TITLE: Effects of ethanol exposure on oligodendrocyte development in the brain

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ABSTRACT:
Background: Prenatal Alcohol Exposure (PAE) occurs when an expecting mother consumes alcohol. PAE will lead to children to develop fetal alcohol spectrum disorders (FASDs), which are a group of conditions that can include a wide range of physical deformities and/or intellectual disabilities. Glial cells such as oligodendrocyte precursor cells (OPCs) are responsible for generating oligodendrocytes to myelinate neuronal axons, which is essential for proper conduction of action potentials. Studies in both humans and animal models showed that decrease myelination in the brain are prominent features of PAE. In this project, we propose that pups exposed to ethanol at the third trimester during the height of OPC generation will show reduced differentiation into mature myelinating oligodendrocytes.
Methods: Our project used the vapor chamber to expose mouse pups to either air (control) or ethanol (experimental) vapor for 4 hours/day (10:00 – 14:00) under reversed dark-light cycle from postnatal day (P) 4 to P8. At day P3, pups were injected with tamoxifen to induce Cre and label OPCs with YFP reporter to demonstrate that they were present at the time of exposure. Pups were either perfused at P8 or kept alive till P30 to study long term effects. Immunohistochemistry was used to study PAE effects on OPC differentiation into oligodendrocytes in the cortex and corpus callosum. Oligodendrocyte markers OLIG2, MBP, CC1, and cleaved Caspase 3 (CC3), a cell death marker, were used.
Conclusions: Pups that experienced PAE showed decreased myelination at P8 based on MBP expression, while the number of mature YFP-labeled oligodendrocytes as labeled by CC1 was also decreased at P30 compared to air exposed control mice. CC3 showed that these decreased was not due to an increase in the death of OLIG2+ OPCs or oligodendrocytes. These findings demonstrate that PAE prevents the differentiation of OPCs into oligodendrocytes.

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