Neonatal programming with testosterone propionate reduces dopamine transporter expression in nucleus accumbens and methylphenidate-induced locomotor activity in adult female rats

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Research in programming is focused on the study of stimuli that alters sensitive periods in development, such as prenatal and neonatal stages, that can produce long-term deleterious effects. These effects can occur in various organs or tissues such as the brain, affecting brain circuits and related behaviors. Our laboratory has demonstrated that neonatal programming with sex hormones affects the mesocorticolimbic circuitry, increasing the synthesis and release of dopamine (DA) in striatum and nucleus accumbens (NAcc). However, the behavioral response to psychostimulant drugs such as methylphenidate and the possible mechanism(s) involved have not been studied in adult rats exposed to sex hormones during the first hours of life. Thus, the aim of this study was to examine the locomotor activity induced by methylphenidate (5 mg/kg i.p.) and the expression of the DA transporter (DAT) in NAcc of adult rats exposed to a single dose of testosterone propionate (TP: 1 mg/50 ?L s.c.) or estradiol valerate (EV: 0.1 mg/50 ?L s.c.) at postnatal day 1. Our results demonstrated that adult female rats treated with TP have a lower methylphenidate-induced locomotor activity compared to control and EV-treated adult female rats. This reduction in locomotor activity is related with a lower NAcc DAT expression. However, neither methylphenidate-induced locomotor activity nor NAcc DAT expression was affected in EV or TP-treated adult male rats. Our results suggest that early exposure to sex hormones affects long-term dopaminergic brain areas involved in the response to psychostimulants, which could be a vulnerability factor to favor the escalating doses of drugs of abuse. © 2017 Elsevier B.V.

DAT

Locomotor activity

Methylphenidate

Programming

Testosterone

dopamine transporter

estradiol valerate

methylphenidate

testosterone propionate

central nervous system agents

dopamine transporter

estradiol

methylphenidate

testosterone propionate

adult

animal experiment

animal tissue

Article

behavior

cognition

controlled study

corpus striatum

dopamine release

female

hormone action

locomotion

male

newborn

nonhuman

nucleus accumbens

perinatal period

priority journal

protein expression

rat

analogs and derivatives

animal

drug effect

growth, development and aging

locomotion

metabolism

motor activity

nucleus accumbens

physiology

randomization

sexual characteristics

Sprague Dawley rat

Animals

Animals, Newborn

Central Nervous System Agents

Dopamine Plasma Membrane Transport Proteins

Estradiol

Female

Locomotion

Male

Methylphenidate

Motor Activity

Nucleus Accumbens

Random Allocation

Rats, Sprague-Dawley

Sex Characteristics

Testosterone Propionate