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RESEARCH PAPER

THE EFFECT OF *MONDIA WHITEI* ON THE HISTOLOGY OF THE BRAIN OF WISTAR RAT

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ABSTRACT

This study was designed to investigate the effect of *Mondia whitei* on the histology of the brain. 20 adult male Wister rats were involved in the study.The animals were assigned into four groups: a control (group A) and three test groups (B, C and D). Animal weights were measured before and after acclimatization (2 weeks); and after three weeksof dosage administration. At the end of three weeks, the animals were sacrificed to harvest the brain for histological study. The results showed that while normal brain cells were presented in the control (group A), group B presented cellular pyknosis, necrosis, degenerative vacoulations, and mild infarction without gliosis. Group C showed cellular degeneration, pyknosis, gliosis/astrocytosis, vacoulation, while group D showed cellular degeneration, pyknosis and parenchymal erosion. The observed histological changes were duration dependent and suggest that *Mondia whitei* is toxic to the brain and may induce neurotoxic damages in a duration dependent manner. Hence, there is a need for further research on the effects of *Mondia whitei* on other organs and system.

Key words: brain, *mondia whitei*, neurotoxic effects, histology

INTRODUCTION

WHO, (1985) defines a medicinal plant as any plant in which one or more of its parts contain substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. The indigenous medicinal plants form an important component of the natural wealth of Nigeria and many indigenous plants have been used by common man since time immemorial for curing of various ailments and thus lessening human suffering without the actual knowledge of the active ingredients that cause relief (Soladoye *et al*., 2006).

Interestingly, Nigeria flora has already and will continue to make a great contribution to the health care needs of Nigerians (Gbile and Adeshina, 1987; Gbile *et al*., 1988; Soladoye *et al*., 2006). The potentialities of some of these plants have been established and the various plant parts commonly used in traditional medicine include stems, leaves, roots, shoot of plant or whole plant to prepare extracts, decoction, concoction, mixtures, creams, soaps, infusions, pastes, macerations, syrup and powders (Soladoye *et al*., 2006). Although it is generally agreed that medicinal plants and their products are naturally safer than their synthetic counterparts drugs (Gamaniel, 2000), a general assumption of this safety should not always be made, as a plant may prove efficacious but would have low therapeutic index or safety margin (Agaie *et al*., 2007). In most cases, their toxicity potentials have been attributed to the contained active principles as well as over-dose due to the absence of standard dosage system in herbal medicine (Onyeyili *et al*., 2000; Hashemi *et al*., 2008).

Furthermore, various plants have been used in folk medicines of different cultures to treat male infertility problems. Some have been identified pharmacologically, allowing for understanding of their mechanisms of action but most of these plants have not been scientifically investigated in order to test and substantiate their claimed properties (Kamtchouing *et al.*, 2002 and Sharma *et al.*, 2003). Substances often used as aphrodisiac cross the blood brain barrier and mimic or stimulate some area of sexual arousal in the central nervous system (Gundidza *et al.*, 2009). They act at the level of the central nervous system (Brain and spinal cord) by altering specific neurotransmitter or specific sex hormone concentrations and can be viewed as any food, drug, scent or device that can arouse or increase sexual drive or libido (Rosen and Ashton, 1993). They can be effective in both sexes, though most act through an increase in testosterone concentration and as such, male-specific (Murphy and Lee 2002).

One such plant is *Mondia whitei*, an aromatic plant of the *Periplocacea* family. It is a woody climber with large tuberous root stock which is widely distributed in Tropical Africa (Watcho *et al.*, 2004). The roots are traditionally used as either aphrodisiacs or for the treatment of urinary tract infection, jaundice and headaches, while the whole plant is used to treat diarrhoea (Adjanohoum *et al.*, 1996 and Noumi *et al.*, 1998). There are claims that it is an efficacious aphrodisiac for the treatment of male impotence and infertility especially the aqueous extracts and root (Lampiao, 2009). This study therefore, is designed to investigate the effects of *Mondia whitei* on the histology of the brain.

MATERIALS AND METHODS

Substance of Study: The roots of the plant material (*Mondia whitei*) were obtained from a local market in Alimosho, Lagos, Nigeria and authenticated in the Department of Botany, Faculty of Natural Sciences, Ambrose Alli University, Ekpoma, Edo, Nigeria.

Experimental Animals: Twenty adult male Wister rats of comparable weights and sizes were procured from the animal farm of the department of Physiology, College of Medicine, Ambrose Alli University, Ekpoma, and moved to the site of the experiment (the animal house of Anthonio Research Centre) where they were housed in well ventilated wooden cages.

Animal Grouping: The animals were assigned into four groups: a control (group A) and three test groups (B, C and D). The rats were allowed acclimatization period of two weeks, during which they were fed *adlibitum* with water and grower mesh (Bendel Feeds and Flour Mills, Ewu, Edo State, Nigeria) obtained in a store at number 14, Ihumudumu Road, Ekpoma.

Substance Preparation: The roots were cut into pieces to increase its surface area and dried in sunlight for seven days, subsequently blended into fine powder with an electronic blending machine. Substance measurements was carried out using an electric balance by Denver Company, USA, (200398. 1REV. CXP-3000) in the diagnostic laboratory of the department of Medical Laboratory Science, Ambrose Alli University, Ekpoma, and packed in small plastic bags respectively. These were then stored in a dry glass container pending usage.

For the purpose of this study, feed pellet were prepared by sprinkling water into specific quantities (in grams) of *Mondia whitei* powder and appropriate amount of grower's mash to form a semi-solid paste. The resultant paste was then split into bits and allowed to dry under the sun.

Substance Administration: After acclimatization, group A (Control) received 100g of feed (growers mash) only. Group B received 91.0g of feed plus 9.0g of *Mondia whitei*, while group C and D, received 91.0g of feed plus 9.0g of *Mondia whitei* and 91.0g of feed plus 9.0g of *Mondia whitei*respectively. Throughout the experiment, water was given ad libitum.

Study Period: The study lasted from October, 2011 - December, 2011. However, the actual experiment lasted for five weeks (2weeks for acclimatization and 3 weeks for treatment with test material). During the experimental period,the animals were fed and monitored between the hours of 8:00am – 12:00 pm.

Sample Collection: At the end of the experiment, the brain of each of the rats harvested with chloroform gas serving as anaesthesia. The harvested brains were then fixed in 10% formalin for histological processing.

Histological Analysis: The tissues were processed using automatic tissue processor according to the processing schedule used in Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), Ile-Ife, Osun State. The

tissue blocks were then trimmed and cut serially at 3nm on a rotary microtome. The sections were floated in water bath at 55^{o}C and picked up by the use of a clean frosted end slides. The frosted end slides were now placed on the hot plate for 40 minutes for adequate attachment of the sections on the slides after which the sections were de-waxed, hydrated, air dried and stored in a slide box ready for staining process. Haematoxylin and Eosin was used for routine staining while the tissue slides were mounted with dibuthylphthalate propylene xylene (DPX). Microscopy and micrography was performed with a light microscope and a digital camera attached to the microscope.

RESULTS

The results showed that the brain sections from control group A presented normal features (Figure 1). On the contrary, the brain sections from test groups B, C, and D presented histological signs of tissue damage. Specifically, group B sections presented cellular pyknosis (CP), infarction without gliosis (I), and vacoulations (V) (Figure 2). Group C sections presented cellular necrosis (N), Gliosis/Astrocytosis (G&A), and vacoulations (V) (Figure 3), while group D presented cellular pyknosis (P) and degeneration (CD), with parenchymal Erosion (PE) (Figure 4). The severity trend across the test groups indicates that the changes in the cytoarchitecture of the brainwere duration dependent.

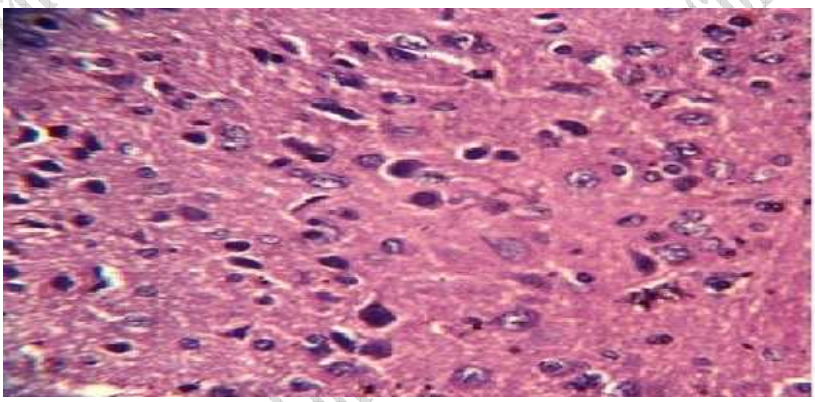

Figure 1: Brain section (control; H&E X400) showing normal cytoarchitecture

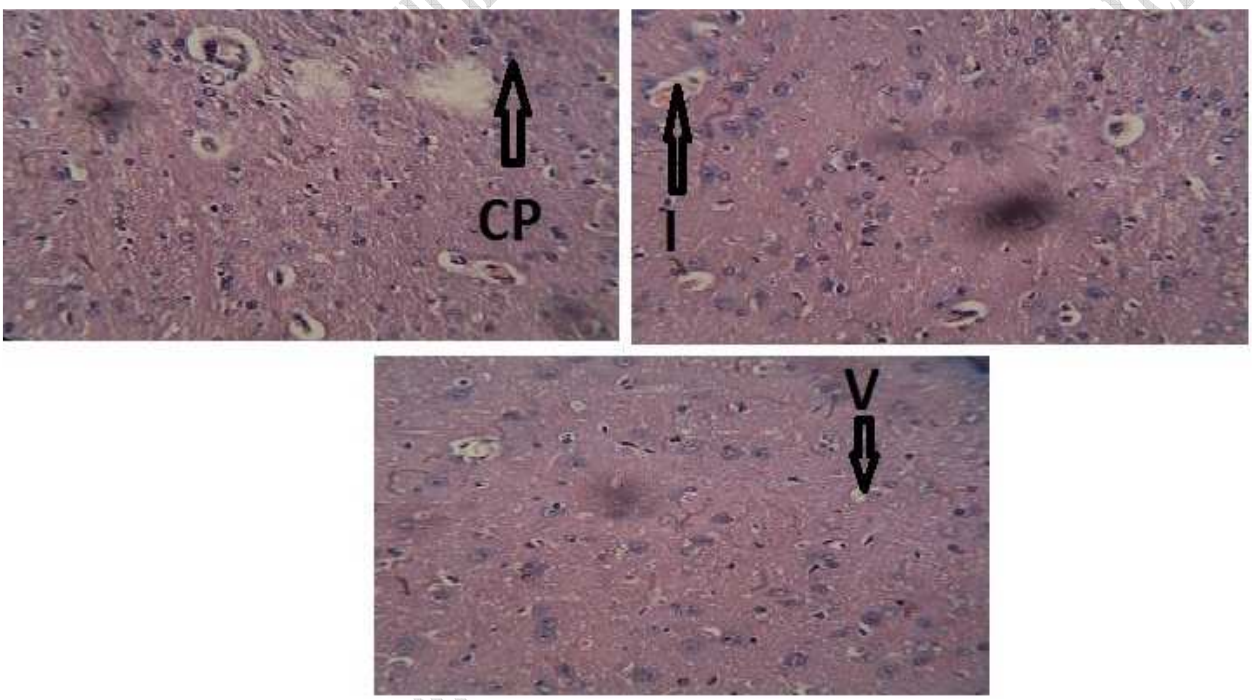

Figure 2: Brain sections (Test group B; H&E X400) showing cellular pyknosis (CP), infarction without gliosis (I), and vacoulations (V)

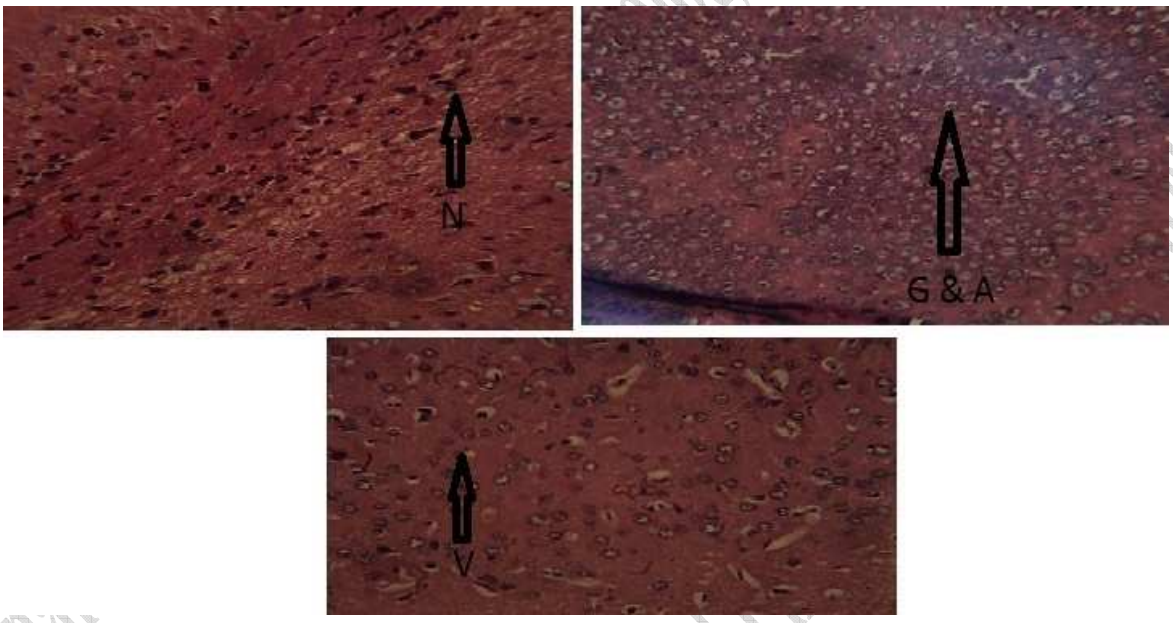

Figure 3: Brain sections (Test group C; H&E X400) showing necrosis (N), gliosis and astrocytosis (G&A), and vacoulations (V).

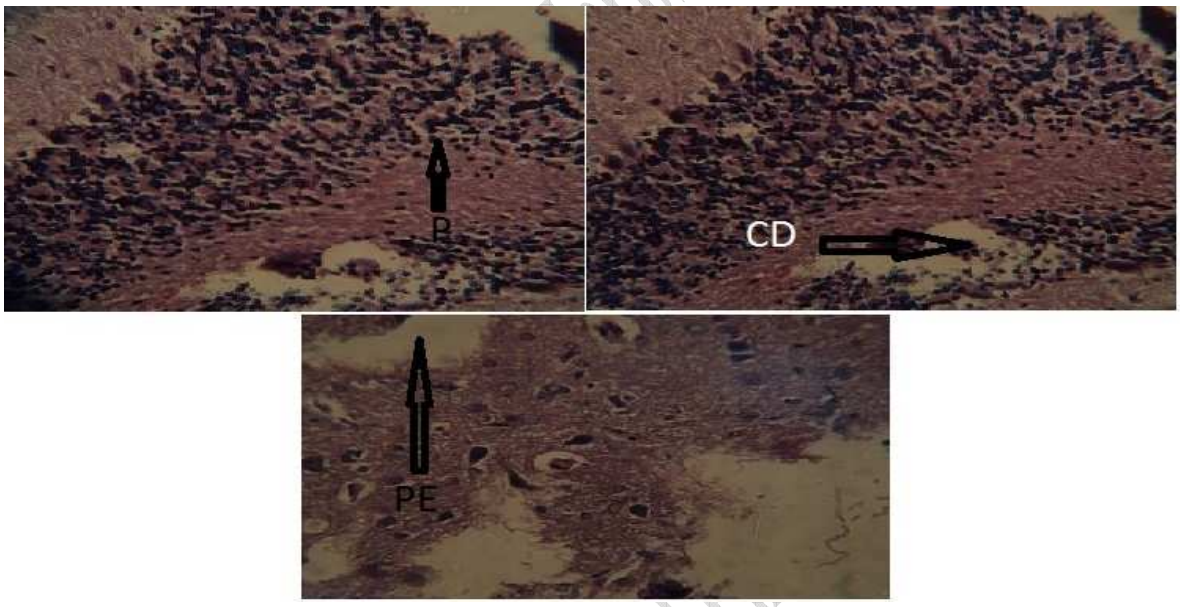

Figure 4: Brain section (Test group C; H&E X400) showing pyknosis (P), cellular degeneration (CD), parenchymal erosion (PE).

DISCUSSION

Neuronal degeneration has been associated with cell death and two types have been identified namely: apoptotic and necrotic cell deaths. These two types differs morphologically and biochemically (Wyllie, 1980). Pathological or accidental cell death is regarded as necrotic and could result from extrinsic insults to the cell such as osmotic, thermal, toxic and traumatic effect (Farber *et al*., 1980). This kind of necrotic cell death was observed in the test

groups fed with varying doses of *Mondia whitei* in grams per body weight, indicating that this substance has the potential to elicit necrotic changes in the cytoarchitecture of the brain. Waters, (1994) had earlier reported that cell death in response to neurotoxins might trigger an apoptotic death pathway within the brain cells which might also explain the observed histological changes.

Available literature has shown however, that cellular necrosis is not induced by intrinsic stimuli to the cells as in programmed cell death (PCD), but by an abrupt environmental perturbation and departure from the normal physiological conditions (Martins *et al*., 1978) and the rate of progression depends on the severity of the environmental insults which was observed in this study and the greater the severity of the results, the more rapid the progression of neuronal injury (Ito *et al*., 1975).

On the other hand, the observed astrocytosis in group C was similar to that reported by Nwaopara *et al*, (2011) in a study with rats fed with *Yaji*-a complex combination of groundnut powder and spices. It is a well-known fact that astrocytosis is a sequential morphological change of astrocytic reaction to tissue damage, and is associated with regulation of antioxidant defence mechanism to reduce oxidative brain damage.

In addition, the observed decrease in cellular population in group D suggested also that there were severe incidences of cell death possibly due to *Mondia whitei* toxicity. In fact, it has been reported that chronic administration of quinine results in the cellular degenerative changes, sparse cellular population and vacuolations (Adjene and Adenowo, 2005; Adjene and Caxton-martins, 2006). Our results has shown therefore, that the results of this study indicates that *Mondia whitei* have neurotoxic potentials.

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REFERENCES

Adjanohoum, J.E., Aboubaka, N., Dramane, K., Ebot, N.E., Ekpere, J.A. and Enow- Orock, E.G. (1996): Traditional medicine and pharmacopoeia. Contribution to ethnobotanical and floristic studies in Cameroon.

Adjene, J.O and Adenowo, T.K. (2005): Histological studies of the effect of chronic administration of chloroquine on the inferior colliculus of adult wistar rats. *JMBR*, 4(1): 83-87.

Adjene, J.O and Caxton-Martins, A.E. (2006): Some histological effect of chronic administration of chloroquine on the medial geniculate body of adult wister rats. *Afri.J.Med.Sci*. 35:131-135.

Agaie, B. M., Onyeyili, P. A., Muhammad, B.Y. and Ladan, M. J. (2007): Acute toxicity effects of the aqueous leaf extract of *Anogeissusleiocarpus*in rats. *African Journal of Biotechnology Vol. 6 (7)*, 886-889,

Farber, J.L., Chein, K.R., and Mittnacht, S. (1981): the pathogenesis of irreversible cell injury in ischemia; *American journal of a pathology*. 102:271-281.

Gammaniel, K.S. (2000): Toxicity from Medicinal plants and their products. *Nig. J. Prod. Med. 4*: 4-8.

Gbile, Z. O. and Adesina, S. K. (1987): Nigeria Floral and its Pharmaceutical Potentials. *JournalofEthnopharmacology.* 19: 1 – 16.

Gbile, Z.O. (1988): Study on Medicinal Plants. A Lecture delivered at the Meeting of the Nigerian Field Society, Ibadan.

Gundidza, G.M., Mmbengwa, V.M., Magwa, M.L., Ramalivhana, N.J., Mukwevho, N.T., Ndaradzi, W. and Samie, A. (2009): Acute toxicity effects of the aqueous leaf extract of *Anogeissusleiocarpus*in rats.

Hashemi, S.R., Zulkifli, I., Hair-Bejo, M., Farida A. and Somchit, M.N. (2008): Acute toxicity study and phytochemical screening of selected herbal aqueous extract in broiler chickens. *Int. J. Pharmacol., 4*: 352-360.

Ito, U., Sparts, M., Walker, J.R. and Warzo. I. (1975): Experimental cerebral ischemia in magolian gerbils(I). Light microscope observations. *Acta Neurophatology.* USA. 32: 209-223.

Kamtchouing, P., Mbongue, G.Y., Dimo, T. and Jatsa, H.B. (2002): Evaluation of androgenic activity of Zingiberofficinale and Pentadiplandrabrazzeana in male rats. *Asian J Androl*, 4, 299-301.

Lampiao, F. (2009): The role of Mondia whitei in reproduction: a review of current evidence. *The Internet Journal of Third World Medicine* 8 (1).

Martins, L.J., Al-Abdulla, N.A., Kirsh, J.R., Sieber, F.E and Portera-Cailliau, C. (1978): Neurodegeneration in excitotoxicity, global cerebral ischemia and target deprivation: A perspective on the contributions of apoptosis and necrosis. *Brain Res. Bull*. 46(4):281-309.

Murphy, L.L. and Lee, T.J. (2002): Ginseng Sex behavior and nitric oxide. Annals of the New York Academy of Sciences, 962, 372-377.

Noumi, E., Amvam, Z.P.H. and Lontsi, D. (1998): Aphrodisiac plants used in Cameroon. *Fitoterapia*,69,125-134.

Nwaopara A.O., Akpamu, U., Izunya A.M., Oaikhena, G.A., Okhiai, O., Anyanwu, L.C., Idonije, B.O. and Oyadonghon, G.P. (2011): The effect of *Yaji*-meat-sauce consumption on cerebellar neurons of white albino rats. *CurrentResearch Journal of Biological Sciences; 3 (4): 308 - 312.*

Onyeyili, P.A., Nwosu, C.O., Jibike, G.I., Amin J.D. and Daniels, R. (2000): Anthelmintic activity and haematological effects of stem bark water extract of *Khayasenegalensis* (Desr.). *Biosci. Res. Comm., 12*: 67-71.

Rosen, R.C. and Ashton, A.K. (1993): Emperical Status of New Aphrodi-siacs- *Arch. Sex. Behav*. 22: 581-543.

Sharma, A., Verma, P.K. and Dixit, V.P. (2003): Effect of Semecarpusanarcadium fruits on reproductive function of male albino rats. *Asian J Androl*, 5, 121-124.

Soladoye, M.O., Yakubu, F.A., Kola-Oladiji, K., Alabi,, D.A. and Agbomeji, Y.O. (2006): The Collection, Conservation and Cultivation of Local Medicinal Plants for Natural Medicine Production. Paper presented at the Seminar/Workshop and Exhibition of natural Medicine products. Organized by Nigeria Traditional Medical Association, Ijebu-North in collaboration with Faculty of Science, OlabisiOnabanjo University, Ago-Iwoye held 19th-23rd September, 2006.

Waters, C.M. (1994): Glutamate induced apoptosis of striatal cells in rodent model for parkinsonism. *Neuroscience*. 63:1-5.

Watcho, P.P., Kamtchouing, S.D., Sokeng, P.F., Moundipa, J., Tantchou, J.L., Essame.andKoueta, N. (2004): Androgenic effect of Mondia whitei roots in male rats. *Asian J. Androl*., 6:26.

WHO (1985): The WHO traditional medicne programme: policy and implementation.*Int Trad. Med.* Newslett. 1(2).1-5.

Wyllie, A.H. (1980): Glucocorticoid-induced thymocyte apoptosis in associated and endogenous endonuclease activation. *Nature*: London. 284:555-556.

AUTHORS' CONTRIBUTIONS

All authors [Dikibo E., Ehimigbai J., Eloka CCV., Ekoh SN., Ezeah GAC., Okoro C.J.] contributed to the completion of this study and were actively involved in the presentation of this manuscript.