

## Handling dimethylmercury

**Michael B. Blayney, Environmental Health & Safety, Dartmouth College**

**John S. Winn, Department of Chemistry, Dartmouth College**

**David W. Nierenberg, Departments of Medicine and Pharmacology/Toxicology, Dartmouth Medical School**

*Chemical & Engineering News* (12 May 1997) Vol. 75, No. 19, pp. 7.

---

We report a case of severe mercury toxicity resulting from a single exposure to dimethylmercury. Review of research notes, interviews, hair analysis, and statements made by the patient established the circumstances and events described here. Testing of the type of gloves worn by the patient supports the hypothesis that dimethylmercury rapidly penetrated them, resulting in transdermal exposure.

It appears that there was only one acute exposure to dimethylmercury. The patient recounted spilling one or several drops (estimated to total 0.1 to 0.5 mL) on disposable latex gloves during a transfer procedure in a fume hood while preparing a mercury nuclear magnetic resonance (Hg NMR) standard. A severely toxic dose of 100 to 200 mg of mercury absorbed requires absorption of less than 0.1 mL of liquid (density 3 g per mL). The possibility of inhalation exposure (the vapor pressure at 20 °C is 50 torr [J. Inorg. Nucl. Chem., 20, 340 (1961)]) is considered highly unlikely given the brief time the material was handled, the use of the fume hood, and the high concentration in the patient's body.

A profile of the mercury content along a 15-cm length of the patient's hair revealed what was probably a single, large exposure to mercury in mid-August 1996, in accord with a review of research notes and interviews with colleagues. Approximately three months later, the patient experienced episodes of nausea and vomiting spaced weeks apart. Approximately five months after exposure, the patient noted the onset of ataxia (difficulty with balance), dysarthria (slurred speech), loss of vision, and loss of hearing. Medical evaluation at this time revealed a whole blood mercury concentration of 4,000 .mu.g per L - 80 times the usual toxic threshold (50.mu. g per L) and markedly above the normal range (<10 .mu.g per L).

The patient's symptoms progressed rapidly over approximately three weeks to cognitive deficits and coma. Chelation increased the rate of elimination of mercury from the body, but without clinical improvement. Whole blood and urine testing of family members and laboratory coworkers revealed no other abnormal mercury levels. Air samples from the patient's laboratory, office, and home revealed detectable levels of mercury only near the sealed mercury waste can in the laboratory hood.

Permeation tests done by an independent testing laboratory found that dimethylmercury penetrates disposable latex gloves in 15 seconds or less, and perhaps instantaneously. Individuals working with alkyl mercury compounds should employ cautions similar to those described in "Prudent Practices in the Laboratory" (National Research Council, 1995) for highly toxic substances.

A highly resistant laminate glove (SilverShield or 4H) should be worn under a pair of long-cuffed, unsupported neoprene, nitrile, or similar heavy-duty gloves. Latex or PVC gloves have an important role in many laboratory activities, but they are not suitable for significant, direct contact with aggressive or highly toxic chemicals. Medical surveillance measuring mercury concentrations in whole blood or urine should be considered for repeated or extended use of alkyl mercury compounds. In all cases, the potential hazards associated with dimethylmercury and related alkyl mercury compounds must not be underestimated.

All laboratories working with such compounds are strongly encouraged to conduct an assessment of existing work practices and precautions. We urge the Hg NMR community to consider a safer standard compound.

We report a case of severe mercury toxicity resulting from a single exposure to dimethylmercury. Review of research notes, interviews, hair analysis, and statements made by the patient established the

circumstances and events described here. Testing of the type of gloves worn by the patient supports the hypothesis that dimethylmercury rapidly penetrated them, resulting in transdermal exposure.

It appears that there was only one acute exposure to dimethylmercury. The patient recounted spilling one or several drops (estimated to total 0.1 to 0.5 mL) on disposable latex gloves during a transfer procedure in a fume hood while preparing a mercury nuclear magnetic resonance (Hg NMR) standard. A severely toxic dose of 100 to 200 mg of mercury absorbed requires absorption of less than 0.1 mL of liquid (density 3 g per mL). The possibility of inhalation exposure (the vapor pressure at 20 °C is 50 torr [J. Inorg. Nucl. Chem., 20, 340 (1961)]) is considered highly unlikely given the brief time the material was handled, the use of the fume hood, and the high concentration in the patient's body.

A profile of the mercury content along a 15-cm length of the patient's hair revealed what was probably a single, large exposure to mercury in mid-August 1996, in accord with a review of research notes and interviews with colleagues. Approximately three months later, the patient experienced episodes of nausea and vomiting spaced weeks apart. Approximately five months after exposure, the patient noted the onset of ataxia (difficulty with balance), dysarthria (slurred speech), loss of vision, and loss of hearing. Medical evaluation at this time revealed a whole blood mercury concentration of 4,000 .mu.g per L - 80 times the usual toxic threshold (50.mu. g per L) and markedly above the normal range (<10 .mu.g per L).

The patient's symptoms progressed rapidly over approximately three weeks to cognitive deficits and coma. Chelation increased the rate of elimination of mercury from the body, but without clinical improvement. Whole blood and urine testing of family members and laboratory coworkers revealed no other abnormal mercury levels. Air samples from the patient's laboratory, office, and home revealed detectable levels of mercury only near the sealed mercury waste can in the laboratory hood.

Permeation tests done by an independent testing laboratory found that dimethylmercury penetrates disposable latex gloves in 15 seconds or less, and perhaps instantaneously. Individuals working with alkyl mercury compounds should employ cautions similar to those described in "Prudent Practices in the Laboratory" (National Research Council, 1995) for highly toxic substances.

A highly resistant laminate glove (SilverShield or 4H) should be worn under a pair of long-cuffed, unsupported neoprene, nitrile, or similar heavy-duty gloves. Latex or PVC gloves have an important role in many laboratory activities, but they are not suitable for significant, direct contact with aggressive or highly toxic chemicals. Medical surveillance measuring mercury concentrations in whole blood or urine should be considered for repeated or extended use of alkyl mercury compounds. In all cases, the potential hazards associated with dimethylmercury and related alkyl mercury compounds must not be underestimated.

All laboratories working with such compounds are strongly encouraged to conduct an assessment of existing work practices and precautions. We urge the Hg NMR community to consider a safer standard compound.

**Return to [List of Safety Letters](#)**

**Return to [Chemical & Engineering News Home Page](#)**

---

This page last revised December 7, 1998  
© Copyright 1998 by the American Chemical Society