Mercury in seafood: Tempest in a tuna tin?

The element mercury has long captured people's imaginations. A silvery liquid at room temperature, this heavy metal has historically enjoyed an exalted status that belies its potent toxicity.

Mercury comes from a range of natural sources such as volcanoes, soils, undersea vents, mercury-rich geological zones, and forest fires, as well as from freshwater lakes, rivers, and oceans.[1] However, human activity has also increased the amount of mercury in the environment in several ways, including through combustion and industrial processes like coal-fired power generation, metal mining and smelting, and waste incineration.[1] The main source of anthropogenic mercury emissions is coal-fired power plants, which accounts for a quarter of total mercury emissions.[2]

Health Canada calls mercury a global contaminant because of its toxicity and because of its inability to break down in the environment.[1] Mercury can also change from one form to another in the environment.[1] It is particularly a concern when it exists in the form of methyl mercury, which rapidly enters body tissues and causes various health problems, particularly neurological problems.[2] This form of mercury tends to accumulate in body tissues and thus accumulates (biomagnifies) as it travels up the food chain. Mercury is of particular concern to pregnant women and young children because it has deleterious effects on a developing nervous system.[3]

Methyl mercury tends to accumulate to some degree in all fish, but especially in predatory fish such as shark, swordfish, and certain species of tuna.[1] The current Canadian standard is 0.5 ppm of total mercury in commercially sold fish, except for shark, swordfish, of fresh/frozen tuna.[3] In the United States the limits on mercury are more permissive, 1.0 ppm.

As predatory freshwater fish may also have elevated methyl mercury levels, sport fishing is also impacted.

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Although advisories exist to warn fishers when mercury in wild fish is expected to be problematic, occasionally cases occur of mercury poisoning when large amounts of contaminated fish are eaten.[4]

Canned tuna contains relatively low levels of mercury compared with other varieties of fish (personal communication with R. Copes, 2015). Canned tuna tends to contain younger, smaller fish that have had less opportunity to accumulate mercury. Currently Health Canada cautions consumers only about canned albacore (white) tuna.[5]

Concerns have been raised in the past when it has been discovered that some commercially available canned tuna has exceeded the 0.5 ppm limit.[6] This has prompted questions about the adequacy of federal monitoring and a call for further cautions to be applied to the consumption of seafood previously deemed to be safe—canned tuna in particular.

The nutritional benefits of fish consumption are well known. Fish is an excellent source of protein, and the projected cardiovascular benefits of omega fatty acids are thought to outweigh the risks of low levels of mercury.[7,8] Widely publicized mercury warnings may have had unintended consequences. In the United States, government cautions about mercury in albacore tuna were followed by a 15% reduction in all tuna consumption.[8]

Are we deterring people from enjoying an affordable and excellent nutritional resource? Even for albacore tuna the levels of mercury are very low. The US FDA monitoring program from 1990 to 2010 typically found mercury levels well below 0.5 ppm, rarely slightly above, and never over 1.0 ppm.[9]

Similar intensity in monitoring does not exist in Canada, but such data could reassure consumers about the safety of their food supply and encourage the public to avail themselves of a nutritional option that conveys much more benefit than risk. Precautionary approaches fill an information gap in a way that could be counterproductive.

A measure that is currently lacking, however, is mandatory case reporting of high mercury levels. Abnormally high blood lead readings, for example, are, by law, reportable to health authorities. This has allowed much better source identification and public protection. A similar status for elevated blood mercury would further enable government authorities to reduce the risk of mercury poisoning by more rapid identification of problem species or regions.

In a world full of real risks and perceived risks, we will need to thread our way between environmental hazards and clear benefits. More surveillance of food safety and increased ability to discover harmful effects will help us in this effort.

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a dose-response fashion.

Our own data demonstrate that compliance with recommended processes of care cannot be assumed. It is essential to develop an effective measurement strategy, one that sets targets, measures compliance, and uses data to drive further improvement. In particular, comparison of the processes of care that contributed to outcomes can provide insight into causal relationships that undermine desired outcomes; this can inform further improvement cycles.

Significant and unresolved barriers to implementing large-scale, evidence-based recommendations remain, such as perceived threats to clinical autonomy, the cost of continuous process and outcome measurement, a lack of infrastructure, and the effort to find good evidence, develop actionable processes of care based on that evidence, and bring those processes to the bedside.

Ultimately none of these issues is an adequate reason for not trying; good outcomes are not accidental, they are the result of engagement, clear focus, sustained effort, measurement, and shared accountability. It is clear that efforts under the banner of Enhanced Recovery have and will continue to promote a call to action by clinicians and patients alike through collaboration.

To learn more about the BC ERAS Collaborative, please visit www.enhancedrecoverybc.ca.

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