Postnatal Binge-like Alcohol Exposure Can Cause Thinner Myelin in Rat CNS [MAS]

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We have previously demonstrated that postnatal alcohol exposures in the rat (third trimester human equivalency) delay the acquisition of myelin and cause thinner myelin. The present study provided a "binge-like" exposure to alcohol during that same time frame to determine if such an exposure, limited in time but of a high concentration, would produce similar effects and if so, to determine if any temporal windows of vulnerability could be correlated with known developmental events associated with myelination. Rat pups were artificially reared from postnatal days (P) 4-11. Control animals were provided a gastrostomy-fed artificial diet in 12 daily feedings, given over 20 minutes every 2 hours. Experimental animals were provided the same diet except dietary ethanol (15%v/v) was included in two successive feedings on P9 and P10. Blood alcohol concentrations following such an exposure averaged 392 mg/dl. Optic nerve tissues from animals at P15 & P20 were prepared for light and electron microscopic study. Brain weight was decreased by

approximately 10 percent at P15 and approximately 5 percent at P20. The following effects were present in optic nerve of alcohol-exposed animals compared to control animals at P15: the cross-sectional area of the nerve was reduced by approximately 15 percent; the myelin was thinner at larger axon diameters, based on regression line analysis; and, the overall ratio of myelin thickness to axon diameter was reduced. The number of myelinated axons per unit area, axon diameters, and the number of glial cell nuclei per cross section were unaffected by the alcohol exposure. There was a subtle trend toward the same effects at P20 but the differences were generally not statistically significant. Thus, even a relatively limited "binge-like" ethanol exposure on P9 and P10 in the rat can cause effects on myelin acquisition and maturation in optic nerve similar to, but more subtle, than those from a more chronic third trimester equivalency exposure.