

Methylmercury (MeHg⁺)

Mercury (Hg) is well known as an environmental contaminant. Its high toxicity and penchant for bioaccumulation make it of particular concern among heavy metals. There are several ways of determining total mercury in environmental samples. Speciation of mercury, however, is more difficult. It is known that Hg species metabolically convert to methylmercury (MeHg⁺), a highly toxic

form which can accumulate in tissues. This is especially true in fish. This makes measurement of methylmercury of vital importance in accurately assessing risk. Previous methods of determining methylmercury involved the gas chromatographic analysis of poorly behaved methylmercuric chloride (CH₃HgCl). New methods have been published which improve the analysis.

By LC-ICPMS (8/2002)

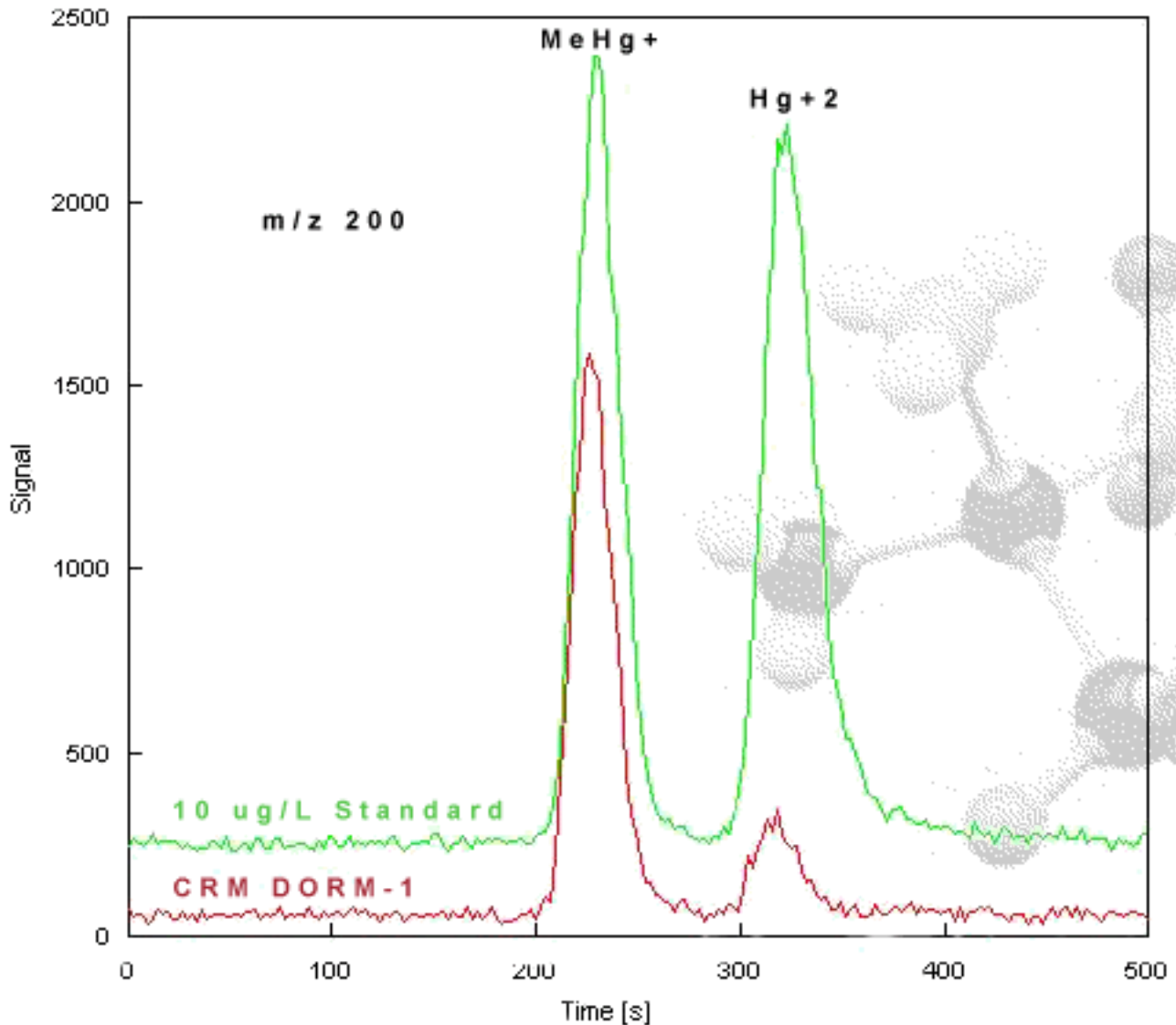
We've finally found a methylmercury method that we like. It is based on a method by Chiou, et al¹. Biological tissue samples are extracted into a mixture of L-cysteine and 2-mercaptoethanol by microwave digestion. Mercury compounds are separated on a C8-column using the same mixture of L-cysteine and 2-mercaptoethanol. An ICPMS system with conventional pneumatic nebulization is used as the HPLC detector.

This method has been applied to the National Research Council of Canada Reference Material DORM-1 Dogfish

Muscle. Concentrations of 0.70 ± 0.03 µg/g methylmercury and 0.12 ± 0.03 µg/g inorganic mercury have been found in very good agreement with the certified value for total mercury of 0.800 ± 0.074 µg/g and a value of 0.721 ± 0.033 µg/g for methylmercury determined by Beauchemin, et al².

Using this method a detection limit of about 0.3 µg/L for standard solutions is achievable. Detection limits for tissue samples are about 30 µg/kg. The option of vapor generation might give better detection limits by a factor of 10.

The chromatograms show a 10 µg/L standard and an extract of DORM-1.



By GCMS

Another novel method employs alkylation and GCMS. The mercury compounds are derivatized using sodium tetraethylborate, which convert methylmercuric chloride to methylethylmercury and inorganic mercury [Hg(II)] to diethylmercury. These volatile species (and native dimethylmercury) can be effectively purged from water with helium, analogous to EPA Method 8260.

The purged contaminants are then determined using GCMS. The purge-and-trap technique cleanly removes the target compounds from the matrix, leaving the interferences behind.

Click here for a [Chromatogram](#) and a [Mass Spectrum](#).

Unfortunately we've found this method difficult to perform routinely at an appropriate cost.

References

For more information on methylmercury analysis:

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4. Determination of Picogram Levels of Methylmercury by Aqueous Phase Ethylation, followed by Cryogenic Gas Chromatography with Cold Vapor Atomic Fluorescence Detection, Can. J. Fish. Aquat. Sci., 46, 1131 (1989)
5. EPA Methods [245.7](#) and [1630](#), and EPA [Water Quality Criteria](#)
6. Method performance evaluation for methylmercury determination in fish and sediment, P. Quevauviller, et al., Trends in Analytical Chemistry, 19, 157 (2000).
7. "Methylmercury Toxicology Probed", [C&EN, Jan 19, 2004](#).
8. Draft FDA/EPA [Methylmercury Consumer Advisory](#), Dec 2003.



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