2014 FDA Testing of Alaska Fish for Fukushima Radiation

Dr. Bob Gerlach – Dept. of Environmental Conservation
Dr. Ali Hamade – Dept. of Health and Social Services

Alaska Forum on the Environment
February 13, 2015
Fukushima Background

- March 2011 – Tsunami and earthquake precipitate a nuclear accident in Fukushima, Japan
- In 2011, state and federal agencies in Alaska issued joint press release indicating safety of wild foods
- Concerns remain of fish contaminated with Fukushima-related radiation
  - Tribal and nontribal concerns over food safety
- DEC and DHSS set up websites to explain radiation monitoring, exposure, and health risk
Insufficient Explanation

Alaskans demanded testing of fish despite signs from other Pacific states and Canada that Alaska water and fish were unlikely to have been affected.

FDA planned to evaluate migratory species of fish: North Pacific Albacore Tuna, Pacific Bluefin Tuna, Pacific Salmon.

Public demanded more from the commercial industry.
**Average Commercial Fishing Harvests 2008-2012**

- **Groundfish** = 4.0 Billion lbs.
- **Shellfish** = 92.6 Million lbs.
- **Dive** = 2.6 Million lbs.
- **Salmon** = 790.7 Million lbs.
- **Herring** = 91.4 Million lbs.
- **Halibut** = 38.4 Million lbs.
Fukushima

- DEC and DHSS initiated an interagency workgroup call with all Pacific states, Canada, federal agencies, tribal agencies, and academics
  - Compile public concerns
  - Compare biota and other media for radionuclides
- Interagency workgroup helped connect with FDA and researchers testing for Fukushima-related radionuclides
Alaska – FDA Project

DEC Division of Environmental Health Fish Monitoring and Food Safety and Sanitation programs worked with FDA and commercial fisheries

• Fish samples collected using FDA statistical protocols
• Composite samples (4 – 10 fish/sample) = 4 lbs
• FDA Standard analytical techniques
Where were samples collected?

Fish were collected from Spring to Fall - over the entire fishing season.
What was measured?

- I-131 (Iodine)
- Cs-134 (Cesium) (Short life – usually indicated fresh release)
- Cs-137 (Cesium) (Long life – can indicate old or fresh release)
- K-40 (Potassium)
Results

- No detections of Fukushima-related radionuclides (I-131, Cs-134, Cs-137)
- Detections of only naturally occurring radionuclide Potassium-40 (K-40)

<table>
<thead>
<tr>
<th>Area</th>
<th>Species</th>
<th>I-131</th>
<th>MDC*</th>
<th>Cs-134</th>
<th>MDC*</th>
<th>Cs-137</th>
<th>MDC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aleutian / Bering Sea</td>
<td>Pollock</td>
<td>ND</td>
<td>3.55</td>
<td>ND</td>
<td>2.12</td>
<td>ND</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td>Halibut</td>
<td>ND</td>
<td>3.00</td>
<td>ND</td>
<td>1.93</td>
<td>ND</td>
<td>1.82</td>
</tr>
<tr>
<td></td>
<td>Pollock</td>
<td>ND</td>
<td>3.86</td>
<td>ND</td>
<td>2.56</td>
<td>ND</td>
<td>1.97</td>
</tr>
<tr>
<td></td>
<td>Pollock</td>
<td>ND</td>
<td>6.13</td>
<td>ND</td>
<td>2.00</td>
<td>ND</td>
<td>2.01</td>
</tr>
<tr>
<td></td>
<td>Cod</td>
<td>ND</td>
<td>3.71</td>
<td>ND</td>
<td>2.42</td>
<td>ND</td>
<td>1.98</td>
</tr>
<tr>
<td>Bristol Bay</td>
<td>Chinook</td>
<td>ND</td>
<td>3.71</td>
<td>ND</td>
<td>2.08</td>
<td>ND</td>
<td>1.88</td>
</tr>
<tr>
<td></td>
<td>Sockeye</td>
<td>ND</td>
<td>3.39</td>
<td>ND</td>
<td>1.92</td>
<td>ND</td>
<td>1.64</td>
</tr>
</tbody>
</table>

*Minimum Detectable Concentrations = analytical detection limits (Bq/kg)*
## Results

<table>
<thead>
<tr>
<th>Area</th>
<th>Species</th>
<th>I-131</th>
<th>MDC*</th>
<th>Cs-134</th>
<th>MDC*</th>
<th>Cs-137</th>
<th>MDC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulf of Alaska</td>
<td>Sablefish</td>
<td>ND</td>
<td>2.11</td>
<td>ND</td>
<td>1.96</td>
<td>ND</td>
<td>1.68</td>
</tr>
<tr>
<td></td>
<td>Sablefish</td>
<td>ND</td>
<td>2.72</td>
<td>ND</td>
<td>2.31</td>
<td>ND</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td>Halibut</td>
<td>ND</td>
<td>2.67</td>
<td>ND</td>
<td>2.13</td>
<td>ND</td>
<td>1.94</td>
</tr>
<tr>
<td></td>
<td>Halibut</td>
<td>ND</td>
<td>2.34</td>
<td>ND</td>
<td>1.75</td>
<td>ND</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>Pollock</td>
<td>ND</td>
<td>3.41</td>
<td>ND</td>
<td>1.88</td>
<td>ND</td>
<td>1.77</td>
</tr>
<tr>
<td></td>
<td>Pollock</td>
<td>ND</td>
<td>5.92</td>
<td>ND</td>
<td>2.07</td>
<td>ND</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>Chum</td>
<td>ND</td>
<td>5.97</td>
<td>ND</td>
<td>2.23</td>
<td>ND</td>
<td>1.76</td>
</tr>
<tr>
<td></td>
<td>Chum</td>
<td>ND</td>
<td>5.29</td>
<td>ND</td>
<td>1.88</td>
<td>ND</td>
<td>1.72</td>
</tr>
<tr>
<td>Southeast</td>
<td>Halibut</td>
<td>ND</td>
<td>3.31</td>
<td>ND</td>
<td>1.81</td>
<td>ND</td>
<td>1.67</td>
</tr>
<tr>
<td></td>
<td>Halibut</td>
<td>ND</td>
<td>6.07</td>
<td>ND</td>
<td>1.94</td>
<td>ND</td>
<td>1.91</td>
</tr>
<tr>
<td></td>
<td>Chinook</td>
<td>ND</td>
<td>5.05</td>
<td>ND</td>
<td>1.8</td>
<td>ND</td>
<td>1.79</td>
</tr>
<tr>
<td></td>
<td>Chum</td>
<td>ND</td>
<td>9.99</td>
<td>ND</td>
<td>1.8</td>
<td>ND</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Pink</td>
<td>ND</td>
<td>10.61</td>
<td>ND</td>
<td>2.08</td>
<td>ND</td>
<td>2.05</td>
</tr>
</tbody>
</table>
Are Alaskan fish safe to eat?

YES!

- No detections of Fukushima-related radionuclides
- Minimum Detectable Concentrations (MDCs = analytical detection limits) are significantly lower than FDA’s Derived Intervention Levels (DILs)
FDA's Derived Intervention Levels (DILs)

Radionuclide Group | DIL (Bq/kg)
--- | ---
Iodine-131 | 170
Cesium-134 + Cesium-137 | 1,200

- FDA’s Derived Intervention Levels (DILs) take into consideration:
  - Percent of food in diet
  - Amount eaten
  - Exposure time
  - Sensitive populations (infants & children)
- DILs are used by the FDA to determine whether a food presents a safety concern.
- FDA uses food-density corrected data to evaluate food safety
Cs-137 and Cs-134 Not Detected

Derived Intervention Level (FDA Level of Concern) 1,200

Not Detected. Average Minimum Detection Concentration 1.9 Bq/kg
What are the risks?

Is the FDA DIL protective of subsistence or upper end fish consumers?

• We assumed
  • 273 pounds (124 Kg) consumption of a variety of fish over a 70-year period
  • Radionuclide level was at the limit of detection of FDA analytical method

• We found
  • Excess cancer risk = 1 - 10 cancers in every 10,000,000 persons exposed (i.e., very low)

There is no appreciable risk to Alaskans’ health from Fukushima-related radionuclides in Alaska Fish
# Marine Mammal Testing
(North Slope Borough + UAF)

<table>
<thead>
<tr>
<th>Analysis Result</th>
<th>Bq/Kg dry weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample</strong></td>
<td></td>
</tr>
<tr>
<td>Ringed Seal</td>
<td>North Slope, AK</td>
</tr>
<tr>
<td></td>
<td>&lt;MDA</td>
</tr>
<tr>
<td></td>
<td>1.07</td>
</tr>
<tr>
<td>Bearded Seal</td>
<td>Little Diomede, AK</td>
</tr>
<tr>
<td></td>
<td>&lt;MDA</td>
</tr>
<tr>
<td></td>
<td>0.99</td>
</tr>
<tr>
<td>Ringed Seal</td>
<td>Point Lay, AK</td>
</tr>
<tr>
<td></td>
<td>&lt;MDA</td>
</tr>
<tr>
<td></td>
<td>0.85</td>
</tr>
<tr>
<td>Ringed Seal</td>
<td>Hooper Bay, AK</td>
</tr>
<tr>
<td></td>
<td>&lt;MDA</td>
</tr>
<tr>
<td></td>
<td>0.55</td>
</tr>
<tr>
<td>Ringed Seal</td>
<td>Shishmaref, AK</td>
</tr>
<tr>
<td></td>
<td>&lt;MDA</td>
</tr>
<tr>
<td></td>
<td>1.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Historical data (1996-97) (Cooper et al., 2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearded Seal</td>
</tr>
<tr>
<td>Ringed Seal</td>
</tr>
<tr>
<td>Spotted Seal</td>
</tr>
</tbody>
</table>

Dasher et al., 2011
What about Water?

Wood’s Hole Crowd Sourcing efforts
• Collect a container of water, ship to California, get radiation test result for water
  • 5 Alaskan locations
    (St Lawrence Is., Kodiak Is., Cook Inlet, Seward, Prince William Sound)
  • Dozens of other locations, mostly from Pacific Coast
• Detection Limits
  • 0.1 Bq/m³ for 137Cs
  • 0.2 Bq/m³ for 134Cs
• EPA maximum acceptable level in drinking water = 7,400 Bq/m³)
Woods Hole 2014 Water Samples

www.ourradioactiveocean.org
Alaska Water Results

- Nondetect for Cs-134
- Background for Cs-137
- Positive for Cs-134 at 100 miles from the Northern California Coast
  - Radiation level = < 2 Bq/m³ [lower than the EPA drinking water standard = 7,400 Bq/m³]
KelpWatch

- California researchers test kelp samples for radiation
  - Mostly samples from the Pacific Coast states, including Alaska
- Marine brown seaweeds are known to concentrate Cesium (Cs) and Iodine (I) into their tissues among many other elements.
  - *Macrocystis* tissue Cs levels are 20x that of its concentration in seawater
- If you send them a kelp sample, they will analyze it for free
KelpWatch – No signs of Fukushima in >80 Samples
Fukushima-related Radiation expected to peak in US marine waters in 2015

Will there be continued monitoring?

- Peak activity North Pacific predicted \( \rightarrow 3 \text{ to } 5 \text{ Bq/m}^3 \)
  (EPA safe drinking water limit = 7,400 Bq/m³)

- Fish sampling – Collaborative Effort with FDA again in 2015
  - Sampling of 20 samples across Alaska
  - Same target species of fish
  - Collection time and location dependent on DEC inspectors schedules
  - Plan to collect over the entire fishing season
Summary

- Based upon exposure & detection levels, there is no public health concern for Alaskans.
- DHSS and ADEC continue to do public outreach & education
- Continued assessment of the situation
  - Federal agencies - NRC, NOAA, EPA, & FDA
  - Alaska state agencies - ASMI, DHSS, DF&G, NSB
  - Pacific States
  - Academic and Private Institutions
Contacts

Bob Gerlach, VMD  
Alaska Department of Environmental Conservation (ADEC)  
Division of Environmental Health  
Office of the State Veterinarian  
Bob.Gerlach@alaska.gov

Clyde E. Pearce, RHS  
Alaska Department of Health & Social Services (DHSS)  
Division of Public Health  
Radiological Health  
Clyde.Pearce@alaska.gov

Ali Hamade, Ph.D.  
Alaska Department of Health & Social Services (DHSS)  
Division of Public Health  
Section of Epidemiology  
Ali.Hamade@alaska.gov

Marlena (Marty) Brewer  
Alaska Department of Environmental Conservation (ADEC)  
Division of Environmental Health  
Marlena.Brewer@alaska.gov