(184)

In-vitro Toxicity Study of Cylindrospermopsin on Wistar Rats

Abeysiri H.A.S.N.[1], Dilrukshi K.T.[1], Abinaiyan I.[1], Manage S.P.[1], Wanigasuriya K.[2], Suresh T.S.[3], Manage P.M.[1*]

[1]Centre for Water Quality and Algae Research, Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[2]Centre for Kidney Research, Department of Medicine, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[*]pathmalal@ sjp.ac.lk

Abstract

Naturally derived cyanotoxin, Cylindrospermopsin (CYN) found in fresh water systems poses a threat to human health worldwide. Cylindrospermopsin (CYN) is most potent cyanotoxin which affects the functions of kidney and liver. The present study was carried out to determine the possible effects of Cylindrospermopsin on mammals using male Wistar rats as an animal model. All experimental protocols were approved by the ethics committee of Faculty of Medical Science, University of Sri Jayewardenepura (No. 17/18). Thirty-five Wistar rats were divided into five groups (n=7) and rats were orally treated with different concentrations of cyanotoxin; Cylindrospermopsin (2.5 µg/L, 2 µg/L, 1.5 µg/L) and control group was treated with distilled water for 90 days. Fifth group received environmental water sample contaminated with Cylindrospermopsin (2.3 µg/L) obtained from randomly selected well in Padaviya. Blood and urine samples from each individual were collected at 0, 7, 14, 28, 42, 60, 90 days intervals and the collected samples were subjected to serum creatinine and urine creatinine analysis using creatinine assay kits. Cylindrospermopsin in urine samples were quantified by the ELISA methods. Aspartate aminotransferase (AST), Aspartate alaninetransferase (ALT) and Full Blood Count (FBC) were analysed. The mean body weight of treated (200 to 310 g) and control groups (200-335 g) of the experiment gradually increased until fourteenth week. There was no significant difference of body weights between treated and control groups ($p=0.08$). The absolute and relative (% body weight) weights of liver and kidneys of the treated groups were less than control group. Cylindrospermopsin dose 2.5 µg/L, 2 µg/L , 1.5 µg/L, 2.3 µg/L and control showed increased serum creatinine levels from 0.62 to 0.87 mg/dL, 0.64 to 0.86 mg/dL, 0.64 to 0.86 mg/dL, 0.61 to 0.83 mg/dL and 0.6 to 0.79 mg/dL respectively after 90 days treatment. The control group did not show a significant cause. Rat treated with different concentrations of Cylindrospermopsin, 2.5 µg/L, 2 µg/L, 1.5 µg/L, 2.3 µg/L and control showed gradually decreased of urine creatinine level from 34 to 55 mg/dL, 40 to 54 mg/dL, 38 to 54 mg/dL, 32 to 53 mg/dL and 43 to 54 mg/dL respectively after 90 days treatment and statistically significant ($p<0.05$) difference was found between treated and control groups. The highest Aspartate Aminotransferase (AST) and Aspartate Alaninetransferase (ALT) levels were obtained from Cylindrospermopsin dose 2.5 µg/L at 90 days exposure. Cylindrospermopsin concentration in urine gradually increased from 1.5 to 2.32 µg/L, 0.9 to 1.7 µg/L, 0.8 to 1.1 µg/L and 0.4 to 1.5 µg/L when animal exposed to 2.5 µg/L, 2 µg/L, 1.5 µg/L and 2.3 µg/L concentrations of Cylindrospermopsin where control did not show. Thus, the result of present study show consumption of Cylindrospermopsin contaminated water may lead to liver and kidney injuries.

Keywords: Cylindrospermopsin (CYN), Wistar rats, ELISA, AST, ALT