ABSTRACT

Perinatal asphyxia is a condition resulting from hypoxic-ischemic injury in utero or during birth and causing perinatal morbidity and mortality. Up until now, numerous models of neonatal hypoxia-ischemia were created and presented simulating brain damage patterns and motor deficits. Rice-Vannucci model is a leading representative of animal rodent models of hypoxic injury. It uses unilateral ligation of the common carotid artery in combination with exposure to hypoxic environment.

Seven-day-old mouse pups underwent unilateral ligation of the common carotid artery in combination with exposure to 8 % oxygen hypoxic air (Rice-Vannucci model modification). Experimental groups with isolated carotid artery ligation or only exposure to hypoxia were created, too. To assess the spontaneous behavior changes of mice we used an automated system for the continuous tracking of small rodent behavior (LABORAS ™). On postnatal day 60, the spontaneous behavior of mice was analyzed in various behavioral domains. The observed areas for histological analysis were the cerebral cortex, CA1 and CA3 regions of the hippocampus, hilus, and the dorsal and ventral blades of the dentate gyrus.

Induced hypoxia and ischemia together generated substantial behavioral and morphological changes which led to significant differences in behavioral profiles for habituation and the ability of mice to cope with novelty. In contrast, the observed alterations in the spontaneous behavior were not accompanied by morphological changes in groups with separately induced hypoxia or ischemia. Nonetheless, the isolated insults significantly influenced the spontaneous behavior of these mice later in life. Our adapted animal model indicates the importance of behavioral testing, since mild hypoxic damage may not be morphologically detectable but may induce substantial behavioral changes in adult mice. An interesting outcome of the present study is that perinatal hypoxia resulted in generation of sex-specific consequences in some behavioral domains.