Original Article

Vitamin E Supplementation with *Rauwolfia Vomitoria* Root Bark Extract Improves Hematological Indices

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Abstract

Background: Vitamin supplementation in *Rauwolfia vomitoria* root bark extract administration may interact and impact significantly on hematology of albino Wistar rats. **Aim**: In this investigation we studied vitamin E supplementation with *Rauwolfia vomitoria* root bark extract on the hematology of experimental animals. **Materials and Methods:** Forty two rats weighing 200 – 230 g were randomly selected into six groups of seven animals each. Group 1 animals serve as controls; group 2 received vitamin E (10 IU/kg body weight). Groups 3 and 4 were given the extract (150 and 300 mg/kg body weight) respectively. Groups 5 and 6 were given vitamin E (10 IU/kg body weight), the extract (150 and 300 mg/kg body weight) respectively. The extract and the vitamin were administered daily by oral intubation. Blood samples analyzed for hematological indices. **Results**: Decrease in white blood cell count (WBC) was observed, indicating improved immunity of animals. Extract at 150 and 300 mg/kg body weight with and without vitamin E affected hemoglobin and packed cell volume. **Conclusion**: *Rauwolfia vomitoria* with or without vitamin E improved animal's immunity and enhances their hematology. Interaction of vitamin E with the extract affects medicinal therapeutics of this plant.

Keywords: *Rauwolfia vomitoria*, Vitamin E, Hematological indices, Antioxidant, Medicinal therapeutics, Immunity

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Introduction

Plants have been considered as sources of medicinal agents for the treatment of various diseases such as malaria, leprotic ulcer, skin infections,[1] high blood pressure.[2] In our earlier work, we reported the effect of *Rauwolfia vomitoria* root bark extract on the activities of cardiac enzymes and how this plant extract affects learning and memory in mice.[2-4] *Rauwolfia vomitoria* root bark extract has also been used extensively by other researchers and is implicated in health problems such as mental depression which may persist for several months, early morning insomnia, and impotence.[4] The mechanism by which *Rauwolfia vomitoria* elicits these health problems is of major research concern.

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The blood is a major vehicle for the transport of most drugs in the human and animal systems, and as such any alteration in the integrity of blood cells may lead to serious health problems. The hematological system is responsible for the well being of intact organisms. The vasculature in which blood present surface areas of over 10,000 m^2 permits this system to interact extensively with other systems in the body.[5] Therefore, changes in the hematological indices may occur as a result of other systemic disease conditions.

Reactive oxygen species and free radicals have been implicated in a number of complex biological processes and diseases such as ageing, inflammation and malaria, atherosclerosis, ischemia.[6,7] The role of vitamin E in preventing or delaying coronary heart disease is well known.[8] Vitamin supplementation is known to impart

significantly on health and is of special benefits in term of disease prevention and treatment. However, Vitamin(s) supplementation during some specific drug therapy may be deleterious to health and hence defeats the very purpose of administration.[9] These effects may be due to nutrient interactions resulting in either alteration in absorption and metabolism of vitamin or increased metabolic clearance of the drug thereby compromising the therapeutic benefit. The aim of this research work was to study the possible interaction of vitamin E with *Rauwolfia vomitoria* root bark extract on some haematological indices of Wistar albino rats.

Materials and methods

Plant materials

Rauwolfia vomitoria roots were obtained from a farm land in Ekpene Obo, Nigeria in the month of November. Samples of the plant were authenticated by the Botanist in the Botanical Garden of University of Calabar. A voucher specimen (No. MIA2004) was submitted to the herbarium of the same University.

The roots were cleaned and made free from sand and other impurities. The fresh air-dried roots were powdered in an electric kitchen blender. One hundred gram of root powder was extracted twice with 80% ethanol according to the method of Ugochukwu *et al*.[10] The filtrate was concentrated using rotary evaporator, and the concentrate was dried in a Plus 11 Gallenkamp oven at 45–50^{o}C. One gram of the extract was re-suspended in 10% DMSO solution daily whenever required for use.

Animal and treatment

Forty-two albino rats of the Wistar strain weighing 200 – 230 g were used in this work. The animals were obtained from the animal house, Biochemistry Department, University of Calabar. They were maintained under standard laboratory conditions with rat chow (Guinea Feed Ltd., Nigeria) and water *ad libitum*. All animal experiments were carried out in line with the guidelines of Institutional Animal Ethical committee as approved by the graduate School, University of Calabar, Nigeria. The animals were randomly selected into six groups of seven animals each. Group 1 animals were the control group; group 2 was administered with vitamin E (10 IU/kg body weight). Groups 3 and 4 were given *Rauwolfia vomitoria* root bark extract (150 and 300 mg mg/kg body weight) respectively. Groups 5 and 6 were given vitamin E (10 IU/kg body weight) and *R. vomitoria* root bark extract (150 and 300 mg/kg body weight) respectively. The extract and the vitamin were administered daily by oral intubation.

Animal sacrifice

All experimental animals were anaesthetized using chloroform fumes 24 h after the last administration of the extract. Blood samples were collected into ethylenediaminetertraacetic acid (EDTA) sample bottles for hematological studies.

Determination of hematological parameters

Determination of hemoglobin concentration was carried out according to the method described by Jain[11] using the cyanomethaemoglobin method. Parked cell volume (PCV) was carried out using the micro hematocrit centrifugation method according to Allexander and Griffiths.[12] Red blood cell (RBC) count, White blood cell (WBC) count and count were estimated by visual means using the new improved Neubauser counting chamber according to Dacie and Lewis.[13]

Results

The effects of vitamin E supplementation during *Rauwolfia vomitoria* (*R. vomitoria*) root bark extract administration in Wistar albino rats were investigated to assess the benefits and possible risk involved. In order to do these hematological indices: hemoglobin, PCV, WBC, RBC platelets were estimated. Table 1 shows that hemoglobin levels (gm/dl) increased significantly (P<0.005) during concomitant administration of vitamin

Table 1: Effect of vitamin E supplementation with *Rauwolfia vomitoria* root bark extract on Hb, PCV, WBC, RBC, and platelet counts in Wistar albino rats

Parameter[a]/Group	Hemoglobin (gm/dl)	PCV (%)	RBC ($N\times10^{6}/mm^{3}$)	WBC ($N\times10^{3}/mm^{3}$)	Platelet ($N\times10^{6}/mm^{3}$)
Control	12.71±1.85	38.57±3.05	4.96±0.69	2.67±0.56	2.64±0.05
Vitamin E (40 IU/kg body wt.)	11.54±1.95	39.29±6.07	5.73±1.08	3.26±0.73	2.79±0.17*
RV (150 mg/kg body wt.)	14.85±1.77*	44.00±1.79*	6.87±0.64**	2.33±0.28	2.88±0.14*
RV (300 mg/kg body wt.)	12.11±0.67	39.86±2.15	5.76±0.49	2.46±0.71	2.75±0.23*
RV (150 mg/kg bd. wt.) + Vit E (1 IU/kg bd. wt.)	14.64±1.28**	48.14±3.64**	5.06±1.15	2.39±0.20	2.89±0.14*
RV (300 mg/kg bd. wt.) + Vit E (10 IU/kg bd. wt.)	14.98±1.57*	46.29±2.14**	6.13±0.51*	2.63±0.74	2.94±0.27***

RV: *Rauwolfia vomitoria* root bark extract; a: mean±SD of seven determinations; *: $P\leq0.05$; **: $P\leq0.01$; ***: $P\leq0.001$. PCV: Parked cell volume; RBC: Red blood cell count; WBC: White blood cell count

E and *R. vomitoria* root bark extract at 150 or 300 mg/kg body weight respectively. However, the group that was treated with only 300 mg/kg body weight of the *Rauwolfia vomitoria* root bark extract had decreased Hemoglobin concentration compared with the control group.

There was a significant (P<0.005) increase in the PCV of the groups treated with *R. vomitoria* root bark extract only and in the groups treated with a combination of vitamin E and *R. vomitoria* root bark extract (150 or 300 mg/kg body weight). The result also indicated that RBC increased significantly (P<0.005) on administration of 150 mg/kg body weight of *R. vomitoria* while an insignificant decrease (P>0.005) was observed in other groups when compared with the control. Similarly, the result of platelet analysis showed a significant increase when compared with the control. The WBC count was observed to have decreased insignificantly (P>0.005) in all the groups. This observed decreased in total WBC may be due to the toxic effect of *R. vomitoria* root bark extract on the immune system.

Discussion

Literature is replete with the use of plant materials and its derivatives for the prevention and treatment of diseases. The beneficial therapeutic effects of these medicinal herbs are expressed in their scientific implications in health conditions of the users. Thus, medicinal herbs such as *Rauwolfia vomitoria* have played a major role in the development of modern medicine and their traditional applications cannot be under estimated as some persons in the African societies do not have access to modern medications. Generally, there is still need to investigate the potential adverse effects associated with the use of medicinal herbs and the possible way of ameliorating this toxic effects.

Rauwolfia vomitoria is a natural medicinal herb which has been used for over 2000 years for treatment of diseases such as hypertension and mental disorders.[14,15] Its adverse effects include: decreased heart rate and blood pressure, which is due to dilatation of blood vessels. It also causes low sex drive, increased appetite, weight loss, swellings, stomach upset, hallucinations, poor co-ordination, dizziness, impairment of physical abilities and psychotic depression.[15] However, the possible mechanism by which this plant extract elicits its toxicity is very necessary in order to balance its therapeutic benefits with the associated adverse effects.

Generation of free radicals by many xenobiotics in biological systems have been implicated in cell membrane damage, depletion of the immune system and many other diseases.[16,7] Vitamin E and other antioxidants protect the cells of the body from the effects of free radicals and the potentially damaging by-products of metabolism. The results of this study showed that *Rauwolfia vomitoria* root bark extract could help to increase some haematological indices like haemoglobin content, packed cell volume, red blood cell count, and total platelet count. Its ability to reduce the total white blood cell count in the experimental animals may be a possible mechanism by which its potent active ingredients elicit certain levels of immunological advantage. Therefore, the need to administer this extract in health conditions where the immune system is compromised due to microbial and other infections. This extract may prevent other opportunistic diseases associated with decreased immunity.

The effects of vitamin E supplementation in this experiment corroborates its function of boosting the immune system as observed in the group treated with 10 IU/kg body weight of vitamin E over the control group. This result is in agreement with the work of Fritsche *et al*.,[17] who reported that there were significant interactions between vitamin E and (n-3) fatty acids that affect the immune system. We also observed that the effect of *R. vomitoria* root bark extract at 300mg/kg body weight did not result in any positive effect on the hematological indices. This showed that *R. vomitoria* activity may be more effective at lower concentrations than a higher one and this may in effect reduce its possible toxicity, thereby favoring its therapeutic activity.

In resource-limited environments, people are desperately looking for cure of diseases due to scarcity or high cost of medicine and have resorted to herbal medicinal therapy without adequate knowledge of the possible latent side effects. To this group of persons the beneficial effects of medicinal plants often over shadowed their deleterious effects, hence, the need for concerted efforts in the screening of plants for possible toxicity with the view of advising properly. The simplest method of assessing toxicity in experimental studies is by enzyme assay and hematological indices since these parameters are often affected by introduction of xenobiotics in biological species. Also the administration of some vitamins that are capable of quenching free radicals may be of special relevance in ameliorating the toxic effects of medicinal plants.

Conclusion

In conclusion, we observed that extract of *Rauwolfia vomitoria* root bark is a useful medication in the treatment of many diseases and the combination of this herbal extract with vitamin E may be of more biochemical and therapeutic significance since the antioxidant vitamin is capable of de-potentiating the adverse effect of this herb.

Rauwolfia vomitoria with or without vitamin E improved the immunity and enhances the hematological indices of the experimental animals. Our findings suggest that interaction of vitamin E with *Rauwolfia vomitoria* root bark extract would be a meaningful approach in medicinal therapeutics of this plant. More work on the interaction of this plant with vitamins is ongoing in our laboratory.

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