ESTROGEN LEVELS IN THE THREE TRIMESTERS OF PREGNANCY IN ALBINO RAT.

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ABSTRACT
An experimental investigation using DRG Estradiol ELISA Kit to determine the levels of estrogen in the serum of the first, second and third trimesters of pregnant and non-pregnant albino rats were undertaken.

Twenty rats were divided into four groups of five rats each. Group one was the control group (non-pregnant rats) ; group two to four were pregnant rats in the first, second and third trimesters which were days 7, 14 and 21 respectively.

Results from this study showed that the mean estrogen levels in albino rats were significantly increased ($p< 0.001$) in first (14.681.36pg), second (16.26) and third (23.601.82pg) trimesters of pregnancy when compared to non pregnant control albino rats (9.740.50pg). This study confirmed that estrogen level increased in all stages of pregnancy with the highest level recorded in the third trimester.

Analysis of variance indicated that there was significant difference ($p<0.001$) in estrogen levels across all the trimesters of pregnancy

INTRODUCTION
Pregnancy is the state of carrying a growing embryo or fetus inside the uterus of a woman or female animal carrying unborn offspring inside her womb from fertilization to birth. It starts when a male's sperm fertilizes ovum and implants into the lining at the uterus[1] Pregnancy changes a woman's normal hormone patterns.

In many societies, medical or legal definition, human pregnancy is somewhat arbitrarily divided into three trimester periods[2], as a means to simplify reference to the different stages of prenatal development. During pregnancy, the placenta produces large quantities of estrogens, up to 100 times the amount secreted by the ovaries during the normal monthly cycle. Estrogen and progesterone stimulate the endometrium to support fertilized egg if pregnancy occurs.

In the normal non-pregnant female, estrogens are secreted in significant quantities mainly by the ovaries, although minute amount are also secreted by the adrenal cortices. β-estradiol is considered to be the major estrogen, although the estrogenic effects of estrone are far from negligible[3] (Guyton and Hall, 2000).

They promote the development of female secondary sexual characteristics, such as breast, and are also involved in regulating the menstrual cycle and prepare the uterus for pregnancy by enriching and thickening the endometrium[4].

Estrogen also helps to protect the heart and bones, as well as maintaining the breasts, womb, vagina and bladder in their healthy state as well as less facial hair and smoother skin than men[5]. Estrogen also plays a very important role in the development of the foetus by maintaining the endometrium during implantation. Yunlong et al.[6] reported that estrogen increases nitric oxide-dependent relaxation during pregnancy and that the estrogen receptor antagonist tamoxifen prevents a pregnancy associated increase in nitric oxide synthase (NOS) activity in a variety of tissues.. Diethylstilbestrol (DES), an oestrogen, was for decades widely believed to prevent miscarriage and

other undesirable outcomes[7]. During the second trimester, the development of the foetus can be more easily monitored and diagnosed. The beginning of the third trimester often approximates the foetus to survive, with or without medical help, outside of the uterus[1].

The aim of this study is to determination of estrogen levels in first, second and third trimesters of pregnant albino rats.

MATERIALS AND METHODS

TEST SUBJECTS

20 female albino rats and 6 male albino rats, with initial weight of 165-180g were purchase from the animal house of Department of Animal and Environmental Biology , University of Benin, Benin city, Edo state, Nigeria. They were housed in wooden cages in groups of five (5) each with the 6 males in a separate cage in the animal house of the Department of Animal and Environmental Biology (AEB), Faculty of life science, University of Benin, Benin City. They were acclimatized for seven days. A 12-hours light/dark cycle was maintained. They were fed with growers mash (produced from Ewu flour mill, in Edo state) and water until a weight between 210-290g was achieved.

All procedures met international guidelines for the care and use of laboratory animals as stated by the Ethical committee, faculty of life science, university of Benin, Edo State, Nigeria.

The females rats in estrous in three of the cages were crossed by introducing two (2) males to a separate cages containing five (5) females each overnight. At the dawn of the following day, the females were checked for pregnancy by checking if the vagina were closed and smears covering them.
The female rats were divided into two groups; non pregnant (n=5) serving as control and pregnant (n=15). The pregnant group was subdivided into three groups; first trimester (n=5), second trimester (n=5) and third trimester (n=5).

At day 5, 12 and 19 corresponding to first, second and third trimesters respectively, the animals were anaesthetized and blood samples collected from the abdominal aorta using a 5ml syringe each and the blood immediately transferred into a non EDTA bottle for recovery of serum. The same procedure was undertaken for the control (non pregnant) group.

STATISTICAL ANALYSIS OF RESULTS

Statistical analysis was performed using the computer program GRAPHPAD INSTAT. All data were expressed as Mean + SEM. Statistical significance was accepted at a level of $p < 0.05$ and data were analyzed by a single factor design ANOVA.

RESULTS

The results are presented below in figures I to IV showing significant increases in estrogen levels in first, second and third trimesters of pregnancies

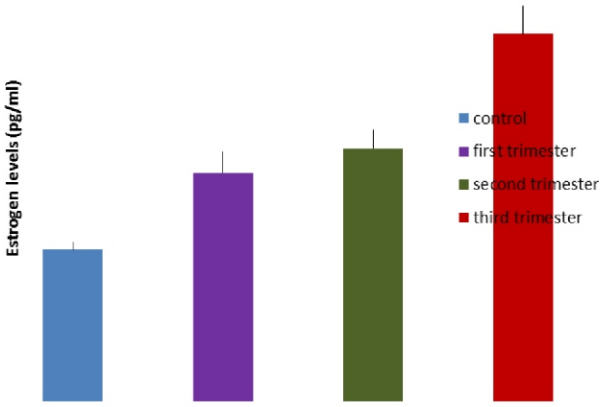

Figure I: A bar chart showing Estrogen levels (pg/mL) in first, second and third trimesters of pregnancy in albino rats.

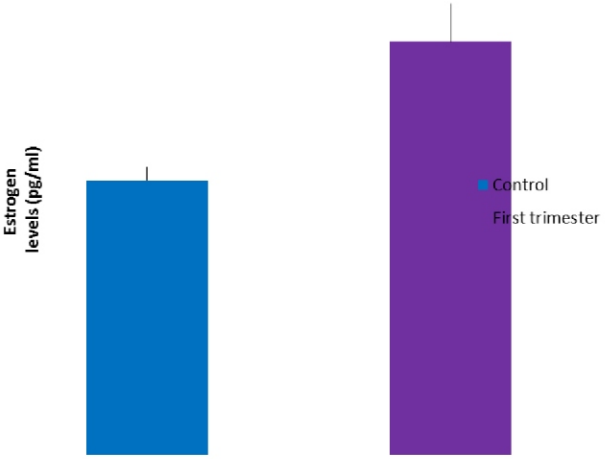

Figure II: A bar chart showing Estrogen levels (pg/ml) in the first trimester of pregnancy in Albino R

Figure II, shows that the estrogen mean value of the first trimester of pregnant groups was higher than ($p<0.001$) that of the control groups.

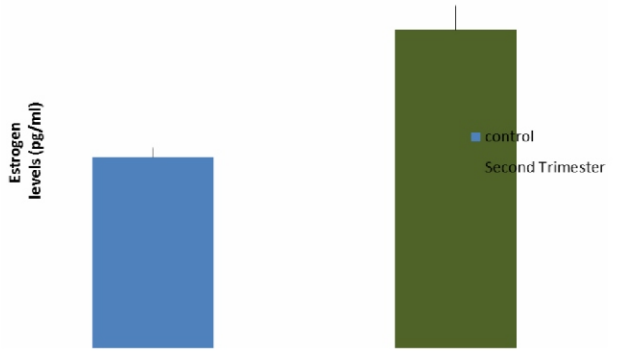

Figure III: A bar chart showing Estrogen levels (pg/mL) in the second trimester of pregnancy in albino rats.

Figure III shows that estrogen mean value of the second trimester of pregnancy in albino rats was significantly higher ($p<0.001$) when compared to control groups.

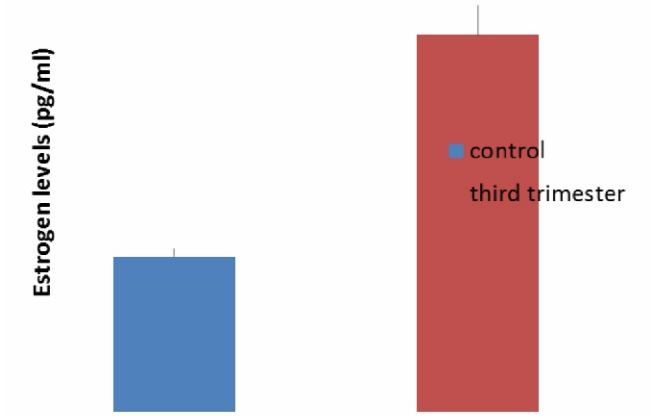

Figure IV: A bar showing estrogen levels (pg/ml) in the third trimester of pregnancy in Albino rats.

DISCUSSION

The present data showed the quantitative difference between the estrogen levels in pregnant and non-pregnant albino rats.

Rresults from this study showed that there was an increase in estrogen levels during pregnancy. The growth-promoting and vascularizing effect of estrogen on the uterus is in harmony with the fact that increasing amounts of it are present in the body fluids as pregnancy progresses**.**

Analysis of variance of the control, first, second and third trimesters showed that there was a significant increase in the amount of estrogen levels in the three trimesters of pregnancy . The mean value of estrogen levels recorded in the non-pregnant was significantly lower ($p<0.001$) when compared with the pregnant groups. The concentration of estrogen increased steadily with the duration of pregnancy. The increases observed were significantly higher when compared with the non pregnant rats. This is in line with the work done by Nelson and Bulun[5].

During the first trimester, estrogen production was mostly made by the placenta, and this continues until near the end of the pregnancy when the amount circulating in the body is a thousand times the amount when not pregnant[5]. This rapid increase in estrogen level during pregnancy could be as a result of a massive production of estrone and estriol by the placenta[5]. The increase in estrogen during pregnancy gets to its peak just before parturition. Absence of estrogen just before parturition has been known to affect parturition negatively as reported by Csapo, et al.[8] who showed that rats ovariectomized two days before term maintained life litters but failed to deliver them; but estrogen replacement therapy on the expected day of parturition resulted in normal delivery. Waynforth, et al.[9] concluded that the greatly increased ovarian estradiol-17β secretion in the last 1 to 2 days of gestation, when progesterone secretion has fallen to low values, provides physiologically the high estrogen levels, required for normal delivery. Estrogen is a hormone involved in the ripening of the neck of the womb (cervix) and preparing it for the birth of the baby. It is possible that oestrogen increases the release of other local hormones (prostaglandins) which help ripen the cervix[10].

CONCLUSION

This study has shown that estrogen levels increases during pregnancy in albino rats compared to when not pregnant. This could be as a result of massive production of estrogen by the placenta during pregnancy. The increases in the level of estrogen in pregnancy may explain most of the behavioural changes and increased water intake associated with pregnancy.

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