Sexual dimorphic nature of epigenetic and environmental interactions during CNS development

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Gene expression during brain development is modulated through interaction between epigenetic and factors in the environment. These studies considered a possibility that environmental factors may impact the developing cerebellum differently in male and female rats. Our studies of perinatal exposure to polychlorinated biphenyls (PCBs), found as contaminants in fish, demonstrated impaired motor coordination, cerebellar structure and protein expression more profound in males than in females. At the end of nursing period, motor coordination was inhibited by 79% in males, but only 13% in females. We have also observed that perinatal exposure to altered gravity resulted in impaired motor behavior and a decrease in Purkinje cell number; the relationship between the Purkinje cell number and rotorod performance appeared to be more consistent in males, but not females. In males the rotorod performance on P21 was reduced from 54.3±13.3 sec. in controls to 17.5±3.11 sec. in rats exposed to altered gravity; the Purkinje cell number was reduced from 9.53±0.84x105 to 7.85±0.68x105 in the exposed pups. Our results suggest that physical forms of environmental perturbations, just like chemical neurotoxins, may impact developing cerebellar Purkinje cells and motor coordination more significantly in males. Such sex-dependent vulnerability to environmental impacts could contribute to a greater preponderance of neurodevelopment disorders in males.