The effect of chronic nandrolone decanoate treatment on emotional behavior and neurochemical changes in rats

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Although the legitimate medical use, anabolic androgenic steroids (AAS) are nowadays most often discussed in terms of illicit use not only among professional and amateur athletes but also outside the sport, especially among adolescents, to improve physical appearance and increase self-esteem (Denham, 2006; Kindlundh,1999). AAS abuse and misuse is considered a matter of growing public health issue due principally to the physical and neuropsychiatric effects of long-term AAS exposure, as documented in case reports and observational studies (Gruber & Pope, 2000; Pagonis et al., 2006). However, neurobiochemical mechanisms behind observed behavioral changes are poorly understood. A recent study from our lab demonstrated alterations in dopamine (DA), serotonin (5-HT) and noradrenalin (NA) content in several brain areas of stanozolol-treated rats (Tucci et al., 2012). Laboratory statistics of the World Anti- Doping Agency (WADA, 2011) showed that after stanozolol, nandrolone is the second most used prohibited drug in all sports.
Thus, the aim of the present study was to investigate the effects of nandrolone decanoate on emotional behavior and neurochemical brain alterations in gonadally intact male rats. Behavioral reactivity to elevated plus maze (EPM) and social interaction test was used to assess anxiety-related symptoms in male Wistar rats after a 4-week administration of nandrolone decanoate (5mg kg^{-1} daily, s.c) or vehicle (PEG, 1 ml kg^{-1}, s.c). In EPM test, rat was placed in the central platform facing an open arm, and allowed to explore the maze for 5 min. Following parameters were analysed: number of entries into open and closed arms and time spent on open arms. Social interaction procedure was adapted from File et al., 2004. The test was performed in a circular open arena where pairs of rats were assigned on the basis of weight and treatment (social, aggressive and exploratory behaviours were analysed during the 10 min test). Furthermore, sucrose preference test was used to evaluate anhedonia and was carried out in the animal's individual cages, where non-food-deprived rats were given a 48-hour two-bottle exposure, one containing a 2% of sucrose solution and the other containing water according to the protocol described by Monteggia et al., 2007. Dopamine, serotonin and noradrenaline concentration were determined by high performance liquid chromatography (HPLC) analysis in two brain regions predominantly involved in regulating emotional responses, such as nucleus accumbens (NAc) and amygdala (Amy).
Chronic administration of nandrolone did not induce anxiety-like behaviour as we did not detect any difference in the time spent into the open arms or in the social interaction test between two treatment groups. As expected from the behavioral analysis, we did not find alterations in NA levels, as well as in DA and 5-HT tissue levels in the Amy. However, a significant decrease of sucrose intake was observed in nandrolone-treated animals and it was accompanied by a reduction of DA, 5-HT and NA contents in nucleus accumbens. In conclusion, our data suggest that nandrolone-treated rats have a depressive, but not anxiogenic-like, profile, accompanied by brain region-dependent changes in dopaminergic, serotonergic and noradrenergic neurotransmission.

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