Survey of Total and Methyl Mercury Content in Earthworms and Soils Collected from the South River (Virginia USA) Floodplain

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Summary:

Mercury was released from an industrial point source located in Waynesboro, Virginia between 1929 and 1950 and entered into the ecosystem of the South River. We conducted a survey to evaluate the relationship between total mercury (THg) and methyl mercury (MeHg) concentrations in paired earthworm and soil samples and to understand the extent to which mercury may bioaccumulate in earthworms.

Twelve vegetated, relatively undisturbed locations were selected along the South River floodplain. These locations included a control that was 1.6 km upstream from the industrial point source and eleven other sampling locations between Waynesboro, VA and the confluence with the North River forming the South Fork of the Shenandoah River at Port Republic, VA. The confluence is about 40 km downstream of the source. In fall 2006, 10x10m plots were established at each of the twelve locations and subdivided into 100 1x1m quadrats; five were randomly selected for sampling. A surface layer 50-cm deep was excavated at each quadrat to collect a minimum of 30 individual earthworms. The earthworms were rinsed with DI water and a sub-sample of at least 12 earthworms from three quadrats was frozen undepurated. Furthermore, earthworms from all five quadrats were first depurated for 24 hours in a container with moist filter paper and then frozen. Additionally, a representative soil sample was collected from the surface layer at each quadrat from which earthworms were collected. Earthworm and soil samples were analyzed for THg, MeHg, and moisture content.

THg concentrations measured in the earthworm samples ranged from about 10% to less than 60% of that measured in paired soil samples and were correlated ($R^2 = 0.72$) with THg measured in the soil samples. In contrast, MeHg was 15 to 70 times greater in earthworm samples compared to that measured in paired soil samples but were not as well correlated with MeHg in soil samples ($R^2 = 0.42$). The survey demonstrated that THg and MeHg concentrations are highly variable among quadrats within a location for

both soils and earthworm samples. It also demonstrated that MeHg occurred in earthworms collected from floodplain soils at a higher concentration than that measured in soil from which they were collected. THg concentrations in earthworms, however, were lower than that measured in the soil.