A tale about tuna fish and reporting limits

Dr. Merck, the head scientist at the Heavy Metal Inspection lab. As part of his legacy to the institution, he has started an aggressive plan to reform the reporting procedures for heavy metals, including mercury present in fish. He has hired you and your group for helping him out draw an strategic plan. In a preliminary meeting, he described the following:

- "We are now discovering that even very tiny amounts of “methyl-mercury” can be dangerous. The new regulation calls for less than 1.5 ppb of methyl-mercury. I have sent test samples of tuna fish with small amounts of methyl-mercury, nominally 3 ±0.2 ppb, to three labs that are using their new methods to see if they can achieve the necessary **limits of detection**…”
- "Our norm had a cut-off of 1 ±0.1 ppm of “inorganic mercury” for pass/no pass – with a much smaller quantity of methyl-mercury to report, we will need to check on the Horwitz curve on how to set the required precision”
- “Unfortunately we also have to consider the total amount of mercury that a person is exposed to- I have never designed a strategy that tries to control also the **reporting limits**”

Sample results for different methods

<table>
<thead>
<tr>
<th>method</th>
<th>Samp1</th>
<th>Samp2</th>
<th>Samp3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AnodStrip</strong></td>
<td>3.02</td>
<td>3.12</td>
<td>3.05</td>
</tr>
<tr>
<td><strong>Plasma</strong></td>
<td>5.45</td>
<td>5.23</td>
<td>4.88</td>
</tr>
<tr>
<td><strong>Lchrom</strong></td>
<td>2.34</td>
<td>1.58</td>
<td>4.55</td>
</tr>
</tbody>
</table>

Concentrations in ppm

You are now rushing to meet Dr. Merck to discuss ideas. Your lab partner was just able to send you some SMS with some key ideas:

Check conf.interval of companies?
Limit of detection – maybe from standard deviation?
Horwitz curve? Think has to do with policy.
Reporting limits – no idea, but maybe check portion size?

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• Define Problem(s)

• What do we know? What can we derive from information?

• What do we need to know

• Calculations, preliminary solution