Available on line www.jocpr.com

Journal of Chemical and Pharmaceutical Research

J. Chem. Pharm. Res., 2010, 2(6):125-128

ISSN No: 0975-7384
CODEN(USA): JCPRC5

Hepatoprotective effect of green tea (*Camellia sinesis*) on Cadmium chloride induced toxicity in rats

P. Vinoth Kumar[1*], A. Amala Pricy[2], Ch. Sudheer Kumar[3a] and G. Kiran Kumar Goud[3b]

[1]Department of Biotechnology, J.J College of Arts and Science, Pudukottai, India
[2]Department of Biotechnology, Bharathidasan University, Trichy, India
[3a]School of Life Sciences, Department of Biotechnology, University College of Engineering, JNTU, Kakinada, Andhra Pradesh, India
[3b]Department of Microbiology, J. J college of Arts and Science, Pudukottai, India

ABSTRACT

Cadmium chloride is potent hepatotoxic agents. The present study was undertaken to examine the inhibitory effect of the green tea (Camellia sinesis) on cadmium chloride induced hepatoprotective activity in liver. In rats injected with cadmium chloride, the activities of serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), lactate dehydrogenase (LDH), γ-glutamyl transferase (GGT) was significantly ($p < 0.05$) increased when compared to those values in control rats. The rats administrated with green tea extract and cadmium chloride showed a significantly ($p < 0.05$) decreased levels of serum SGOT, SGPT, LDH and GGT. The results of this study indicate that the green tea extract is a potent hepatoprotectant agent for therapeutic purposes

Key words: Cadmium chloride, Green tea (*Camellia sinesis)*, Hepatoprotective.

INTRODUCTION

Heavy metals are placed under pollutant category due to their toxic effects on animals and human beings. Exposure to toxic metals has become an increasingly recognized source of illness world wide [1]. Dietary intake of many heavy metals through consumption of plants has long-term detrimental effects on human health [2]. Cadmium is present in soil as the result of which can be taken up selectively from the soil by edible plants and producing cadmium concentrations many times than that of the surrounding soil [3]. Cadmium has no essential biological functions

in living organisms. The major natural sources for mobilization of cadmium from the earth's crust are volcanoes and weathering of rocks [4]. Other sources of environmental cadmium are the burning of fossil fuels and waste materials and use of phosphate fertilizers and sewage sludge. Meat and fish normally contains lower cadmium contents, from 5 to 40 ppb. The World health organization (WHO) has recommended that the provisional permissible intake of cadmium is 0.4 to 0.5 mg per week or 0.057 to 0.071 mg/day [5]. Cadmium is present in the plasma of blood within minutes after its exposure, from which cadmium is readily taken up by the liver. Cadmium in plasma circulates primarily bound to albumin. Cadmium enters the liver where it becomes bound to metallothionein and is released to the blood stream. Twenty four hours after exposure, most of the cadmium is distributed in blood cells probably bound to metallothionein, a cystine rich metal binding protein [6].

Camellia sinesis (Family-Solanacea) is an annual herb, native of India, wild or naturalized throughout the tropics of both the hemispheres. Green tea is made from unfermented leaves and reportedly contains the highest concentration of powerful antioxidants called polyphenols. In traditional Chinese medicine, practitioners used green tea as a stimulant, diuretic, astringent and to improve heart health [7]. Other traditional uses of green tea include treating flatulence (gas), regulating body temperature and blood sugar, promoting digestion and improving mental processes. Our study is mainly focused to explore the protective role of green tea extract on Cadmium chloride induced toxicity in rats by analyzing their biochemical alteration.

EXPERIMENTAL SECTION

Animals

Adult male albino rats of Wistar strain weighing 170-200 g were used for the study. The rats were housed in polypropylene cage and kept under standard laboratory conditions (temperature 25±2°C; natural light-dark cycle).The rats were provided with food and water *adlibitum*. The commercial rat feed contained 5% fat, 21% protein, 55% nitrogen free extract and 4% fibre (w/w) with adequate minerals and vitamin contents.

Chemicals

Cadmium chloride was purchased from Sigma chemical Co. (St. Louis, MO, USA). The rest of the chemicals and biochemicals were obtained from local firms (India) and were of analytical grade.

The green tea was made by soaking 15 g of instant green tea powder in 1 L of boiling distilled water for 5 minutes. The solution was filtered to make 1.5% green tea extract (GTE).

Treatment Schedule

The animals were randominised into experimental and control groups and divided into 4 groups of six animals each. Animals in

Group-I control rats subcutaneously treated with isotonic saline (1 mg/kg body weight/day).
Group-II GTE was provided to rats as their sole source of drinking water.
Group-3 Toxicity was induced in rats by administration of Cadmium chloride (1.25 mg/kg) body weight via intraperitonial administration.
Group-4 Rats were treated with Cadmium chloride (1.25 mg/kg body weight) as in group 3 and group 1.

Estimations

Blood was collected in unheparinised tubes and serum was separated for the estimation of marker enzymes such as SGOT, SGPT, LDH and GGT. SGOT and SGPT were estimated by the method of Reitmann and Frankel method [8], alkaline phosphate and γ-glutamyl transferase by literature methods [9, 10].

Statistical analysis

All data were expressed as mean ± standard deviation of number of experiments. The statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS version 9.0 (SPSS, Cary, NC, USA) and Duncan's multiple range test (DMRT) [11]. A value of $p < 0.05$ was considered to indicate a significant difference between groups.

RESULTS AND DISCUSSION

The activities of liver SGOT, SGPT, LDH and GGT specific markers in serum is shown in table-1. In cadmium chloride injected rats (Group-III), the activities of SGOT, SGPT, LDH and GGT were significantly ($p < 0.05$) increased when compared to those values in control rats (Group-I). The rats administrated with cadmium chloride and green tea extract (Group-IV) showed a significantly ($p < 0.05$) decreased levels of serum SGOT, SGPT, LDH and GGT. Administration of green tea extract significantly reversed the cadmium chloride induced changes in circulation towards near normal. There was no significant change in the levels of green tea extract alone given group compared to normal.

Table.1: Effects of green tea on the activities of hepatic serum markers in control and experimental rats

S. No	Groups	SGOT (IU/L)	SGPT (IU/L)	LDH (IU/L)	GGT(IU/L)
1	Control	60.19±6.25	62.12±7.43	42.59±3.90	07.84±0.73
2	GTE	61.14±7.90	62.05±8.75	41.03±4.24	07.69±0.50
3	$Cdcl_2$	165.14±5.96	144.30±11.50	79.15±05.90	12.00±01.90
4	$Cdcl_2$ + GTE	98.14±8.41	80.47±8.61	54.06±1.76	10.46±0.49

Values are mean±SD for six rats in each group.

Cadmium is perhaps one of the most toxic industrial and environmental metals and possesses a continuing health hazard. Since it is rapidly distributed in the tissues [12]. Increased activities of serum SGOT, SGPT, LDH and GGT are well known diagnostic indicators of hepatic injury. In cases such as liver damage with hepatocellular lesions, these enzymes are released from the liver into the blood stream [13]. The results obtained by us indicate a significantly recovered in the activities of these marker enzymes in serum, which is in accordance with the previous reports [14, 15]. Pre-treatment with GTE significantly lowered the levels of these enzymes, and the values were comparable with that of the control group.

In the present study, a decrease in the activities of amino transferases, LDH and GGT was observed in the liver following $Cdcl_2$ administration. Serum amino transferases (SGOT and SGPT) being an important class of enzymes linking carbohydrate and amino acid metabolism, have established a relationship between the intermediates of citric acid cycle. These enzymes are markers of liver injury since liver is the major site of metabolism. The marked decrease in the activity of hepatic LDH and GGTwith $Cdcl_2$ treatment indicates impaired liver function. Several researchers have reported decreased activities of SGOT, SGPT, LDH and GGT in liver during

$Cdcl_2$ treatment, which corroborate with our study [16, 17]. Thus the present study shown the hepatoprotective effect of green tea in cadmium chloride toxicated rats.

REFERENCES

[1] ND Lyn Patrick. *Alt. Med. Rev*, **2003**, 8, 106-128.
[2] RK Sharma and M Agarwal. *J. Environ. Biol*. **2005**, 26, 301-313.
[3] EA Korzun and HH Heck. *J .Air .Waste Assoc*, **1990**, 40, 1220-1226.
[4] JO Nriagu. *Nature*, **1989**, 338, 47-48.
[5] World Health organization (WHO), Environmental Health Criteria 134-Cadmium International Programme on Chemistry Safety (IPCS) Monograph, WHO Geneva, **1992**.
[6] GF Nordberg; M Piscator and Nordberg M. *Acta .Pharmacol. Toxicol*, **1971**, 30, 289-295
[7] O Weinreb; S Mandel; T Amit and BHM Youndim. *Journal.of. Nutritional Biochemistry*, **2004**, 15, 506-516.
[8] S Reitman and S Frankel. *Am. J .Clin .Pathol*, **1957**, 28, 56-63.
[9] EJ King and AR Armstrong. *Canad. Med. Assoc .J*, **1934**, 31, 56-63.
[10] SB Rosalki and D Rau. *Clin. Chem. Acta*, **1972**, 39, 41-47.
[11] BD Duncan. *Biometrics*, **1957**, 13, 359-364.
[12] MP Waalkes; TP Coogan and RA Barter. *Crit Rev Toxicol*, **1992**, 22, 175-201.
[13] GL Plaa and WR Hewitt. Detection and evolution of chemically induced liver injury. In: Hayes, A.W. (Ed.), Principles and Methods of Toxicology. Raven press, New York, **1986**, 401–41.
[14] CJ Wang; SJ Shiow and JK Lin. *Carcinogenesis*, **1991**, 12, 459–462.
[15] J Liu ; CF Yang C F; S Wasser ; HM Shen ; CE Tan and CN Ong . *Life Sci*, **2001**, 69, 309–326.
[16] MM Kalengayi and VJ Desmet. *Cancer Res*, **1975**, 35, 2845–2852.
[17] SJ Yin; MC Kao and SC Lee. *Brit J Cancer*, **1980**, 42, 319–325.