How the environment reacts to heavy metals excedents and the measures taken to st...

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Heavy metals are introduced into the environment from many different point sources, such as agricultural runoff or refining of ores. These metals are non-essential and can be toxic to many invertebrate species (Handy 1994). Fish ingest these heavy metals through their gills, skin, and by their main sources of food. To assess the contamination within a man made lake this study evaluated heavy metals, lead and cadmium, in freshwater Tilapia nilocita. The purpose of this study was to evaluate the reliability of Tilapia nilocita as an indicator of heavy metal contamination, and to identify the contributing factors to accumulation in freshwater Tilapia nilocita.

Fifty specimens were taken from the High Dam Lake, Khor Kalabsha Egypt. All of the fishes collected were classified by age: 1, 1. 5, 2, 2. 5, and 3. Sediment and flora samples were taken from the lakebed, in order to analyze their contributions to the overall contamination. Water samples were also collected from the area where fish were collected, to further analyze for heavy metal.

The High Dam Lake area is a newly man made dam in Egypt where little commerce takes place. Shipping does not play a significant roll in contributing lead to the lake system. However there are sailing vessels and fishing boats that use leaded gasoline, which contributes to lead contamination (Rashed 1999). Fish collected from the High Dam Lake serve as a baseline for comparison to the more commercialized T. nilocita of the Nile River.

Bioaccumulation of lead occurs mainly in the scales and spinal column, but can be processed out over time (figure 2). It was found that lead

accumulation in the processing organs is not as significant. The Gills, liver, intestine, stomach, and muscles are less affected over time by heavy metals. The same holds true when compared to the tilapia from the Nile River. Lead levels from the Nile River tilapia are noticeably higher, but still accumulate in the same main regions. Furthermore, the accumulation of lead in the edible part of the fish, muscle, from both areas remains well below the standard for human consumption (2. 62 ppm).

Bioaccumulation of cadmium occurs mainly on the gills, spinal column, and the scales. Also the accumulation of cadmium is highest in the 3 yr. age fishes (figure 4). Analysis shows that the amount of cadmium and lead on the gill positively correlates with fish age. The average level of Cd in the edible part of the fish, from both sites, fell well below the standard for human consumption (1. 85 ppm).

Rashed concludes that T. nilocita can be used as a good indicator of lead and cadmium pollution, and the main source of lead accumulation comes from plants within the lake bed sediment. In figure 1, the average total amount of lead in the fish is greater than the average total amount of cadmium. This is due to the high concentration of lead in the soil which leads to higher concentrations in the lakebed plant, Najas arameta: T. nilocita main food source (figure 3). The accumulation of lead in the soil at High Dam Lake is caused by natural processes, and not by industry or commerce. In comparison the tilapia from the highly industrialized Nile River, have higher levels of lead and cadmium because of increased concentrations in the water, coupled with their food sources. While their results showed a safe

level for human consumption in both areas, T. nilocita prove to be a viable indicator for heavy metal pollution in river or lake ecosystems.

Two main ideas can be pulled from this article and explored in our own lead research; how do we handle lead sampling and precautions, and the way lead accumulates throughout the body. Exploring these two overarching ideas will help us be more apt to clean accurate samples and analyze the trends behind lead accumulation. Also, this article addresses many viewpoints of lead contamination that we must take into account when beginning to understand lead.

Lead enters into an ecosystem in various ways, naturally and man made. While lead can take many pathways into an ecosystem, the natural ones are often glanced over. We need to pay attention to the manmade pathways, such as leaded gas, mining, refining, and also the natural geography of the surrounding areas. Rashed takes into account the naturally high levels of Pb and Cd in the soils of High Dam Lake by saying " Cadmium and lead inter the High Dam Lake naturally as a result of weathering products of Nubian granite, Wadi alluvium, granodorite, and Nubian sandstone..." They also do research into the amount of lead put into the water from fishing boats and vessels.

We can also use their sampling procedure to help increase our accuracy of lead levels. After the fish were caught, they sent them back to the lab via icebox, and then soil, water, and plant samples were taken from the same area. All of the sample containers were previously washed and were free of

significant Pb and Cd levels. Once back at the lab, all samples were washed with tap and bidistilled water, which had been tested for Pb and Cd levels before use. They also took triplicates of each portion of tissue they were testing, to ensure accuracy on each sample. Finally, in order to get continuous data “ Cadmium and lead concentrations were measured in all samples using Pye Unicum Atomic Absorption Spectrophotometer and Cd and Pb hollow cathode lamps and air-acetylene flame.” Using a spectrometer will give us more accurate, and continuous data than simple reaction strips.

Furthermore, we must understand the pathways that lead enters the body, and the contributing factors to that accumulation. Lead accumulation is more substantial in the earlier stages of tilapia life, accumulating primarily on the gills and in the column. This is due to newly forming bones that accept the lead ions through cation exchange with calcium. Accumulation is also compounded by prolonged exposure in early life. Lead accumulation on the gills comes from the constant movement of lead contaminated water around the gills, but it can be processed out over time (figure 2.)

In conclusion, in order to better our understanding and study of lead, we must take into account various sources of lead, sampling procedure, and accumulation patterns. By doing this our results will be accurate, presentable and well supported.