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Vanadium toxicity to fish *Heteropneustes fossilis* (Bloch)

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Abstract

Vanadium toxicity to fish *Heteropneustes fossilis* (Bloch) was studied for a period of two weeks. When the fishes were exposed to 1, 4 and 7 ppm of Vanadium (NaVO_3), the biochemical parameter like glucose increased significantly ($p < 0.001$) from the control value in different tissues. Whereas the protein content in tissues like liver, muscle and kidney decreased significantly ($p < 0.001$) from the control. The LC_{50} value was found to be 13.2 ppm.

Keywords: Vanadium, fish, tissue

1. Introduction

Vanadium is a rare element found mostly in coal & crude oil deposits. It is used as steel additives and alloys. The average level of vanadium in the earth crust is normally 100-150 ppm and is known to be found in living organisms also [1]. Vanadium in the fish dry tissue was found to be $0.4 \mu\text{g/g}$ [2]. The LC_{50} of vanadium to American flag fish *Jordanella floridae* was 11.2mg/l. [3] Vanadium accumulation in muscle tissues of fish species of Persian gulf water was less than the lower limits of international standard [4]. However when fishes were given dietary vanadium, there was a significant physiological changes like increase in cortisol and cholesterol level [5]. Hence an attempt was made to study the effect of vanadium on some tissues of air breathing fish *Heteropneustes fossilis* (Bloch)

2. Materials and Methods

Heteropneustes fossilis, the common Indian cat fish ranging a length of 14-16 cms and 20-22 g in weight were procured from local fish pond. They were acclimatized to laboratory condition in glass aquaria (1.5 x 1.0 x 0.6m) for a period of seven days to recover from the stress which might have occurred during catching and transportation. Fishes were fed with commercial fish food having balanced diet. After determining the LC_{50} value of vanadium (13.2ppm), experimental group of four were selected with 0 ppm, 1 ppm, 4 ppm, & 7 ppm concentration of vanadium. 0 ppm was the control group. Fishes were kept in each aquaria at the start of experiment. The exposure period was two weeks. During the experiment period fishes were fed regularly with continuous aeration. At the end of exposure period liver, muscle and kidney were dissected and chilled immediately for estimation. Protein and Glucose were determined following the methods of Lowry *et al.* [6] and Yemn & Willis [7] respectively. Data were analyzed by ANOVA.

3. Results and Discussion

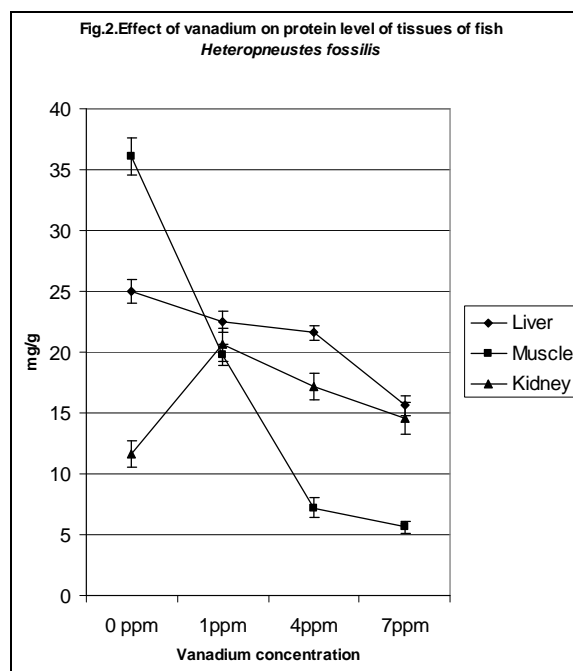
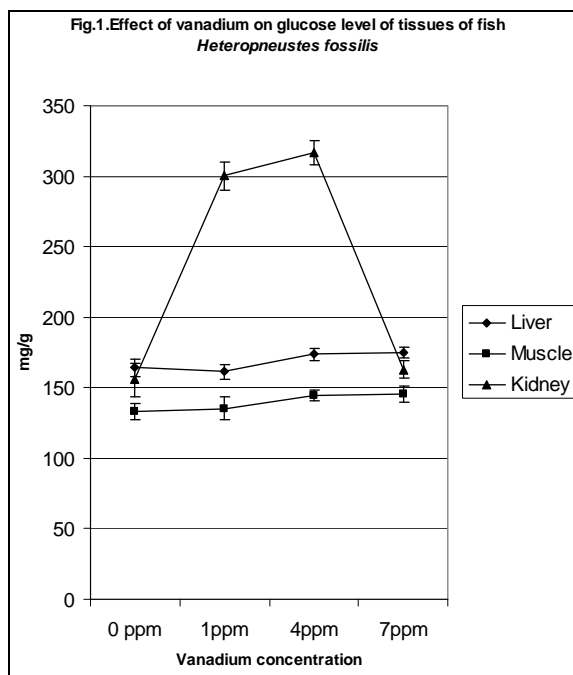
Results on the effect of vanadium on tissues like Liver, Muscle and Kidney of *Heteropneustes fossilis* are presented in the fig. 1 & 2. The presence of glucose in the tissue was Liver > kidney > muscle. Glucose metabolism in the tissues is heavily affected by vanadium exposure. When exposed to different concentration of vanadium (1, 4, 7 ppm) there was an increase in glucose level in liver, muscle and kidney. The glucose content in kidney tissues is found to be more when compared to that of liver and muscle tissue in exposed fish. The increase in glucose concentration indicates stressful condition of fish which required more energy. Blood cortisol level increases when fishes were under vanadium stress [8]. The increase in glucose level may be due to increased glycogenolysis in liver. Liver of *Clarias lazera* was seriously affected due to vanadium toxicity [8].

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The protein content of the different tissues of fish *Heteropneustes fossilis* was found in the trend of muscle>liver> kidney. When exposed to different concentration (1, 4 & 7ppm) of vanadium, there was a significant ($p<0.001$) decrease in protein content in liver, muscle and kidney. Liver and muscle shows decrease from control value where as kidney shows an increasing trend. The decrease in protein level may be attributed to the stress condition and excess intermediate metabolism. There was also depletion in protein content of liver when *Heteropneustes fossilis* under metal stress [9]. The increase in glucose and decrease in protein may be due to inhibition of glycolysis [10] and that leads to alternative pathways of amino acid degradation used for energy source [11]. Thus there was a change in biochemical parameters of liver muscle and kidney of fish *Heteropneustes fossilis* due to vanadium toxicity.



4. References

- Gummow B. Vanadium: Environmental Pollution & Health effects. Elsevier B.V, 2011, 628-636.
- Lavilla I, Villas P, Bendicho C. Fast determination of arsenic, selenium, nickel and vanadium in fish and shellfish by electrothermal atomic absorption spectrometry following ultrasound assisted extraction. Food Chemistry, 2008; 106(1):403-409.
- Douglas A, Holdway John, Sprague B. Chronic toxicity of vanadium to flagfish. Water Research, 1979; 13(9):905-910.
- Moghdani S, Pazira AR, Ghanbari F, Zadeh NJ. Vanadium concentration levels in muscle tissues of two commercial fish species in Persian Gulf waters. International journal of the Bioflux Society. 2014; 7(6):489-496.
- Zaki MS, Sharaf NE, Osfer MH. Effect of vanadium toxicity in *Clarias lazera*. Journal of American Science. 2010; 6(12):291-296
- Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with Folin's - phenol reagent. J Biol Chem. 1951; 193:265-275.
- Yemm EW, Willis AJ. The estimation of carbohydrates in plants extract by Anthrone. Biochemical journal. 1954; 55:508-514.
- Kress LW. Effect of vanadium toxicity in *Clarias lazera*. International Journal of Agr & Env. 2012; 3:35-40.
- Nanda P. Nickel toxicity to liver and brain of a cat fish *Heteropneustes fossilis* (Bloch). Env. Ecol. 1997; 15(2):329-331.
- Simons TJB. Vanadate a new tool for biologist. Nature, 1979; 281:337-338.
- Gupta S, Rai V. Effect of vanadium on phosphatases and transaminases in certain organs of *Clarias batrachus*. 1995; 22:71-77.