Estimation of target hazard quotients and potential health risks for metals by consumption of seafood in Taiwan.

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Abstract

The purpose of this paper is to describe the impact of metal pollution on the main seafood and assess the potential health risk from consuming the contaminated seafood in Taiwan. The results of geometric mean (GM) metal concentrations in various seafood showed that the copper, zinc, and arsenic concentrations in oysters were significantly ($p < 0.001$) higher than those in the other seafood by about 1,057, 74.3, and 56.2 times, respectively. The green color found in the oysters was due to high GM copper and zinc concentrations of 909 (ranging from 113-2,805) and 1,293 (ranging from 303-3,593) microg/g dry wt, respectively. In addition, using a maximum consumption rate of 139 g/day of oysters for individuals, calculations yield target hazard quotients (daily intake/reference dose) of below 1 for cadmium and mercury and high values of 1.61, 9. 33, and 1.77 for inorganic arsenic, copper, and zinc in adults, respectively. The various lifetime cancer risks for inorganic arsenic (maximum exposed individuals risk ranging from $9.93 \times 10^{(-6)}$ to $3.11 \times 10^{(-4)}$) might be caused by consuming different seafood in Taiwan. The highest risk estimate for inorganic arsenic was $5.10 \times 10^{(-4)}$ for consumption of oysters by Machu Islands residents. The long-term exposure of metals through consumption of oysters, especially for some high-risk groups, could be dangerous. Taking inorganic arsenic for example, a $10^{(-6)}$ upper limit on lifetime risk as the health protection standard would require maximum oyster residue levels of approximately 0.0076-0.056 microg/g wet wt, for consumption rates of 139-18.6 g/d. In the light of known risks to public health, the government should issue an immediate warning to the public to refrain from eating all seafood harvested from the Taiwan coastal areas, especially the Hsiangshan area and the Machu Islands.