

**MERCURY IN SEDIMENT, FISH AND HAIR:
AN ECOSYSTEM STUDY OF BIOACCUMULATION OF
MERCURY IN MEXICO**

by

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ABSTRACT

High mercury levels have been previously documented in a species of fish historically relied upon by subsistence-fishing communities around Lake Chapala in Mexico. Consumption of seafood in other parts of the world has been scientifically linked to high mercury levels in humans, and this has in turn been tied to neurotoxicity, particularly in infants. With the goal of determining whether members of the subsistence-fishing communities around Lake Chapala are accumulating body burdens of mercury that could place infants at risk, hair samples were obtained from 94 women of child-bearing age residing in communities located on the north, west and southern shores of Lake Chapala. The 2 cm of hair proximal to the scalp was analyzed to determine total mercury sequestered to the hair within the previous 60-90 days. An additional sixteen 1 cm segments were subsequently analyzed from selected remaining samples in order to draw conclusions on the temporal measure of mercury in hair as a proxy for body burden and its possible connection to variations in the diet of those individuals.

Samples of carp (*Cyprinus carpio*), tilapia (*Oreochromis spp.*), and whitefish (*Chirostoma spp.*, also locally known as Charal)—the three types of fish most often consumed by the local population—were also obtained and analyzed for total mercury content in order to investigate the variation in mercury present in muscle tissue of these fish. Overall mean total mercury ranged from 0.040 ppm in tilapia to 0.107 ppm in whitefish to 0.862 ppm in carp. However, the total mercury found in muscle tissue of carp ranged from 0.251 ppm in the lowest-level individual to 2.387 ppm in the individual with the highest levels. These results point to a need for more investigation into the species of carp present in Lake Chapala, specifically into their feeding and breeding habits. The higher than expected total mercury content in the muscle tissue of whitefish also invites further investigation.

Bioaccumulation of mercury present in sediments and/or the water column upward through the food chain would seem to be the main source for total mercury present in the muscle tissue of fish. To test this hypothesis, two sediment cores and four samples of suspended particles present in the water column were collected and analyzed. The sediment cores were sectioned into 2 cm portions, and then subjected to mercury analysis as well as to analysis for radionuclides. Total mercury concentrations appeared

to show sediment deposition dating to recognized historical background levels in the lowest section of one of the two cores, and the presence of Be-7 in the presence of the top (0-2 cm) section of one core confirmed recent sediment deposition. Eleven samples of suspended particles were taken from the lake, the first near the mouth of the Rio Lerma and the other three at increasing distances from that point. Decreasing total mercury concentration with distance from the mouth of the Rio Lerma indicates hydrologic transport of mercury. Further investigation is necessary to determine whether this is point-source deposition along the Rio Lerma and its tributaries, or atmospheric deposition within the Lerma watershed which is communicated to the river through precipitation.