Effects of Sublethal Methylmercury on Hippocampus and Telencephalon Volume of Zebra Finches

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Methylmercury (MeHg) is a neuro-toxicant that disrupts neural processes and neurogenesis of animals in terrestrial and aquatic ecosystems at sublethal levels. Recent studies using zebra finches (Taeniopygia castanotis) as model songbirds found that those exposed to MeHg their entire lives performed worse on spatial cognition tasks. However, the neural mechanism for this deficit is yet unknown. By measuring the volumes of the telencephalon and hippocampus, important spatial learning and memory consolidation regions of the brain, I aimed to understand the effects of MeHg on the songbird neuroanatomy. I predicted that mercury-exposed zebra finches would have a larger telencephalon volume due to mercury-induced inflammation and a smaller hippocampus volume due to mitochondrial-dependent apoptosis. The sample consisted of 22 female birds, 12 controls, and 10 exposed to dietary MeHg their entire life, including in ovo. Zebra finch tissues (collected and fixed prior to my experiment) were sectioned coronally at 30µm using a cryostat, wet mounted onto slides, and stained with nissl to be scanned onto a computer. Afterward, the telencephalon and hippocampal area of each brain tissue were measured using QuPath. Data were analyzed using a linear mixed effects model with treatment as a fixed effect and the sectioner as a random effect. Contrary to our prediction, telencephalon volumes of control birds were greater than the volumes of MeHg birds by about 14.979 mm3, although this difference was not statistically significant (p=0.587). Furthermore, there was no statistical difference in the hippocampus volume of the controls and MeHg-exposed birds in the study (p=0.802). Further study is necessary to understand the effects of lifelong methylmercury exposure in songbirds.