

Healthy, Sustainable Seafood: A Study of Mercury in Shrimp

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Background

Mercury is a highly toxic element that can impair brain development in children, and affect cognition, hearing, vision, and muscle coordination in adults. Many watersheds in the Northeast have relatively high mercury concentrations for the US, because the region is downwind of major pollution sources.

Mercury is especially active in aquatic environments, so people are exposed to mercury primarily through the consumption of fish. Shrimp, the most popular seafood in the United States, is often touted as a “low-mercury” seafood choice, although available information is not specific to Maine’s native shrimp species.

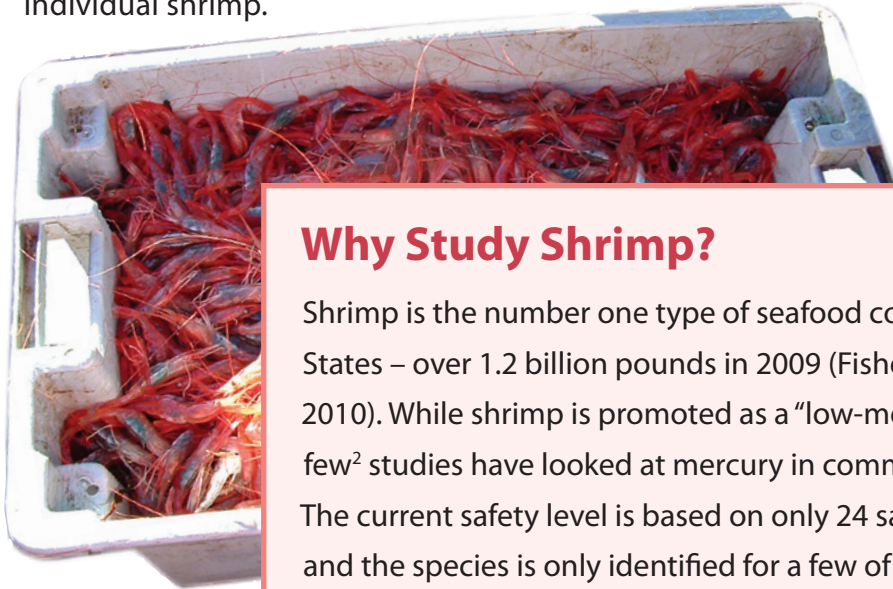
This study intended to answer two questions:

Are shrimp truly a low-mercury food? Does it matter where the shrimp come from?



Methods

We purchased three types of frozen, headless shrimp from a Maine supermarket: Maine Northern shrimp (*Pandalus borealis*), Louisiana brown shrimp (*Farfantepenaeus aztecus*), and Thailand tiger shrimp (*Penaeus monodon*). After lab tests confirmed that shrimp had similar concentrations of mercury along the whole length of the edible part¹ of their bodies, a section of shrimp meat was analyzed in the University of Maine's Sawyer Environmental Chemistry Research Laboratory to determine total mercury concentration in each individual shrimp.



Why Study Shrimp?

Shrimp is the number one type of seafood consumed in the United States – over 1.2 billion pounds in 2009 (Fisheries Statistics Division 2010). While shrimp is promoted as a “low-mercury” seafood choice, few² studies have looked at mercury in commercially available shrimp. The current safety level is based on only 24 samples from the 1990s³, and the species is only identified for a few of those samples⁴, even though several different species of shrimp are available to consumers. Most shrimp consumed in the US is imported from farms in Asia, but Maine has its own wild shrimp fishery, for *Pandalus borealis* or Northern shrimp. This is a small but sustainable fishery that employs fishermen in the winter months. Maine shrimp are typically available fresh from December through April and frozen year-round.



1. Some people do cook and/or consume shrimp whole with the shell, however we analyzed them headless and without shells, as most consumers prepare them.

2. One study found that shrimp do accumulate mercury rapidly when they are in a high mercury environment (Palmer and Presley 1993); another study in New Jersey (which did not say which species/origin shrimp they used) found low-mercury in shrimp and noted that bigger shrimp tended to have less mercury (Burger et al. 2005). We are not aware of any studies that determined mercury in commercially available Maine wild-caught shrimp.

3. <http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FoodbornePathogensContaminants/Methylmercury/ucm115644.htm>

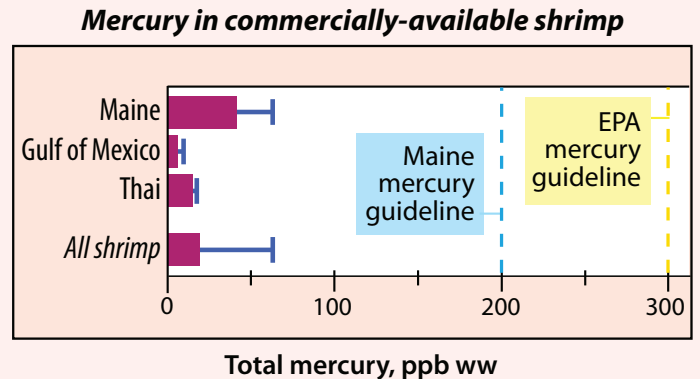
4. <http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FoodbornePathogensContaminants/Methylmercury/ucm191007.htm>

Average and maximum mercury concentrations in shrimp and other seafood

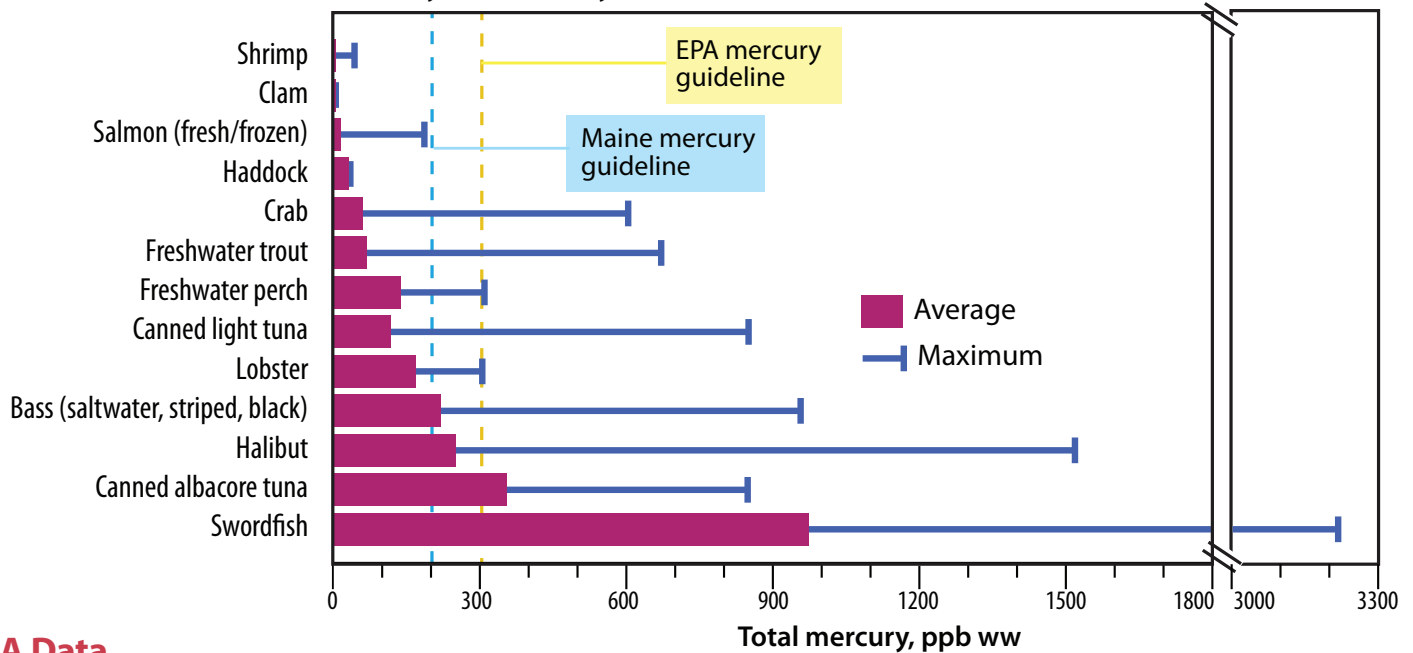
This Study

All samples were very low in mercury, in agreement with the existing FDA data.

Mercury in shrimp for all samples taken together (“All shrimp” bar) averaged 21 ppb, ww (parts per billion, wet weight). The range of values in our study was 4 – 66 ppb, ww. Although there were statistically significant differences among the three types of shrimp we studied, these differences are not meaningful for human consumption because the levels of mercury are so low. The differences among the types of shrimp raise interesting research questions, such as, Does shrimp size matter? What is the difference between farm raised and wild shrimp?



Mercury in commonly-eaten seafood (FDA data)



FDA Data

The **Maine Center for Disease Control and Prevention** and the **Environmental Protection Agency** set limits on the level of mercury in fish that is considered safe to eat. Maine’s guideline is stricter, to protect sensitive populations like children and pregnant women. The average mercury concentration in shrimp in this study (21 ppb) is 10 times lower than Maine’s fish tissue action level of 200 ppb. Even the one shrimp with the highest mercury concentration (66 ppb) still had three times less mercury than Maine’s action level. By comparison, EPA recently found that approximately half of the freshwater fish sampled from 76,559 lakes across the US had mercury concentrations that exceeded the EPA’s recommended safety level of 300 ppb (US EPA 2009).

References

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- Fisheries Statistics Division. 2010. *Fisheries of the United States 2009*. Silver Spring, MD: National Marine Fisheries Service. <http://www.st.nmfs.noaa.gov/st1/fus/fus09/index.html>
- Palmer, S.J., B.J. Presley. 1993. Mercury bioaccumulation by shrimp (*Penaeus aztecus*) transplanted to Lavaca Bay, Texas. *Marine Pollution Bulletin* 26:564-566.
- US EPA. 2009. *The National Study of Chemical Residues in Lake Fish Tissue*, EPA-823-R-09-006. Washington, DC: US Environmental Protection Agency Office of Water.

Conclusion

Balancing safety, nutritional value, affordability, and environmental concerns when making food decisions is challenging for many Maine families. This study provided more data to support the assertion that people who are concerned about mercury should feel comfortable eating shrimp, including Maine shrimp. Shrimp are a low-fat, healthy protein source, and Maine shrimp are a local, affordable, and sustainably managed seafood choice.

Maine Safe Eating Guidelines

According to the Maine Department of Environmental Protection, mercury levels in Maine fish, loons, and eagles are among the highest in North America. This has led the Maine Center for Disease Control and Prevention to issue a statewide advisory recommending that pregnant women, women of childbearing age, and young children limit their fish consumption based on the type of fish they consume. The advisories have been in place since 1994 and remain in effect today because mercury levels in fish have not decreased. Currently 49 states, including Maine, have fish consumption advisories due to mercury contamination. <http://www.maine.gov/dep/mercury/>

The Maine Safe Eating Guidelines set fish consumption limits to protect everyone. <http://www.maine.gov/dhhs/eohp/fish>

The Maine Family Fish Guide: Advice from the Maine Center for Disease Control and Prevention
Fish: 2 Meals a Week for Good Health
for pregnant women, children, and adults

Buy **Cook**
Catch **Eat Out**

Why are Omega 3 fish oils important? Omega 3 fish oils are "brain food" for babies in the womb and babies who are nursing. These oils also help protect adults from heart attack deaths. Fish is also a great source of protein, zinc and iron and is low in saturated fat.
Most farm raised fish are safe to eat. See page 9. For farm raised salmon, see page 10.

Healthy Fish for Pregnant Women and Families
Eat 2 Meals a Week of Different Fish

Mercury and high in Omega 3 fish oils
Smelt Atlantic Mackerel

Fish low in mercury
Light Canned Tuna Clams and Scallops Haddock, Hake, Cod and Pollock
Lobster Flounder and Sole Imitation Crab and Lobster Shrimp

Eat These Fish!
may get pregnant or a child under 8
• King Mackerel • Tilefish
2 meals a month of these 4 fish

1-866-292-3474

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