

Seafood Risk Assessment: What does safe seafood mean?

In light of the recent oil spill, a lot of attention around the nation has focused on safe seafood. Seafood sensory teams are detecting if seafood is tainted, but what does this mean? Here is an overview of the actual factors the U.S. Food and Drug Administration (USFDA) use to determine safe seafood.

Potential Health Risk:

Petroleum oils contain compounds that can be considered hazardous to human health, specifically polycyclic aromatic hydrocarbons (PAH). Studies have shown several of these PAHs in petroleum oil to be probable human carcinogens, or cancer causing agents, from lifetime exposure studies. It is this cancer risk that is the potential health risk.

USFDA uses these known thresholds of exposure to PAHs as guidelines for seafood taint. Specifically, the PAH benzo[a]pyrene (BaP) is used for detection. BaP is used because of the amount of toxicity data available, and it is the standard. Other PAHs are compared to the known level of the standard to create an equivalent concentration. Through long calculations, all the PAH risks are considered, using the known BaP concentrations.

However, it is not as simple as taking the known cancer threshold and applying it to the level of PAHs in the seafood. The detection threshold is based on lifetime exposure, so exposure time becomes a component. Therefore, it becomes a case by case basis of contamination, requiring the USFDA to evaluate each contamination event. In other words, the USFDA cannot simply use the levels determined safe after the *Exxon Valdez* oil spill as many of the factors are different.

Calculating the risk:

Six major factors are taken into consideration to determine the exposure and threat to human health. These are:

1. Acceptable Risk Level (RL): The maximum level of carcinogenic risk versus the average risk of cancer in a population.
2. Body Weight (BW): The body weight of the average individual consumer
3. Average Time (AT): The average length of a human lifetime
4. BAP Cancer Slope Factor (SF): Using known toxicity studies, what amount of BaP, per weight of human, per day is a conservative cancer risk
5. Exposure Duration (ED): How long is the carcinogen a risk, or what is the duration of the spill event.
6. Seafood Consumption Rate (CR): The quantity of seafood the average individual consumes per day.

These six factors vary based on the individual population being affected. Coastal Louisiana residents will mostly likely consume much more Louisiana seafood than an average individual in a northern state. The duration of the Deepwater Horizon spill is different from a small localized spill that lasts for two days. All these factors are considered by the USFDA. The risk level also varies by type of seafood, as all types of seafood are not usually consumed at the same rate. Shellfish, crustaceans and finfish each get their own advisory level. For example, after the Exxon Valdez spill, the advisory levels of BaP for subsistence consumers were 3 parts per billion (ppb) for salmon, 5 ppb for finfish, 11 ppb for crustaceans and 120 ppb for bivalve mollusks. Any detection of BaP above this level resulted in the seafood being considered tainted.

-Julie Anderson

Source: Yender, R., J. Michel, and C. Lord. 2002. *Managing Seafood Safety after an Oil Spill*. Seattle: Hazardous Materials Response Division, Office of Response and Restoration, NOAA, 72 pp. A pdf of the report is available at <http://response.restoration.noaa.gov/oilaid/pdfs/seafood2.pdf>

