indicating that it is harmful to them. Lead nitrate, *Clarias batrachus*, ecology, serum, SGOT, and SGPT are some of the keywords used in this study.

Keywords : Lead nitrate, *Clarias batrachus*, ecosystem, serum, SGOT and SGPT.

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Introduction

Even a brief exposure of freshwater animals to contaminants can cause significant damage to their internal organs and enzymatic processes. Deterioration in freshwater biota occurs when individuals are rendered unable to do their jobs, which in turn damages their bodies. In the event of organ dysfunction, it is widely accepted that biochemical testing plays a significant role. These biochemical tools are critical to our understanding of environmental toxicity because the toxicant-induced biochemical lesions in an organism precede the emergence of morphological and pathological characteristics. Insecticides have an effect on the organism's metabolic characteristics. A pollutant's impact on an organism's physiology and behaviour begins with changes in the structure and function of cells and tissues, as well as the physiology and behaviour of the organisms themselves. It's possible that these alterations could have a long-term impact on the population and the ecology.

Due to the fact that fish's protein content is closely linked to their nutritional worth, the presence of the harmful material will diminish their nutritional value. The most common organic molecules in cells are proteins, which can be found in every area of the cell. Building components of cell architecture, they also fulfil other cellular tasks. It is crucial to know the total protein and amino acid content of various internal organs and tissues for toxicological research. Toxic elements like insecticides mixed with the food reduced the nutritional value of the fish, although their food value was directly dependent on the amino acid content. As most enzymes are involved in a variety of metabolic processes, changes in enzyme activity patterns generated by pollutants serve as a signal of functional disruption. Sublethal impacts of toxic pollution can be detected using biochemical methods like bioasays of enzyme and the estimation of metabolites that have been shown to be reliable.

When an organism produces an enzyme, it produces a specialised protein that can perform a specific chemical reaction. Soluble tissue enzyme leakage has been linked to necrosis, cytoplasmic degeneration and other cellular changes. Toxic stress damages the liver, resulting in an increase in AAT, AIAT, and bilirubin levels in the bloodstream. Because enzymes play such an important part in the metabolic system, they are the first to be impacted by hazardous compounds. As a result, the enzymes listed below were chosen for the current investigation based on their activity. L-aspjertate aminotransferase, E.C2,6,1.1, AST) is an SGOT (Serum glutamic oxaloacetic transaminase or asperate aminotransferase, ASAT). - SGOT is a liver paranchymal cell-associated enzyme. In cases of acute liver injury, it is increased. Red blood cells and heart muscle also contain it. 1 / SGOT is found in high levels in the liver: An high level of this enzyme is seen in hepatic necrosis and other disorders that cause liver damage. This is an enzyme found in hepatocytes that catalyses the conversion of glutamic acid to bxaloacetic acid, as well as a reverse process. Alanine transaminases (ALT) and alanine aminotransferases (ALT) are other names for the same enzyme (liver cells). An amino group from glutamic acid is transferred to pyruvic acid and the other way around. Blood tests for this enzyme are used to determine if a liver cell has been damaged. Acute liver disease, such as viral hepatitis or paracetamol (acetaminophen) overdose, causes a substantial increase in ALT. It's common practise to measure elevation in multiples of the typical upper limit. Itransfer of amino groups between amino acids and a-keto acids is catalysed by both enzymes (reaction shown below) Either L-asperate or Lglutemate+ Oxogluterate+L-Asperate Pyruvate+ Lglutemate= L-alanine+ a-oxogluterate

Materials and Methods

The live specimens of *Clarias batrachus* commonly known as "Mangur" were obtained from ponds in the area of Agra and the fish market of Agra for the present study's purpose. Since *Clarias batrachus* is readily available and resilient in terms of survival despite pollution treatments being provided, its selection as an experimental fish was made based on these factors. Fish is also a cost-effective source of protein.

The following is the procedure for doing an experiment: Acute and control groups of *Clarias batrachus*, each with six fish, were used to examine the effects of lead nitrate on the fish.

The caudal vein of the *Clarias batrachus* was severed at the peduncle and the blood was obtained for biochemical analysis from the caudal vein. The centrifuge tubes were used to collect the blood samples.

About 30 minutes later, the centrifuge tubes holding blood samples were left to stand in a slanting posture to coagulate. Centrifugation at 3000 rpm for 15 minutes was used to get red blood corpuscles during the clot retraction. Fine rubber bulb glass pipettes were used to gently separate the clot from the supernatant serum, which was transferred to airtight glass vials and maintained in the freezer until required. When performing biochemical assays, serum was warmed to room temperature first.

Lead nitrate is the intoxicant of choice for this investigation. *Clarias batrachus* were subdivided into five groups to determine the LC_{50} concentration: (A, B, C, D and E). Ten people make up each group. When dissolving in water with a strength of 300mg/L, the standard solution of the experimental chemical, Lead nitrate was created. After 96 hours, we counted the number of fish that died and those that survived at each concentration. The log dose/probit regression line approach was used to conduct the statistical analysis of the data (Finney, 1971). Log dosage and empirical probit were used to create a simple graph paper regression line and get the predicted probit needed for LC_{50} determination.

A sub-lethal dosage of Lead nitrate (1/5th of LC_{50}) was administered to six fish from each set (control and experimental) for biochemical tests, resulting in the death of six fish from each set.

Glutamate oxaloacetate transminase in the bloodstream (SGOT)

The Reitman and Frankel kit technique was used to estimate serum glutamic oxaloacetic transaminase (1957). Two amino acids, aspartic acid and ketoglutarate, are converted by Aspartic Acid Synthetase (AST). In an alkaline media, the hydrazone generated by the reaction of the Oxaloacetate with 2, 4 dinitrophenylhydrazine generates a brown coloured complex whose intensity is measured. There was no delay in using serum tissue.

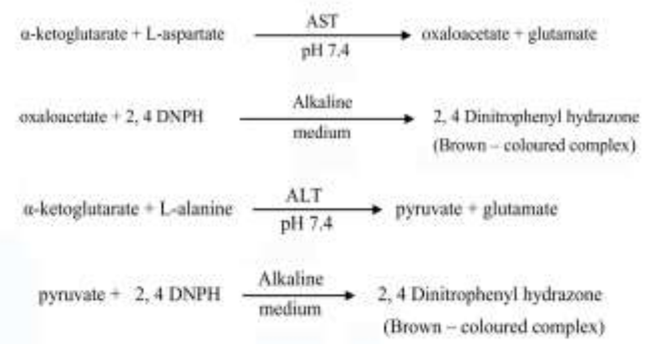
Phosphatidylinositol 3-phosphate transmutase (SGPT)

According to Reitman and Frankel, the kit approach was used to estimate the serum glutamic pyruvate transamine (1957). Alanine and ketoglutarate are converted into pyruvate and glutamate by ALT. An alkaline medium creates the brown coloured complex when the pyruvate combines with 2,4 dinitrophenyl hydrozine to make the equivalent 2,4 dinitrophenylhydrazine. Within minutes, the serum was put to good use.

Calculations based on statistical data: Formulas based on Fischer and Yates were employed in the current research for various statistical computations (1950).

Results and Discussion

Toxicity occurs in decreased activity in *Clarias batrachus*, with a large expulsion of mucus that almost completely covers the body before death. When the gas exchange is hindered by mucus and oxygen shortage occurs, the body's overall physiology is adversely affected, terminating in mortality. There were no significant differences in LC_{50} values for lead nitrate between the fish *Clarias batrachus* and other species of fish, and the regression equation Y = 5.00+6.50 (X-2.72) was used for the fish. The sub-lethal dosage was 105.62mg/L, which is one-fifth of the LC_{50}. Exposure to sublethal levels of lead nitrate (24, 48, 72, and 96 hours) in *Clarias batrachus* led to an increase in the SGOT and SGPT. Lead nitrate exposure resulted in substantial increases in the SGOT and the SGPT after 24 hours, 48 hours, 72 hours, and 96 hours of exposure.



Determination of enzyme activities in serum is one of the most important factors for analysis of several disorders of any organisms. Serum transaminase or amino transferase has a distinct clinical significant for diagnosis of various diseases, like hepatic abnormalities, myocardial infarction, acute panereatities and carcinoma. These two enzymes (SGOT and SGPT) catalyse the reversible transfer of a-amino group from

amino acid aspartate and alanine respectively to aketo acid. The changes in serum GOT and GPT activities after the exposure of endosulfan were correlated with the histopathological changes in the liver. The increased transaminase activities in the serum may be due to the seepage of the mitochondrial enzymes in to cytoplasm and serum due to structural deformity caused by the endosulfan. Tubular necrosis may also lead to increase these enzymes as endosulfan can also produce cellular damage in kidney. Increasing trend of these enzymes indicate energy crisis resulted by the pesticides toxicity and adaptive mechanisms of the animal to survive in the insecticidal stress. Membrane damage and severe destruction of mature RBC in the spleen may also attribute to the evaluation of the level of GOT and GPT as they are present in the membrane.

Under the effect of lead nitrate, experimental fish exhibited a skewed metabolism, as indicated by an altered SGOT pattern. This may be the result of liver dysfunction or cellular damage in multiple organ systems. These findings are likewise in agreement with those made by Goel and Maya (1986) in *Clarias batrachus* during pesticidal stress caused by roger. Verma *et al*. (1981) found that *Mystus vittatus* had similar SGOT rise patterns after exposure to pesticides.

The heart, liver, skeletal muscles, and kidneys all have the largest concentration of SGOT in the blood system. Myocardial ischemia, liver disease such as cirrhosis, viral hepatitis, necrosis, and skeletal muscle disease everyone would raise the SGOT level.

The elevated SGOT activity might be the result of tissue damage and enzyme disruption by inhibiting the enzyme's active sites (Verma *et al*., 1981). Revathi *et al*. (2003) in *S. mossambicus* reported similar results of SGOT rise due to tissue harm caused by insecticide stress.

Venous glutamic pyruvic transaminase is more active so because liver has already been damaged by lead nitrate, which helps make it more active. Agarwal *et al*. (1982) reported that *Clarias batrachus* exposed to achlor had a higher level of transaminases. The present findings are in line with some of these findings. *Mystus vittatus* was also revealed to dichlorvos by Verma *et al*. (1981), as well as they did find a same thing happened to eachother.

SGPT is in highest concentration in the liver followed by the kidney. Under pesticidal stress these organs get damaged and the enzyme level elevates in the serum. The SGPT level is found to be raised in the liver diseases such as infective hepatitis, liver cirrhosis, cholestatic jaundice and skeletal muscle damage.

Raised level of serum transaminase (SGPT) was also reported by Sulodia and Singh (2004) in *Channa punctatus*. Revathi *et al*. (2003) also reported similar results in the fish *Satherodon mossambicus* exposed to organoplosphorous pesticide tempos.

Changes in activities of SGPT along with SGOT have been used to demonstrate tissue damage in the fish. Arsta *et al*. (1996) Magare (1997) have reported the similar alteration of transaminases in the fish, *Barbus ticto*. The findings in the present investigation can be collaborated with the results of Nemcsik *et al*. (1987) in *Cyprinus carpio* after exposed to an organophosphate insecticide methidation in which they mentioned the increased levels of transaminase enzymes due to subsequent liver damage.

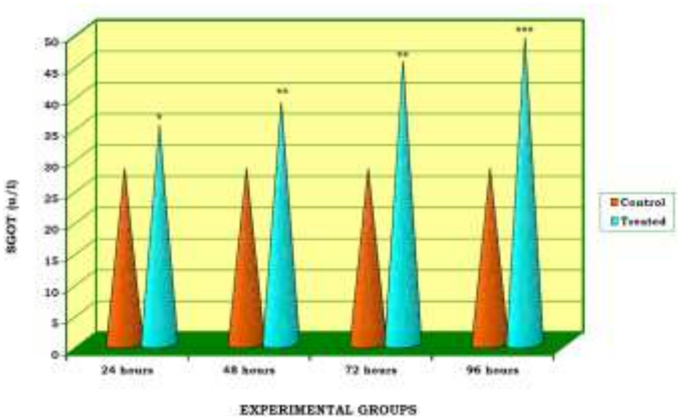
Table 1 : Effect of lead nitrate on SGOT (u/l) in *Clarias batrachus* (Linn.)

SGOT (u/l)	Control	Exposure hours			
		24	48	72	96
Range	27.50-29.00	34.10-36.00	38.12-39.88	44.25-46.52	48.50-49.30
Mean	28.10	35.00	38.66	45.20	49.00
±S.Em.	±0.52	±0.50*	±0.50**	±0.33**	±0.10***

Table 2 : Effect of lead nitrate on SGPT (u/l) in *Clarias batrachus* (Linn.)

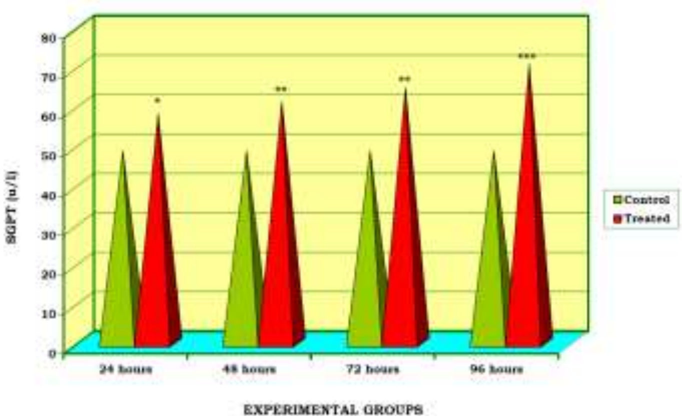
SGOT (u/l)	Control	Exposure hours			
		24	48	72	96
Range	48.50-49.50	55.90-58.20	59.50-62.00	64.00-66.50	69.54-71.53
Mean	48.59	57.99	61.00	64.58	70.53
±S.Em.	±0.19	±0.55*	±0.30**	±0.55**	±0.67***

S.Em.- Standard error of mean NS- Non-significant *- Significant
- Highly significant *- Very highly significant



*** Non-significant; ** Significant;**
***** Highly significant; **** Very highly significant**

Fig. 1 : Effect of lead nitrate on SGOT (u/l) in *Clarias batrachus* (Linn.)



*** Non-significant; ** Significant;**
***** Highly significant; **** Very highly significant**

Fig. 2 : Effect of lead nitrate on SGPT (u/l) in *Clarias batrachus* (Linn.)

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