

Response to Comment on "Sources and Variations of Mercury in Tuna"

Dr. Aucott's comment on our paper can be summarized in three points. He agrees with us that anthropogenic mercury emissions, particularly from eastern Asia, have increased between 1971 and 1998. But he argues that the region around Hawaii is an exception and not significantly affected by mercury pollution. Hence our finding of no increase in the methylmercury concentration in tuna caught from that region during that period cannot be used as evidence against a surface source for methylmercury or that mercury in tuna is not responding to mercury pollution.

Unfortunately, we have to disagree with Dr. Aucott that rising mercury pollution from Asia does not affect the region of our study. The modeling study he cites to support his claim actually shows that the emissions of mercury from Asia reach well into the region around Hawaii where the tuna were caught (see Figure 5c,d of ref 1). (We note also that the region of interest is actually quite large since tuna are known to travel thousands of miles (2)). Mercury emissions from Asia contributed at least 28% to global mercury emissions in 1990 (1) and increased considerably between 1990 and 1995 (3). It is true that most of the particle-bound and reactive Hg emitted in Asia is predicted to deposit locally, with decreasing deposition farther offshore. But in Dastoor and Larocque's model (1) elemental gaseous mercury represents 57% of emissions and is transported globally contributing a significant fraction to wet deposition in the north and equatorial Pacific. While surface currents may bring some surface water from the North American coast to Hawaii, tracer data indicate a general clockwise circulation of the surface North Pacific with most flow trajectories passing Hawaii originating in the West Pacific (4), close to the Asian coast where mercury pollution is high. Dr. Aucott's assumption that surface waters near Hawaii have not been affected by the increase in Asian emissions over the last 30 years is thus not supported by the available data.

Our finding that the concentration of mercury in tuna caught in the region around Hawaii has not changed over a period of time during which anthropogenic mercury inputs to that region have increased supports the idea that the source of methylmercury in tuna is not in surface waters. In freshwater systems, it is thought that mercury is methylated by sulfate reducing bacteria in anoxic waters or sediments. But there are no sulfidic waters near the surface in any open ocean region, and the source of the relatively high concentration of methylmercury measured globally in tuna and other

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open ocean fish is thus mysterious at this point. In our paper, we thus hypothesized that the source of methylmercury in the open oceans may be found in deep waters or sediments. This is a hypothesis worth testing since mercury in marine fish is the major route of mercury exposure for much of the human population. Regardless, the unchanging mercury concentration in tuna caught near Hawaii provides prima facie evidence that this concentration is not responding to anthropogenic emissions irrespective of the mechanisms by which mercury is methylated in the oceans and accumulated in tuna.

Literature Cited

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