

# IMMUNE RESPONSE IN A POLLUTENT STRESSED FISH

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## ABSTRACT

Aquatic animals are constantly being exposed to an array of toxic substances which are leaching through industrial effluents and agriculture. To protect by these dreadful chemicals these animals are naturally endowed by an intrinsic self sustaining defense system. Fish are first group of organisms that possess an innate and adaptive immune system<sup>1</sup>. In fish immune system skin mucosa is very important part serving as an anatomical and physiological barrier against external hazards. Skin mucosa cells of fishes can be used to maintain stress in them. Stress hormones adrenocorticotrophins are produced by leucocytes to allow for bidirectional communication between neuroendocrine system and immune system<sup>2</sup>. Circulating leucocytes are the key cells of vertebrate innate immunity, namely eosinophils, macrophages, and neutrophils<sup>3</sup>. Hence the following study has been undertaken to evaluate stress in freshwater edible fish, *Channa orientalis* (Sch) exposed to cypermethrin on blood parameter leukocyte.

In the present investigation, *Channa orientalis* exposed to sub lethal concentration of cypermethrin showed marked behavioral changes, large secretion of mucous, pale white in colour and became lethargic. A reduction in total leukocyte count within few hours but then steady increase in the count signify that secretion of mucus on body may be an adaptive response for protection against corrosive nature of pesticide to combat against toxicant stress<sup>4</sup> which in turn reflects the gearing up of the defense mechanism against pollution stress.

**Keywords:** Leukocyte count, pollutant, lethality, mucous, stress.

## INTRODUCTION

Immune system of fish is important for defense against a variety of pathogens. The system is very sensitive to homeostatic adjustments via endocrine regulation and is influenced by the biochemical status of nervous system. Thus any impairment in nervous system and disturbance in the biochemical homeostasis can weaken the immune system of fish. Different insecticides at sub lethal have been recognized as stressors causing immune suppression in fish (Werner and Oram, 2008). The immune system is essential in the defense against infection as well as in maintaining good health in all developmental stages of fish. All fishes have an immune system to fight elisions. Innate immunity cells mostly characterized are circulating leukocytes-namely macrophages, neutrophils and eosinophils (Saurabh and Sahoo, 2008).

In fish different insecticides can be absorbed through gills, skin or alimentary canal (Banaee, M, 2013). In fish, skin mucosa is very important part serving as an anatomical and physiological barrier against external hazards and defense mechanism of fish, serves as a need to develop health. Synthetic pyrethroid- cypermethrin

is the most prevailing and widely employed insecticide has been reported to be toxic to fish and aquatic invertebrate even at minute concentration (Collins and Cappellio,2006 ) .As the leukocytes are the primary means of fighting infection , attempt has been made in present piece of work how fluctuations in blood parameter leucocyte count reflects the immune system leading to deterioration of freshwater fish *Channa orientalis* (Sch) when exposed to very low concentration of cypermethrin .

### MATERIALS AND METHODS

For the present study, freshwater air breathing edible fish *Channa orientalis* (Schneider) were collected from nearby rivers of Daryapur city and acclimatized for 15 days after disinfecting them .The physico-chemical characters of aquarium water were analyzed as per the method of (APHA,1995) .The fishes were subjected for toxicity evaluation of cypermethrin and then concentration was fixed at 0.01 ppm after several exploratory and lethal toxicity studies. For experimental analysis fishes were exposed at different time intervals to investigate the toxic effect on leukocyte count. The leukocyte count was measured by using Neubaur Hamocytometer .The analysis of blood parameter was repeated three times for various exposure periods from 24hrs to 720 hrs. Of duration .The results were subjected to statistical analysis with student ‘t’ test for significance (Baley, 1965).

### RESULTS AND DISCUSSION

Remarkable behavioral changes like rapid jerky movements, fall into damp ( Svobovdova et,al.2003) were noted. As exposure period increases fish become lethargic and hypoactive. Heavy secretions of mucus findings in present study indicate an adaptive response for protection against corrosive nature of pesticide to avoid contact with body surface. Skin mucus cells which secrete mucus can be used to monitor stress in them as well as mucus cell densities in skin seen to act as a sensitive first line of immune defense parameter in fish as mucus contains many immune molecules (Kumarie et, al).

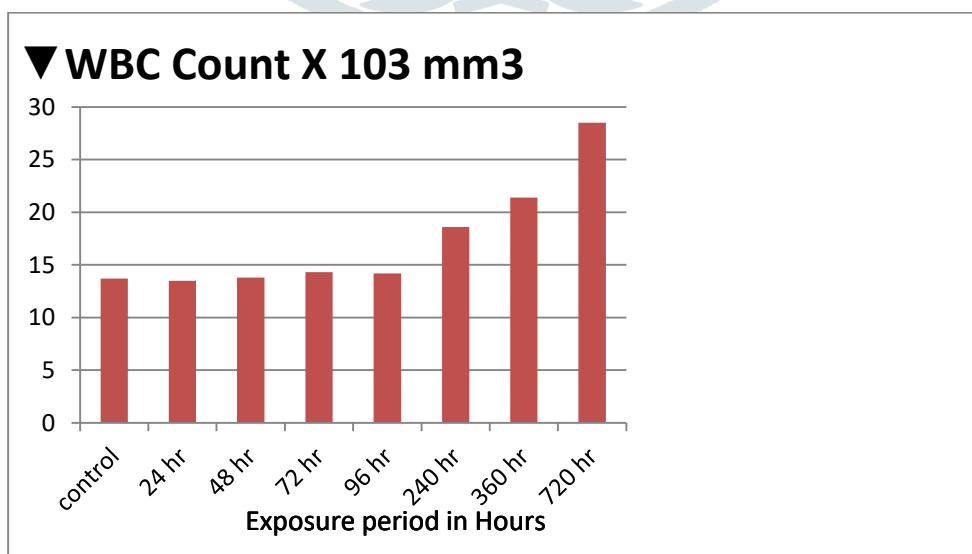


Figure 1: Values of WBC of Fish *Channa orientalis* exposed to cypermethrin at different time intervals

As circulating leucocytes are the key cells of vertebrate innate immunity the leukocyte count in the present study was reduced at early exposure period but then there was a steadily increase in the count up to the end of the experiment (Figure). This may be probably a response to combat against toxicant stress (Adhikari,et.al.,2004).As different insecticides at sub lethal level have been recognized as stressors causing immune suppression in fish (Zelikoff,et al.,2000) is similar in finding with present work as cypermethrin may be altering the function of immune system in fish.

### CONCLUSION

Thus it can be inferred from the investigation that pyrethroids cause numerous immune disorders contributing to lowering of immunity in fishes as they cause inhibition of peripheral blood leukocytes and reduce the concentration of IgG immunoglobulins. As well as lower as normal levels of lymphocytes can be indicator of immune system deficiency

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