Evaluation of the Effect of Caffeine on the Cerebellar Cortex of Mercury Treated Wistar Rats

Emem-Obong J. Ema¹, Sunday A. Musa¹, Ibrahim A. Iliya²

¹Department of Human Anatomy, Faculty of Basic Medical Sciences, Ahmadu Bello University Zaria, Nigeria
²Department of Human Anatomy, Faculty of Basic Medical Sciences, Federal University, Dutse, Nigeria

Received: ……………. September 2019
Accepted: ……………. December 2019

ABSTRACT

Mercury is a toxic heavy metal that constitutes a significant environmental and health problem, with evidences indicating the central nervous system as the main target. This study was therefore designed to evaluate the effect of caffeine on the histology of the cerebellum of mercury treated Wistar rats. Twenty adult male Wistar rats were distributed into four groups (n=4). Administration was as follows: Control (distilled water, 1 ml/kg), mercury chloride (HgCl₂), 16.6 mg/kg body weight, low dose caffeine (20.7 mg/kg) with mercury chloride (16.6 mg/kg), high dose caffeine (41.5 mg/kg) with mercury chloride (16.6 mg/kg). The administrations lasted for 28 days via oral route daily. Histological evaluation was carried out with haematoxylin and eosin, and cresyl violet stains. Beam walking test (BWT) for motor coordination was carried out. Alteration in the cerebellar cortex histoarchitecture seen in mercury chloride group was ameliorated in the groups treated with caffeine. The result of BWT test showed an increase in the time taken to locate the platform after mercury chloride administration but was decreased after administration of caffeine (p>0.05). The administration of caffeine protect against mercury chloride toxicity to the cerebellum of Wistar rats.

Key words: Mercury chloride, Caffeine, Wistar rats, Cerebellum

INTRODUCTION

Interaction of man with his environment exposes him to a range of heavy metals (Burger et al. 2011) that affect major systems in the body (McDowell 2003). This interaction which is due to advancement in technology and improvement in standard of living brought unrestrained industrialization and urbanization without proper emission and pollution controls (Bennett et al. 2003). This posed a major challenge to environmental safety as the heavy metals are widely utilized to sustain the standards of living in the modern world (Arif et al. 2015). Mercury chloride (HgCl₂) is commonly found in antiseptics, antifungal and anti-parasite materials. It is also an ingredient in skin lightening soaps, creams, eye makeup cleansing products and mascara (WHO 1991). Reported cases of mercury toxicity have been widespread in Sweden, Mexico, USA and the Minamata Bay (Takizawa and Osame 2001). In Nigeria, the use of Kohl (a traditional cosmetic) among some northern states such as Katsina, Sokoto, and Gombe also predisposes to mercury toxicity (Onyeike et al. 2002). Mercury exerts its toxicity by inducing oxidative stress and apoptosis in affected organs of which the brain is very sensitive. This is due to its ability to affect the antioxidant system in the cell, resulting in loss of membrane integrity and finally cellular necrosis (Diamond and Zalups 1998). It inhibits: production of brain tubulin cells (Pendergrass and Haley 1997a; Hock et al. 1998), production of neurotransmitters, Mexico, USA and the Minamata Bay (Takizawa and Osame 2001). In Nigeria, the use of Kohl (a traditional cosmetic) among some northern states such as Katsina, Sokoto, and Gombe also predisposes to mercury toxicity (Onyeike et al. 2002). Mercury exerts its toxicity by inducing oxidative stress and apoptosis in affected organs of which the brain is very sensitive. This is due to its ability to affect the antioxidant system in the cell, resulting in loss of membrane integrity and finally cellular necrosis (Diamond and Zalups 1998). It inhibits: production of brain tubulin cells (Pendergrass and Haley 1997a; Hock et al. 1998), production of neurotransmitters,

Correspondence: Ememobong J. Ema, MSc, ¹Neuroscience Unit, Department of Human Anatomy, Faculty of Basic Medical Sciences, Ahmadu Bello University, P.M.B. 1008, Zaria, Nigeria. ememema97@gmail.com; +2347064627633

35
REFERENCES
receptors in the motor effects of caffeine after its acute and chronic administration. Neuropsychopharmacology. 28:1281-1291.