



Mercury diffusion in fish of the Hg mining district of Monte Amiata (Southern Tuscany, Italy)

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Mercury (Hg) is a heavy metal of environmental concern as it is highly toxic to living organisms. The most toxic Hg compound is methyl-mercury (MeHg), which is a neurotoxin that biomagnifies in the food chain. Fish greatly accumulate MeHg, thus representing the dominant pathway of Hg to humans that consume fish. Human poisoning by MeHg is known as “Minamata disease”, as result of one of the world most important event of human mass poisoning that occurred in 1956 in the Minamata Bay and Niigata regions (Japan). Fish contamination by Hg has been reported in abandoned mining area (e.g. Gray et al., 2000) where inorganic form of Hg (e.g., cinnabar and elemental Hg) can be converted to organic ones (e.g., MeHg). Because of the risk of Hg entering the human food chain, the USEPA established a consumption advisory for Hg in fish muscle of 0.3 wet weight (w/w) (USEPA, 2001).

This study focuses on the Italian Hg district of Monte Amiata, which represents one of the world largest Hg resources. About 102,000 t were produced between 1850s-1980s, ranking it as the 4th largest Hg producing district worldwide. At present, no studies have been carried out on Hg diffusion through the biota, in particular in fish. The main aim of this work is to determine Hg diffusion in fish living in the Paglia River, which drains the east side of the Hg district and particularly the mining area of Abbadia San Salvatore, in order to evaluate the potential risk for human people living in the surroundings, eventually consuming fish.

A total of 16 fish were caught at two sites on the Paglia River and included two different fish species, roaches (*Chondrostoma genei*) and barbells (*Barbus plebejus*). Fish were caught by angling technique and kept frozen until analysis. Because of their small size (ranging from 8 to 15 cm, fork length) and weight (from 6 to 46 g), they were analyzed as a whole fish following the EPA Method 7473. Analyses were conducted by Battelle Marine Sciences Laboratories (Washington, USA).

High Hg concentrations were found in fish (0.17-0.77 $\mu\text{g/g}$, w/w), but no significant Hg differences were observed between barbells and roaches. Higher Hg concentration are found in fish coming from the site located closer to the Hg mine of Abbadia San Salvatore, testifying this site as an important source of Hg to the environment. As more than 90% of Hg in fish tissue is present in the form of MeHg (Becker and Bigham, 1995), the USEPA defines the consumption advisory of 0.3 $\mu\text{g/g}$ (w/w) for Hg in fish muscle. As only whole fish Hg concentrations were determined in this study, the comparison between the USEPA advisory and the Paglia River fish is not direct and further investigations are needed.

Preliminary analyses made in this study show that fish coming from the Paglia River are polluted by Hg, thus attesting the transference of the heavy metal from the environment to the biota in the Amiata area. Studies are in progress to further access the potential MeHg contamination of fish in the Paglia River ecosystem and its bioavailability to humans living in this area.

References

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