Neonatal anoxia in rats: evaluation of somatic and sensory-motor development

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Introduction

The neonatal anoxia, characterized by a significant reduction in the availability of oxygen during birth, is one of major causes of infant mortality and the emergence of lasting neurological sequelae including cerebral palsy, epilepsy, learning disabilities, hyperactivity, cognitive and sensorimotor defects, among others. Previous studies have identified deleterious effects on glial and neuronal populations of the hippocampal formation, neuronal death by apoptosis and necrosis, neurogenesis and volume changes in the hippocampus, loss to learning and spatial navigation of the animal, among other behavioral sequelae.

Objective

The present study investigated whether Neonatal Anoxia impacts somatic and sensory-motor development in male rats, evaluating the possibility of the animals present changes in somatic and ontogenetic patterns between groups.

Material and Methods

Wistar rats 30 hours old (5-8 grams), male, was exposed for 25 minutes to 100% nitrogen gas flow of 9.6/min, pressure 101.7 kPa at a temperature between 35 and 37°C in a semi-hermetic chamber polycarbonate. After 25 minutes animals were taken out from the chamber, and returned to the cages with their mothers, where they remained until P21. Their physical and somatic growth and ontogenesis of reflexes was daily evaluated. A control group of animals were subjected to the same experimental conditions but the chamber was opened to atmospheric air rather than nitrogen stream.

Results

The results showed that animals submitted to anoxia showed, compared to the control, present significant delay in the appearance of the ear canal opening (control: 18 ± 0.01; anoxia: 14.83 ± 0.43), the upper- and lower incisors budding (control: 9.75 ± 0.16; anoxia: 10.66 ± 0.43) and in the maturation. Of the negative geotaxis ontogenetic reflexes (control: 9.75 ± 0.31; anoxia: 12 ± 0.96). In addition, the anoxic animals exhibited an advance in the onset of placing vibration (control: 10.87 ± 0.31; anoxia: 11.9 ± 0.96). Skull morphometric measurements of the body weight, opening ears and pinna and decussates recovery reflexes, cliff avoidance, response to shock, acceleration and palmer pressure were also evaluated, but no significant difference was observed. The delay in the negative geotaxis reflexes during puéril phase indicates a non-functional integrity of motor and muscular system which might impair locomotion later.

Conclusions

Neonatal anoxia in rats exerted damaging effects on the development of their morphofunctional characteristics, and on the sensory-motor and on the onset of some ontogenetic reflex parameters of the rats which lasted until weaning. The causes require more investigation which are in course at our laboratory.

To understand the implication of oxygen deprivation on developing brain in terms of white matter damage and also to evaluate of maturation of sensorimotor system, physical development and onset of reflexes we need more investigation. Use of neuroprotection to work as therapy at the right brain developmental stage.