

Abstract

The aim of our study was to investigate the impact of prenatal methamphetamine (MA) exposure and cross-fostering on development of rat pups during preweaning period and on behavior, anxiety, cognitive function and nociception in adulthood.

Mothers were daily exposed to injection of MA (5 mg/kg) or saline (S) approximately for 9 weeks: three weeks prior to impregnation, throughout the entire gestation period and for 23 days of lactation. Control females (C) did not receive any injection. On postnatal day (PD) 1, pups were cross-fostered so that each mother received some of her own and some of the pups of mother with the other two treatments. We obtained 9 experimental groups (C/C, C/S, C/MA, S/C, S/S, S/MA, MA/C, MA/S, MA/MA). Pups were tested during postnatal development by means of following behavioral tests: negative geotaxis, tail pull, righting reflex on surface and in mid-air, rotarod and bar-holding and were examined for physiological maturation. In adulthood, males and females rats were tested in the Open field (OF) and in the Elevated plus maze (EPM) for behavior and anxiety and in the Plantar test for thermal nociception. Adult male rats were tested on cognitive function in the Morris water maze (MWM). In adult female rats, phases of the estrous cycle were recognized and compared.

Our results showed that both prenatal and postnatal MA exposure via breast milk impair development of rat pups during preweaning period. In adulthood, female rats postnatally exposed to MA via breast milk had decreased exploratory behavior in the OF, increase anxiety in the OF and decreased nociception in the plantar test relative to female rats fostered by control or saline-treated dams. Adult male rats postnatally exposed to MA or saline had decreased locomotion in the OF and increased anxiety in the OF as well as in the EPM compared to male rats fostered by control dams. Nociception was increased in male rats prenatally exposed to saline or MA relative to prenatally control rats.

The present study demonstrates that cross-fostering may affect development of rat pup in preweaning period and functional changes in adulthood. Postnatal care of mother exposed to MA causes negative changes which persist until adulthood. In some cases postnatal care of control mothers at least partially suppressed the negative effect of prenatal MA exposure.