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Effect of Endosulfan on Cholesterol Metabolism in Liver of Heteropneustes Fossilis

Dr. KEERTY SHRIVASTAVA
Department of Biotechnology
Institute for Excellence in Higher Education, Bhopal
India

Abstract:

The effect of endosulfan on cholesterol value in the liver of Hetropneustes fossilis was studied. The fish exposed so sublethal concentration (0.04 ppm) of endosulfan for a period of 30 days. The results revealed that endosulfan impared the metabolism of cholesterol.

Key words: *Hetropneustes fossilis*, Endosulfan, Liver, Cholesterol.

Introduction:

Pesticides are widely used to control agricultural pests and their application has greatly contributed to stepping up the agricultural production. But the indiscriminate use of pesticides has posed grave environmental problems as a result of contamination of various water bodies, thereby adversely affecting the aquatic fauna. Pollution of the aquatic environment generally causes changes in the physiological and structural aspects of the inhabitant organisms, particularly the fishes. Thus, the fish system provides an excellent means of detecting water-born pollutants.

Endosulfan is one of the broad spectrum pesticide because of its reasonable effectiveness, need to be studied so as

to evaluate its toxic impact on aquatic animals. The present investigation reports the effect of endosulfan on cholesterol metabolism in liver of *Heteropneustes fossilis*.

Material and Method:

The live specimens of fish *Heteropneustes fossilis* were collected from lake. They were acclimated to laboratory conditions for 4-5 days prior to experiments. On the basis of pre-determined LC 50 values, these fishes were exposed to sublethal concentration of endosulfan 0.04 ppm for a period of one month. One group was maintained as control. After exposure liver was separated from exposed animal on intervals of 7-15-30 days. The Cholesterol contents of the tissues were estimated by Libremann - Burchard **(Kabara - 1966)** method. The values recorded for the test fish were compared with those of the controls by employing student's t- test.

Results & Discussion:

Data presented in Table and Figure show that the concentration of cholesterol content augmented after an initial attenuation in liver of endosulfan exposed *Heteropneustes fossilis*. Within one week of intoxication cholesterol content depleted 53.0154%, afterwards, gradual elevation from 39.6040% to 84.7378% over control was followed during 15^{th} and 30^{th} day of exposure.

The observation of following zoologists almost support the present findings, as they have also found decrease and increase in cholesterol content in dose dependent manner**Nahar and Saraf (1987)** observed the effect of DDT and BHC in liver of *Heteropneustes fossilis* and found depletion in cholesterol level at the low concentration of pesticides. **Sudheesh et al (1996)** investigated the toxic effects of condensed tannins from Solanum melongena on rats, they

noticed hypocholesterolemia and hypercholesterolemia at lower and higher dose of tannins respectively. **Majumdar et al(1997)** studied the effect of fenvalerate in liver of broiler chicks and found decreased level of cholesterol with lower dose of fenvalerate, whereas higher dose application of fenvalerate increased the cholesterol level.

The depletion in cholesterol content in early phase of intoxication indicates inhibition of cholesterol synthesis due to non-availability of acetoacetate units because acetyle CoA may be involved in gluconeogenesis to produce glucose to fulfil the energy requirement under pesticidal stress. **Inoue et al (1976)** and **Shakoori et al(1994)** also reported decrease of hepatic cholesterol biosynthesis under mercury intoxication, **Ganeshwade R M (2012)**, **Binukumar and Vasanthi (2014)** and **Shruti et al (2014)** also reported decreased cholesterol in liver of fresh water fish exposed to pollutants.

In response to stress situation, hypothalamus secretes corticotropin releasing hormone which stimulates the anterior pituitary to release corticortopin by which adrenal cortex is stimulated to secrete corticoid hormones. These hormones influence the anti-inflammatory and anti-allergic actions alongwith carbohydrate metabolism (**Lehninger 1982**). That's why, probably, the biosynthesis of steroids alongwith inhibition of cholesterol synthesis is another cause of reduction in cholesterol content in present findings.

Some Scientists also found depletion in cholesterol content in different investigations, such as **Pugalendhi et al (1992)**, **Shakoori et al(1994)** and **Jain et al(1995)** reported decrease of cholesterol content in liver of albino rats, *Ctenopharyngodon idella* and *Heteropneustes fossilis* due to the effect of Bactrim, mercuric chloride and lead respectively.

The increase of cholesterol content in later phase of exposure may be due to imperative need of cholesterol for steroidogenesis, because, according to **Swami et al (1983)**, steroids are responsible for increasing the survivability of the

animal under adverse toxic conditions. Probably, an increased diversion of acetyl CoA to acetoacetate for the synthesis of cholesterol also caused elevation of cholesterol in liver. This diversion may be expected as there is a possibility of accumulation of Acetyl CoA, since **Kabeer et al(1978)** reported that enzymes of Kreb's cycle are inhibited during stress condition.

In the present investigation after 7th day of endosulfan exposure, cholesterol content attenuated in liver and thereafter during 15th and 30th day of exposure it augmented. **Pugalendhi and Ramakrishnan (1990)** reported total cholesterol decreased at high protein diet and increased at low protein diet in liver of albino rats. **Shakoori et al (1994)** investigated the effect of mercuric chloride in the liver of *Ctenopharyngodon idella* and found decline in protein content after an initial increase. On the basis of the investigation of **Pugalendhi and Ramakrishnan(1990)** and **Shakoori et al (1994)**, the concentration of cholesterol in liver may dependent upon the amount of protein. That's why, decreased protein synthesis in liver, disturbing cholesterol and fatty acid utilization for energy, thus influencing cholesterol accumulation in liver.

Some other reasons of increased cholesterol in liver are, probably, movement of cholesterol and fatty acid from other tissues to the liver during stress, decrease in cholesterol catabolism due to liver dysfunction and non-utilization of cholesterol for the synthesis of steroid hormones as **Kupfer(1969)** also reported inhibition of steroid metabolism by organophosphate pesticide.

The observations of several scientists support the present findings as they also reported increased cholesterol in liver.

Sivaprasada Rao and Ramana Rao (1981) investigated the effect of methyl parathion on liver of *saurotherodon mossambicus* and recorded significant elevation in total cholesterol. **Swami et al (1983) and Madhu (1983)**

reported increased cholesterol content in mussels and selected tissue of fish respectively under pesticidal stress conditions. **Katti and Sathyanesan(1984)** studied changes in hepatic cholesterol content in *Clarias batrachus* exposed to cadmium chloride and found a significant elevation. **Ram and Sathyanesan(1984)** also observed a significant elevation in cholesterol level in liver of *Channa-punctatus* after mercuric chloride intoxication.

Gill et al (1991) reported increase in cholesterol content in liver of *Barbus conchonius* after the exposure of endosulfan. **Pugalendhi et al(1992)** noticed increase in cholesterol content in liver of albino rats due to the effect of tetracycline and ampicillin. **Bhattacharya (1994)** observed the effect of industrial effluents on fishes and found and increase in hepatic cholesterol content. **Hota (1996)** also observed augmented level of hepatic cholesterol in *Channa-punctatus* due to arsenic toxicity.

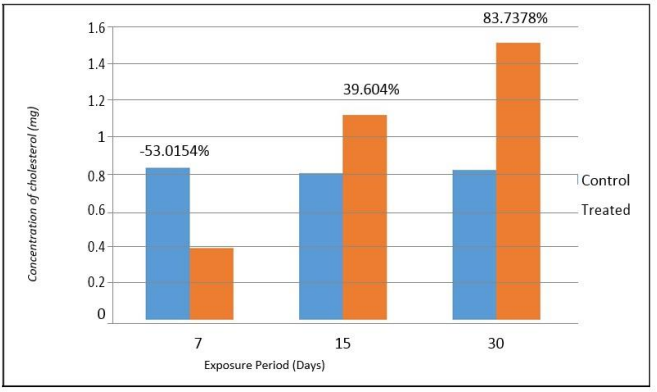
From this investigation it is obvious that the toxic nature of endosulfan produces degraded metabolic changes and affecting the nutritive value of animal. Therefore, it may be suggested that necessary care may be taken to avoid contamination of fresh water bodies while spraying pesticides.

Table Effect of Endosulfan(0.04 ppm) on Cholesterol Content in Liver of *Hetropneustes fossilis*

S. No.	Time (Days)	Amount of Cholesterol		%age Change (Increase / Decrease)	t' value	Probability
		Control (mg.)	Treated (mg.)			
1	7	0.8321 ± 0.0258	0.3909 ± 0.0228	-53.0154	11.4555	≤0.001
2	15	0.8020 ± 0.0262	1.1197 ± 0.0378	39.6040	-6.1790	≤0.001
3	30	0.8207 ± 0.0186	1.5162 ± 0.0648	84.7378	-9.2228	≤0.001

Values Expressed as mg/100 mg wet weight of tissue. Each Value is the mean ± standard error of five Individual observations

Figure showing the effect of endosulfan (0.04 ppm) on Cholesterol content in Liver of *Heteropneustes fossilis*



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