

LEVELS OF LIPID METABOLITES IN *Cyprinus carpio* (L.) ON SUBLETHAL EXPOSURE TO SYNTHETIC DETERGENT LINEAR ALKYL BENZENE SULFONATE (LAS)

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SUMMARY

Synthetic detergents deposited in the aquatic environment may accumulate in the food chain and cause ecological damage and even threat to human health. Linear alkyl benzene sulfonate (LAS) is an anionic surfactant and placed head list of chemical pollutants posing a great potential risk than the organic wastes and eutrophicating nutrients. During this research sublethal effects of LAS on the levels of lipid metabolites in various tissues of freshwater fish *Cyprinus carpio* were studied. The levels of total lipids decreased initially at 24h in relation to control and up to day 7. After day 7, these levels increased gradually and maximum increase was observed at day 15 from where there was again decrease in those levels up to day 20 and reached nearer to control at day 30. The increase in the levels of total lipids was more in muscle than liver followed by gill. The levels of both free fatty acids and lipase activity followed a reverse trend to that of total lipids.

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Lipids are heterogenous group of complex macromolecules such as fatty acids, acylglycerols, phosphoglycerides, steroids, terpenes and prostaglandins having high calorific value. Changes in lipid metabolism provide demanding energy to survive from toxicological effects of the fish under stressed conditions. They form the rich energy reserves whose calorific value was reported to be twice that of an equivalent weight of carbohydrates or proteins (Oser, 1979). Lipids are generally stored in the liver, adipose tissues and muscles and are one of the most important fish energy sources. They are mobilized, when food intake cannot supply the energy demands of growth and maintenance (Moreira *et al.*, 2002). The mobilization of lipid reserves in an organism testifies the imposition of high-energy demands (Srinivasulu Reddy and Raman Rao, 1989). Lassiter and Hallam (1990) proposed the survival of the fattest model which means the fish with higher body lipid content will survive longer since they are more resistant to toxic effects of chemicals than those with lower lipid content. Since lipids undergo rapid breakdown, resynthesis and interconversion in response to different stimuli, it is essential to consider simultaneously various lipid fractions in different tissues to provide a clear cut picture of lipid metabolism.

Synthetic detergents are one of the resultants of these modern technologies emerged as major contributors to the problem of pollution. Synthetic detergents are head list of chemical pollutants at this moment, posing a great potential risk than the organic wastes and eutrophicating nutrients. All surfactants are potentially harmful to most

of the organisms, aquatic as well as terrestrial, at some level or other and are reported to produce toxic effects (Belanger *et al.*, 2002). Several reports have come to light in recent years explaining that synthetic detergents interfere with various metabolic aspects of organisms and cause death (Goodrich *et al.*, 1991; Toshima *et al.*, 1992).

Linear Alkyl benzene Sulfonate (LAS) is one the most widely used anionic surfactants in commercial use today. It has a variety of industrial uses and is a common ingredient in laundry detergents, household cleaning products and personal products (e.g. shampoos and cosmetics) with an annual use of approximately 1 million metric ton. LAS accounts for 28% of the surfactants produced in United States, Western Europe and Japan (Federle *et al.*, 1989). Although most LAS is discarded as sewage and effectively removed during sewage treatment, in some areas raw sewage containing LAS is discharged directly into the environment (Rapaport *et al.*, 1990). In India, per capita consumption of detergent in 1994 was 2kg per annum and was projected to rise to over 4kg per annum by 2005 (Indian Toxics Link, 2002). Most detergents are formulated products containing surfactants, which remove dirt, stain and soil from surfaces or textiles. Surfactants consist of a hydrophobic and hydrophilic component and have the ability to change the surface properties of water. In aqueous solutions, surfactants tend to accumulate at air/solution or solid/liquid interfaces, whereby the surface tension of water is reduced.

Several biochemical changes are involved during utilization of lipid reserves. Energy yielding processes of fatty acid oxidation is known to proceed by the release of fatty acids from triglycerides and then they are transported to the site of utilization. The physiological role of lipase in