

SELENIUM AND MERCURY IN OCEAN

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Protective effects of selenium against mercury toxicity have been demonstrated in all animal models evaluated. Since interactions between selenium and mercury and their molar ratios in seafood are essential factors in evaluating risks associated with dietary mercury exposure, considering mercury content alone is inadequate. In order to evaluate the safety of Hawaii seafood products in regards to the potential mercury hazard, the absolute and molar concentrations of mercury and selenium were determined in edible portions from 2 sets of fish.

The first set was a sample of 420 individual fish representing 15 species of pelagic fish collected from the central North Pacific Ocean near Hawaii. Selenium was in molar excess of mercury in almost all fish species evaluated. The rank order of mean Se:Hg molar ratios was striped marlin (17.6)> yellowfin tuna (14.1)> mahimahi (13.1)> skipjack tuna (12.8)> spearfish (11.4)> wahoo (10.8)> sickle pomfret (6.7)> albacore tuna (5.3)> bigeye tuna (5.2)> blue marlin (4.1)> escolar (2.4)> opah (2.3)> thresher shark (1.5)> swordfish (1.2)> mako shark (0.5). With a Se:Hg molar ratio of less than 1, mako shark was the only fish containing a net molar excess of mercury.

The second set was a sample of 108 individual fish (and shrimp) representing eight important seafood species in Hawaii including 2 species of small pelagic fish, 3 species of deepwater bottomfish, a shoreline species (both wild-caught and farm-raised), and farm-raised tilapia and Pacific white shrimp. Samples were collected from fishermen, farms and the market. Selenium was found in molar excess of mercury in each of the species evaluated. The rank order of mean Se:Hg molar ratios was farm-raised Pacific white shrimp (41.1)> bigeye scad (39.8)> mackerel scad (39.4)> farm-raised Pacific threadfin (32.8)> pink snapper (26.7)> far-raised tilapia (21.6)> Hawaii seabass (8.1)> blue-green snapper (3.3). The relatively high Se:Hg molar ratios resulted in part from low levels of mercury in these species in comparison with the pelagic fish in the first sample set.

The Selenium Health Benefit Value (SeHBV) which is based on the absolute amounts and relative proportions of selenium and mercury in seafood has been proposed as an important seafood safety criterion, one that is far superior to the determination of mercury content in fish alone. Seafoods containing positive SeHBVs provide health-promoting selenium in the diet, while those with negative SeHBVs do not. Each of the Hawaii seafood species evaluated had positive SeHBV with the exception of mako shark.