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The interactions between selenium and methyl mercury in rat tissues

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Methyl mercury (MeHg) is a neurotoxin that is prevalent in marine ecosystems worldwide. Deleterious effects to humans from MeHg exposure include loss of neurons, microcavitation, edema in the cerebral cortex and death. The fetal brain is particularly vulnerable, as MeHg crosses the placental barrier. There is evidence that dietary selenium plays a protective role against the toxicity of MeHg. Epidemiologists can study the health risks of MeHg and Se by using the nail as an index of exposure. In this study, instrumental neutron activation analysis was used to measure levels of Se and Hg in a rat model to determine how the interactions between Se and MeHg affect the nail as a biological monitor. Groups (n=24) of male weanling Long Evans rats were fed diets of deficient, adequate or enriched levels of Se. These groups were then subdivided into 3 groups of 8 and fed diets with either no MeHg, low levels of MeHg or high levels of MeHg. The rats were terminated and the brain, kidney, liver, pituitary gland, testes and nail were collected. The samples were freeze dried, weighed and sealed into quartz vials. The samples, quality controls and standards were irradiated at a neutron flux of ca. 5×10^{13} $n\cdot cm^{-2}\cdot s^{-1}$ for 50 hours at the University of Missouri Research Reactor and were allowed to decay for several days. The reactions involved were ^{202}Hg (n,γ) ^{203}Hg and ^{74}Se (n,γ) ^{75}Se. Samples were counted using an automated sample changer with an HPGe detector, and peak areas were determined interactively with Genie ESP spectroscopy software. Ultimately, we hope to correlate the tissue and nail studies to ascertain if the nail is an accurate biomarker for measuring MeHg and Se exposure in various tissues.