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Effect of caffeine on the hepatic tissue of Wistar Albino rat

Suman Swaraj*
Department of Zoology, B.N.Mandal University, Madhepura, Bihar, India

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Abstract : Caffeine is probably the most frequently ingested pharmacologically active substance in the world. It is found in common beverages (coffee, tea, soft drinks), in products containing cocoa or chocolate, and in medications. Because of its wide consumption at different levels by most segments of the population, the public and the scientific community have expressed interest in the potential for caffeine to produce adverse effects on human health. The present paper reports the results of an investigation of the effect of caffeine, given as coffee or tea, on the generation of malondialdehyde (MDA) lipid peroxidation, alanine aminotransferase (ALT) & aspirate aminotransferase (AST) in the liver of Wister Albino rats. The rats were divided into three groups – a control group of 3 rats which received normal feed and plain water, and two other groups of 3 rats each which received 1 gm of either coffee or tea dissolved in 2 ml of water in addition to their normal feeds. Treatment lasted for 14 days after which the animals were sacrificed and the liver was harvested. It was found that both coffee and tea increased the mean concentrations of MDA, AST ALT in liver of the rats and leads to damage. Thus it is concluded that caffeine, given as either tea or coffee (excess) has a pro-oxidant effect on the rat liver leading to liver toxicity.

Key words: Energy drink, Malondialdehyde, Lipid peroxidation, Aminotransferases, Caffeine

INTRODUCTION

Caffeine is a central nervous system (CNS) stimulant of the methylxanthine class. It is the worlds most widely consumed psychoactive drug due to their stimulant effect on the central nervous system & body and the property of both enhancing coginitive and physical performances, if taken in millimolar[1] Unlike many other physioactive substances, it is legal and unregulated in nearly all parts of the world. There are several known mechanism of action to explain the effects of caffeine. The most prominent is that it reversibly blocks the action of adenosine on its receptor and consequently prevents the onset of drowsiness induced by adenosine. Caffeine also stimulates certain portions of the autonomous nervous system. The role of caffeine possibly depends on the dose of caffeine injested and the animal species studied. It is found in the seeds, nuts, or leaves of a number of a plants native to Africa, East Asia and South America. These plants extracts have been used by traditional medical practioners for the treatment of liver disorders[2]. Therefore, this is an essential research about suitable herbal drugs that could replace the chemical ones[3]. It is being acknowledged that plants contain beneficial health effects such as anti-inflammatory and anti-carcinogenic properties[4]. Cirrhosis is a consequence of chronic liver disease[5]. Caffeine has been recognized as an efficient biological antioxidant. However several studies suggest that this property is observed when caffeine is present in millimolar quantities. Caffeine was an effective inhibitor of lipid peroxidation, at millimolar concentrations, in rat liver microsomes. Thus it appears that the observed effects of caffeine on peroxdation is variable and probably depends on the dose of the agent given, the species studied, and the possible presence of

*Corresponding author :
Phone : 9955875200
E-mail : drsumanswaraj@gmail.com

other agents like flavonoids or polyphenols that may be in the tea or coffee.

MATERIALS & METHODS

Coffee and tea sold as Classical Nescafe and Tope Tea were purchased from the local commercial shops. Twelve adult male Wister Albino rats weighing (mean weight = 115.5g) were obtained from the animal house and were housed in metallic cage in normal healthy laboratory condition with a 12 hour light/dark photoperiod. All the rats were fed normally with diet & water & received humane care in accordance with the National institute of health guidelines for the care and use of laboratory animals. The 9 rats were divided into three groups of 3 rats in each. Rats of the control group (Gr.1) were provided basal diet & distilled water throughout the experiment. Gr.2 rats were fed normal feed water &1 gm of coffee dissolved in 2 ml of water while Gr.3 rats were fed normal feed, water & 1 gm of tea dissolved in 2 ml of water.

Sample collection & preparation

Blood samples were taken from each of the sample, and the animals were sacrificed after 14 days of treatment. They were anaesthetized with the help of chloroform, one at a time. Each rat was dissected and the liver was excised, separately and processed for light microscopy and histological investigation for the determination of tissue concentration of malondialdehyde (MDA), plasma alanine aminotransferase (ALT) & aspartate aminotransferase (AST).

Biochemical analysis

ALT, AST were determined according to the method of Reitman and Frankel[6] using test kit (Randox laboratories, U.K) in line with the manufacturer protocol[7]. MDA concentration in plasma was determined spectrophotometrically as described by[8].

Statistical analysis

Data are expressed as mean ± SD for each group. Differences between group means were estimated using a one way ANOVA followed by Tukey statistical test, using SPSS version 20.0 for windows (SPSS Inc., Chicago IL, USA). Results were considered statistically significant at $p<0.05$.

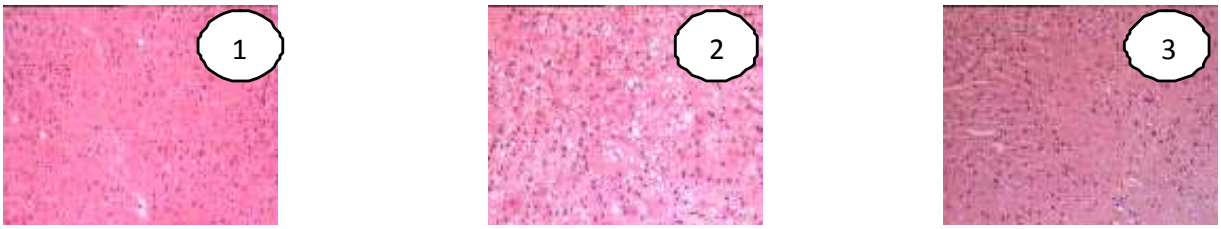
Histological examination

The liver from rats of different groups for histological examinations was collected after sacrifice. These tissues samples were fixed in 10% neutral buffered formalin, dehydrated in alcohol and embedded in paraffin. Fine sections obtained were mounted on glass slides and counter-stained with hematoxylin eosin (H&E) for light microscopic analysis. The photograph of the slide was taken after its examination by the histopathologist.

OBSERVATION

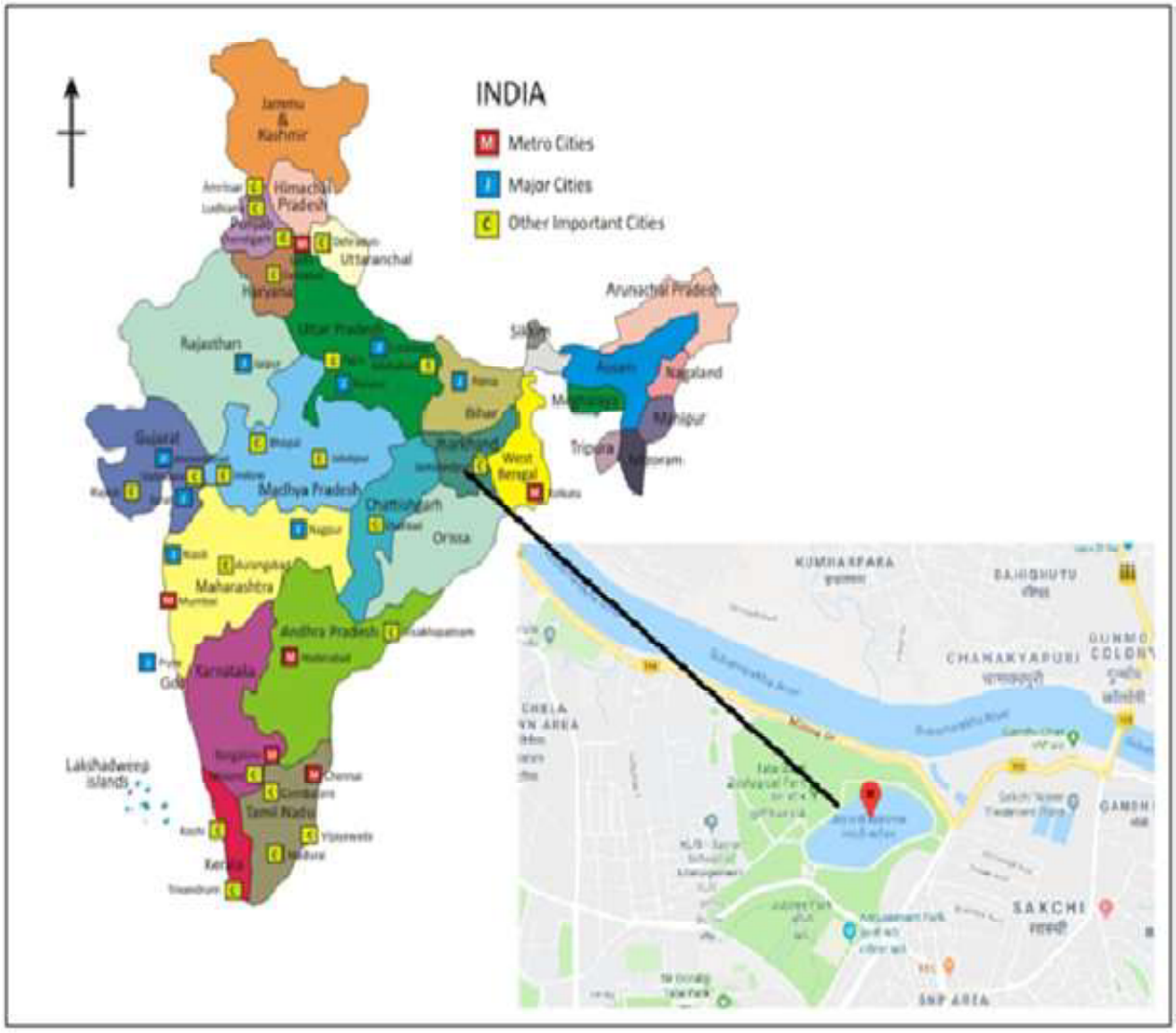
Mean MDA, AST and ALT levels in the experimental animals

Groups	no. of animals	MDA (Unit/g tissue x 10^5)	AST (Unit/g tissue x 10^5)	ALT (Unit/g tissue x 10^5)
Group 1 (control)	3	2.50 ± 0.24	68.60 ± 4.70	54.27 ± 4.62
Group 2 (Nescafe)	3	3.19 ± 0.17	93.43 ± 6.91	61.94 ± 4.23
Group 3 (top tea)	3	3.35 ± 0.19	128.57 ± 6.83	90.79 ± 6.73
p-value		<0.01	0.001	0.001



Control Coffee Top Tea

Fig: Histology of liver in control, coffee treated and top tea treated rat.



RESULTS & DISCUSSION

A common concern that is expressed about caffeinated energy drinks consumption is that these products may emerge as energy beverages with clinical or subclinical toxic effect on the consumers. The result shown in the table compares the mean concentration of MDA, ALT AST in the liver of the three groups of animals. It shows that the mean concentration of MDA, ALT AST in the liver of the rats in group 2 (treated with Nescafe) and the mean concentration of the former in the liver of the rats in group 3(treated with Top tea) were highly significantly greater than the concentration of the above in the control group.

Lipid peroxidation

The effects of energy drinks on MDA are given in the table. Here we observed that ED consumption by animals increased concentration of MDA. Nescafe induced lipid peroxidation such that MDA level significantly increased as compared to control. The observed lipid peroxidation by increased plasma malondialdehyde suggests possible potential of ED to induce tissue damage.

Liver function parameters

The effects of administration of energy drinks on plasma liver function were shown in the table. Treatment with Nescafe, top tea generally caused significant elevation in serum AST, ALT[9]) Increases in the blood levels of hepatic enzymes serves as reliable indicators of liver damage by

the toxic agents. It has been demonstrated that rats administered ED alone or in combination with alcohol showed higher serum total ALT, AST than the untreated controls[10] in AST and ALT compared to control.

CONCLUSION

The study of "Effects of Caffeine on the Hepatic tissue of Wiser Albino rat demonstrate that exposure of rats to high doses of caffeine for leads to liver damage or liver cirrhosis.

REFERENCES

1. **F Zeidán-Chuliá; DP Gelain; EA Kolling 2013; LR Rybarczyk-Filho; P Ambrosi; SR Terra; AS Pires, 2013.** *Oxid. Med.Cell Longev.*, 2013, doi.org/10.1155 /2013/791795.
2. **Schuppan, D.J Jia. B Brikhaus and E.G Han. 1999.** herbal products for liver diseases: a therapeutic challenge for the new millennium. *Hematol*. **30:** 1099-1104.
3. **Bruck. R.R O Hershkoviz, H Lider, L. Aeed. Z. Zaidel. J. Matas. Barg and Z. Halpern, 1996.** Inhibition of experimentally- induced liver cirrhosis in rats by a nonpeptidic mimetic of the extracellular matrix associated. Arg. Gly. Asp. Epitope. *J. hepatol*. **24:** 731-738.
4. **Bissell, D.M, 1998.** Hepatic fibrosis as wound repair: a progress report. *J. gastroenterol*. **33:** 295-302.
5. **Wolf. A.T, R. Maurer, J. Glickman and N.D Grace, 2008.** Hepatic venous pressure gradient supplements liver biopsy in the diagnosis of cirrhosis. *J. clin. Gastroentrol.* **42:** 199-203.
6. **Reitman, S Frankel. A.M. 1957.** *J. Clin. Path.* **289(1):** 56-58.
7. **Bergmeyer H.V . 1984.** Method of enzymatic analysis Weinheim Verlag Chemie. 3-92.
8. **B. wallin: B. Rosengren. 1993.** HG Shertzer: G Camejo. *Anal. Biochem*. **208:**10-15.
9. **Bukhari HM., EI Sawy, N.A Header, EA Header E.A, 2012.** Biological effects of high energy drink on normal and hyperglycemic rats. *Pak. J. nut.* **11(4):** 301-309.
10. **Ugwuja EI, 2014.** Biochemical effects of energy drinks alone or in combination with alcohol in normal albino rat. *Adv. Pharm. Bull.* **4(1):** 69-74.

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