

# ABSTRACT

**Introduction:** Drug addiction and its effect on the behavior and development of children has become a serious problem in our society. Methamphetamine (MA) is one of the most abused psychostimulants in the Czech Republic, and its abuse is rising worldwide. Previous studies have demonstrated the adverse long-term effects of maternal drug abuse on rat offspring. However, the father's contribution as a parent and donor of half the genetic information is unclear.

**Aim:** First, the present study aimed to examine the effect of MA administration on male sexual behavior, locomotor activity, spermatogenesis, and testosterone level. Second, the impact of paternal MA exposure on behavioral development, locomotor activity, and social interaction in rat offspring was examined.

**Methods:** MA was administered for 30 days at a dose of 5 mg/kg s.c. to adult male rats (PD 90). The control group was exposed to saline (SA). During the experiments, 6–8 individuals from each group were tested. The sensorimotor development of rat pups was examined during PD 1–23. The Social play experiment was conducted with juvenile rats (PD 30). The sexual behavior, spermatogenesis, and locomotor activity of fathers and offspring were tested in adulthood. Prior to testing, adult offspring were exposed to an acute challenge dose of MA (1 mg/kg) to examine the possible sensitizing effect of the paternal treatment.

**Results:** Our results demonstrated that MA exposure did not affect the sexual behavior of male rats. Moreover, MA administration did not influence testosterone levels or spermatogenesis in adult males compared to the control group. The data from the Laboras test showed that chronic MA administration impairs locomotor activity in fathers. Further, our results demonstrated a significant increase in locomotor activity on the Laboras test after acute MA application.

Regarding the paternal administration effect on offspring, there were no significant differences in behavioral development or locomotor activity in adulthood. Our data showed that paternal and acute MA administration significantly impaired the social interaction of adolescent offspring. Paternal MA exposure significantly decreases the frequency of pouncing, increases the duration of rearing in males and decreases the duration of mutual sniffing in both genders. When comparing sex differences, males were more active during development, whereas females showed more activity in adolescence and in adulthood than males.

**Conclusion:** In conclusion, our results demonstrate that chronic MA abuse does not impair the sexual behavior and reproductive functions of adult male rats. Additionally, paternal MA administration does not affect offspring's behavior during development and adulthood, as it was seen after maternal MA administration. However, MA exposure significantly impairs the social behavior of progeny. These results suggest that drug addiction in fathers may not have the same serious consequences for their offspring as drug addiction in mothers. Our study is critical because it is the first to assess the effect of MA on the male's role as a parent and donor of half the genetic information of their offspring.