

This document provides guidelines to all Florida County Health Departments (CHDs) about the interpretation and use of case report forms developed for mercury poisoning reporting. These guidelines will help to identify cases and to report them in a systematic manner so that control measures can be initiated promptly and effectively.

I. General Information: Mercury ¹

Mercury is a naturally occurring element. Its distribution in the environment is the result of both natural and man-made processes. There are three categories of mercury with unique characteristics and unique potential health effects:

- Elemental or metallic mercury
- Organic mercury compounds
- Inorganic mercury compounds

Not all forms are encountered by the general public. The forms most likely encountered by the general public are:

- Elemental mercury vapor (Hg⁰) from metallic mercury or liquid mercury - This is the elemental or pure form of mercury; i.e., it is not combined with other elements. It is the form of mercury found in mercury thermometers, dental amalgam, some blood pressure cuffs and fluorescent light bulbs.
- Methylmercury - Microorganisms in the environment can convert inorganic mercury to the organic form methylmercury. This form can build up in the environment and accumulate in certain freshwater and saltwater fish, and marine mammals.
- Ethylmercury - This is an organic form of mercury found in some medical preservatives.
- Inorganic mercury (mercuric salts) - This is an oxidized mercury that combines with other chemical elements to create salt forms.

Health Effects ²

The different forms of mercury have distinct patterns of adverse health effects. Not everyone is equally susceptible to the effects of mercury. The following chart shows the duration, intensity, route of exposure, and effects on the body of specific forms of mercury.

Form	Urine Hg µg/L	Toxic Effects
Elemental mercury vapor (Hg⁰) from: <ul style="list-style-type: none">• Metallic mercury• Liquid mercury	Low level exposure:	There are no reports of clinical effects for people with urine mercury levels ranging from 21-39 µg/L, but this does not rule out the possibility of toxicity in sensitive individuals. No clinical or subclinical effects reported for urine mercury levels below 20 µg/L.

Medium level exposure: 40-60 µg/L

- acrodynia (pink's disease in children)
- fever
- Insomnia
- rapidly shifting moods
- tremors

High level exposure: 60 µg/L

- acrodynia (pink's disease in children)
- insomnia
- possible respiratory effects
- rapidly shifting moods
- restlessness
- tremors

Methylmercury

Blood Hg µg/L

Effect (adults unless stated)

<10

- No apparent effect
- Background levels for most of the U.S. population

50-100

Self-reported, nonspecific complaints: malaise, weakness, cognition. For children, increasingly abnormal test components on neurodevelopmental testing in relation to cord blood concentrations.

- low prevalence of paresthesias (sensory changes)
- decreased visual fields
- decreased hearing acuity
- ataxia (loss of the ability to coordinate muscular movement)

100-200

200 and above

Increasing prevalence and severity of the effects listed above. In children via maternal exposure, signs of delayed development. At much higher levels, retardation, blindness, and deafness.

Ethylmercury

- Toxicological information is very limited.
- Studies show that the neurotoxicity of thimerosal would be much less than that of methylmercury because of the more rapid breakdown and elimination of ethylmercury from the body.

Inorganic Mercury Compounds also know as:

- **Mercury salts**

- The kidneys are the primary organs affected by chronic exposure to mercury salts. Severe renal damage can result from ingestion of mercury salts. At very high exposures there could be neurological effects.

II. Case classification

A. Mercury Poisoning:

Clinical description

The clinical presentation of mercury poisoning varies depending upon the form of mercury (elemental, organic or inorganic) as well as the route of exposure and the dose if ingested. Any organ system may be affected.

The signs and symptoms of acute exposure to mercury may vary depending on the form of mercury (elemental or inorganic). For elemental mercury, acute toxicity might result in fever, fatigue, and clinical signs of pneumonitis. For inorganic mercury, symptoms might include profuse vomiting and diarrhea that is often bloody, followed by hypovolemic shock, oliguric (decreased urine production) renal failure, and possibly death. Delayed toxicity symptoms (> 1 month) are typical of organic mercury poisoning and usually involve the central nervous system. These symptoms might include paresthesias, headaches, ataxia, dysarthria (motor speech disorder), visual field constriction, blindness, and hearing impairment.

Laboratory criteria for diagnosis

Elevated levels of mercury found in urine, whole blood or hair as determined by laboratory tests:

- ≥ 10 micrograms per liter ($\mu\text{g/L}$) of urine
- OR
- ≥ 10 micrograms per liter ($\mu\text{g/L}$) of whole blood
- OR
- ≥ 5 micrograms per gram ($\mu\text{g/g}$) of hair

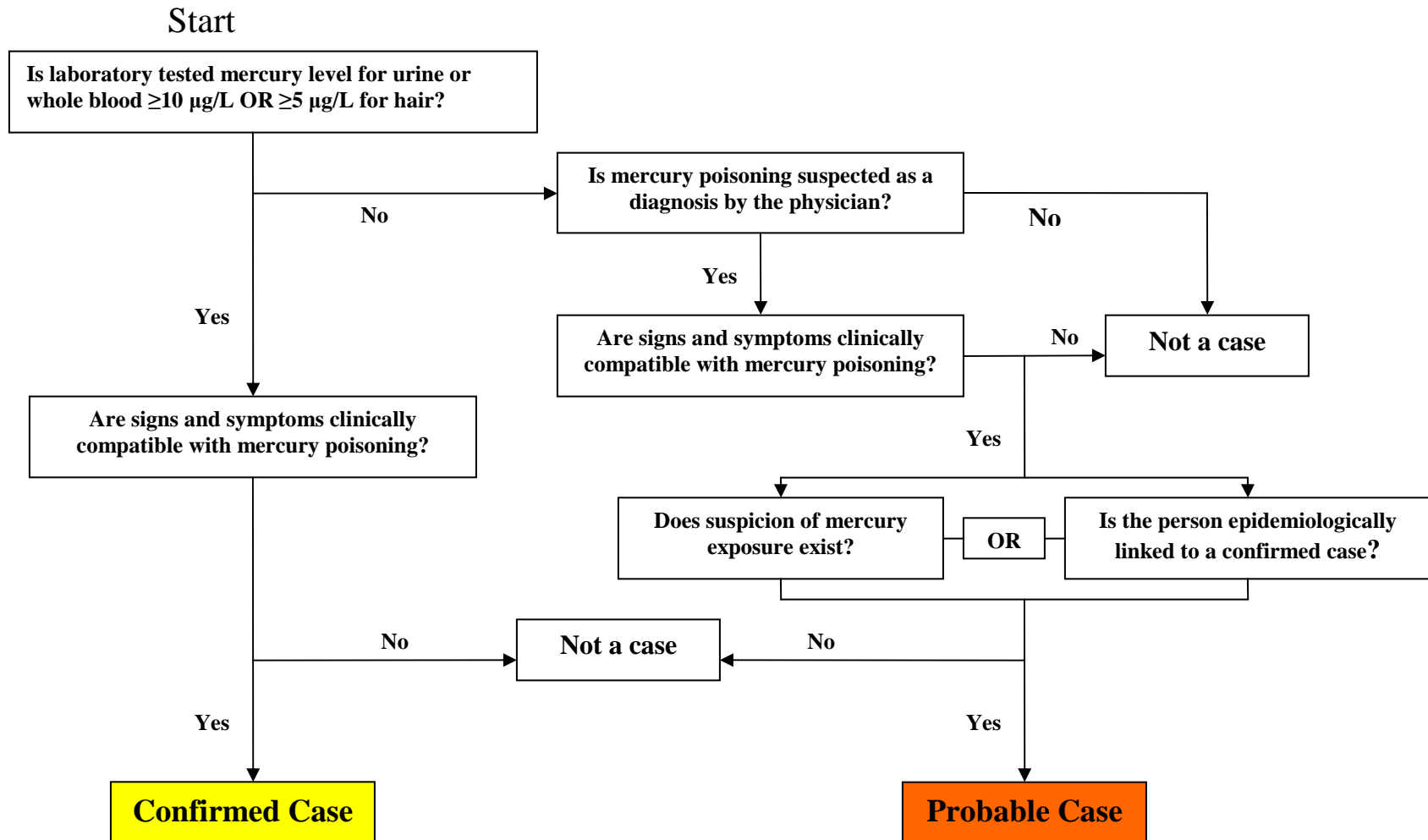
No definitive correlation exists between either blood or urine mercury levels or mercury toxicity. Urine mercury levels are not useful in evaluating organic mercury poisonings.

Case classification

Confirmed: a clinically compatible case that meets the laboratory criteria for diagnosis.

Probable: a clinically compatible case in which a high index of suspicion exist (patient's exposure history regarding location and time) or an epidemiologic link exists between this case and a laboratory-confirmed case.

B. Mercury Poisoning Flow Chart:



Environmental Health Mercury Poisoning Case Report Form

Florida Department of Health
DOH/Division of Environmental Health
Bureau of Environmental Public Health Medicine

Merlin Case Number: _____
Telephone number: (850) 245-4299
Fax Number: (850) 922-8473

Demographic Information

Name: _____ Date of Birth: (mm/dd/yyyy) ____/____/____
Street Address: _____
City: _____ County: _____ Zip: _____
Name of Employer OR School: _____
Telephone #: Home: _____ Work: _____ Other: _____

Gender: Male Female
Race/Ethnicity: White Black Asian Native American
 Hispanic Other: _____

Exposure Information

Within the last month, have you been in contact with any of the following potential sources of mercury?

Fish A broken mercury thermometer A broken blood pressure monitor A broken florescent light bulb
 Dental amalgam Other: _____ Unknown

If the exposure was by fish consumption, check all that was consumed in 1 month:

<input type="checkbox"/> Amberjack	<input type="checkbox"/> Jack	<input type="checkbox"/> Silver perch	<input type="checkbox"/> Yellowfin tuna
<input type="checkbox"/> Atlantic stingray	<input type="checkbox"/> Ladyfish	<input type="checkbox"/> Skipjack tuna	<input type="checkbox"/> Shark
<input type="checkbox"/> Bluefish	<input type="checkbox"/> Mackerel	<input type="checkbox"/> Snapper	<input type="checkbox"/> Swordfish
<input type="checkbox"/> Bonefish	<input type="checkbox"/> Pinfish	<input type="checkbox"/> Snook	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Gag	<input type="checkbox"/> Red drum	<input type="checkbox"/> Tilefish	
<input type="checkbox"/> Great barracuda	<input type="checkbox"/> Scamp	<input type="checkbox"/> Tripletail	
<input type="checkbox"/> Grouper	<input type="checkbox"/> Seatrout	<input type="checkbox"/> Wahoo	
<input type="checkbox"/> Gulf Flounder	<input type="checkbox"/> Sheephead	<input type="checkbox"/> White grunt	

How many 6 oz. (twice the palm of the hand) meals of cooked fish do you consume per week?

0-2 3-5 6-10 11-15 16-21 >21 Unknown

Where did the exposure occur? Work Home Other: _____ Unknown

If the exposure is work-related, indicate the industry:

<input type="checkbox"/> Dental office	<input type="checkbox"/> Chemical processing plant	<input type="checkbox"/> Waste Incinerator plant
<input type="checkbox"/> Medical facility	<input type="checkbox"/> Manufacturing plant	<input type="checkbox"/> Construction site
<input type="checkbox"/> Laboratory	<input type="checkbox"/> Metal processing plant	<input type="checkbox"/> Mercury Mine
<input type="checkbox"/> Emergency response	<input type="checkbox"/> Other: _____	<input type="checkbox"/> Unknown

When did the exposure occur? (mm/dd/yyyy): ____/____/____ Unknown

Case Number: _____ County: _____ Patient initials: ____

Health Effects and Medical Information

Date of illness onset (mm/dd/yyyy): ____/____/____ Unknown

Signs and Symptoms associated with illness (Check all that apply):

- | | | | |
|--|--|--|---------------------------------------|
| <input type="checkbox"/> Arrhythmia | <input type="checkbox"/> Vomiting | <input type="checkbox"/> Joint pain/ Lumbar pain | <input type="checkbox"/> Headache |
| <input type="checkbox"/> Chest pain | <input type="checkbox"/> Diarrhea | <input type="checkbox"/> Muscle fasciculation | <input type="checkbox"/> Fever |
| <input type="checkbox"/> Palpitations | <input type="checkbox"/> Abdominal pain | <input type="checkbox"/> Muscle pain | <input type="checkbox"/> Vertigo |
| <input type="checkbox"/> Anxiety | <input type="checkbox"/> Constipation | <input type="checkbox"/> Muscle stiffness | <input type="checkbox"/> Sweats |
| <input type="checkbox"/> Depressed thoughts | <input type="checkbox"/> Metallic taste | <input type="checkbox"/> Muscle weakness | <input type="checkbox"/> Tremor |
| <input type="checkbox"/> Decreased memory | <input type="checkbox"/> Urinary complaints | <input type="checkbox"/> Fatigue | <input type="checkbox"/> Chills |
| <input type="checkbox"/> Decreased concentration | <input type="checkbox"/> Erythematous/ pruritic rash | <input type="checkbox"/> Poor coordination | <input type="checkbox"/> Syncope |
| <input type="checkbox"/> Cough | <input type="checkbox"/> Exfoliating Dermatitis | <input type="checkbox"/> Insomnia | <input type="checkbox"/> Paresthesias |
| <input type="checkbox"/> Dyspnea | <input type="checkbox"/> Hair loss | <input type="checkbox"/> Irritability | <input type="checkbox"/> Acrodynia |
| <input type="checkbox"/> Nausea | <input type="checkbox"/> Other: _____ | | |

Do you have a preexisting illness with any of these (the mentioned) signs and symptoms?
 Yes (specify) _____ No Unknown

Name of physician (who made diagnosis): _____

Telephone #: () _____ Were you hospitalized? Yes No Unknown

If yes, name of medical facility and address: _____

Date of admission: (mm/dd/yyyy) ____/____/____ Diagnosis (if known): _____

What was the medical outcome? Survived Died Unknown

Date of discharge/death: (mm/dd/yyyy) ____/____/____

Are you pregnant? Yes No Unknown

Test/Laboratory Information

Was a test ordered to confirm mercury poisoning? Yes No Unknown

If yes, which test(s) were conducted? Whole Blood Urine Hair

If a blood/urine test was conducted, was the mercury concentration level $\geq 10 \mu\text{g/L}$? Yes No

If a hair test was conducted, was the mercury concentration level $\geq 5 \mu\text{g/g}$? Yes No

Investigator's name (Please print): _____ Phone: () _____

Please submit the completed survey to the Office of Environmental Public Health Medicine, Division of Environmental Health, Department of Health, Bald Cypress Way, Bin A08, Tallahassee, Florida 32399-1712 or FAX 850-922-8472

III. Instructions for completing the case report form-Mercury

A. Demographic Information- All demographic information needs to be filled out in full.

B. Exposure Information- Please ask this series of questions to complete the exposure section.

Within the last month, have you been in contact with any of the following potential sources of mercury?

Fish: Methylmercury: the organic form of mercury accumulates in certain freshwater and saltwater fish, and marine mammals. Methylmercury is the form of mercury that is most likely to cause adverse health effects in the general population.

A broken mercury thermometer: Metallic mercury is the familiar liquid used in thermometers.

A broken blood pressure monitor: Metallic mercury is used to produce barometers & some blood pressure devices.

A broken florescent light bulb: Metallic mercury is used to produce fluorescent light bulbs.

Dental amalgam: Metallic mercury is used to produce dental fillings.

Other: Exposure to mercury can occur through various other products using mercury in its preparation. The following are some of the common uses of mercury.²

- **Elemental mercury:** Some folk medicines (Voodoo, Santería, and Espiritismo) use mercury. Metallic mercury is used to produce chlorine gas and caustic soda. It is also used in neon signs, outdoor lighting, cameras, electrical switches, and some batteries.
- **Ethyl mercury:** Ethyl mercury and methyl mercury are organic forms of mercury. It is used medically as fungicides and antibacterials as well as released from preservatives used in vaccines (thimerosal or merthiolate)
- **Inorganic mercury compounds:** Sometimes used in skin lightening creams and as antiseptic creams and ointments. Some use in folk medicines. Used in preserving solutions for some collected biological specimens. Used as a reagent in analytical chemistry reactions, photography, and metal etching solutions.

If the exposure was by fish consumption, check all that was consumed in 1 month:

The most common way people in the U.S. are exposed to mercury is by eating fish containing methylmercury. Consumption of fish with higher methylmercury levels can lead to elevated levels of mercury in the bloodstream of unborn babies and young children and may harm their developing nervous system.

C. Health Effects and Medical Information: Complete this series of questions

Date of illness onset: Month/ day/year that symptoms started, if patient is unsure or you are unable to contact the patient, please enter the first positive laboratory date and indicate that it is a laboratory date and not an onset date.

Signs and Symptoms (Check all that apply): Select appropriate signs and symptoms. All patients should have signs and symptoms consistent with mercury poisoning to make a confirmed or probable case. *

Definition of selected clinical symptoms:

Exfoliating Dermatitis- Widespread dermatitis characterized by scaling and shedding of the skin and usually accompanied by redness.

Muscle fasciculation- Involuntary contraction or twitching of muscle fibers.

Vertigo- It is the sensation of moving around in the space or of having objects move about the person.

Syncope-A transient loss of consciousness due to inadequate blood flow to the brain

Paresthesias- Sensation of numbness, pricking, or tingling; heightened sensitivity.

Acrodynia- A disease of infant and young children caused by chronic mercury poisoning. It has a prolonged clinical course with various grades of severity. The child is listless, irritable, and no longer interested in play. The rash has several variations. Initially, the tips of the fingers and toes become pink, the hands and feet become pink but color shades off at the wrist and ankles. As the disease progress, the skin of the extremities desquamates; there is profuse sweating and pruritus, and excruciating pain in the hands and feet. Neurological symptoms with neuritis and mental apathy develop.

Do you have a preexisting illness with any of these (the mentioned) signs and symptoms? Indicate if patient had experienced any of the signs and symptoms consistent with mercury poisoning before being diagnosed with/evaluated for mercury poisoning. Specify signs and symptoms.

Are you pregnant? Exposure during pregnancy can lead to elevated levels of mercury in the bloodstream of unborn babies and women exposed to mercury during pregnancy have sometimes given birth to children with serious birth defects. The target organ of the most toxic form, methylmercury (MeHg) is the brain, especially in the early stage of development, when the brain is highly vulnerable because of the ability of MeHg to easily cross the blood–brain and placental barriers.³

D. Test/Laboratory Information: Please ask this series of questions to complete the Test/Laboratory Information section.

- Blood is mainly tested to detect the presence of methyl mercury. Other forms of mercury can also be detected in the blood, but according to the Agency for Toxic Substances and Disease Registry (ATSDR), the amount present will decrease by half about every 3 days as the mercury moves into other organs.
- Urine is used to test for metallic mercury and inorganic forms of mercury, but it cannot be used to determine exposure to methyl mercury.

*Signs and symptoms can not be entered in to Merlin.

- Hair testing may be useful to detect methyl mercury exposures that occurred several months previously, but hair testing is relatively complex and is not used frequently. Although not routinely tested, mercury has been shown to be present in nails, breast milk, stool, and breath.

Department of Health Contacts:

Prakash Mulay: [Prakash_Mulay@doh.state.fl.us] 850-245-4444 ext 4576

*** YOU MUST ATTACH LAB REPORTS WITH THIS CASE REPORT FORM**

References

¹ATSDR, Mercury, Retrieved from <http://www.atsdr.cdc.gov/mercury/> on February 10, 2009.

²ATSDR, Chemical Agent Briefing Sheets (CABS), Retrieved from <http://www.atsdr.cdc.gov/cabs/mercury/index.html> on February 10, 2009.

³Díez S, Montuori P, Pagano A et al (2008) Hair mercury levels in an urban population from southern Italy: fish consumption as a determinant of exposure. *Environ Int* 4:162–167