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Research Article

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Weight Evaluation and Serum Indices Effect of Potash Administration on the Uterus of Pregnant Wistar Rat

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Abstract

Potash known as potassium carbonate (K_2CO_3) is a mixture of salt with other components including impurities which coexist in mineral and salt is highly consumed in various forms by pregnant women. The aim of this research is to evaluate the weight and serum indices of potash on the uterus of pregnant wistar rat with the specific objectives of determining the effect of potash on the progesterone and estrogen level and weight index of pregnant wistar rat. A total of Twenty-five albino Wistar rat with weights ranging from (180-300g) were used and allocated into five groups of five animals each (4 females and a male) designated as groups 1, 2, 3, 4, and 5. The experimental groups 2, 3, 4, and 5 were administered different doses of potash. The animals were allowed for a period of one week for acclimatization under normal temperature (270C -300C) which they were being feed with normal feed (grower's mash) and water ad libitum for one (1) week. Administration of potash were through the oral route. Group 1 served as the control group and was administered distilled water only. Group 2 received 300mg/kg of potash plus feed and water was given ad libitum for 7 days after detection of pregnancy. Group 3 received 600mg/kg of potash plus feed and water was given ad libitum. Group 4 received 900mg/kg of potash plus feed and water was given ad libitum. Group 5 received 1200mg/kg of potash plus feed and water was given ad libitum. After analysis from histological procedures, the progesterone and estrogen level of pregnant wistar rat were evaluated and observed that treatment with potash induced changes. However, the level of progesterone activities increased in the test groups (2, 3, and 5) when compared to the control group. As for estrogen level, the increased level was observed to be progressive in the test groups, with the highest seen with the 1200mg/kg group as well as the physical activity of the wistar rats. At the end of the study, the results showed that Potash alters progesterone and estrogen level as well as the physical activity of the wistar rats.

Keywords: Potash, Uterus, Hormonal levels, Mucous Plug, Pregnancy, Weight

Introduction

Potash known as potassium carbonate (K_2CO_3) is a mixture of salt with other components including impurities which coexist in mineral and salt such as thermonitrite, halite, thernadite, mirabilite and gypsum [1]. It consists of some metals like Ca, Mg, Fe, K, Na and Al. [2-4].

In the developed West, it is a highly industrial useful product. However, for developing nations, its popularity is evident from the various domestic benefits observed among indigenous Nigerian populations and Africans at large. Notable among these usages include, aiding the preservation of green color of vegetables with a concentration of 0.1-0.5% potash in cooking, also as snuff when mixed with tobacco in powdery form. In the Northern part of Nigeria, it is usually utilized in large doses by the Hausa ethnic region in the form of guinea corn and millet porridges called 'kunun Potash' which is administered to women immediately after delivery for the purpose of increasing the quality and quantity of breast milk [5]. It is also used as a tenderizer, flavoring agent, and prophylactic as well as improving protein digestibility of cowpea [6]. Reports of its use as softener for food and vegetables such as cowpea, okro and certain leaf such as ewedu have been established by [7]. Apart from being taken in food, it is also used as a component by some Nigeria medicinal concoctions and sometimes it is chewed raw [8] with high potency in cough, tooth and stomach aches and constipation [8,9]. Reported the medicinal use of potash for all sorts of ailments as well. It is assumed that women consume this substance, with the belief of reducing risk for gestational complications, such as hypokalemia, and preterm delivery or long-term morbidities, such as excessive bone loss as well as minimizing the spitting habit of pregnant women.

While it may seem to be an almost indispensable additive to food, experts have warned that it should be taken with caution as consumption of high amount could be detrimental to human health [5]. In fact, based on its composition of being a mixture of salts and various other impurities, doubt on the toxicity level and ingestion safety by humans is of concern. Of attention are findings from several studies, showing that potash can be used to increase

uterine contractility and this has been suspected to have the ability to induce abortions in the early stages of pregnancy if used in high enough concentration [10]. In fact, reported peripartum cardiac failure in fetus, forty days after birth [5]. Although the biochemical and physiological effects of potash have been investigated but data paucity still exists, concerning its dietary effects in humans [11]. Pregnancy is usually accompanied with changes in hormonal level of the female. According to progesterone level tends to increase in every stages of pregnancy in the first trimester (11.78±2.83ng), second trimester (25.62±3.74ng) and third trimester (36.36± 1.17ng), similar to the observed statistically significant increases in the level of estrogen in pregnant female wistar rats [12]. The rationale behind this work is attributed to an increase in the rate of potash consumption especially in maternity amongst pregnant women, hence the need to find out the effect of potash on the hormonal make-up of the uterus and weight of subject upon potash administration due to its importance to complications associated with it in pregnancy.

The aim of this research is to evaluate the weight index and serum levels of potash on the uterus of pregnant wistar rat with the specific objectives of determining the effect of potash on the weight index and progesterone level of pregnant wistar rat and to determine the effect of potash on the estrogen level of pregnant wistar rat. This study is significantly important to establish the safety level of potash as well as dosage that could be detrimental to the uterus upon consumption towards safe pre and post natal life of mother and embryo.

Materials and Methods

A total of Twenty-five albino Wistar rat with weights ranging from (180-300g) were obtained from the animal house of Abia State University, Uturu, Nigeria, Metal cages were used to house the animals. The animals were allowed for a period of one week for acclimatization under normal temperature (270C -300C) which they were being feed with normal feed (grower's mash) and water ad libitum for one (1) week. Four (4) females and one (1) male were assigned to each group and also the females were examined every morning for presence of mucus plug once mating was confirmed by the presence of copulation plug, administration of potash commenced the following day. Administration of potash was through the oral route.

Ethical Consideration

All experiment procedures were conducted in accordance with National Institute of Health Guide for the care and use of Laboratory Animals as stated in the "guide to the care and use of Laboratory Animals Resources".

Materials

All chemical used in this research were of analytical grade. Chemicals and materials used for this experiment include: A dissection set, Plain bottles, Diethyl ether, 10% Formal saline, measuring cylinder, Centrifuge, Tissue bottles, Ice packs, Iron cages with iron netting, Distilled water, Cotton wool, Desiccator, Disinfectant, Stainless plate, 25 Adult wistar rats (4 females, one male), Electronic balance, Potash.

Study Duration

The preliminary studies, animal acclimatization, ingredients procurement (potash preparation, actual animal experiment and evaluation of results lasted for a period of one month. However, the actual administration of potash to the test animals lasted for 1 week.

Preparation of Sample

Potash was purchased at Eke-Okigwe market, Abia State, Nigeria, grounded and poured in a clean dry container. From the container, it was measured using a sensitive electronic balance. The substance preparation process was done with care to avoid contamination.

Experimental Protocols

Twenty-five animals were weighed and allocated into five groups of five animals each (4 females and a male). The groups were designated as groups 1, 2, 3, 4, and 5. Group 1 served as the control group and was administered distilled water only. The experimental groups 2, 3, 4, & 5 were administered different doses of potash as follows:

Mode of Potash Administration
Were administered orally

Group 1: This group served as the control group which was used to check all parameters and to attain the normal range of values for histological and serum indices to serve as comparative medium for other groups

Group 2: This group received 300mg/kg of potash plus feed and water was given ad libitum for 7 days after detection of pregnancy.

Group 3: This group received 600mg/kg of potash plus feed and water was given ad libitum for 7 days after detection of pregnancy.

Group 4: This group received 900mg/kg of potash plus feed and water was given ad libitum for 7 days after detection of pregnancy.

Group 5: This group received 1200mg/kg of potash plus feed and water was given ad libitum for 7 days after detection of pregnancy The extract was administered via oral route once in every 24 hours for a period of seven days.

Animal sacrifice/organ extraction

Twenty-four hours after the last administration which lasted for seven days, the rats were anesthetized using diethyl ether. This was carried out by placing them in a desiccators containing cotton wool soaked in diethyl ether. When the wistar rat seized breathing, they were removed and quickly dissected. The tissue of interest (uterus) was then removed, and put into container containing 10% formal saline. The blood samples (5m/s) of each rat were obtained through cardiac puncture. Blood for serum preparation was put into sterile plain tubes labeled appropriately (1, 2, 3, 4, and 5) without an anti-coagulant. Serum samples were separated from the clot by centrifugation at 3,000rpm for 10minutes within 2 hours of collection. All analysis on blood serum samples were completed within 24hours of sample collection. Laboratory estimation of the serum indices on estrogen and progesterone level were then carried out on the samples.

Results
Physical Observation

During the period of administration, physical activities of the rats were observed. Rats in the control group were observed to exhibit normal physical activities, such as movement, increase in appetite, which occurs because the pregnant female's body requires extra nutrients to maintain her health and strength and to nourish her growing fetuses. There was no observable change in the fur color of both the test and control animals. On the other hand, there were no

recorded changes in skin surfaces on the feet, hand, tail, mouth, ears and eyes. However, test animals in group 4 and 5 presented signs of aggressiveness as part of their behavior. There was no death recorded in both control and test groups. It was observed that test groups 4 and 5 rejected water intake within the period of study. It was also observed that the control group and the test group B gave birth within the second week of the study. The feed intake was observed to be higher in the control group particularly when compared with the test groups.

Table 1.1: Physical Observations of Rats Fed with Potash

Observations	Control	2 (300mg Pot)	3 (600mg Pot)	4 (900mg Pot)	5 (1200mg Pot)
Fur color	-	-	-	-	-
Behavioral changes	-	-	-	+ (aggressive)	+ (aggressive)
Skin changes	-	-	-	-	-
Death	-	-	-	-	-
Water rejection	-	-	-	+	+
Pregnancy	2	4	1	3	2
Physical agility	Active	Active	Active	Weak	Weak

Key: + = present; - = negative; Pot= Potash; Gp= group. Values are mean standard error of mean.

Body Weight

Table 1.2 presented the body weight changes in pregnant wistar rats fed with Potash for 7 days. In this study it was observed that the mean weight of both test groups and control increased before the administration of the substance, this observation was not statistically significant ($P>0.05$). The weights of the rats, in all groups were observed to vary when initial and final weights were compared. Remarkable increases in weight were observed only with the control and group 2 those treated with (300mg/kg) dose. Similarly, there was significant reduction ($P<0.05$) in the body weight following the administration of potash.

Table 1.2: Body weight of the Experimental Groups

Groups	Treatment	Dosage of Potash (ml)	Weight before administration (g)	Weight After Final administration (g)	No Pregnant
1	Control	0.00	127.00±32.77	150.06±38.72	2
2	300mg/kg	0.38	141.80±39.43	151.60±42.04	All
3	600mg/kg	0.92	152.00±42.47	148.00±39.85	1
4	900mg/kg	1.38	154.30±39.90	153.00±39.34	3
5	1200mg/kg	1.78	155.80±40.77	117.00±45.19	2

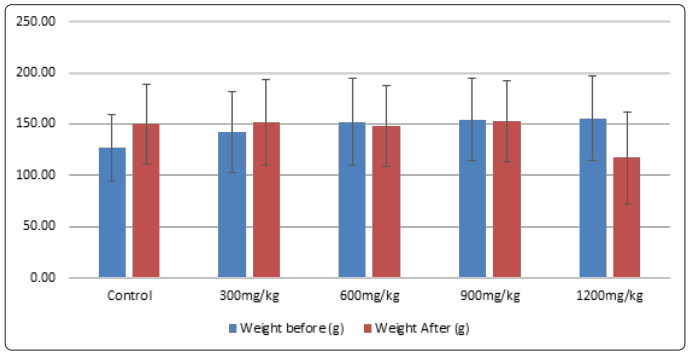

Figure 1.1: Body weight of the Experimental Groups

Serum indices examination of the uterus

Fig. 1.2 presented the progesterone level changes in pregnant wistar rats fed with Potash for 7 days. The results obtained in this study shows that there was significant increase ($P<0.05$) in the levels of progesterone in the treated animals when compare to the values in the control. These statistical significant differences in the mean values of these parameters were dosage dependent.

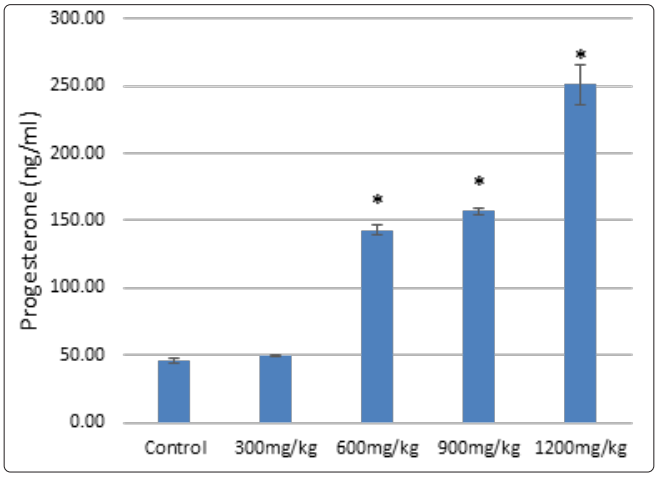

Figure 1.2: Showing Progesterone level of experimental animals.

Fig. 1.3 presented the estrogen level changes in pregnant wistar rats fed with Potash for 7 days. The results obtained in this study shows that there was a decrease ($P>0.05$) in the levels of estrogen in the treated animals when compared to the values in the control. These differences in the values of these parameters were dosage dependent. Also there was significant increase in estrogen level

after the administration of potash. This increase was observable in Group 2 and 3 that received 300mg/kg and 600mg/kg of potash respectively thou the result is not statically significant.

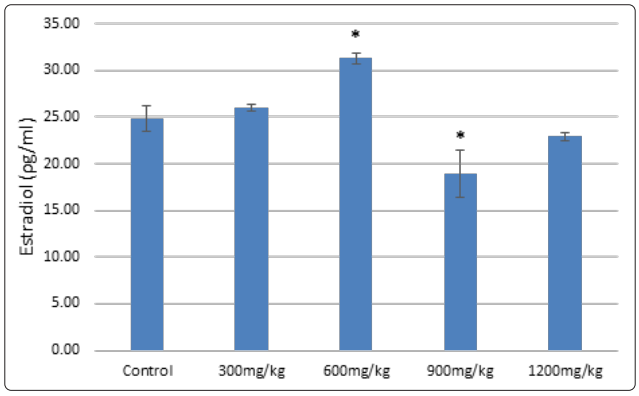

Figure 1.3: Showing Estrogen level of Experimental animals.

Discussion

This study investigated the serum indices effect of potash on the uterus of pregnant wistar rat. The results obtained showed that the administration of potash induced a significant decrease in the weight of wistar rats fed orally for 7 days when compared with the control groups. This reduction is dosage dependent. This finding is in agreement with the study carried out by in which they reported that the reduction in body weight could be as a result of the chemical nature of potash and probably as a result of decreased feed intake resulting from the undesirable taste of potash [13]. This finding is also supported by the work done by who reported a significant reduction in body weight of Rabbits that received potassium bromated [14]. Furthermore, the result on weight reveals that the intake of potash caused some characteristic physical changes in adult wistar rat as evident in the reduction of physical activity and feebleness. This is in agreement with the study of who reported the alterations in wistar rats fed with potassium bromate. In this study, the progesterone and estrogen level of pregnant wistar rat were evaluated [15]. It was observed that treatment with potash induced changes in progesterone and estrogen level. However, the level of progesterone activities increased in the test groups (2, 3, and 5) when compared to the control group. As for estrogen level, the increased level was observed to be progressive in the test groups, with the highest seen with the 1200mg/kg group.

Conclusion

This study has revealed that Potash alters progesterone and estrogen level as well as the physical activity of the wistar rats. Though the intake of Potash in small quantities may not be toxic to the uterus we suggest that the consumption of Potash be reduced to the barest minimum especially during the fetal period of pregnancy. The structural changes in the uterus observed in this experiment can be associated with functional changes that may be detrimental to the health status of the animals. Although the actual mechanism by which potash induced cellular degeneration observed in this experiment is unknown and needs further investigation.

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