Developmental Neurotoxicity of Artificial Sweeteners and Ethanol in Danio rerio Embryos

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Over 70 countries approve the consumption of artificial sweeteners (Ogungbemi et al., 2019). People, including pregnant women, consume them to substitute sugar in drinks such as diet soda (Petre, 2019). Moderately drinking alcohol during pregnancy has been deemed safe by medical professionals (Uscher, 2012). One study revealed that adding a diet drink (with artificial sweetener instead of sugar) to your alcohol drink leads to a dramatic spike in alcohol levels in the bloodstream (Hitti, 2006). Therefore, one can raise questions about pregnant women drinking alcoholic drinks with artificial sweeteners. Zebrafish studies expose embryos to artificial sweeteners or ethanol, but a gap in the literature exists for studies that combine artificial sweeteners and ethanol exposure. In this study, zebrafish embryos were exposed to ethanol, saccharin, and a combination of both (simulating a diet alcoholic beverage). Heart rate, embryonic development, and spontaneous tail coiling activity were analyzed. STC in zebrafish embryos is an emerging indicator for neurotoxicity (Zindler et al., 2019). In this study, results show that exposing zebrafish embryos to a combination of artificial sweeteners such as saccharin and ethanol can have detrimental effects on their development, including altered STC, which may indicate neurotoxicity. In this study, zebrafish embryos in the saccharin-ethanol combination group demonstrated abnormal heart rates, abnormal STC activity, lordosis, cardiac edema, cerebral hemorrhage, and behaviors associated with stress. Although the zebrafish embryos were exposed to minimal doses, the effects were still more severe in saccharin-ethanol embryos than in the other groups, suggesting pregnant women should avoid artificial sweeteners and ethanol altogether.

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