



HISTOMORPHOLOGICAL EFFECT OF NANDROLONE DECANOATE ON THE HEPATORENAL TISSUES OF ADULT WISTAR RAT EXPOSED PHYSICAL ACTIVITY

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ABSTRACT

Nandrolone Decanoate is a type of Anabolic Androgenic Steroid is used by athletes and non-athletes to increase their performance, body weight and also to cure ailment. This study is aimed at investigating the intraperitoneal effect of Nandrolone Decanoate on the liver and kidney with an administration which lasted for 28-days on ten (10) adult wistar rats male and female respectively. The models where divided into three groups. Group A (Control) received distilled water and rat feed Group B (Sedentary) received Nandrolone decanoate and where not subjected to physical exercise while Group C (Exercise) nandrolone Decanoate was administered to them and where subjected to physical exercise of swimming in water till they experience drowning. The rats where sacrificed at the end of the 28 day. The liver and kidney were removed and processed for histopathological analysis. The results from the study showed hepatic tissue with periportal infiltration of the polymorphonuclear cells for sedentary models and congestion of vascular channels, fat deposit and binucleated hepatocyte for the exercise model, While the renal tissue of the sedentary models revealed glomerulosclerosis, glomerular edema with tubular degeneration and the renal tissue from the exercised models revealed the renal tissue that are essentially normal. The study showed that Nandrolone Decanoate induced hepato-renal toxicity, consumers should be cautioned.

KEYWORDS: Nandrolone Decanoate, binucleated hepatocyte, periportal infiltration.

INTRODUCTION

Nandrolone (19-nortestosterone) is an Anabolic Androgenic Steroids (AAS) commonly sold as its decanoate ester Deca-Durabolin and less commonly as a phenylpropionate ester.

Anabolic Androgenic Steroids (AAS) is the familiar name for synthetic substances related to the male sex hormones (E.g testosterone) which promote the growth of skeletal muscle (Anabolic effects) and the development of male sexual characteristics (Androgenic effects) in both males and females (Bahrke, 1996).

The Androgenic property of Nandrolone Decanoate stimulates or controls the development and maintenance of male characteristics by binding to androgen receptor (Sriram, 2007). This includes the activity of the accessory male sex organs and development of male secondary sex characteristics. Androgens are also the original Anabolic steroids, the precursor of all estrogens and the primary and most well-known Androgen is testosterone. In past decades, the therapeutic use of Anabolic Androgenic Steroids (AAS) such as Nandrolone Decanoate (ND) has been over shadowed by the abuse of these drugs by athletes and non-athletes. Nandrolone Decanoate was described as a drug that is

abused based on its effects in gaining muscular mass, strength and performance in physical activities (Iriat, 2000).

However, Nandrolone Decanoate was seen to be detrimental to the reproductive health and physical appearance of humans (Strauss, 1985, Korkia, 1997). In females, Nandrolone Decanoate is associated with certain androgenic effects such as facial hair growth, deepening of voice, clitoral enlargement, menstrual irregularities (Strauss, 1985, Korkia and Stimson, 1997). Moreover, some disturbances in gonadal function such as delayed puberty, luteal phase deficiency, oligo-amenorrhea or annovulation may occur in girls and women participating in strenuous physical exercise (Cannavo, 2001). This study seeks to access the effects of this steroid on the liver and kidney histopathology as these organs are involved in the metabolism and excretion of the drugs respectively

MATERIALS AND METHODS

Experimental Animals

Adult wistar rats (*Rattus norvegicus albinus*) were purchased from the animal holdings of Delta State University, Abraka. This experiment was carried out on ten (10) adult albino wistar rats whose weights weighs

between 150-200g obtained from the animal house breeding unit of the college of Basic Medical Medical Sciences, Delta State University, Abraka, Delta State. They were kept in rat cages that were well ventilated and exposed to 12hours light and 12hours darkness and where fed with clean water and commercial rat feed. Good hygiene was maintained by constant cleaning and removal of feces and spilled water/feed from the cages daily. Ethical approval was gotten from the Ethics and Research Committee of the Department of Human Anatomy and Cell Biology, Delta State University, Abraka.

Experimental Design

Ten (10) adult wistar rats of five (5) males and females each, with an average weight of about 150g-200g. They were randomly grouped into three (3) groups (A, B & C) of four (4) rats (comprising 2 males and 2 females) per group as follows.

Group A (Control group); they were fed with rat chow and clean water without administration.

Group B (Sedentary Group); they were fed with rat chow and clean water. Nandrolone Decanoate was administered to them in accordance to their weight without subjecting them to any physical effort. Hence they are called sedentary animals.

Group C (Exercise Group); they were fed with rat chow and clean water. Nandrolone Decanoate was administered to them in accordance to their weight and they were subjected to physical effort which entails placing the animals in a large body of water to swim till drowning occur.

These experimental rats were handled in strict compliance to the recommendation in the guideline to the care and use of laboratory animals.

Procurement and Administration of Nandrolone Decanoate

Nandrolone Decanoate was purchased from an organon industry as an injectable solution, containing 50mg of androgen. The treated rats received doses of ND (5mg/kg BW of DecaDurabolin), available as oily solution (Pope 1988; Marqueti 2010). The doses were given once a week via intraperitoneal injection (Karbalay-Doust 2009) which lasted for a period of four weeks. In this study, the dosage and administration schedule deals with the same condition AAS users found at fitness centers. Thus, ND injection was administered on the same day (Monday) at the same time (10:30AM) to keep the estrous condition.

As forced-exercise can cause forefoot and toe injuries because of the impact and stress arising from the exercise models, aerobic swimming was chosen as the method of physical effort. The rats were conditioned to the exercise during the beginning of the experimental period. They were placed in water till signs that the rats are drowning occur which include sinking and floating in the water without trying to swim out.

Dosage Calculation of Nandrolone Decanoate

Each rats (except the control group) received 5mg/kg BW of DecaDurabolin. The table below shows the calculation of ND that was administered.

Group	Weight	Dose calculation	Dose of ND administered
Sedentary male animal 1	172	$5/1000 \times 172/1 = 860/1000 = 0.86\text{mg}$ $0.86/50 = 0.017\text{ml}$	0.17ml
Sedentary male animal 2	200	$5/1000 \times 200/1 = 1000/1000 = 1$ $1/50 = 0.02$	0.2ml
Exercised male animal 1	150	$5/1000 \times 150/1 = 0.75$ $0.75/50 = 0.15$	0.15ml
Exercised male animal 2	155	$5/1000 \times 155/1 = 0.775$ $0.775/50 = 0.015$	0.15 ml
Sedentary female model 1	146	$5/1000 \times 146/1 = 0.73$ $0.73/50 = 0.0146$	0.14
Sedentary female model 2	149	$5/1000 \times 149/1 = 0.745$ $0.745/50 = 0.0149$	0.14
Exercise female model 1	146	$5/1000 \times 146/1 = 0.73$ $0.73/50 = 0.0146$	0.14
Exercised female model 2	150	$5/1000 \times 150/1 = 0.75$ $0.75/50 = 0.15$	0.15ml

Tissue Preparation and Processing

The tissues were harvested and processed histological diagnosis using the method described by Carlton (1967). The various slides of the liver and kidney tissues were studied under low and high magnification of a binocular light microscope. The slides were compared to the control group for identification of histopathological changes which might have taken place as a result of the administration of Nandrolone Decanoate.

RESULTS

The weight of the experimental animals decreases after the first administration which could not be traced to any factor such as loss of appetite as the models ate well and fed was constant in the cage. However, this was in consonance with Wanke *et al.*, (2003) whose studies showed that as many as 29% of people with HIV in the era of HAART are still losing weight despite the undetectable viral loads of ND.

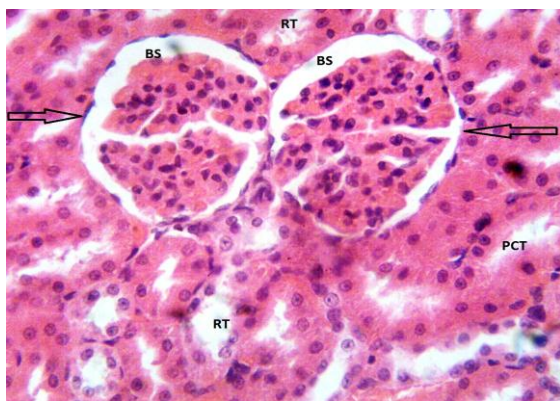
Table 4.1 showing changes in body weight of male wistar rats treated with Nandrolone Decanoate.

Days	Group 1 (Control)	Group 2 (Sedentary animals)	Group 3 (Exercise animals)
Day 1	172.00 mg	173.50	152.50
Day 7	168.00 mg	164.00	165.00
Day 14	175.00 mg	170.00	172.50
Day 21	170.00 mg	202.50	187.50

Table 4.2 showing changes in body weight of female wistar rats treated with Nandrolone Decanoate.

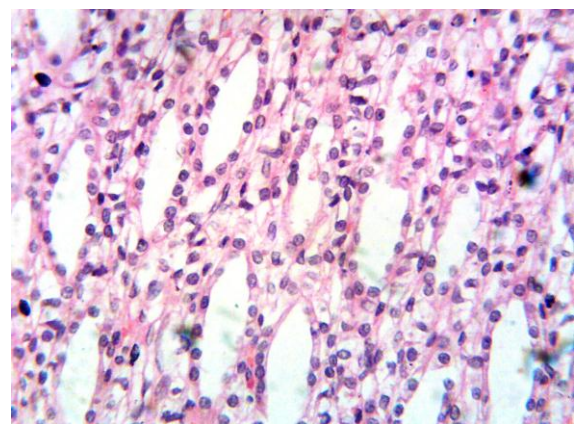
Days	Group 1 (Control)	Group 2 (Sedentary animals)	Group 3 (Exercise animals)
Day 1	100.00 mg	147.50	149.50
Day 7	108.00 mg	140.00	141.00
Day 14	120.00 mg	150.00	150.00
Day 21	140.00 mg	172.50	175.00

The values of the weight for the animal models were calculated in standard average mean



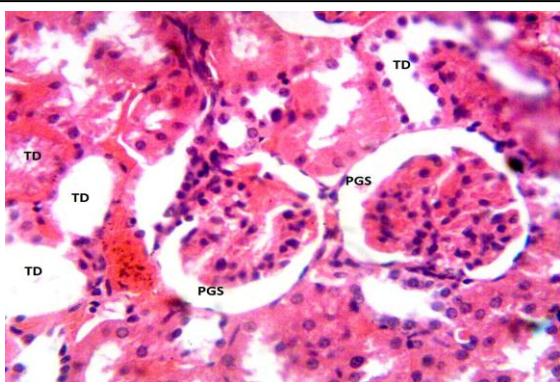
CONTROL KIDNEY MALE X 400 H&E

Micrograph shows renal section with the renal corpuscle (arrow) with a well defined and bowmans space (BS). The renal tubules (RT) are lined by regular epithelium, the Interstitium is free of collections and inflammatory cells.



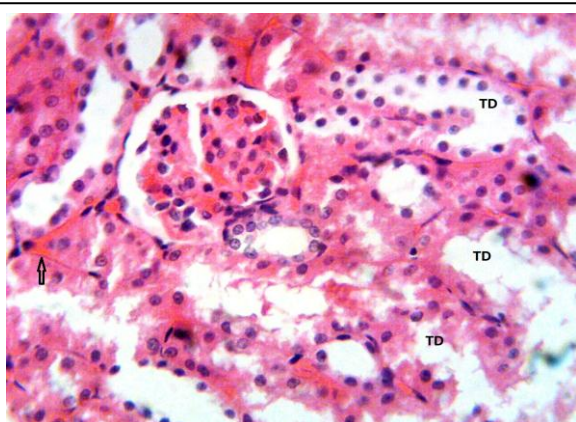
CONTROL FEMALE X 400 H&E

Micrograph shows renal tubules of varying size and dimensions, they are lined by conventional epithelium. Section appears essentially normal and unremarkable.



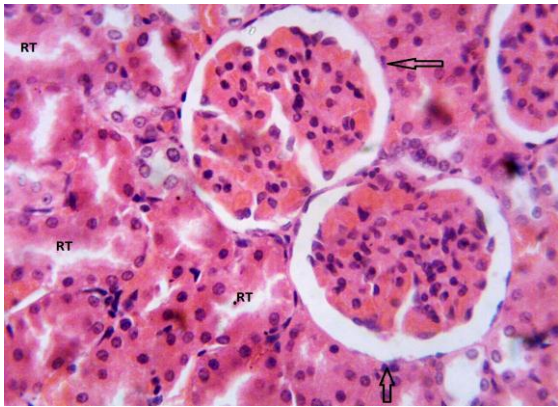
KIDNEY STERIOD SEDENTARY MALE X400 H&E

Micrograph shows renal tissue with partial glomerulosclerosis (PGS) and mild tubular degeneration (TD) there are foci of congestion and mild infiltrate of polymorphonuclear cells.



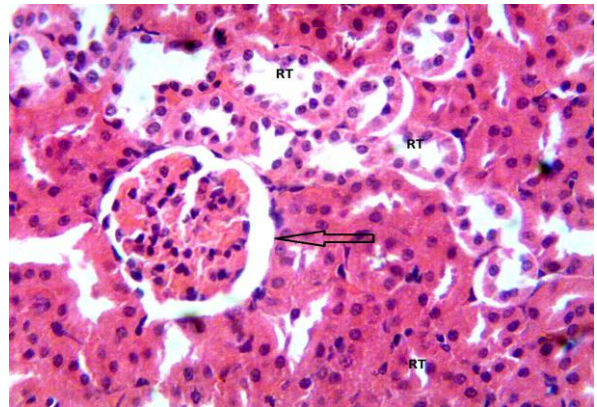
KIDNEY SEDENTARY FEMALE X400 H&E

Section shows interstitial and glomerular edema (arrow) and tubular degeneration (TD)



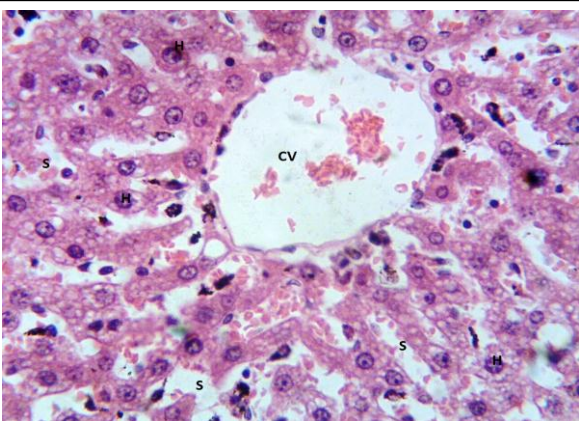
KIDNEY EXERCISED MALE X 400 H&E

Micrograph unremarkable renal section the renal corpuscles (arrow) and renal tubule appear essentially normal.



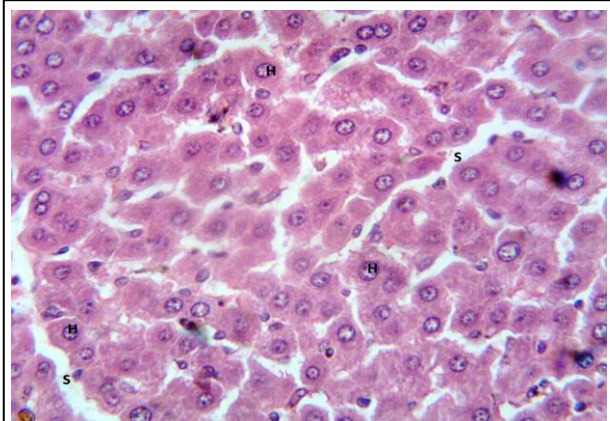
KIDNEY EXERCISED FEMALE X 400 H&E

Micrograph unremarkable renal section the renal corpuscles (arrow) and renal tubule appear essentially normal.



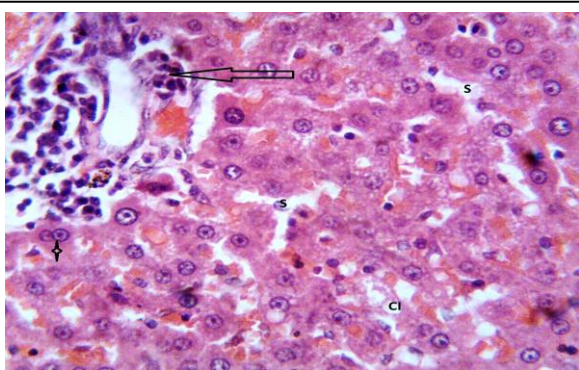
CONTROL MALE X 400 H&E

Micrograph shows a hepatic tissue with central vein (CV) located at the center of the lobule; hepatocytes (H) disposed in sheet, and separated by the sinusoids (S). The Interstitium is free of collections and inflammatory cells



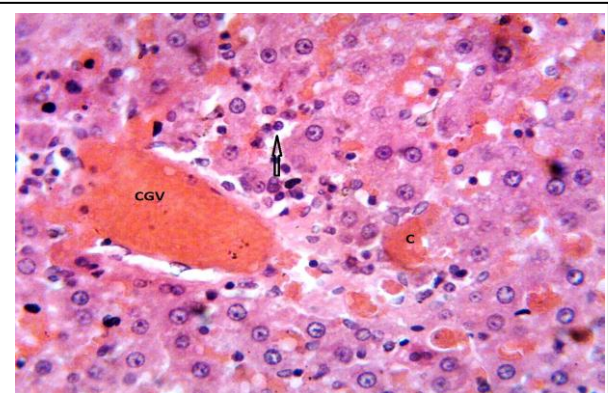
CONTROL FEMALE X 400 H&E

Micrograph shows hepatocytes (H) disposed in sheet and separated by sinusoids (S) the vascular channels are free from inflammatory cells and congestion.



LIVER SEDENTARY MALE X 400 H&E

Micrograph shows hepatic tissue with periportal infiltration of polymorphonuclear cells (arrow), congested interstitial spaces (CI) and binucleated hepatocytes.



LIVER SEDENTARY FEMALE X 400 H&E

Micrograph shows hepatic tissue with periportal infiltration of polymorphonuclear cells (arrow), marked congestion of the vessels (CGV) and vascular channels.

DISCUSSION

Nandrolone (19-nortestosterone) commonly sold as its decanoate ester Deca-Durabolin is a class of Anabolic Androgenic Steroid taken to enhance the performance of athletes and non-athletes, however, the administration of this steroid was and is still been traced to so many side effects. The physical activity of the models increased most especially in the female as the models became more aggressive with an increase in their physical activity. This was in consonance with the research of McGinnis *et al.*, (2002) where they measured aggressive attitude after treating with testosterone propionate, Nandrolone Decanoate and stanozolol which are all class of Anabolic Androgenic Steroid. A research carried out by Karbalay-Doust *et al.*, (2009) revealed the short and long term side effect of ND on the liver. According to their research, the stereological study of the liver revealed an increase in weight and volume of hepatocyte. From this current research, the sedentary hepatic tissues were with periportal infiltration of polymorphonuclear cells, congested interstitial spaces binucleated hepatocytes and congestion of the vessels and vascular channels this are classical inflammatory response. The exercise models photomicrograph revealed hepatic tissue with congestion of the vascular channels, fat deposit and binucleated hepatocyte. Fat deposition in the liver is something I find new and could have resulted from weight gained by the liver. Significant changes occur in the kidneys which are glomerulosclerosis, glomerular edema, tubular degeneration and foci of congestion in the sedentary kidney. This was in correspondence to the findings of Takahasi *et al.*, (2004) they stated the pathological changes in the rat kidney after administration of high doses of Nandrolone Decanoate.

They found that the tubular epithelial cells were swollen. The exercise renal section where unremarkable and renal tubule appear essentially normal. This could be as a result of combination of Nandrolone Decanoate with exercise. Exercise undergone by the models especially aerobics have been proven to prevent kidney damage (exercise and kidney disease 2015).

CONCLUSION

The study empirically place emphasis again on the effect of ND through intraperitoneal administration which was time and dose dependent. The effect on the liver and kidney could be seen to pose a threat to life while exercise could reduce its effect on the kidney.

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