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Maternal exercise during pregnancy modulates genetic and biochemical damage caused by high consumption of fructose in offspring

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The consumption of fructose increased exponentially over the past decades. Especially during pregnancy a poor diet, such as high fructose consumption, can have adverse health effect via fetal programming. Thus, preventive measures to minimize the effects of poor diet in this period are necessary. Therefore, the objective of this study was to evaluate whether the practice of voluntary physical exercise (VPE) can reduce the adverse effects of chronic consumption of fructose, from the beginning of life and/or until the gestational period, on the metabolism and genome of pregnant females and their offspring. For this, 70 Swiss female mice with 21 days of life received fructose (FRU; 20%/L) in the hydration bottle and/or practiced VPE for 8 weeks (pre-pregnancy). Females were divided into 4 treatment groups: G1-Water; G2-Water+VPE; G3-FRU; G4-FRU+VPE. After the lactation period, the offspring of the 4 experimental groups were separated by sex. The mothers were euthanized after lactation. The offspring (males and females) continued on the respective treatments and were euthanized at 60 days of age for genetic and biochemical evaluations. It was observed that the consumption of fructose increased the serum fructose concentration in the mothers and offspring, and that the VPE decreases these parameters. In addition, fructose was genotoxic (assessed via comet assay) and mutagenic (micronucleus assay) in the mothers' peripheral tissues and VPE had a preventive effect on these parameters. An increase in the adiposity index was observed in male offspring in the FRU group and a decrease in the FRU+VPE group. Furthermore, fructose lead to hepatic steatosis in the offspring and VPE was able to decrease the area of steatosis. Also, fructose led to genotoxicity in the offspring and VPE was able to modulate this effect, reducing damages.

The practice of physical exercise in the control group did not significantly affect the mother nor the offspring. In conclusion, we observed that intervention with VPE had genetic and biochemical benefits in blood and liver of the mothers and their offspring, counteracting the adverse effects of fructose.

Keywords:

Fetal programming; Fructose; Physical exercise; Genotoxicity; Mutagenicity.