Life Sciences 85 (2009) 541–545

Contents lists available at ScienceDirect

Life Sciences

journal homepage: www.elsevier.com/locate/lifescie

Effects of swimming and nandrolone decanoate treatment on vas deferens response to norepinephrine

Lidyane R.G. Castor [a], Eunice Oba [b], Oduvaldo C.M. Pereira [a,c,*]

[a] Department of Pharmacology, Institute of Biosciences, Sao Paulo State University – UNESP, 18610-000 Botucatu, Sao Paulo, Brazil
[b] Department of Animal Reproduction and Radiology, School of Veterinary Medicine and Animal Science, Sao Paulo State University – UNESP, 18610-000 Botucatu, Sao Paulo, Brazil
[c] Department of Internal Medicine, Botucatu Medical School, Sao Paulo State University – UNESP, 18618-000 Botucatu, Sao Paulo, Brazil

ARTICLE INFO

Article history:
Received 19 June 2008
Accepted 13 August 2009

Keywords:
Swimming
Vas deferens
Norepinephrine response
Nandrolone decanoate
Rats

ABSTRACT

Aims: To investigate the response to norepinephrine of vas deferens isolated from intact and castrated rats submitted to swimming and/or treated with nandrolone decanoate.
Main methods: Intact and castrated male rats were submitted to swimming for 15 days, 1 session per day, 5 days/week and were either treated or not with 7.5 mg/kg of nandrolone decanoate on days 1, 5, 9, and 13 after the beginning of training. Plasma androgen concentration was measured by radioimmunoassay. Vas deferens was isolated and set up for analysis of its contractile capacity in response to norepinephrine.
Key findings: In intact rats, nandrolone, training, and training plus nandrolone did not change body mass or vas deferens weight. In castrated rats, the vas deferens wet weight was decreased in both untrained and trained groups. In castrated rats, nandrolone prevented vas deferens atrophy. In intact animals, nandrolone decreased ($P<0.05$) the androgen level in untrained group, while in castrated rats this treatment partially restored the androgen level. An increased sensitivity ($P<0.05$) to norepinephrine was observed in vas deferens isolated from intact trained rats, treated or not with nandrolone decanoate, while nandrolone did not alter norepinephrine response in organs from untrained animals. In untrained castrated rats, nandrolone fully restored the sensitivity to norepinephrine in untrained rats, while in trained castrated rats the anabolic steroid only partially restored this response.
Significance: The present results indicate that training can increase norepinephrine response of vas deferens in intact rats, while nandrolone decanoate can partially restore the responsiveness to norepinephrine in castrated rats.

© 2009 Published by Elsevier Inc.

Introduction

Anabolic steroids enhance body-tissue-building processes and retard or reverse tissue catabolism. Based on these properties, some athletes use anabolic steroids in an attempt to improve their athletic performance. However, serious adverse outcomes have been correlated with the use of anabolic steroid (Maravelias et al. 2005; Casavant et al. 2007). Moreover, altered androgenic levels have been found following administration of anabolic steroids as well as during prolonged physical activity (Opstad 1992; Hackney et al. 2003). One potentially useful experimental model of exercise in rats is forced swimming. However, elevated levels of norepinephrine and epinephrine are also found during forced swimming, resulting from the physical imposition of forced exercise and the strong emotional components (Östman-Smith 1979; Perronét et al. 1981). In this exercise model, adaptation to water is necessary to reduce stress to the animals. Changes in testosterone levels can also modulate adrenergic neurotransmission in some reproductive organs, including the vas deferens (MacDonald and McGrath 1980). The rat vas deferens, a smooth muscle of the genital tract, has commonly been considered a suitable preparation for studying α-adrenoceptors (Sallés and Badia 1991). Studies in our laboratory demonstrated reduced sensitivity of vas deferens to norepinephrine in rats submitted to acute swimming. The reduced sensitivity was a consequence of increased neuronal uptake of norepinephrine and β_2-adrenoceptor upregulation, which opposes α_1-adrenoceptor activity (Chies and Pereira 1995). In androgenic deprivation models, altered responses of isolated seminal vesicles and vas deferens to various drugs have been shown (Porto et al. 1988; Pereira et al. 1993; Souza and Pereira 1999). In addition, castration has been proposed to result in altered response to norepinephrine as a consequence of changes in functional α_1-adrenoceptors subtypes involved in the rat vas deferens contractile responses (Pupo 1998). Thus, the physiological level of testosterone, the use of anabolic steroids and exposure to intensive exercise may be involved in the noradrenergic response

* Corresponding author. Department of Pharmacology, Institute of Biosciences, Sao Paulo State University – UNESP, 18610-000 Botucatu, Sao Paulo, Brazil.
E-mail address: pereira@ibb.unesp.br (O.C.M. Pereira).

0024-3205/$ – see front matter © 2009 Published by Elsevier Inc.
doi:10.1016/j.lfs.2009.08.009

pattern of the smooth muscle of the genital tract. On the basis of these considerations, the present study aimed to investigate the norepinephrine response of vas deferens isolated from rats submitted to swimming and/or treated with nandrolone decanoate, an anabolic steroid.

Materials and methods

Animals

Adult male Wistar rats (about 3 months old, average weight 300–350 g) were randomly divided into respective experimental groups and housed five rats per polypropylene cage (32×40×18 cm) with bedding of wood shavings. Food and water were freely available with a 12 h light–dark cycle. The temperature and humidity were controlled at 25±1 °C and 55±5%, respectively. The animals used in this study were maintained in accordance with Ethical Principles in Animal Research, adopted by the Brazilian College of Animal Experimentation and approved by the Bioscience Institute/UNESP Animal Research Ethics Committee, protocol number 93/01.

Experimental groups

Six experimental groups were included in this study, as defined by whether they were castrated or not, submitted to swimming (referred to as training) or not, and either treated or not with nandrolone decanoate. Control groups were included for each of these groups.

Castration

Castration, consisting of bilateral removal of the testicles, was carried out via transscrotal access under sodium pentobarbital (40 mg/kg, ip) anesthesia when the rats were at least 75 days old. These rats were utilized 7 days after orchidectomy in the subsequent experiments.

Nandrolone decanoate treatment

Rats received subcutaneous injections of 7.5 mg/kg of nandrolone decanoate (Deca durabolin^{R} Organon) or vehicle (peanut oil plus benzilic alcohol, 1:16) 1, 5, 9, and 13 days after beginning the exercise protocol.

Exercise protocol

Rats were submitted to a 7-day period of adaptation to water in order to minimize stress. For 15 min each day, rats were placed in water (27 °C) within a glass tank of increasing depth, starting with 5 cm of water and increasing gradually to a water height of 40 cm. After this process, the animals were individually submitted to 60 min of swimming each day for 15 days, 1 session per day, 5 days per week. For the swimming procedure (training), the rats carried a metallic ring of about 2% of their body weight on their tails. The tank measured 35 cm in length, 17 cm in width, and 50 cm in depth. Immediately after the last swimming session, the animals were anesthetized by volatile anesthetic, blood samples were collected, and the animals were killed by decapitation.

Plasma androgen level

Plasma androgen levels represent total testosterone levels in the rat. To measure these levels blood samples (2.0–2.5 ml) were collected from the abdominal aorta into heparinized vials, always between 09:00 and 10:00 am. Immediately after collection, blood samples were centrifuged (700×g for 20 min, at 2 °C) and the plasma androgen level (total testosterone) was assayed by solid-phase [I_{125}] radioimmunoassay (Coat-A-Count Rat Testosterone kit, DPC, Los Angeles, CA, Lot 40101). All samples were measured in duplicate. Data are reported as nanomol per liter of plasma. The interassay coefficient of variation was 6.0%.

Pharmacological analysis

The left vas deferens was removed, separated from the surrounding tissue, freed of secretions, weighed, and set up for analysis of contractile capacity in a 10 ml organ-bath circulating a nutritive solution aerated with 95% O_2 and 5% CO_2 and maintained at 30 °C. The composition of the nutritive solution was 136.0 mM NaCl, 5.7 mM KCl, 1.8 mM $CaCl_2$, 0.36 mM $NaH_2PO_4 \cdot H_2O$, 15.0 mM $NaHCO_3$, and 5.5 mM dextrose, prepared in a glass containing distilled water (Picarelli et al. 1962). A resting tension of 1.0 g was applied to the tissue and the change in isometric tension was measured via force displacement transducers. After an initial resting period of 30 min, concentration–response curves for norepinephrine (arterenol bitartrate, Sigma) were obtained. The concentration–response curves for norepinephrine were obtained in the absence and presence of timolol (10^{-5} M; timolol maleate, Sigma) added 30 min before the norepinephrine. The agonists were added at successively increasing molar concentrations (van Rossum 1963; van Rossum and van Der Brink 1963). The parameter determined was the pD_2, estimated as the negative of the logarithm of the agonist concentration producing 50% (ED_{50}) of the maximum effect (Miller et al. 1948).

Statistical analysis

Data are presented as mean±SEM. Data sets were first compared by analysis of variance, and Tukey's test was used for post-hoc comparisons between pairs of means. The results were considered significant at $P<0.05$.

Results

Body mass and wet weight of vas deferens

Intact and castrated rats, untrained or submitted to swimming (trained), treated or not with nandrolone decanoate showed no significant difference in body mass. Vas deferens from intact rats, untrained or submitted to swimming, treated or not with nandrolone decanoate also showed no alteration in wet weight, while vas deferens from castrated rats, untrained or submitted to exercise weighed significantly less than intact rats. In castrated rats treated with nandrolone decanoate, the wet weight of the vas deferens did not differ significantly from those of intact rats (Table 1).

Plasma androgen level

Plasma androgen level (total testosterone) in intact rats decreased significantly after nandrolone decanoate treatment for both rats undergoing training as well as those undergoing training plus nandrolone decanoate. In castrated rats, treatment with the synthetic testosterone, nandrolone decanoate, restored the plasma androgen levels to levels observed in intact untrained rats treated with nandrolone decanoate, intact trained rats, and intact trained rats treated with nandrolone decanoate (Table 2).

Pharmacological response of the vas deferens

All rats swam vigorously during the swimming sessions. The mean concentration–response curves for norepinephrine in vas deferens from intact rats submitted to swimming, treated or not with nandrolone decanoate, was shifted to the left (Fig. 1). In addition, the corresponding pD_2 values were significantly increased (Table 3).

Download English Version:

https://daneshyari.com/en/article/2553151

Download Persian Version:

https://daneshyari.com/article/2553151

Daneshyari.com