



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2017; 3(6): 368-371  
www.allresearchjournal.com  
Received: 12-04-2017  
Accepted: 13-05-2017

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## Comparing the adverse impact posed by the administration of ethanolic root bark and leaf extracts of *Rauwolfia vomitoria* (Apocynaceae) on cerebellar astrocytes of adult wistar rats

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### Abstract

*Rauwolfia vomitoria* is one of the many herbal products consumed in Nigeria for its medicinal values, especially for its antipsychotic values. Many consumers believe that herbal medicines are safe because they are natural. Herbal medicine may interact with synthetic drugs causing toxicity to the patient. 30 adult Wistar rats were used for this investigation and were randomly divided into 6 groups (A, B, C, D, E and F). From this investigation, *Rauwolfia vomitoria* root-bark extract was more potent than the leaf extract. The staining intensity of the neurons in the cerebellum was affected and there was hyperplasia and hypertrophy of the cerebellar astrocytes especially in groups C and D which received 200mg/kg and 300mg/kg of the ethanolic root-bark extract of *Rauwolfia vomitoria*. Astrocyte hypertrophy and hyperplasia was found to be more in the groups that received the root-bark extract than the leaf extract treated groups. It therefore means that precaution should be taken during the consumption of the root bark of *Rauwolfia vomitoria* for any purposes.

**Keywords:** *Rauwolfia vomitoria*, Root –bark, leaf extract, astrocytes, cerebellum

### 1. Introduction

The use of herbal medicine for the treatment of diverse ailments has continued to be on the increase despite the availability of pharmaceutical drugs for almost any disease. Herbal medicine is an integral part of traditional medicines. Over 80% of the populations in some Asian and African countries depend on traditional medicine for primary health care (WHO, 2008) [1]. Traditional medicine has a broad range of characteristics and elements, and has been defined by the World Health Organization (WHO) as diverse health practices, approaches, knowledge and beliefs that incorporate plant, animal and/or mineral based medicines, spiritual therapies, manual techniques and exercises which are applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness (WHO, 2008) [1]. The increasing widespread use of herbal medicine has prompted the WHO to promote the integration of traditional medicine, complementary and alternative medicines into the national health care systems of some countries (WHO, 2005) [2]. Herbal medicines, also called botanical medicines or phytomedicines, refer to herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients (WHO, 2008) [1].

In Nigeria, many herbal products are used for treating illnesses. For instance, *Ocimum gratissimum* is used for treating diarrheal diseases (Ilori *et al.* 1996) [3]. The seeds of *Citrus parasidi* are effective in treating urinary tract infections that are resistant to the conventional antibiotics (Oyelami *et al.* 2005) [4]; pure honey healed infected wounds faster than eusol (Okeniyi *et al.* 2005) [5]; dried seeds of *Carica papaya* L. is effective in the treatment of intestinal parasitosis, the analgesic and inflammatory effects of *Garcinia kola* is known to enhance its use for osteoarthritis treatment (Adegbehingbe *et al.* 2008) [6]; and Aloe vera Mill gel is as effective as benzyl benzoate in the treatment of scabies and, in South Africa, plant extracts with muscle relaxant properties are used by traditional birth attendants to assist in child deliveries (Veale *et al.* 1992) [7].

People prefer to use herbal medicine because they believe that it is cheap and affordable, and have no side effects, being from natural sources.

However, this is not usually the case. The indiscriminate, irresponsible and non-regulated use of several herbal medicines may put the health of their users at risk of toxicity (Kloucek *et al.* 2005; Nnorom *et al.* 2006; Bury and Fullnfaw, 1987; Abt *et al.* 1995) [8,11]. Also, there is limited scientific evidence from studies done to evaluate the safety and effectiveness of traditional medicine products and practices (WHO, 2008) [1]. Adverse reactions have been reported about herbal medicines when used alone (Oshikoya *et al.* 2007) [12] or concurrently with conventional or orthodox medicines (Langlois-Klassen *et al.* 2007) [13]. Despite the international diversity and adoption of traditional medicine in different cultures and regions, there is no parallel advance in international standards and methods for its evaluation. *Rauwolfia vomitoria* is used for its various medicinal values, especially for its antipsychotic and antihypertensive values. Many people using it may erroneously believe that, being a herbal product, it is safe. Besides, people in many parts of Nigeria use either the leaves or root-bark of this plant, apparently oblivious of the fact that these parts may have different degrees of toxicity in the body.

## 2. Materials and Methods

### Breeding of Animals

Thirty (30) adult Wistar rats weighing 180g – 230g were obtained from the Department of Biochemistry, University of Calabar. They were housed in the animal house of the Department of Anatomy under standard conditions. The animals were fed with standard diet and allowed access to drinking water *ad libitum*. They were randomly divided into 6 groups (n=5).

### Preparation of Extracts

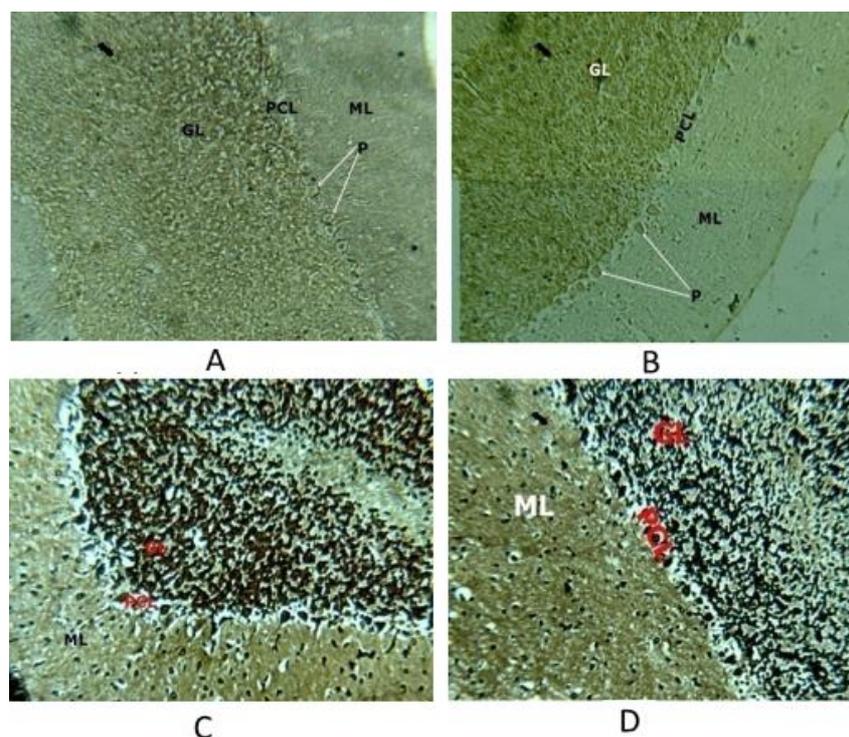
The root-bark and leaves of *Rauwolfia vomitoria* were obtained from the University of Calabar farm, Calabar. They were identified and authenticated by a botanist in the Department of Botany, University of Calabar. The roots and the leaves were washed in water and the root-bark was defoliated and dried. The dried root-bark and leaves were blended into powdered form using a Binatone kitchen blender. The blended sample was soaked in ethanol for 24 hours and the extract was filtered and evaporated to obtain the crude extract.

### Experimental protocol

The animals were randomly divided into 6 groups of 5 animals each labelled A, B, C, D, E, F. Groups A and B were the normal control and olive oil control respectively. Groups C, D, E, and F served as the experimental. Group A animals received 0.5ml/200g of normal saline while group B animals received 0.5ml/200g for 7 days respectively. The ethanolic extracts of *Rauwolfia vomitoria* root-bark and leaf were administered orally to the animals with the aid of orogastric tube. After the last dose schedule, the animals were sacrificed using chloroform. The cerebellum was removed and fixed in 10% formol saline solution. The cerebellar sections were stained using Hortega's (1917) [14] silver carbonate method for astrocytes.

## 3. Results

The photomicrograph of the control cerebellum showed normal distribution of astrocytes. Sections of cerebellum from all the treated groups showed increased hyperplasia and hypertrophy of astrocytes especially in groups C and D which received 200mg/kg and 300mg/kg of the ethanolic root-bark extract of *Rauwolfia vomitoria* when compared to the control groups and the groups E and F animals which received 200mg/kg and 300mg/kg of ethanolic leaf extract of *Rauwolfia vomitoria*.



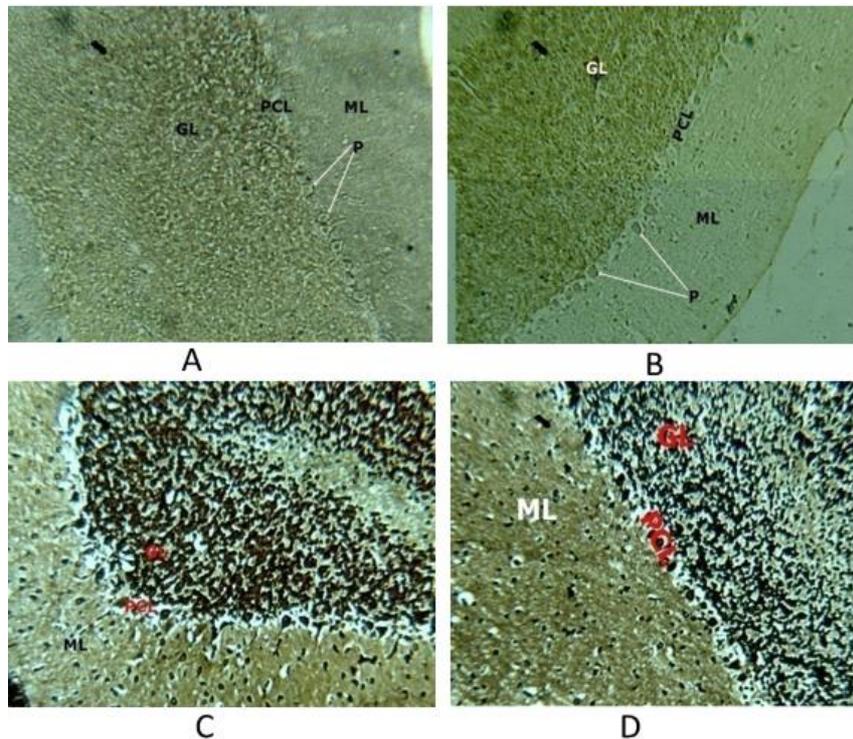
**Fig 1:** Photomicrographs of cerebellum of normal control, olive oil control and groups that received 200mg/kg root bark and leaf extract (Hortega's Lithium carbonate method; Mag. X 100)

A: Cerebellar cortex of normal control group showing normal astrocytes distribution; Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL); Purkinje cell outline (P).

B: Cerebellar cortex - of olive oil control group rats showing normal astrocytes distribution Molecular layer; Purkinje cell layer (PCL); Granular layer (GL); Purkinje cell outline (P).

C: Cerebellar cortex - 200mg/kg root-bark extract showing hyperplasia of reactive astrocytes compared to the controls; Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL).

D: Cerebellar cortex - 200mg/kg leaf extract showing hyperplasia and hypertrophy of astrocytes compared to the controls; Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL)



**Fig 2:** Photomicrographs of cerebellum of normal control, olive oil control and groups that received 300mg/kg root bark and leaf extract (Hortega's Lithium carbonate method; Mag. X 100)

A: Cerebellar cortex of normal control group showing normal astrocytes distribution; Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL); Purkinje cell outline (P)

B: Cerebellar cortex - of olive oil control group rats showing normal astrocytes distribution Molecular layer; Purkinje cell layer (PCL); Granular layer (GL); Purkinje cell outline (P)

C: cerebellar cortex - 300mg/kg root-bark extract showing hyperplasia and hypertrophy of astrocytes compared to the controls; Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL)

D: Cerebellar cortex - 300mg/kg leaf extract showing hyperplasia and hypertrophy in reactive astrocytes compared to the controls Molecular layer (ML); Purkinje cell layer (PCL); Granular layer (GL)

#### 4. Discussion

Astrocytes are star-shaped glial cells which are basically found in the central nervous system. They help to regulate ionic concentration, form the blood-brain-barrier and serve as intermediary stations for converging nutrient, gases and removal of waste products between neuron (George *et al.* 1998) [15]. They regulate synaptic transmission along neurons through modulation of their volume, composition and concentration of neurotransmitter glutamate and ATP receptor (Peter *et al.* 1998) [16] Astrocytes are neuroprotective, involved in healing and recovering of

neurons in various nervous system pathology (Peter *et al.* 1998) [16].

In this study, findings revealed dose-dependent hyperplasia and hypertrophy of reactive astrocytes in the groups treated with root-bark extract and leaf extract when compared to the control groups which showed normal distribution of astrocytes. Hypertrophy and hyperplasia of reactive astrocytes were found to be more in the root-bark extract treated groups than the leaf extract groups. Thus, the *Rauwolfia vomitoria* extracts may have caused cerebellar injury as showed by the proliferation of astrocytes to contain the injury. This work is in line with findings made by Ekanem *et al* (2009) [17] who reported that mefloquine and Artequin induced dose dependent pattern of alteration and pairing of astrocytes observed in rats treated with increased dosages of mefloquine and Artequin (2.14mg/kg, 4.28mg/kg of MQ and 1.71/2.214mg/kg and 3.24/4.28mg/kg of Artequin) in the hippocampus. Moses *et al* (2009) [18] reported increased hyperplasia and hypertrophy of astrocytes in rats treated with larimal compared to the control.

Barreto *et al* (2011) [19] reported cerebral damage induces the expression of different astrocytic proteins. The astroglial response to injury consists of changes in morphology and gene expression, and an intense proliferative activity surrounding the wound. These progressive changes are widely implicated in some beneficial and detrimental functions of astrocytes after brain injury. Abbas and Nelson

(2004) [20] reported that the presence of reactive astrocytes indicates early sign of cell loss and serve as indicator of pathologic process.

## 5. Conclusion

It may be suggested that *Rauwolfia vomitoria* root-bark and leaf extracts has a neurotoxic and neurodegenerative effects on the cerebellum of Wistar rats.

## 6. References

- World Health Organisation Media Centre: Traditional Medicine. Fact sheet [http://www.who.int/mediacentre/factsheets/fs134/en/], (Accessed June 2011). 2008.
- World Health Organization: National Policy on traditional medicine and regulation of herbal medicines – report of a WHO global survey. [http://apps.who.int/medicinedocs/pdf/s7916e/s7916e.pdf], (Accessed June 2011). 2005.
- Ilori M, Sheteolu AO, Omonigbehin EA, Adeneye AA. Antidiarrhoeal Activities of *Ocimum gratissimum* (Lamiaceae). *Journal of Diarrhoeal disease Research*. 1996; 4:283-285.
- Oyelami OA, Agbakwuru EA, Adeyemi LA, Adedeji GB. The effectiveness of grapefruit (*Citrus paradisi*) seeds in treating urinary tract infections. *Journal of Alternative and Complementary Medicine*. 2005; 11:369-371.
- Okeniyi JA, Olubanjo OO, Ogunlesi TA, Oyelami OA. Comparison of healing of incised abscess wounds with honey and EUSOL dressing. *Journal of Alternative and Complementary Medicine*. 2005; 11:511-513.
- Adegbhingbe OO, Adesanya SA, Idowu TO, Okimi OC, Oyelami OA, Iwalewa EO Clinical effects of *Garcinia kola* in knee osteoarthritis. *Journal of Orthopedic Surgery Research*. 2008; 3:4.
- Veale DJH, Furman KI, Oliver DW. South African traditional herbal medicines used during pregnancy and childbirth. *Journal of Ethnopharmacology*. 1992; 36:185-260.
- Kloucek P, Polesny Z, Svobodova B, Vlkova E, Kokoska L. Antibacterial screening of some Peruvian medicinal plants used in Calleria District. *Journal of Ethnopharmacology*. 2005; 99:309-312.
- Nnorom IC, Osibanjo O, Eleke C. Evaluation of human exposure to Lead and Cadmium from some local Nigerian Medicinal preparations. *Journal of Applied Science*. 2006; 6:2907-2911.
- Bury RW and Fullinfaw RO Problem with herbal medicines. *Medical Journal of Australia*. 1987; 146:324-325
- Abt AB, Oh JY, Huntington RA, Burkhart KK. Chinese herbal medicine induced acute renal failure. *Archives of Internal Medicine*, 1995; 155:211-212.
- Oshikoya KA, Njokanma OF, Chukwura HA, Ojo OI. Adverse drug reactions in Nigerian children. *Paediatric and Perinatal Drug Therapy*, 2007; 8:81-88.
- Langlois-Klassen D, Kipp W, Jhangri GS, Rubaale T. Use of traditional herbal medicine by AIDS patients in Kabarole district, Western Uganda. *American Tropical and Medical Hygiene*, 2007; 77:757-763.
- Hortiga, Del Rio P. *Trab. Lab. Invest. Boil. Univ. Madrid*, 1917; 15, 367.
- George J S, Bernard WA, Wayne RA, Stephen KF, Michael DU. *Basic Neurochemistry Molecular, Cellular and Medical aspects* (6th edition.). Philadelphia: Lippincott Williams and Wilkins. 1998.
- Peter R L, Eva S, Andreas R, Glenn I H, Herbert B. *Glia cells: Their Roles in Behavior* (1<sup>st</sup> edition) Cambridge University Press, 1998; 1-20, 315-332.
- Ekanem TB, Salami E, Ekong MB, Eluwa MA, Akpantah AO. Combination Therapy Antimalarial Drugs Mefloquine and Artequin Induce Reactive Astrocytes Formation in the Hippocampus of Rats. *The Internet Journal of Health*, 2009; 9(2):2.
- Ekong MB, Igiri, AO, Egwu AO. Histomorphologic Alterations of the Cerebellum of Wistar Rats following Amodiaquine Plus Artesunate Administration. *Internet Journal of Medical Update*. 2009; 4(2):15-18
- Barreto GE, Gonzalez J, Toress Y, Morales L. Astrocytic-neuronal crosstalk: Implications for neuroprotection from brain injury. *Neuroscience Research*, 2011; 71 (2):107-113
- Abbas A, Nelson FK. *Robins, Cotran Pathologic Basis of Diseases* (7th ed). New Delhi: Elsevier. 2004.