# 30 - EFFECT OF THE USE OF TESTOSTERONE AND EXERCISE ON BLOOD GLUCOSE AND LACTATE AGED WISTAR RATS

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## INTRODUCTION

The andropause is a modification that affects a significant number of men over 60 years (Kaufman and Vermeulen, 1998) and, as already described and accepted, even a little earlier, from age 50 (Nilsson, MOLLER, SOLSTAD, 1999). Life habits and psychogenic stress are factors that may contribute to an earlier occurrence. Among reasons for the disbelief of the existence of andropause was the fact that it does not occur in all men in this age group, the confusion of his clinical picture of senescence, since the effects are similar and, finally, the absence of clinical data and reliable laboratory confirming its existence. The first studies with evidentiary and relevant way from l958 (HOLLANDER HOLLANDER E, 1958), which really was the finding of decreased concentrations of testosterone in the spermatic veins, and l966 (E KENTZ ACONE, 1966), reducing your production by Leydig cells. After 40 years, occurs each year a decrease of 1.2% of circulating levels of free testosterone (FT) and 1.0% of testosterone bound to albumin and also an increase of about 1.2 % of binding globulin sex hormone (SHBG), the carrier protein that binds to about 50% of circulating testosterone (9,10). The total testosterone (TT) remains stable until 50 to 55 years and, thereafter, also begins to reduce at a rate between 0.4% (GRAY, Feldman, McKinlay and LONGCOPE, 1999) and 0.85% years (Vermeulen and Kaufman and GIAGULLI). This reduction is about 35% between 25 and 75 years and consequently their average age of 75 are about 65% of those found in young men. Since the TL decreases between 50% and 60% over this period of time, which results in bioavailable testosterone levels reduced by more than 25% of men over 75 years. In the process of senescence and andropause number of changes occur in the body in circulating levels of hormones and vitamins (Bonaccorsi, 2001), while cortisol levels remained stable and even higher, the adrenal hormone undergoes a marked reduction (Belanger et al , 1994). Because these benchmarks is needed use of exogenous hormones to maintain the same level in the body and most commonly used hormone is testosterone. The hormone testosterone was discovered in 1889 as a rejuvenating substance (Hoberman, Yesalis, 1995), produced by the Leydig cells of the testes and adrenal gland, has the anabolic effect could increase the mass (Bardin, 1996; Hikin et al. 2002), muscle strength (Urban, 1999, Arnold et al., 1996, Bhasin et al., 2001) and stimulate the development of organs such as kidneys, salivary glands and liver (Urban, 1999). There is evidence that treatment with AAS can improve endurance capacity in skeletal muscles. For example, improving submaximal running in rats. It has been shown that after treatment with the AAS is an improved resistance to fatigue in the skeletal muscles tested via electrical stimulation, can increase the tolerance of animal activity (TAMAKI et al, 2001). Then seen its importance in the treatment of diabetic patients.

## OBJECT

Check for possible changes in blood after physical exercise sessions with the use of injectable testosterone in older animals

## Methodology

To carry out the present study were used (n = 12) Wistar albino rats (Rattus norvegicus), males, aged (12 months) from one animal house of the University Center Plateau Araxá (Uniaraxá). All procedures, management, use and sacrifice of these animals followed carefully the resolutions proposed by the Brazilian College of Animal Experimentation (Cobea, 2007) and the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (Council of Europe No. 123, Strasburg , 1985) (ILAR, 1996). The animals were randomly divided into 2 groups:

a) trained control (N): animals submitted to physical training, 40 minutes a day, five days a week for four weeks (n = 6).

b) treated control (NT): animals treated with durateston subjected to physical training, 40 minutes a day, five days a week for four weeks (n = 6).

The control rats had undergone similar, however, instead of durateston ®, were injected with peanut oil. The animals were kept in collective cages (100x50x30cm) with an average of six rats per cage. With constant temperature 22 - Sao Paulo -° C. All animals were fed with standard balanced diet (Purina Brazil) and water "ad libitum" (Oliveira et al., 2002).

### Handling and application of hormone

Applications were made 15 mg kg-1 of durateston ® intramuscular injection in the respective groups in 1-ml disposable syringes (BD brand. Sao Paulo - Brazil) 2 times a week, on Tuesdays and Fridays at 16:30 for 4 weeks. Was administered in control animals (N) an injection vehicle consisting of peanut oil with 10% (v / v) benzyl alcohol, as was previously described (Trifunovic et al., 1995). The animals in the respective groups received injections (alcohol, oil or peanut durateston) in similar volume (~ 0.20 ml). After an adjustment period of 2 weeks proposed by Oliveira et al. (2002), the animals of the same group were collectively subjected to sessions of moderate swimming, with 5% body weight attached to tail at a frequency of 5 times a week for 4 weeks, the 14/17h00min, beyond the training period previously described (Ostman-Smith, 1979; FRIEDMAN, 1994, Oliveira et al. 2002; VOLTARELLI et al., 2002, Cunha et al. , 2005a) (Table 1). The animals swam in a tank-adapted pool with a depth of 48 cm and water temperature kept at 30/36 º C (MARCONDES et al., 1996).

### Exhaustion and sacrifice

At the end of two weeks of adaptation and 4 weeks of training, the animals underwent an intense PE until complete exhaustion, the exhaustion time characterized at the time the animal could not keep the nostrils out of water for more than 10 seconds . Were then quickly removed from the water and placed on a bench. Body and tail were carefully dried with sterile paper towels (VOLTARELLI et al., 2002). After the last session of Parliament, the animals were sacrificed by guillotine (Marshall et al. 1994; COBEA, 2007), after anesthesia with ketamine and xelasina (Vetec Chemistry. Rio de Janeiro - Brazil).

## Results

The analysis of ANOVA and Tukey tests show blood glucose levels in group C (control), the lowest values after exhaustion with 92.75 ± 14.05 mg / dLpré exercise and 42 ± 12.24 mg / dL after exercise (Figure 1), but this same group was found the lowest lactate post depleted (7.32 ± 3.12 mmol / L) (Figure 2) and also in control animals the swimming time was 203.75 ± 71.92 minutes. The control group treated (T) presented the glycemic value 98.6 ± 8.14 mg / dL pre exhaustion and 73.4 ± 39.87

mg / dL (figure 1) after exhaustion and value of lactate was 9.28 ± 2.67 mmol / L after the exhaustion and 2.76 ± 0.32 mmol / dL pre-exercise (Figure 2) and its swimming time was 305.8 ± 34.36 minutes showing much higher values of lactate, glucose and exercise time.

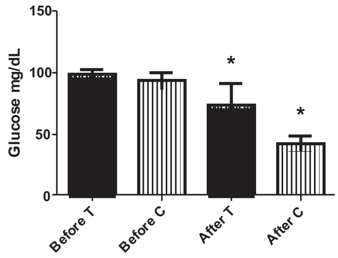


Figure 1 - Concentration of glucose in mg / dL of 24 control animals ©, and treated with testosterone (T), Before and after exhaustion.

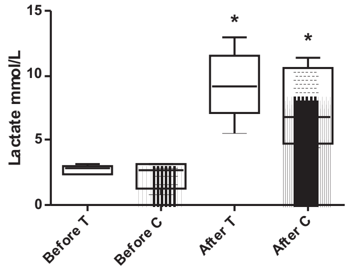


Figure 2 - Concentration of lactate expressed in mmol / L of 24 control animals ©, and treated with testosterone (T), Before and after exhaustion.

Table 1. Mean values and standard deviations (SD) of andthe swimming time of normal rats (C) and treated (T) with durateston trained 6 weeks.

**Table 1.** Mean values and standard deviations (SD) of and®the swimming time of normal rats (C) and treated (T) with durateston trained 6 weeks.

| | Control (C) | Control Treaty (T) |
|---|---|---|
| Swimming time ( min.) | 203,75±71,92 | 305,8±34,36 |
| | Mean ± DP | Mean ± DP |

**Conclusion**

From this study it was concluded that the use of testosterone in older animals increases their athletic performance and leads to better glycemic control, which may be explained by the longer duration of exercise performed by these animals in the group treated with the hormone, which and was significantly higher.

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**EFFECT OF THE USE OF TESTOSTERONE AND EXERCISE ON BLOOD GLUCOSE AND LACTATE AGED WISTAR RATS**

**ABSTRACT**

In order to assess possible changes in blood after physical exercise sessions in the use of testosterone, 12 Wistar rats groups underwent 20 sessions of swimming with daily training sessions of 40 minutes 5 times a week after two weeks of adaptation to an overload of 5% body weight attached to its tail. Their animals were divided into two groups: trained control group (C) and control treated (T), where the treated group than in the sessions of swimming, was applied 15mg/kg-1 (the value of their body weight) of durateston ® twice a week and control groups had undergone similar but were injected with oil peanuts. On the last day of 4 weeks of training the animals were undergoing a training period until exhaustion, sedo from water, dried, injected with ketamine and xelasina for later beheaded by guillotine for blood tests. The analysis showed the control group (C), the lowest glucose exhaustion after (92.75 ± 14.05 mg / dL) and pre-exercise (42 ± 12.24 mg / dL) after exercise, but this same group was found the lowest lactate post depleted (7.32 ± 3.12 mmol / L), also in control animals the swimming time was 203.75 ± 71.92 minutes. The control group treated (T) had higher post-exercise blood glucose value (73.4 ± 39.87 mg / dL), lactate (9.28 ± 2.67 mmol / L) and swimming time (305.8 ± 34.36 minutes) leading us to believe that the use of injectable testosterone in older animals increases their athletic performance and leads to better glycemic control, which may be explained by the longer duration of exercise performed by these animals in the group treated with hormone , which was significantly higher good.

**KEY WORDS:** Testosterone, elderly and training

**EFFET DE L'UTILISATION DE LA TESTOSTERONE ET EXERCICE DE SANG RELATIF AU GLUCOSE ET LE AGED RATS WISTAR**

**RÉSUMÉ**

Afin d'évaluer les changements possibles dans le sang après les séances d'exercice physique dans l'utilisation de la testostérone, les groupes de 12 rats Wistar a subi 20 séances de natation avec des séances quotidiennes d'entraînement de 40 minutes 5 fois par semaine après deux semaines d'adaptation à une surcharge de corps 5% poids attaché à sa queue. Leurs animaux ont été divisés en deux groupes: groupe témoin formé (C) et de contrôle traités (T), où le groupe traité que dans les séances de natation, a été appliqué 15mg/kg-1 (la valeur de leur poids corporel) d'® durateston deux fois par semaine et groupes de contrôle ont fait l'objet similaire, mais ont été injectés avec l'huile d'arachides. Le dernier jour de 4 semaines de formation sur les animaux ont été l'objet d'une période de formation jusqu'à l'épuisement, offre de l'eau, séchées, une injection de kétamine et xelasina de côté décapité par guillotine pour analyses de sang. L'analyse a montré au groupe témoin (C), le plus bas après l'épuisement du glucose (92,75 ± 14,05 mg / dL) et de pré-exercice (42 ± 12,24 mg / dL) après l'exercice, mais ce même groupe a été trouvé le plus bas après lactate appauvri ( 7,32 ± 3,12 mmol / L), également chez les animaux de contrôler le temps que la natation était 203.75 ± 71.92 minutes. Le groupe témoin traité (T) étaient plus élevés après la valeur de l'exercice physique de glucose (73,4 ± 39,87 mg / dL), lactate (9.28 ± 2.67 mmol / L) et l'heure de natation (305.8 ± 34.36 minutes) qui nous conduit à croire que l'utilisation de testostérone injectable chez les animaux plus âgés augmente leur performance athlétique et conduit à un meilleur contrôle glycémique, qui mai être expliqué par la plus longue durée d'exercice réalisé par ces animaux dans le groupe traité aux hormones, ce qui était beaucoup plus grand bien.

**MOTS CLÉS:** testostérone, les personnes âgées et de la formation

**EFECTO DEL USO DE TESTOSTERONA Y EJERCICIO EM GLUCOSA EM SANGRE Y ANCIANO LACTATO WISTAR RATS**

**RESUMEN**

A fin de evaluar posibles cambios en la sangre después de las sesiones de ejercicio físico en el uso de testosterona, 12 grupos de ratas Wistar realizó 20 sesiones de natación con sesiones de entrenamiento diario de 40 minutos 5 veces por semana después de dos semanas de adaptación a una sobrecarga del organismo el 5% peso asignado a la cola. Sus animales fueron divididos en dos grupos: grupo control formado (C) y control de tratamiento (T), donde el grupo tratado que en las sesiones de natación, se aplicó 15mg/kg-1 (el valor de su peso corporal) de durateston ® dos veces por semana y los grupos de control se habían sometido a similares, pero fueron inyectados con aceite de maní. En el último día de 4 semanas de entrenamiento de los animales fueron sometidos a un periodo de formación hasta el agotamiento, sedo de agua, secado, inyección de ketamina y xelasina para más tarde decapitado por la guillotina para los análisis de sangre. El análisis mostró que el grupo control (C), el agotamiento más bajo de glucosa después de mg (92,75 ± 14,05 / dL) y antes del ejercicio (42 ± 12,24 mg / dL) después de hacer ejercicio, pero este mismo grupo se encontró el puesto más bajo de lactato empobrecido ( 7,32 ± 3,12 mmol / L), también en los animales control del tiempo de natación fue 203,75 ± 71,92 minutos. El grupo control tratado (T) tenían mayor valor post-ejercicio de glucosa en sangre (73,4 ± 39,87 mg / dL), lactato (9,28 ± 2,67 mmol / L) y el tiempo de natación (305,8 ± 34,36 minutos) que nos lleva a creer que el uso de testosterona inyectable en animales de más edad aumenta su rendimiento atlético y conduce a un mejor control glucémico, lo que puede explicarse por la mayor duración del ejercicio realizado por estos animales en el grupo tratado con hormona, que fue significativamente mayor bien.

**PALABRAS CLAVE:** Testosterona, los ancianos y la formación

**EFEITO DO USO DE TESTOSTERONA E EXERCÍCIO FÍSICO SOBRE GLICEMIA E LACTATO DE RATOS WISTAR IDOSOS**

**RESUMO**

Com o objetivo de verificar possíveis alterações sanguíneas após sessões de exercícios físicos sob o uso de testosterona, 12 ratos wistar idosos foram submetidos à 20 sessões de natação com treinos diários de 40 minutos 5 vezes por semana após duas semanas de adaptação com sobrecarga de 5% do peso corporal preso a sua cauda. Os respectivos animais foram distribuídos em dois grupos: grupo controle treinado (C) e controle tratado (T), onde o grupo tratado além de realizar as sessões de natação, foi aplicado 15mg/kg-1 (do valor de seu peso corporal) de durateston® duas vezes por semana e o grupos controle sofreram manipulação semelhante mas foram injetados com óleo de amendoin. No último dia das 4 semanas de treino os animais forma submetidos a um período de treinamento ate a exaustão, sedo retirados da água, secados, injetados com ketamina e xelasina para sua posterior decapitação em guilhotina para as análises sanguíneas. Às análises mostraram no grupo controle (C) o menor valor glicêmico pós exaustão (92,75±14,05mg/dL) pré exercício e (42±12,24mg/dL) pós exercício, porém neste mesmo grupo foi encontrado o menor valor de lactato pós exauridos (7,32±3,12 mmol/L), também nos animais controle o tempo de nado foi de 203,75±71,92 minutos. Já o grupo controle tratado (T) apresentou pós exercício maior valor glicêmico (73,4±39,87 mg/dL); de lactato(9,28±2,67mmol/L) e de tempo de nado (305,8±34,36 minutos) nos levando a acreditar que o uso de testosterona injetável em animais idosos aumenta a sua performance atlética e provoca um melhor controle glicêmico, fato que pode ser explicado pelo maior tempo de exercício realizado por estes animais do grupo tratado com o hormônio, que foi significativamente bem mais elevado.

**PALAVRA CHAVE:** Testosterona, idoso e treinamento

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