

# Seafood Safety after the Oil Spill

## How Are Chemical Contamination Levels of Concern Determined?

**Daniel J. Harrington, ScD, CIH**

LSU Health Sciences Center, New Orleans  
School of Public Health

Environmental & Occupational Health Sciences

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# Introduction

- Health Risk Assessment
- Risk Management
- Example Louisiana Seafood Safety Monitoring Report
- Example Calculation of a Level of Concern
- Limitations

# Health Risk Assessment Process

- Hazard Identification
- Dose-Response Assessment
  - Toxicology
  - Extrapolate to levels of human health concern
  - Epidemiological data is sometimes available
- Exposure Assessment
  - What dose of pollutant(s) are people exposed to?
- Risk Characterization

National Academy of Sciences, 1983, *Risk Assessment in the Federal Government: Managing the Process*

# Risk Management

## Incorporates:

- Health Risk Assessment Results
- Politics
- Economics
- Regulations

# Health Risk Assessment for Chemical Contaminants in Seafood

- Hazard Identification and Dose-Response processes for each chemical contaminant of interest can be used for assessing exposure in any environmental media (air, water, soil)
- Our focus today is on the exposure assessment, including:
  - Seafood monitoring data
  - Seafood consumption rates

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Due to the recent oil spill in the Gulf of Mexico, there has been great public concern over the safety of Gulf seafood. The Louisiana departments of Health and Hospitals (DHH), Wildlife and Fisheries (DWF), Environmental Quality (DEQ), and Agriculture and Forestry (DAF) are committed to monitoring Louisiana seafood to ensure it is safe to eat. Officials with these agencies are aggressively pursuing a long-term seafood safety and monitoring plan, as well as ongoing efforts to test seafood and water samples from sources all along the Gulf Coast of Louisiana.

## Louisiana Seafood Safety Surveillance Report

### *Summary*

#### **Summary of Data Collected to Date**

*Of 1221 seafood samples (Figure 1) collected between April 30, 2010 and March 11, 2011 (Table 1), trace levels of polycyclic aromatic hydrocarbons (PAHs) were detected in 698 samples (Table 2). No (0) sample results showed levels of concern (Table 3) meaning that any*

seafood is as safe as possible, while not closing any fishing areas unnecessarily.

NOAA has the authority to close federal waters to fishing, and states have the authority to close waters within their jurisdiction. When necessary, DHH and DWF issue closures of recreational and commercial fishing in state waters based on the best information from field staff and trajectory models from NOAA.

# Concentration Units

What is a mg/kg?

mg: milligram

kg: kilogram

What about ppm?

ppm: parts per million

Fancy type of percentage

1 ppm = 0.0001%

10,000 ppm = 1%

**Table 2. Seafood Sampling Results<sup>1</sup>**

Sample Dates: 4/30/2010- 3/11/2011	No. of samples					Range (mg/kg)	
	Total	NOT Detected	Detected	Above Levels of Concern <sup>2</sup>	Lab Results Pending		
Oysters	754	185	557	0	12	ND-0.057	Hydrocarbon compounds detected include Anthracene, Benzo(a) anthracene, Benzo(b) fluoranthene, Benzo(a) pyrene, Chrysene, Fluorene, Fluoranthene, Indeno(1,2,3-cd) pyrene, Naphthalene, Phenanthrene, and Pyrene.
Shrimp	169	115	54	0	0	ND-0.062	
Crab	93	61	32	0	0	ND-0.014	
Finfish	205	150	55	0	0	ND-0.017	
All seafood	1221	511	698	0	12	ND-0.062	

<sup>1</sup>Includes both baseline and re-opening sampling efforts.

<sup>2</sup>See Table 3.

**Notes:**

ND: Not Detected, or below detection limit

mg/kg: milligram per kilogram

**Table 3. Comparison Values for PAH Compounds**

Compound	Levels of Concern <sup>1</sup> mg/kg		
	Oyster	Shrimp/ Crab	Finfish
Anthracene	2,000	1846	490
Benzo(a)anthracene	1.43	1.32	0.35
Benzo(a)pyrene	0.143	0.132	0.035
Benzo(b)fluoranthene	1.43	1.32	0.35
Benzo(k)fluoranthene	14.3	13.2	3.5
Chrysene	143	132	35
Dibenzo(a,h)anthracene	0.143	0.132	0.035
Fluoranthene	267	246	65
Fluorene	267	246	65
Indeno(1,2,3-CD)pyrene	1.43	1.32	0.35
Naphthalene	133	123	33
Phenanthrene	2,000	1846	490
Pyrene	200	185	49

<sup>1</sup> Protocol for Interpretation and Use of Sensory Testing and Analytical Chemistry Results for Re-opening Oil-impacted Areas Closed to Seafood Harvesting (FDA and NOAA 6/18/2010)

# How were the Levels of Concern Determined?

1. An acceptable level of excess risk was selected:
  - For cancer risk, the level of 1 excess tumor in 100,000 people exposed was selected as the screening risk level
  - For non-cancer risk, an acceptable dose was determined
2. Toxicology data was analyzed to determine the estimated hazard from a pollutant
3. Exposure assessment

# Noncancer Level of Concern

$$\text{LOC} = (\text{RfD})(\text{BW})(\text{CF})/\text{CR}$$

LOC: Level of Concern

RfD: Reference Dose

BW: Body Weight

CF: Conversion Factor

CR: Consumption Rate

# Level of Concern = (RfD)(BW)(CF)/CR

**Reference Dose (RfD):** An estimate of daily human exposure to a chemical that is likely to be without significant risk of adverse effects during a lifetime, in mg/kg/day. Source: USEPA IRIS toxicology database

**Body Weight (BW):** 80 kg. Source: adopted from the most recent CDC National Health Statistics Report

**Conversion Factor (CF):** Unit conversion factor (1000 µg/mg)

**Seafood Consumption Rate (CR):**

shrimp & crab (13 g/day)

oysters (12 g/day)

finfish (49 g/day)

# FDA Seafood Consumption Assumptions

	<b>Meal Sizes</b>	<b>Meal Frequency</b>
<b>Finfish</b>	160 g (5.6 oz)	9.1/month
<b>Oysters</b>	120 g (4.2 oz)	2.9/month
<b>Shrimp/Crab</b>	90 g (3.2 oz)	4.4/month

# Background on FDA Seafood Consumption Assumptions

- Source data: National Health and Nutrition Examination Survey (NHANES)
- Focus on High-level seafood consumers
  - Defined as the 90th percentile from the 2005-2006 NHANES two day recall survey.

# Anthracene Level of Concern

$$\text{Level of Concern} = (\text{RfD})(\text{BW})(\text{CF})/\text{CR}$$

$$\text{LOC} = (0.30 \text{ mg/kg/day} \times 80 \text{ kg} \times 1000 \text{ ug/mg})/13 \text{ g/day}$$

$$\text{LOC} = 1,846 \text{ mg/kg}$$

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# Limitations

- Uncertainty
- Sensitive subpopulations not addressed
- Composite samples, therefore loss of information on variability
- This assessment only estimates risk from chemically contaminated seafood.
- Are these consumption rates relevant in Louisiana?

# Thank you

For follow-up:

Daniel Harrington

[dharr3@LSUHSC.EDU](mailto:dharr3@LSUHSC.EDU)