



## Fish/Seafood

# Determination of Hg in Fish Samples Using Direct Mercury Analysis

Being a great source of protein, vitamins and omega-3's, fish have been an integral part of the diet in coastal areas around the world for centuries. Unfortunately however, fish also contain high levels of toxic metals such as mercury, which have only increased with time according to reports produced by the Biodiversity Research Institute. As our understanding of the health risks caused by mercury and other toxic contaminants increases, more and more researchers are focusing on understanding the mercury transport phenomenon in our environment, which has made mercury analysis of fish and seafood gain significant interest recently.

## Summary

Mercury is naturally present in the earth and enters the air and water through the burning of fossil fuels, discharge of industrial waste and use of pesticides. Through this redistribution, it accumulates in fish tissues. Methyl mercury, its organic form, binds to proteins in the fish muscles and cannot be removed by trimming, skinning or cooking. By eating large quantities of fish and seafood, humans can expose themselves to harmful levels of this neurotoxin, which makes it essential to analyze it and set regulatory limits.

Fish tissues need to be digested in acid prior to mercury analysis on conventional instruments such as CVAA and ICP. This in turn requires digestion equipment, additional labor hours, expensive acids and waste disposal which reduces a lab's productivity. Furthermore, fresh fish tissues are often oily which makes digestion harder and the mercury levels show drastic variations among different species, which could cause contamination issues in conventional mercury analysis systems.

## Instrumentation

Direct mercury analysis, as described in EPA Method 7473, is a cost-effective, proven alternative to these labor-intensive, wet chemistry techniques which involves an integrated sequence of combustion, catalytic hour conversion, amalgamation and detection using AA. Direct analysis affords the laboratory many benefits including:

- Reduced Sample Turnaround (6 Minutes)
- No Sample Preparation
- Reduced Hazardous Waste Generation
- Reduction of Analytical Errors
- General Cost Savings (70% vs. CVAA)

Milestone's DMA-80 provides a highly flexible platform with an extremely wide dynamic detection range to analyze the different fish species with varying mercury levels. Additional features such as internal temperature monitoring, auto-blanking and pre-heated cuvettes ensure a complete and safe decomposition of the highly organic and oily samples without any contamination or memory effects.

The DMA-80 features a circular, stainless steel, interchangeable 40-position autosampler for virtually limitless throughput and can accommodate both nickel (500 mg) and quartz boats (1500 uL) depending on the requirements of the application. It operates from a single-phase 110/220V, 50/60 Hz power supply and requires regular grade oxygen as a carrier gas.

## Calibration

The DMA can be calibrated using aqueous standards or Standard Reference Materials (SRM's). The DMA-80 used for this experiment had a tri-cell spectrophotometer and covered a





dynamic range of 0.0015-1200 ng Hg. Each cell was calibrated using different volumes of 1 ppm and 0.1 ppm stock solutions, prepared from an NIST traceable 1000 ppm stock solution (VHG Labs).

## Experiment and Results

Three different fish tissue samples were analyzed using the DMA-80. NRCC CRM DORM-4 was used pre and post analysis to ensure the results obtained were accurate.

The two concentrations obtained for the Ginkgo SRM – 3248 were 0.2544 ppb and 0.2673 ppb. These concentrations were not only in the certified range of mercury concentration but also had an RSD of 0.05% which represented the accuracy and reproducibility of the DMA-80 at low mercury concentrations. The recovery data mentioned in the table above suggests efficient spike recoveries.

## Conclusion

A laboratory analyzing mercury in fish samples is required to maintain high throughput while keeping its costs under control. The DMA-80 is an excellent tool as it yields results in ~6 min/sample and proves to be proficient, matrix-independent and cost-effective while completely eliminating the challenges of sample preparation posed by conventional mercury analysis techniques.

**Table 1. Mercury Concentrations in Fish Samples**

Sample	Expected Conc. (ppm)	Concentration (ppm)
DORM-4	0.41+/-0.055	0.4209
Fish 1	NA	0.0603
Fish 2	NA	0.0991
Fish 3	NA	0.213
DORM-4	0.41+/-0.055	0.4212

Learn more or request an onsite demonstration:  
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