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Ethanol-induced changes in placental and neural markers after prenatal alcohol exposure in mice

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Objective

The aim of this study is to compare ethanol-induced changes in placental and neural biomarkers after prenatal alcohol exposure according to two different patterns (binge vs chronic) and to analyze the beneficial effect of EGCG administration.

Methods

C57BL/6J pregnant mice, aged 8-12 weeks. Gastric gavage for prenatal maltodextrin, alcohol and EGCG administration. 5 experimental groups: 1) control (maltodextrin 3 g/Kg/d), 2) OH-binge (ethanol 3 mg/Kg/d), 3) OH- chronic (ethanol 0.75 mg/Kg/d), 4) OH-binge + EGCG (ethanol 3 mg/Kg/d + EGCG 30 mg/Kg/d), 5) OH- chronic + EGCG (ethanol 0.75 mg/Kg/d + EGCG 30 mg/Kg/d). Cesarean section at gestational day 19 for placenta and fetal brain tissue sampling. Western blot analysis for VEGF-A receptor, VEGF-A, NeuN, Nrf2, BDNF, SOX2, GDNF, doublecortin. Descriptive analysis.

Results

According to placental samples analysis, VEGF-A receptor is overexpressed in groups 2 (OH-binge) and 4 (OH-binge + EGCG), being lower in group 4. VEGF-A is expressed in higher quantities in groups 1 (control group), 2 and 3. According to brain samples analysis, NeuN and BDNF is expressed in higher quantities in groups 4 (OH-binge + EGCG) and 5 (OH- chronic + EGCG). Nrf2 is expressed in group 2 in higher quantity than in the others. Expression of SOX 2 is elevated in group 2. Expression of GDNF is decreased in group 2. Expression of doublecortin is elevated in all groups when compared to the control group.

Conclusion

Overexpression of VEGF in placental tissue that occurs after prenatal alcohol exposure is related with altered permeability of the feto-maternal barriers and can be the leading cause of intrauterine growth restriction (IUGR). EGCG can be a potential therapy to prevent IUGR when prenatal alcohol exposure occurs. When alcohol consumption occurs, it produces a neuronal loss. NeuN is a neural marker that is increased in alcohol exposure groups treated with EGCG, so EGCG administration could avoid neuronal loss. The brain-derived neurotrophic factor (BDNF) is important in development of central nervous system, plasticity processes and neurogenesis of hippocampus. When prenatal alcohol exposure occurs, hippocampus is one of the main brain structures affected. Given that EGCG increases the expression of BDNF, its administration could be beneficial for the normal hippocampus development. Studies with larger sample size are needed in order to find statistically significant results.