Project: Sublethal Effects of Insecticide on Salamanders

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Overview: Imidacloprid is an insecticide that is currently being widely applied to hemlock (*Tsuga* spp.) stands in the eastern United States to reduce mortality caused by the exotic invasive insect hemlock woolly adelgid (*Adelges tsugae*). While this management strategy has proven to be effective for hemlock conservation, few studies have examined non-target effects of applying imidacloprid in hemlock systems. Our project is investigating potential sublethal effects on stream salamanders of a real world imidacloprid application program in the National Parks of Southern West Virginia, USA. Specifically, we are seeking to understand if stress hormone levels (i.e., corticosterone level) for Northern Dusky Salamanders (*Desmognathus fuscus*) and Seal Salamanders (*Desmognathus monticola*) are correlated with presence and concentration of imidacloprid. Corticosterone (CORT) is a hormone released in response to unexpected stimuli to maintain homeostasis. The CORT-fitness hypothesis predicts that lower baseline levels of CORT indicate a healthier animal. Thus, we would expect that if exposure to imidacloprid in real world concentrations negatively affects salamander health, this would be detectable as higher baseline levels of CORT.

Update: All field work was completed in 2017. We collected CORT samples from 121 Northern Dusky Salamanders and Seal Salamanders, sampling treated and untreated sections of 7 streams. Corticosterone levels were quantified by the Endocrine Technologies Core Team at the Oregon National Primate Research Center, Beaverton, Oregon, USA. Imidacloprid concentration at sampling sites was initially quantified using gas chromatography-mass spectrometry (GC-MS). We found low imidacloprid concentrations in most treated streams, and are currently analyzing the samples using liquid chromatography-mass spectrometry (LC-MS), which has a lower limit of detection and quantification. We performed initial analyses on the CORT data to determine if species, sex, size, and time of day had a significant influence of CORT level. For these variables, only size of individual had a significant effect. We intend to complete final analyses for the project in spring 2019.