

# Mercury, the Community, and Me



*An EPA Partners in Technical Assistance  
Program pilot project for the Black Butte Mine Site  
community in Cottage Grove, Oregon*

In early 2013, the EPA Office of Superfund Remediation and Technology Innovation began a pilot of the Partners in Technical Assistance Program (PTAP). The purpose of PTAP is to expand opportunities for cooperation between EPA and colleges, universities or nonprofits with the shared goal of assessing and addressing the unmet [technical assistance](#) needs of communities impacted by Superfund sites.

PTAP launched the first pilot project with a school located near the [Black Butte Mine Superfund Site](#) in rural Cottage Grove, Oregon.

This educational packet was a collaborative effort between the EPA, the London School in Cottage Grove, OR, and the Superfund Research Program at Oregon State University.

The overall goal of the project was to educate students about mercury in their community and the effects of mercury on human health. The activities are separated between K-3 and 4-8 grades based on a rural school. They are adaptable. See the [project web site](#) for more information.

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# Section 1: Environmental Health

## Overview

The first section of the curriculum gives students a foundation on environmental public health. Students will gain a comprehensive understanding of the various components that create our environment. Through reading educational, grade-appropriate books and working in groups, students will gain a basic understanding of toxicity and how toxic chemicals can impact our environment. Activities allow students to apply concepts to their own life.

Developed in 2014, the package used existing educational resources around mercury and human health. Since then, some of these resources may no longer be available due to software incompatibility, or are no longer maintained by the original source. This packet is provided as a historical record of the types of resources and activities that were implemented in 2014.

<http://superfund.oregonstate.edu/mercury>



Our environment affects our health. If parts of the environment, like the air, water, or soil become polluted, it can lead to health problems. For example, asthma pollutants and chemicals in the air or in the home can trigger asthma attacks.

Some environmental risks are a part of the natural world, like radon in the soil. Others are the result of human activities, like lead poisoning from paint, or exposure to asbestos or mercury from mining or industrial use.

*National Institute of Environmental Health Science (NIEHS),  
an institute of the National Institutes of Science (NIH)*

# Section 1: What is Our Environment?

## K-3 Activities

### K – 3 Overview

Students will gain a comprehensive understanding of the various components that create our environment. Through reading educational, grade-appropriate books and working in groups, students will gain a basic understanding of toxicity and how toxic chemicals can impact our environment. Activities allow students to apply concepts to their own life. *These principles will later be applied specifically to mercury as an environmental contaminant and health concern.*

### Suggested Duration

~ 6-10 days – about 45 minutes per day

### Learning Objectives

**After students complete the three modules in this section, they will be able to:**

1. Define environment and describe the various environments in which they live
2. Identify the three R's (Reduce, Reuse, Recycle) and how they can apply those concepts to the classroom and their house
3. Identify potentially hazardous chemicals by reading labels
4. Make a connection between our environment, our health, how we are exposed to contaminants, and how we can minimize exposure
5. Commit to taking action to improve their environment in a tangible way

### Materials Used

#### **Books and Activity Resources**

- [Sharon Finds the Environment](#) (also available in [Spanish](#), on [YouTube](#) and [pdf format](#))
- [Sharon Cleans Up](#)
- [The Starfish Story video](#)
- [Reduce, Reuse, Recycle Teacher Resource](#)
- [Recycle City – on-line game](#)
- [Crabby Kathy](#)
- [What's Wrong with Whiskers?](#)

#### **Student Worksheets**

- [Reduce, Reuse, Recycle Worksheet](#)
- [Healthy Classroom Assessment Worksheet](#)
- Print-outs for coloring, puzzles, and games from the [Oregon Poison Center](#), [NIEHS](#), and EPA: [water](#), [waste](#)
- [All Together Now](#) – Pledge Cards for last day

## Section 1: K-3 Activities

### K – 3 Suggested Activity Schedule

<b>Monday</b> Read <i>Sharon Finds the Environment</i> Identify words What is our environment?	<b>Tuesday</b> Share <i>Sharon Cleans Up</i> and/or the <i>Starfish Story</i> Discuss how we can make a difference	<b>Wednesday</b> Reduce, Reuse Recycle worksheet	<b>Thursday</b> Coloring/Crafts Grade 2-3: Recycle City interactive game.	<b>Friday</b> Review week. Ask how they will share what they learned with their families.
<b>Monday</b> Perform Healthy Classroom Assessment	<b>Tuesday</b> (as necessary) Complete Healthy Classroom Assessment	<b>Wednesday</b> Read <i>Crabby Kathy</i> Begin vocabulary list	<b>Thursday</b> Read <i>What's Wrong Whiskers</i> What are things we are exposed to? How do we minimize exposure	<b>Friday</b> All Together Now Pledge

### Extension Activities and Resources

- **Careers in Environmental Health video**  
The Careers in Environmental Health video shows scientists answering key questions such as why they chose a career in the sciences, why they love their job, and what their favorite class was in school. The video and worksheet hopes to inspire students to consider science as a fun and exciting career option. The elementary version of the film is 9:32 minutes long. Access the film online: <http://superfund.oregonstate.edu/mercury>
- **Recipes for Healthy Kids and a Healthy Environment** – Curriculum from the EPA  
This nine-lesson program (geared toward kids 9-13) was designed to excite kids about environmental health and empower them to take steps in their everyday lives to improve the environment for their community and reduce their environmental risk.  
<http://www2.epa.gov/children/student-curriculum-recipes-healthy-kids-and-healthy-environment>
- **Breathe Easy – Reducing asthma triggers in schools**  
Students can read short comic books and watch musical videos developed by EPA and the Ad Council on asthma triggers in the classroom and in homes (Available in Spanish).  
<http://www.noattacks.org/kids-stuff>
- **Using Dr. Seuss Books for environmental health education**  
Dr. Seuss gets students to think, ask questions, and activate their imaginations.

## Section 1: K-3 Activities

- Read a teacher’s blog post on [why he uses The Lorax in his classroom](#).
- The [Lorax Project](#) web page provides ideas to share *The Lorax* book in the classroom with printable student activities. The Lorax book is on [YouTube](#) as well.
- *Robert the Rose Horse* provides kids a fun story to learn about things in our environment that cause allergies.

### Lesson Plan

#### MODULE 1.1 WHAT IS OUR ENVIRONMENT

Environment is defined as a series of different places. Students are introduced to new vocabulary and concepts by reading short, illustrated stories.

##### Day 1: Read *Sharon Finds the Environment*

[Sharon Finds the Environment](#) (also available on [YouTube](#) and [pdf](#) format)

The book *Sharon Finds the Environment*, produced by the National Institutes of Health (NIH), shares the story of a young girl discovering her environment. Dependent on reading level, teachers can either read the book to the class, or have students read it aloud.

**Activity:** After reading the story have students share about one of their environments. They can write and illustrate their environment or share verbally with the class.

Below is a partial list of different environment examples the students may have encountered.

- Playground
- School
- Home
- Daycare
- Grandparent’s house
- Friends house
- Park
- Beach
- Plane
- Car
- Parent’s work
- Mall/stores
- Restaurants

##### Day 2: Share the story of *Sharon Cleans Up and/or The Starfish Story*

[Sharon Cleans Up](#) - This on-line story from NIH highlights the small things every person can do to clean up their environment.

##### [The Starfish Story](#) video

Show the Starfish video (2 min long) and/or read the Starfish story to help students understand about the small things every person can do to clean up their environments. ***As we become throwers of stars, we too have the power to change the world. Choose a starfish craft that the students can have as a keepsake to remind them of this story.***

Discussion Questions:

- Which environments where we live need to be cleaned-up or cared for?
- How does caring about other people make a difference to our environment?
- What can one small person like you do to make a difference?

## Section 1: K-3 Activities

### MODULE 1.2 WHAT IS IN OUR ENVIRONMENT?

#### **Day 3: Reduce, Reuse, Recycle**

In this module, the focus is on identifying potential hazards in our environment, and finding ways to avoid or remove the hazards.

- [Reduce, Reuse, Recycle](#) Teacher Resource
- [Reduce, Reuse, Recycle](#) Student Worksheet

#### **Day 4: Recycle City**

An on-line educational game created by the Environmental Protection Agency:

<http://www.epa.gov/recyclecity/mainmap.htm>

Print-outs for coloring, puzzles, and games:

[Oregon Poison Center](#), [NIEHS](#), and EPA: [water](#), [waste](#)

**Day 5: Review the week.** What did they like the best? What can they share with their families?

- Week 2 -

#### **Day 1-2: Healthy Classroom Assessment**

[Healthy Classroom Assessment](#) Worksheet

Working as a class, perform a Healthy Classroom Assessment

Once a potential hazard has been identified, place a Mr. Yuk sticker on the chemical bottle or source of the hazard. Download handouts, brochures and the Mr. Yuk sticker from the [Oregon Poison Center](#). Materials are also available in Spanish, Arabic, Chinese, French, Haitian-Creole, Hmong, and Korean.



### MODULE 1.3: HOW DOES OUR ENVIRONMENT INFLUENCE OUR HEALTH?

#### **Day 3: Read *Crabby Kathy***

[Crabby Kathy](#) On-line

Crabby Kathy discusses how our environment can affect our health. Elementary students created the story and pictures. Students wanted to help Kathy - a teacher who experienced ill health when she taught her classes in their school's library.

**Activity:** As students read the book (or listen to it) have them suggest words that should be added to a classroom glossary. As the list grows, the class will add definitions to unknown words. After the story, **brainstorm ways in which their environment can affect their health. Do they have a personal story to share about a pet or family member getting sick from the environment?** Share that our environment can affect our health when we touch, breath, or eat and drink.

## Section 1: K-3 Activities

Examples the class may discuss (depending on grade level) are:

- Allergies due to food, pollen, etc.
- Asthma that may get triggered happens air pollution or being around people who smoke
- Catching colds and flu due to viruses that are passed sometimes when people don't wash their hands.
- Not eating healthy foods like vegetables, can make us weak or overweight
- Drinking water that is contaminated
- Eating too much fish with mercury (which is discussed in the next module)

**Class activity:** Have students make lists of how the environment can affect their health. On each paper they should draw two columns – how the environment can positively influence their health (diet, nutrition, exercise, etc.) and how the environment can negatively influence their health (traffic exhaust, smoking, air pollution, etc.)

### **Day 4: Read *What's Wrong Whiskers?***

[What's Wrong with Whiskers? On-line](#)

The story was created by elementary students to remind us all that kids and cats have many things in common...Be cautious with the chemicals that you use in your home and garden! After reading this short story, students discuss how what they might be exposed to could influence their health. What are things we can do to minimize exposure?

### **Day 5: *All Together Now Pledge***

[All Together Now](#) – Pledge Cards

End the learning on environmental health with a class, family, or individual pledge. It helps them create a safer and healthier environment. The page from the EPA Children's Health Curriculum Lesson 9 has print-outs to share.

### **Share:**

- All living things need four things to stay alive and thrive: air, water, food, and shelter.
- Our world is interconnected—what happens to our water impacts plants, animals, and us!
- How we get our energy impacts the atmosphere, which impacts the water and plants and animals and us.
- The world we all share operates on a delicate balance and if we change only one thing, it impacts many others.
- We can all take small, simple actions to positively impact the environment and our health.

### **To Do:**

- We Pledge To...Think about all that we've shared with our families about environmental health, and talk with our families about some simple actions that we can pledge, or promise, to take altogether.
- Think about big actions that we can take and little actions that we can take.
- Ask for ideas from everyone and then vote on the one or two ideas that will be best for your family. You can all sign the pledge on the next page



## Section 1: Environmental Health

### 4-8 Activities

#### 4 – 8 Overview

Students will gain a comprehensive understanding of basic scientific principles regarding environmental health and how our environment can affect our health. This understanding will be applied to common household chemicals to guide students through the identification of a contaminant, understanding the risks of exposure, and designing a risk reduction plan. *These principles will later be applied specifically to mercury as an environmental contaminant and health concern.*

#### Suggested Duration

4 weeks with 45-minute class periods

#### Learning Outcomes and Activities

##### After Module 1:

***Your Environment, Your Health,***  
students will be able to:

- Define environmental health science;
- List environmental hazards in their personal environment (house, classroom, recess yard, science lab, etc.); and
- Identify how they are exposed to chemicals.

##### After Module 2:

***What is in our Environment?,***  
students will be able to:

- Define and apply the terms toxicology, chemical, dose and concentration to various environmental health scenarios that include chemicals in their home and classroom.

##### Module 1 Activities/Materials:

- [Your Environment Your Health](#) PPT
- [Your Environment, Your Health Worksheet](#) (PDF)
- [Learning the language of science/Glossary](#) (PDF)
- Student reference for Glossary: [What's that Word?](#)

##### Module 2 Activities/Materials

- [EPA Healthy Homes Interactive Module Online module](#)
  - [Healthy Homes Assignment](#)
- [Healthy Classroom Assessment Worksheet](#)
- [Background information about reading labels from the EPA](#)
  - [What Makes a Product Hazardous? - Reading Hazardous Household Product Labels](#)
- [Reading Household Product Labels Materials List](#)

## Section 1: 4-8 Activities

**After Module 3,  
*How the Environment Influences our  
Health?*,  
students will be able to:**

- Identify environmental health concerns in the home and the classroom

### Module 3 Activities/Materials

[Name that Environmental Hazard – Student version](#) with Background information on the environmental hazards  
[Name that Environmental Hazard – Teacher version](#)  
[Recycle City EPA educational online game](#)  
[Home Chemical Survey Student Worksheet](#)  
[Home Chemical Survey Teacher Guide](#)  
[Home Chemical Survey Report](#)

**After Module 4,  
*Experimenting with Dose*,  
students will be able to:**

- Apply the concepts of dose and response to an experimental scenario.

### Module 4 Activities and Materials

- [Radish Seed Dose Response Activity – Teacher Guide](#)
- [Radish Seed Dose response worksheet – Student version](#)
- [Radish Seed Dose Response Worksheet – Teacher version](#)

### **Module 5: *Careers in Environmental Health*. This can be a stand-alone activity.**

The video “Careers in Environmental Health” was created to introduce students to various careers in science. Environmental Health includes chemists, biologists, toxicologists, epidemiologists, and many more careers. Scientists from Oregon State University (OSU) and the Environmental Protection Agency (EPA) were interviewed about their job, as well as how they ended up becoming a scientist. The video is 13 minutes long.

After watching the video and completing the worksheet, students will be able to

- Identify up to three different careers related to environmental health
- List the types of classes needed to become a scientist
- Share about the diversity of people who become scientists
- Describe some ways that environmental health scientists make a difference
- Describe why scientists enjoy their jobs

*Careers in Environmental Health* video versions located at located at <http://superfund.oregonstate.edu/mercury>

- [Worksheet](#) and [Teacher Guide](#)

## Section 1: 4-8 Activities

### Extension Activities and Resources

#### Module 1: Your Environment, Your Health

- Background information for teachers: **EPA Children’s Health Curriculum, Lesson 1: Environmental Health 101, 3. “Staying Alive”**  
[http://www2.epa.gov/sites/production/files/2014-06/documents/lesson1\\_complete\\_plan.pdf](http://www2.epa.gov/sites/production/files/2014-06/documents/lesson1_complete_plan.pdf)
- **NLM Toxicology Tutorial:** <http://sis.nlm.nih.gov/enviro/toxtutor.html>  
The first module goes through the basics of toxicology. This is for advanced students.

#### Module 2: What’s in Your Environment?

- American Association of Poison Control Centers. <www.aapcc.org>.
- Consumer Fact Sheet: How to Read a Pesticide Label...and Why. California Environmental Protection Agency. Department of Pesticide Regulation  
<http://www.cdpr.ca.gov/docs/dept/factshts/factmenu.htm>
- National Pesticide Information Center, Oregon State University. Signal Words. July 2008.  
<http://www.npic.orst.edu/factsheets/signalwords.pdf>  
**For questions concerning pesticides and other hazardous household products, call NPIC @ 1-800- 858 - 7378 (PEST)**
- U. S. Consumer Product Safety Commission. Office of Compliance. Requirements under the Federal Hazardous Substance Act: Labeling and Banning Requirements for Chemicals and Other Hazardous Substances. August 2002.
- United States Environmental Protection Agency. Office of Pesticide Programs. Read the Label First. <http://www.epa.gov/pesticides/label/>

#### Module 3: How the Environment Influences our Health

- Extension Activity:  
[Writing a Memo: Result of a Recent Household Hazardous Product Inventory](#)

#### Module 4: Experimenting with Dose

- Safety in the Science Classroom: <http://www.nsta.org/docs/SafetyInTheScienceClassroom.pdf>  
Provided by the National Science Teachers Association, an excellent manual that covers appropriate attire for laboratory work, as well as how to handle scientific equipment.
- Lab Safety! Youtube video <https://www.youtube.com/watch?v=qql1gafJA-4>

## Section 1: 4-8 Activities

### 4<sup>th</sup>-8<sup>th</sup> Grade Suggested Activity Schedule

<p><b>Monday</b></p> <p>Present Your Environment, Your Health PPT</p> <p>Discuss various environments and scenarios</p> <p>Begin Glossary</p>	<p><b>Tuesday</b></p> <p><i>(6-8 grade only)</i> NLM Toxicology Tutorial</p> <p>Add terms to Glossary Assignment 1</p>	<p><b>Wednesday</b></p> <p>Perform the EPA Healthy Homes interactive module and fill out worksheet</p>	<p><b>Thursday</b></p> <p>Perform Healthy Classroom Assessment and fill out worksheet</p>	<p><b>Friday</b></p> <p>Label Reading</p> <p>Risk mitigation strategies for hazards identified in Healthy Classroom Assessment</p>
<p><b>Monday</b></p> <p>Play "Name that Environmental Hazard"</p> <p>Create list of environmental chemicals home, outdoors, and classroom</p>	<p><b>Tuesday</b></p> <p>Choose 3 chemicals and define (Assignment 4)</p> <p><i>(Optional)</i> Recycle city</p>	<p><b>Wednesday</b></p> <p>Introduce radish seed dose response activity (controls, etc.)</p> <p>HW: 3 chemicals to test</p>	<p><b>Thursday</b></p> <p>Make a class list of chemicals to test</p> <p>Generate hypothesis'</p> <p>Generate list of responses to evaluate</p>	<p><b>Friday</b></p> <p>Calculate the different doses of the chemicals being used for Experiment 1</p> <p>Turn in Assignment 4</p>
<p><b>Monday</b></p> <p>Mix chemicals and begin Experiment 1</p>	<p><b>Tuesday</b></p> <p>Collect data</p>	<p><b>Wednesday</b></p> <p>Collect data</p> <p>Assignment 5</p>	<p><b>Thursday</b></p> <p>Collect data</p> <p>Assignment 5</p>	<p><b>Friday</b></p> <p>Complete experiment</p> <p>Collect data, including final measurements</p>
<p><b>Monday</b></p> <p>Work on Lab Report</p>	<p><b>Tuesday</b></p> <p>Work on Lab Report</p>	<p><b>Wednesday</b></p> <p>Work on Lab Report</p>	<p><b>Thursday</b></p> <p>Turn in Lab Report</p>	<p><b>Friday</b></p> <p>Watch the "Careers in Environmental Health" video and fill out associated worksheet</p>

## Section 1: 4-8 Activities

### Lesson Plan

#### MODULE 1.1 YOUR ENVIRONMENT, YOUR HEALTH

**Day 1:** Students focus on the definition of environmental health, and how the environment can influence human health. This module will introduce basic terms and concepts related to environmental health and will provide the background for the rest of the segment.

**Begin by sharing the *Your Environment, Your Health PowerPoint presentation (available on the project web site)*, then students work on the corresponding worksheet -*Your Environment, Your Health Worksheet (PDF)***

Share answers and discuss environments and scenarios in class.

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#### Your Environment, Your Health Worksheet – Teacher Key

**Question 1:** Are all chemicals bad for your health or the environment?

No! Not all chemicals are bad. Sometimes, they can be good for us and bad for us, depending on how much of the chemical is present.

**Question 2:** What are ways we can be exposed to chemicals in our environment?

We can be exposed to chemicals by breathing (inhalation), eating and drinking (ingestion), and by having chemicals touch our skin (dermal). There are other ways we can be exposed that are less common, which include intravenous exposure, such as when you go to the doctor and you get a shot. Common examples include: Drinking soda, playing in the yard, driving, touching things, etc.

**Question 3:** What is another word for breathing? Inhalation

**Question 4:** What is another word for eating and drinking? Ingestion

**Question 5:** What is another word for when things touch our skin? Dermal

**Question 6:** Name one example of how you can reduce your exposure to chemicals at home or school.

Common examples include: opening windows, turning on a fan, wearing an apron, wearing gloves, use less of a cleaning chemical

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**Day 2: Focus students on the Glossary worksheet.**

**Learn the Language of Science** Student worksheet ([doc](#), [PDF](#))

Student reference for Glossary: What's that Word? <http://kids.niehs.nih.gov/word/index.htm#d>

More advanced students may be interested in the NLM Toxicology Tutorial listed in Extensions. **NLM Toxicology Tutorial:** <http://sis.nlm.nih.gov/enviro/toxtutor.html>

## Section 1: 4-8 Activities

### MODULE 1.2 WHAT IS IN OUR ENVIRONMENT?

Students begin exploring different types of environments, and what types of chemicals or environmental hazards are found in the environment. An important section of this module is the Label Reading Activity, wherein students understand how to read the labels found on common chemicals. In addition, this module will rely on home assignments to document different types of chemicals found in the home environment, as well as computer curricula to evaluate chemicals found in a variety of different environments.

*From the EPA Healthy Homes Tour:* There are many household products used around your home. What do you know about them? Join us for a house tour and learn more about the chemicals around your home.

#### **Day 3: EPA Healthy Homes Interactive Module**

Online module: <http://www.epa.gov/kidshometour/>

#### **[EPA Healthy Homes Assignment – Teacher Key](#)**

#### **Day 4: [Healthy Classroom Assessment - Student Worksheet](#)**

**Day 5: Label reading activity: [What Makes a Product Hazardous?](#) - Reading Hazardous Household Product Labels, [Teacher Guide](#) and [Materials List](#)**

*Background information about reading labels from the Environmental Protection Agency*  
<http://www.epa.gov/pesticides/kids/hometour/labels.htm>

#### **About Labels**

Many household products contain pesticidal and toxic ingredients that can be harmful to humans, animals, or the environment. Even so, we use these products to clean or maintain our home. Or they are useful because they control disease-causing organisms, insects, weeds, or other pests. The label is your guide to using products safely and effectively.

#### **Signal Words**

Labels use signal words to show how toxic or hazardous a product can be. They are: Caution, Warning, and Danger. Both you and your parents need to be careful when products with signal words on the label are used. Make sure you do not come in contact with any of the chemicals from these products. Remind your parents to always "Read the Label First" to know how to properly use these products and for safety information.

- **Danger** is the strongest signal word. If a label has the word Danger on it, your parents must be extremely careful using the product. If it is used the wrong way, you could get very sick, be hurt for a long time, go blind or even die. Danger is also used on products that could explode if they get hot.
- **Warning** is less strong than Danger, but it still means that you could get really sick or become seriously hurt. Warning is also used to identify products that can easily catch on fire.
- **Caution** shows that the product could hurt you, but it is less harmful than products with a danger or warning signal word. Caution is used on products that could bother your skin, make you sick if you breathed the fumes, or really hurt if the product got in your eyes.

## Section 1: 4-8 Activities

### MODULE 1.3 HOW DOES OUR ENVIRONMENT INFLUENCE OUR HEALTH?

In this module, students will continue to understand how the environment can influence their health. To do this, students will explore types of environmental hazards, as well as how humans can evaluate and influence their environment.

#### Week 2: Day 1

##### [Name that Environmental Hazard](#)

This activity was modified from the “Name that Poison,” produced by the Southern California Environmental Health Sciences Center, a Partnership of USC and UCLA. *Funded by the National Institute of Environmental Health Sciences, NIH.*

For more information about the Center, call 323-442-3077.

#### Background information on the environmental hazards

Carbon monoxide is a colorless, odorless gas. It can be found in traffic exhaust. Carbon monoxide prevents your red blood cells from carrying oxygen.

Lead is a heavy metal that can be found in old paint and very old metal toys. Lead poisoning has very few obvious physical symptoms, but can result in nerve damage and problems with vision and hearing in adults. In children, lead poisoning can result in liver and kidney damage, as well as cause problems with hearing.

Source: <http://www.epa.gov/superfund/lead/health.htm>

Arsenic has no scent and no taste. It is found in rock and soil, and from there enters rivers and wells. Arsenic can be used to create paints and dyes and is currently used to treat lumber. High exposure to arsenic can cause skin damage.

Source: <http://water.epa.gov/drink/contaminants/basicinformation/arsenic.cfm>

Mercury is found naturally in the air, water and soil. In solid form, mercury is a shiny and silver. At room temperature it is a liquid. When heated, it is a colorless, odorless gas. In the 1800’s mercury was used to make felt hats.

Source: <http://www.epa.gov/mercury/about.htm>

Asbestos is found naturally in rock and soil. It was once used as a fire retardant and in building construction materials. It is often found in the ceilings of old buildings in the United States. Exposure to asbestos can increase your risk of developing lung cancer, especially in cigarette smokers.

Source: <http://www2.epa.gov/asbestos/learn-about-asbestos>

## Section 1: 4-8 Activities

### **Day 2 (Optional): Recycle City EPA educational online game**

#### **Welcome to Recycle City!**

Just a few years ago, this place was called Dumptown. For years, the folks living here hadn't thought much about where their food, toys and other possessions came from - or where they went when they threw them out. And, eventually, that became a very BIG problem...

Because Dumptowners didn't know what happened to waste after it was thrown away, they thought nothing of dropping empty soda cans here and there or putting cans of leftover paint right into their trash cans. They bought and dumped more and more every year.

Things that easily could have been reused or recycled were tossed in the trash, because nobody knew recycling made a difference. At the dump, they threw dangerous chemicals and poisons (hazardous waste) into the regular garbage (solid waste).



The garbage heap grew and began to smell. Sometimes it caught fire, sending toxic smoke into the air and making it hard for everyone to breathe. Dumptowners tried moving away from the mess, but wherever they moved, the problem was still there—on the ground and in the air. They knew they had to fix it.

They learned to reduce the amount of waste they threw away. For example, they bought items at the store that weren't wrapped in extra packaging, so there would be less to throw away, and they bought products in larger containers. They learned to reuse other things—like washing out empty containers to store food in instead of throwing them away. And, they learned to recycle. They set up bins around town to collect glass, paper, plastics, and aluminum that could be converted back into raw materials, then made into new products. They turned their food scraps and yard trimmings into rich compost to grow their gardens.

Dumptowners paid special attention to reducing the toxic materials they bought, such as trying safer pest control products or household cleaners. For the hazardous products they did buy, Dumptown set up special collection points where people could drop off used chemicals, paints, and cleansers for safe handling and proper disposal.

Finally, they closed the old city dump and built a new solid waste landfill outside of town. With the town's new image, it needed a new name, and Recycle City was born. Travel around Recycle City and find out what folks here are doing to reduce waste and make the environment better.

**Source:** <http://www.epa.gov/recyclecity/mainmap.htm>



## Section 1: 4-8 Activities

### Home Chemical Survey

[Teacher Guide \(doc\)](#)

[Survey Worksheet \(doc\)](#)

[Survey/Report \(doc\)](#)

### Extension:

- Home Chemical Report/Memo

### EPA Resources and Related Links:

- Teacher Resources <http://www.epa.gov/students/teachers.html>
- Waste Education Resources <http://www.epa.gov/wastes/education/index.htm>

### MODULE 1.4 EXPERIMENTING WITH DOSE

In this module, students will perform a weeklong science experiment to understand the concept of the dose-response relationship used by toxicologists to understand the potential toxicity of various chemicals. Before beginning, it may be helpful to cover safety protocols when working in a laboratory.

- [Radish Seed Dose Response Activity – Teacher Guide](#)
- [Radish Seed Dose response worksheet – Student version](#)
- [Radish Seed Dose Response Worksheet – Teacher version](#)

### Recommended Resources for Lab Safety

- Safety in the Science Classroom: <http://www.nsta.org/docs/SafetyInTheScienceClassroom.pdf>  
Provided by the National Science Teachers Association, an excellent manual that covers appropriate attire for laboratory work, as well as how to handle scientific equipment.
- Lab Safety! Youtube video <https://www.youtube.com/watch?v=qql1gafJA-4>



## Section 2: Mercury in our Environment

### Overview

It is suggested to begin with Section 1 to give students a foundation on our connection to various environments and how our environments impact our health.

This section on **Mercury and the Environment** gives student an overview of mercury and how it enters our environment and our food chain. There are diverse activities - on-line, worksheets, videos, games, and teamwork.

In Section 3, students will expand their learning about mercury and human health.

All resources are kept up to date on the OSU Superfund Research Program Web Site. The student worksheets are available in “doc” format on-line to make them adaptable.

<http://superfund.oregonstate.edu/mercury>



The mission of the *National Institute of Environmental Health Sciences* is to discover how the environment affects people in order to promote healthier lives.

*National Institute of Environmental Health Science (NIEHS),  
an institute of the National Institutes of Science (NIH)*

## Section 2: Mercury and the Environment

### K-3 Activities

#### K – 3 Overview

Students will gain an understanding of where mercury comes from and how it enters the environment and our food system. Activities include on-line interaction, discussions, and worksheets.

#### Suggested Duration

~ 4 days – about 45 minutes per day

#### Learning Objectives

After students complete the three modules in this section, they will be able to:

Share where mercury is found in many areas within the United States (Module 1)

Demonstrate an understanding of bioaccumulation of mercury in fish by reading and following fish advisories in an on-line game (Module 2)

#### K-3 Suggested Activity Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Mercury Sources in the US	The Water Cycle	Mercury in the Food Chain	Mercury in Fish	

#### Lesson Plan

##### MODULE 2.1 MERCURY IN THE UNITED STATES

Suggested Lesson to Adapt:

Mapping US Mercury Emissions Activity (includes teacher instructions)

<http://participatoryscience.org/curriculum-activity/mapping-us-mercury-emissions>

##### MODULE 2.2 MERCURY AND THE WATER CYCLE

Suggested Lesson:

The Water Cycle interactive module created by the EPA

[http://www.epa.gov/safewater/kids/flash/flash\\_watercycle.html](http://www.epa.gov/safewater/kids/flash/flash_watercycle.html)

Coloring and Activity Worksheets

[http://water.epa.gov/learn/kids/drinkingwater/upload/activity\\_grades\\_k-3\\_activitybook.pdf](http://water.epa.gov/learn/kids/drinkingwater/upload/activity_grades_k-3_activitybook.pdf)

<http://kids.niehs.nih.gov/games/coloring/coloringbooks/>

## Section 2: K-3 Activities

### **Optional Module 3: Mercury in the Food Chain**

By understanding the water cycle, students can now learn about how mercury can bioaccumulate once it enters the water cycle. Here, students will learn about the concepts of biomagnification, the process by which mercury accumulates in higher-order organisms within the food cycle.

#### **Suggested Background Reading for Teachers:**

Mercury in Foodwebs (Arcadia Center for Participatory Learning)

<http://participatoryscience.org/unit/mercury-foodwebs>

Suggested Lessons:

#### **Mercury in Fish**

- [Fishing for Safe Food](#) (Adapted from the EPA)  
“In this interactive game adapted from the U.S. Environmental Protection Agency, students on a fishing trip try to catch different types of fish. Once a player catches a fish, he or she decides to keep it or throw it back, based on safety information provided by the EPA. The game teaches students which fish have high or low levels of mercury, and how much is safe to eat.”
- [Mercury in Fish: Bioaccumulation activity](#)  
Use the class to actively demonstrate the mechanics of the food chain as well as the mechanics and effects of bioaccumulation.



#### **Other Activity Resources:**

- *Mercury in Schools* pg. 50  
<http://www.mercuryinschools.uwex.edu/lib/curriculum/national-curriculum.pdf>
- The Food Chain Game (Arcadia Center for Participatory Learning)  
<http://participatoryscience.org/curriculum-activity/food-chain-game>

## Section 2: Mercury and the Environment

### 4 - 8 Activities

#### 4 - 8 Overview

Students will gain a comprehensive understanding of the historical use and sources of mercury within the context of the Black Butte Mine. Students will then apply the principles of the scientific method, as well as principles of toxicology, learned in Section 1, to design, implement and analyze.

#### Suggested Duration

~ Three weeks – about 60 minutes per day

#### Learning Objectives and Activities

##### After Module 2.1: The Black Butte Mine,

Student will be able to:

- Create a timeline of significant years for the mine activities
- Identify three key features of the Black Butte Mine
- Pinpoint three ways mined mercury was beneficial to the nation
- Share what is happening today in the watershed of the Black Butte Mine

##### After 2.2: What is Mercury?,

Students will be able to:

- Define and apply the terms toxicology, dose-response, bioaccumulation and concentration to an experimental scenario.

##### Activities/Materials:

##### After Module 2.3: Mercury in the Environment,

Student will be able to:

- Describe fate and transport of mercury.

##### After Module 2.4: Mercury in the Food Chain,

Student will be able to:

- Describe bioaccumulation and how mercury travels through the environment and fish to humans.

- Define and apply terms specific to mercury and the mining process within the context of the Black Butte Mine.

##### Activities/Materials:

- [Video](#)
- [Student Worksheet](#)
- [Teacher Guide](#)
- Student Science Notebooks

- The [Mercury in Schools](#) expanded curriculum. Detailed lessons and activities in “Lesson Plan”.
- [Learning the Language of Science - Mercury Worksheet](#)
- Assignment 3 Background Reading – [How can you be exposed to mercury?](#)

##### Activities/Materials:

- [The Quicksilver Question](#)
- [The Water Cycle](#) interactive module
- [The Road to Toxicity](#) board game

##### Activities/Materials:

- Games: [Foodwebs](#) and [Foodchain game](#)
- [Fishing for Safe Food](#) on-line module

## Section 2: 4 - 8 Activities

### Suggested Schedule

<b>Monday</b> Black Butte Mine video and worksheet	<b>Tuesday</b> Mercury quiz & readings	<b>Wednesday</b> Mercury in Schools case study	<b>Thursday</b> Assignment 1 Assignment 2	<b>Friday</b> Mercury Sources in the US
<b>Monday</b> Assignment 3	<b>Tuesday</b> Quicksilver readings and online module	<b>Wednesday</b> <i>Optional - Quicksilver activities</i>	<b>Thursday</b> The Water Cycle	<b>Friday</b> Assignment 4
<b>Monday</b> Road to Toxicity board game	<b>Tuesday</b> Mercury in the Food Chain	<b>Wednesday</b> <i>Optional - Further Food Chain activities</i>	<b>Thursday</b> Mercury in Fish	<b>Friday</b> <i>Optional - Host a Guest lecture from (OSU, CDM Smith, EPA). Discuss options for a Citizen Science Project</i>

### MODULE 2.1 THE BLACK BUTTE MINE

#### Overview

In this module, the history of the Black Butte Mine in Cottage Grove, Oregon will be described. The Black Butte Mercury Mine operated off and on between the years 1898 and 1969. The mine is considered one of the largest deposits of mercury in the United States and drew international attention during the world wars when the United States was unable to access supplies of mercury from the large European producers. In total the mine produced around 17,000 flasks, or 1.29 Million pounds, of elemental mercury. The historic operation of Black Butte has left a toxic legacy in the streams and lakes of Cottage Grove, and the Butte itself is heavily contaminated with mercury from the refining process.

The Black Butte Mine Superfund Site is located near Cottage Grove, Oregon in Lane County. Mercury and other contamination from tailing piles at the abandoned mine site affect the Coast Fork Willamette River and creeks that flow into Cottage Grove Reservoir.

## Section 2: 4 - 8 Activities

This video was created for students to learn about the history of their community. Many people have no knowledge of the Black Butte Mine or the role it played in local and national history. The history of the Black Butte Mine is fascinating and important for the current environmental health of the surrounding community. The video is about 11 minutes long and includes interviews with local people sharing their first-hand experience at a Cottage Grove Historical Society event.

[Teacher Guide](#) (pdf) | [Video](#) | [Student Worksheet](#) (pdf) | [Map of Black Butte Mine Watershed](#)

### Suggested Lesson Plan

#### ***Before watching the video***

- Some of the vocabulary used in this video may not be familiar to the students. A vocabulary list is included. It may be helpful to go over these vocabulary terms with the students before watching the video.
- To help the students begin thinking about mercury and mining, it may be helpful to first show the video: ***Mercury in the SF Bay***, which includes a worksheet and teacher key. (<http://superfund.oregonstate.edu/mercury>).
- For younger students, you may want to only show parts of the video and adapt the worksheet and extension activities.

#### ***After watching the video***

- Student can work in pairs or small groups to do the worksheet. It may be helpful to do some sections as a class.
- Students may need to watch the video more than once to find all the answers.

### Suggested Extension Activities

- **Have students find the Black Butte Mine site on a map.**
  - It may be interesting to use Google Earth or Google Maps and view the area in 3D.
  - How far is the Black Butte Mine from their school? From their home?
  - Which river and streams are in the watershed of the mine site? Which reservoirs?
- **Have students create their own map of the area using color pencils.**
  - What would they personally want to include on their map? These maps can be displayed.
- **Have students create a timeline from the worksheet of key events.**
  - The activity of the Black Butte Mine was driven by the price for mercury. This could be used to talk about U.S. economic history such as the Great Depression.
  - Students can be creative and add other events to the timeline or do a parallel timeline comparing other historical events that were happening in the world during that time, such as US Presidents in office, wars, discoveries, civil rights, disasters, celebrations, etc.
- **Bring math into the activity.**
  - How many years was the mine open?
  - How many years after the mine closed did it take to be on the National Priorities List (NPL)?
  - Add your birthday, a parent's birthday, a grandparent's birthday, and a great grandparent's birthday to the timeline. How many years are they apart? What happened at the mine when they were born?

## Section 2: 4 - 8 Activities

### Terminology

**Mine:** A pit, tunnels, and shafts made in the earth for the purpose of taking out ores, coal, precious stones, etc.

**Mining:** The act of extracting ore from the rocks

**Furnace:** A structure at the mine that heated the cinnabar and created liquid quicksilver

**Cinnabar:** A mineral, mercuric sulfide (HgS), occurring in red crystals or masses: the principal ore of mercury

**Quicksilver:** The metallic element mercury, known as “quicksilver” because of its silvery color and heavy liquid texture. Processing cinnabar creates quicksilver.

**Mercury:** a naturally occurring element that is found in cinnabar. It is used in thermometers, barometers, mercury-vapor lamps, and dental amalgams (teeth fillings). Symbol: Hg; atomic no: 80; atomic wt: 200.59; valency: 1 or 2; relative density: 13.546; melting pt:  $-38.842^{\circ}\text{C}$ ; boiling pt:  $357^{\circ}\text{C}$

**Ore:** A metal-bearing mineral or rock, or a native metal that can be mined at a profit

**Ore hopper:** A temporary storage bin, filled from the top and emptied from the bottom, often funnel-shaped.

**Mine Tailings:** Tailings are waste material from ore processing that contains residual Hg (in the case of the Black Butte Mine site). The Hg content is limited based on the efficiency of the ore processing. This lingering mercury that is left behind from the Mill site can find its way into the air and water.

**National Priorities List:** A list of places in the United States that are a priority for cleaning up because they are known to release, or threaten to releases, of hazardous substances into the environment. The National Priority List is intended to guide the EPA in determining which sites warrant further investigation and clean up.

**Watershed:** The area of land where all of the rain that falls on it and water that is on it (rivers, streams, creeks, ponds, lake, the ocean, etc.) flow to the same place. If one part of the watershed gets polluted, the other parts can get polluted.

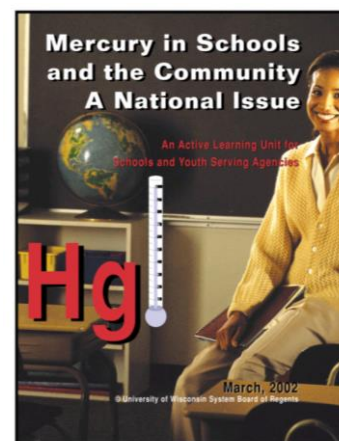
**Fate and Transport of contaminants:** Contaminant distribution, transport, and transformation on hazardous waste sites.

**Reservoir:** A large natural or artificial lake used as a source of water supply.

### **MODULE 2.2 WHAT IS MERCURY?**

Mercury, also known as quicksilver, is a chemical element with the symbol Hg. At room temperature, mercury is a silver liquid and the only metal that can off-gas without being heated up. In the environment, Hg is most commonly found within cinnabar deposits and other volcanic geology.

Mercury is often moved from the environment and into different organisms, such as fish, through mining and burning fossil fuels. In organisms, mercury is most commonly found in the organic form, known as methylmercury. There is a long history of mercury use throughout decades and cultures.





## Section 2: 4 - 8 Activities

This module will explore the definition of mercury, as well as uses of mercury. The majority of this module uses sections from a previously developed curriculum, Mercury in Schools, developed by the University of Wisconsin Extension's Solid and Hazardous Waste Education Center.

The [Mercury in Schools](#) expanded curriculum is freely available

### Suggested Lesson Plan

Students can either read the following sections from the Mercury in Schools curriculum, or teachers may want to work it into a lecture format. After the background readings, students will be able to complete the mercury quiz and case study. The second set of readings focuses on historical and current uses of mercury, and by the end of the readings students will complete a short assignment related to the readings. Adapt appropriately for the class grade level.

#### For teachers

Readings: [Building background information – mercury](#)

#### For students

- Readings: *Mercury in Schools* pg. 4, 6-7, 9, 12, 29-30
- Quiz: *Mercury in Schools* pg. 10-11
- Case study: *Mercury in Schools* pg. 16-21
- Readings:
  - *Mercury in Schools, Mercury through the Ages* pg. 60-63
  - *Mercury in Schools, Industrial Mercury* pg. 64
- Assignment 1: Mercury in Schools pg. 65-66
- Assignment 2: [Learning the Language of Science - Mercury](#) Worksheet
- [Activity Mercury Sources in the US](#) (includes teacher instructions)
- Assignment 3 Background Reading – [How can you be exposed to mercury?](#)

### MODULE 2.3 MERCURY IN THE ENVIRONMENT

In the last module, students learned about mercury, and where it can be found. In this module, students will apply that knowledge to mercury in the environment, specifically how mercury can travel from sites such as a mine, into water sources. The module will begin with an interactive online game created by the University of Washington modeled after a mercury mine.

#### ***The Quicksilver Question***

The Quicksilver Question Web Module introduces students to the connections between historic gold mining, mercury contamination, fish consumption and human health. In this web-based learning adventure, visitors explore the fictional town of Quicksilver, Washington, searching for a series of key documents that will help them decide if fish from the local lake are safe to eat.

This activity can be limited to a single class period, exploring the online game. If desired, teachers can perform further sections of the curriculum developed by the University of Washington, and available for free download here:

#### Environmental Health



#### The Quicksilver Question Web Module



An interactive, computer based environmental health curriculum for middle school students.

<http://depts.washington.edu/iehmstp/>

## Section 2: 4 - 8 Activities

<https://depts.washington.edu/ceeh/educators/k12-resources.html>

As a companion to the online module, the Quicksilver Teacher's Manual provides a collection of print-based extension lessons for teachers of science, language arts, math, and social studies in grades 6 through 8.

Accompanying curricula from the Mercury in Schools Curricula

Reading (for students): *Mercury in Schools* pg. 43-46

Assignment 4: *Mercury in Schools* pg. 52

### ***Understanding the water cycle***

The Quicksilver interactive online module introduced the idea that mercury found in the soil, often found as cinnabar, can move through the environment, where it can enter the water cycle. Here, students will perform a variety of activities related to mercury transport through the water cycle.

Another online resource offered for free by the Environmental Protection Agency helps students understand how the water cycle works. This [interactive module](#) lets students choose which section of the water cycle they would like to learn more about.

### ***The Road to Toxicity – Board Game***

This board game was developed by the Acadia Learning for Participatory Science and is freely available here:

<http://participatoryscience.org/curriculum-activity/road-toxicity>. A full size board game and information for teachers is available at that site.

### **The rules**

The goal of the game is to become TOXIC - to be converted from inorganic mercury to methylmercury, the form that bioaccumulates in organisms and is more toxic to people. You can become toxic in soils, lakes, streams, or wetlands - depending where you land.

- Each player picks a game piece (thermometer, power plant, volcano, hazardous waste).
- Shuffle each stack of cards (FACT and FACTOR) and place in a central location.
- Take turns rolling 1 die and move the number of spaces indicated.
- If you land on a silver space, pick up a FACT card. Read the card aloud to the other players - the information will be important later. Keep the card.
- If you land on a green space, pick up a FACTOR card. Read it aloud to the other players. Keep this card - you need to collect all three factors to become toxic. The three factors are:
  - Chemistry
  - Anaerobic conditions
  - Microbes
- If you land on a SEQUESTERED space, slide to the soil, lake, wetland, or stream nearby. You're now sequestered - stored in the environment, waiting for the right conditions for methylation so you can become toxic. You need to collect all 3 FACTOR cards before becoming toxic.
- If you're missing one or more FACTOR cards, you can steal them from another player when they land on a POP QUIZ space. Ask them a question about one of the FACT cards you're holding. If they get it right, nothing happens. If they get it wrong, you can take one of their FACTOR cards. If no one has a FACTOR card and a POP QUIZ happens, the penalty for an incorrect response is a lost turn.
- Once one player becomes toxic, s/he wins. If time allows, keep playing until everyone is toxic.

***Methylation overview (for teachers)***

## Section 2: 4 - 8 Activities

- Methylation is a product of complex processes that move and transform mercury.
- Atmospheric deposition contains the three principal forms of mercury, although inorganic divalent mercury ( $\text{Hg}^{2+}$ , often called just HgII) is the dominant form.
- Once in surface water, mercury enters a complex cycle in which one form can be converted to another.
- Mercury attached to particles can settle onto the sediments where it can diffuse into the water column, be resuspended, be buried by other sediments, or be methylated.
- Methylmercury can enter the food chain, or it can be released back to the atmosphere by volatilization.

Source: USGS - <http://www.usgs.gov/themes/factsheet/146-00/>

### MODULE 2.4 MERCURY IN THE FOOD CHAIN

In the previous module, students learned about mercury fate and transport in the environment, specifically mercury transport through groundwater. In this module, students will learn about the concepts of biomagnification, the process by which mercury accumulates in higher-order organisms within the food cycle.

Background reading for teachers: Arcadia Center for Participatory Learning

<http://participatoryscience.org/unit/mercury-foodwebs>

#### ***Mercury in the Food Chain Activities***

Activities      *Mercury in Schools* pg. 50

*Arcadia Center for Participatory Learning*

<http://participatoryscience.org/curriculum-activity/food-chain-game>

\*Two food chain games are presented as optional activities

#### ***Mercury in Fish***

In this section, students will apply the concepts of biomagnification in organisms, such as fish, to understand the need for fish advisories. Using an interactive online game developed in collaboration with the Environmental Protection Agency, students will 'go fishing' and determine which fish are acceptable to eat, based on the provided mercury fish advisements.

- [Fish for Safe Food](#)
- Optional: [Mercury in Fish: Bioaccumulation activity](#)  
Use the class to actively demonstrate the mechanics of the food chain as well as the mechanics and effects of bioaccumulation.



## Section 3: Mercury and Human Health

### Overview

It is suggested to begin with Section 1 to give students a foundation on our connection to various environments and how our environments impact our health.

Section 2 on mercury and the environment gives student an overview of mercury and how it enters our environment and our food chain.

In this section, students will expand their learning about mercury and human health.

All resources are kept up to date on the OSU Superfund Research Program Web Site. The student worksheets are available in “doc” format on-line to make them adaptable. <http://superfund.oregonstate.edu/mercury>



Mercury, also known as quicksilver, is a naturally-occurring metal that is toxic to living organisms. Metallic or elemental mercury — an odorless, shiny, silver-white liquid — is commonly used in thermometers, barometers and fluorescent light bulbs. Metallic mercury is extremely dangerous with a few drops generating enough fumes to contaminate the air in a room. Furthermore, skin contact with the metal results in the absorption of mercury into the blood stream and potential health problems.

*National Institute of Environmental Health Science (NIEHS),  
an institute of the National Institutes of Science (NIH)*

## Section 3: Mercury and Human health

### K-3 Activity

#### K - 3 Overview

Students will learn how humans can be exposed to mercury, and how different routes of exposure may influence the effect the mercury has on their health. In addition students will be able to identify the target organs affected by mercury.

#### MODULE 3.1 MERCURY IN THE HUMAN BODY

After the **Module 3.1: Mercury in the Human Body** activity, students will be able to Identify the main organs affected by mercury in the human body.

#### Background information – for Teachers

The following readings are adapted from the summary chapter from the Toxicological Profile for Mercury. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-800-232-4636.

[Full text available at <http://www.atsdr.cdc.gov/phs/phs.asp?id=112&tid=24>]

#### 1.1 How might I be exposed to mercury?

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Because mercury occurs naturally in the environment, everyone is exposed to very low levels of mercury in air, water, and food.

*Exposure from work:* Workers are mostly exposed from breathing air that contains mercury vapors. Family members of workers who have been exposed to mercury may also be exposed to mercury if the worker's clothes are contaminated with mercury particles or liquid.

*Exposure from fish:* Some people may be exposed to higher levels of mercury in the form of methylmercury if they have a diet high in fish, shellfish, or marine mammals (whales, seals, dolphins, and walrus) that come from mercury-contaminated waters.

#### 1.2 How can mercury enter and leave my body?

---

A person can be exposed to mercury from breathing in contaminated air, from swallowing or eating contaminated water or food, or from touching mercury. Not all forms of mercury easily enter your body, even if they come in contact with it; so it is important to know which form of mercury you have been exposed to, and by which route (air, food, or skin). Methylmercury is the form of mercury most easily absorbed through the gastrointestinal tract (about 95% absorbed). After you eat fish or other foods that are contaminated with methylmercury, the methylmercury enters your bloodstream easily and goes rapidly to other parts of your body.

Once organic mercury is in the bloodstream, it moves easily to most tissues and readily enters the brain. Methylmercury can be changed by your body to inorganic mercury. When this happens in the brain, the mercury can remain there for a long time. When methylmercury does leave your body after you have been exposed, it leaves slowly over a period of several months, mostly as inorganic mercury in the feces.

#### 1.3 How can mercury affect my health?

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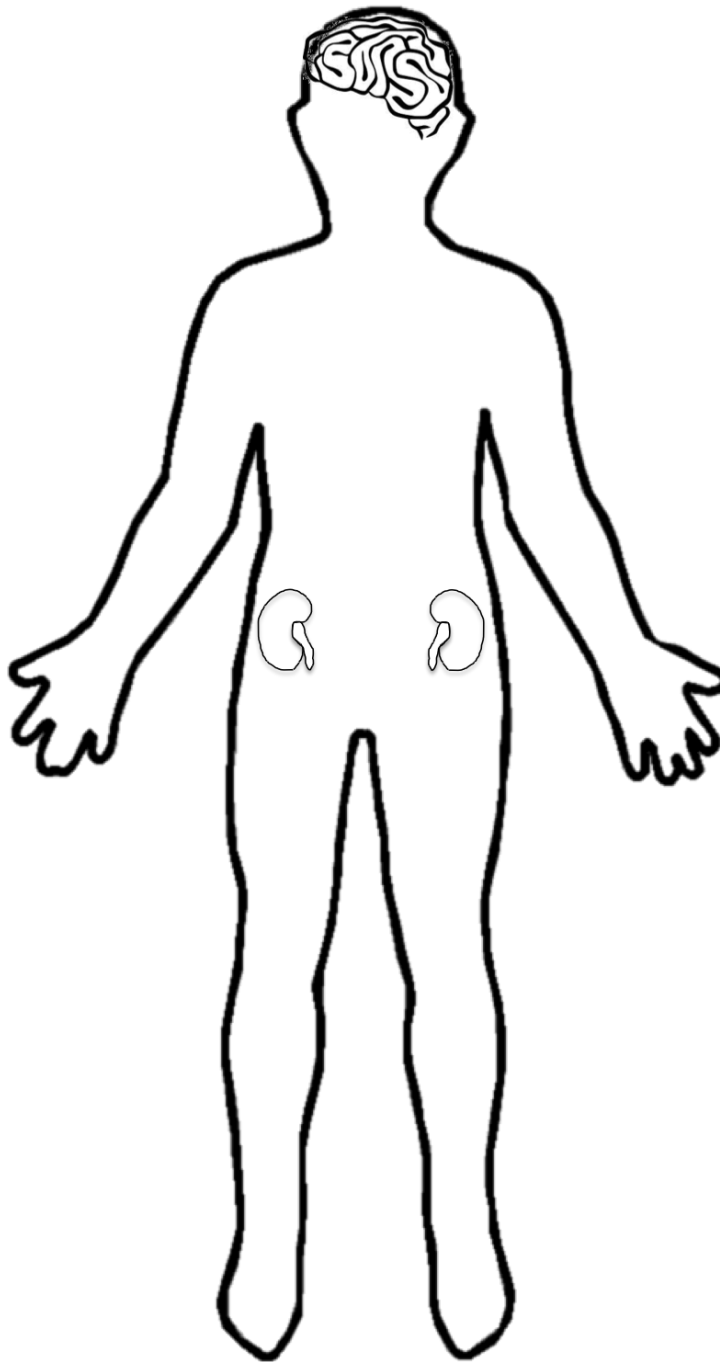
The nervous system is very sensitive to mercury. In poisoning incidents that occurred in other countries, some people who ate fish contaminated with large amounts of methylmercury developed permanent damage to the brain and kidneys.

### Section 3: K-3 Activity

The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues, and thus more damage. All forms of mercury can cause kidney damage if large enough amounts enter the body. If the damage caused by the mercury is not too great, the kidneys are likely to recover once the body clears itself of the contamination.

#### Activity – Mercury in the Human Body

Mercury can accumulate in the nervous system (brain) and the kidneys. Have students color the picture below, and label the brain and kidneys.



## Section 3: Mercury and Human Health

### 4-8 Activities

#### 4 - 8 Overview

Students will learn how humans can be exposed to mercury, and how different routes of exposure may influence the effect the mercury has on their health. In addition students will be able to identify the target organs affected by mercury.

#### Learning Outcomes

- After completing **Module 3.1**, students will be able to demonstrate a deeper understanding of mercury toxicity to humans by attributing physical symptoms of mercury poisoning to the fictional character of the Mad Hatter.
- After completing **Module 3.2**, students will connect basics of environmental health (routes of exposure) to health effects from mercury exposure.
- After completing **Module 3.3**, students will be able to list the target organs affected by mercury.

#### Suggested Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Read "The Basics" and discuss	Read Ch. 7 "Alice in Wonderland" and do Assignment 1	Read "Mercury and Human Health Effects"	Watch "How the Brain Works" and do Activity 1	As a class do the Mercury and Human Health Case Study

#### MODULE 3.1 HUMAN EXPOSURES TO MERCURY

##### Lesson Plan Resources

- Watch video: **Mercury in San Francisco Bay**: <http://science.kqed.org/quest/video/mercury-in-san-francisco-bay>  
A student worksheet is provided on the project web site: <http://superfund.oregonstate.edu/mercury>
- Read and browse “**The Basics**” on mercury at the Environmental Health Student Portal from the National Institutes of Health - <http://kidsenvirohealth.nlm.nih.gov/subtopic/002/chemicals/017/mercury/>
- **Assignment 1: Mercury in fiction**  
Read the story, *Alice's Mad Hatter and Work-Related Illness*, from the National Institutes of Occupational Health and Safety (NIOSH) regarding the Alice in Wonderland movie. *Optional* – watch scenes from the movie. <http://www.cdc.gov/niosh/nppm/upd-03-04-10.html>
- Read **Chapter 7 from Alice in Wonderland about the Mad Hatter**. Have students identify passages in the chapter where the Mad Hatter is exhibiting symptoms of exposure to mercury.  
Chapter 7 is available on-line through Carnegie Mellon University School of Computer Science: <https://www.cs.cmu.edu/~rgs/alice-VII.html>

## Assignment 1: The Mad Hatter – Student version

### Mercury in fiction: Human Health Effects

Read Chapter 7 of Alice’s Adventures in Wonderland by Lewis Carroll. In this chapter, Alice meets the Mad Hatter. Once you have finished the chapter, answer the questions below.

1) **Where did the term “Mad Hatter” come from?**

2) **What are the symptoms of mercury poisoning?** (Hint: read “The Basics” about mercury and human health from the National Institutes of Health <http://kidsenvirohealth.nlm.nih.gov/subtopic/002/chemicals/017/mercury/> )

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

3) **Write down three sentences or paragraphs from the chapter that show or describe a symptom of mercury exposure. After the sentence, write the symptom it is describing.**



## Section 3: 4-8 Activities

### Assignment 1: The Mad Hatter – Teacher version

#### Mercury in fiction: Human Health Effects

Read Chapter 7 of Alice’s Adventures in Wonderland by Lewis Carroll. In this chapter, Alice meets the Mad Hatter. Once you have finished the chapter, answer the questions below.

**1) Where did the term “Mad Hatter” come from?**

When Lewis Carroll was writing Alice in Wonderland in 1865, people in Britain who made hats were called Hatters. They worked in in poorly ventilated rooms, using hot solutions of mercuric nitrate to shape wool felt hats which led them to having high mercury exposure. These Hatters or hat-makers commonly exhibited slurred speech, tremors, irritability, shyness, depression, and other neurological symptoms; hence the expression "mad as a hatter." The symptoms were associated with chronic occupational exposure to mercury.

**2) What are the symptoms of mercury poisoning?** (Hint: read “The Basics” about mercury and human health from the National Institutes of Health <http://kidsenvirohealth.nlm.nih.gov/subtopic/002/chemicals/017/mercury/> )

- a. Tremors (trembling)
- b. Psychosis (losing touch with reality)
- c. Changes in vision or hearing
- d. Memory loss
- e. Loss of appetite (not feeling hungry)
- f. Feeling irritated

**3) Write down three sentences or paragraphs from the chapter that show or describe a symptom of mercury exposure. After the sentence, write the symptom it is describing.**

Alice looked all round the table, but there was nothing on it but tea. [**Loss of appetite**]

“The Hatter was the first to break the silence. ‘What day of the month is it?’ he said, turning to Alice: he had taken his watch out of his pocket, and was looking at it uneasily, shaking it every now and then, and holding it to his ear.” [**Memory loss**]

‘Your hair wants cutting,’ said the Hatter. He had been looking at Alice for some time with great curiosity, and this was his first speech.  
‘You should learn not to make personal remarks,’ Alice said with some severity; ‘it’s very rude.’ [**Irritability**]

‘Two days wrong!’ sighed the Hatter. ‘I told you butter wouldn’t suit the works!’ he added looking angrily at the March Hare.

‘It was the *best* butter,’ the March Hare meekly replied.

‘Yes, but some crumbs must have got in as well,’ the Hatter grumbled: ‘you shouldn’t have put it in with the bread-knife.’

### Section 3: 4-8 Activities

The March Hare took the watch and looked at it gloomily: then he dipped it into his cup of tea, and looked at it again: but he could think of nothing better to say than his first remark, 'It was the *best* butter, you know.' [Irritability]

Alice had been looking over his shoulder with some curiosity. 'What a funny watch!' she remarked. 'It tells the day of the month, and doesn't tell what o'clock it is!'

'Why should it?' muttered the Hatter. 'Does *your* watch tell you what year it is?'

'Of course not,' Alice replied very readily: 'but that's because it stays the same year for such a long time together.'

'Which is just the case with *mine*,' said the Hatter.

Alice felt dreadfully puzzled. The Hatter's remark seemed to have no sort of meaning in it, and yet it was certainly English. 'I don't quite understand you,' she said, as politely as she could. [Psychosis – losing touch with reality]

'If you knew Time as well as I do,' said the Hatter, 'you wouldn't talk about wasting *it*. It's *him*.'

'I don't know what you mean,' said Alice.

'Of course you don't!' the Hatter said, tossing his head contemptuously. 'I dare say you never even spoke to Time!' [Psychosis – losing touch with reality]

'You can draw water out of a water-well,' said the Hatter; 'so I should think you could draw treacle out of a treacle-well--eh, stupid?' [Irritability]

## Section 3: 4-8 Activities

### MODULE 3.2 MERCURY AND HUMAN HEALTH EFFECTS

The following readings are adapted from the summary chapter from the Toxicological Profile for Mercury. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-800-232-4636.

This public health statement tells you about mercury and the effects of exposure.

[Full text available at <http://www.atsdr.cdc.gov/phs/phs.asp?id=112&tid=24>]

#### 1.1 How might I be exposed to mercury?

---

Because mercury occurs naturally in the environment, everyone is exposed to very low levels of mercury in air, water, and food.

*Exposure from dental amalgams:* A potential source of exposure to metallic mercury for the general population is mercury released from dental amalgam fillings. An amalgam is a mixture of metals. Part of the mercury at the surface of the filling may enter the air as mercury vapor or be dissolved in the saliva. However, it should be kept in mind that exposure to very small amounts of mercury, such as that from dental amalgam fillings, does not necessarily pose a health risk.

*Exposure from work:* Workers are mostly exposed from breathing air that contains mercury vapors. Dentists and their assistants may be exposed to metallic mercury from breathing in mercury vapor released from amalgam fillings and to a much lesser extent from skin contact with amalgam restorations. Family members of workers who have been exposed to mercury may also be exposed to mercury if the worker's clothes are contaminated with mercury particles or liquid.

*Exposure from fish:* Some people may be exposed to higher levels of mercury in the form of methylmercury if they have a diet high in fish, shellfish, or marine mammals (whales, seals, dolphins, and walrus) that come from mercury-contaminated waters. Public health advisories are issued by state and federal authorities for local waters that are thought to be contaminated with mercury.

#### 1.2 How can mercury enter and leave my body?

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A person can be exposed to mercury from breathing in contaminated air, from swallowing or eating contaminated water or food, or from having skin contact with mercury. Not all forms of mercury easily enter your body, even if they come in contact with it; so it is important to know which form of mercury you have been exposed to, and by which route (air, food, or skin).

Methylmercury is the form of mercury most easily absorbed through the gastrointestinal tract (about 95% absorbed). After you eat fish or other foods that are contaminated with methylmercury, the methylmercury enters your bloodstream easily and goes rapidly to other parts of your body.

Only small amounts of methylmercury enter the bloodstream directly through the skin, but other forms of organic mercury can rapidly enter the body through the skin.

Organic mercury compounds may evaporate slowly at room temperature and may enter your body easily if you breathe in the vapors.

## Section 3: 4-8 Activities

Once organic mercury is in the bloodstream, it moves easily to most tissues and readily enters the brain. Methylmercury can be changed by your body to inorganic mercury. When this happens in the brain, the mercury can remain there for a long time. When methylmercury does leave your body after you have been exposed, it leaves slowly over a period of several months, mostly as inorganic mercury in the feces.

### 1.3 How can mercury affect my health?

---

The nervous system is very sensitive to mercury. In poisoning incidents that occurred in other countries, some people who ate fish contaminated with large amounts of methylmercury developed permanent damage to the brain and kidneys.

Metallic mercury vapors or organic mercury may affect many different areas of the brain and their associated functions, resulting in a variety of symptoms. These include personality changes (irritability, shyness, nervousness), tremors, changes in vision (constriction (or narrowing) of the visual field), deafness, muscle incoordination, loss of sensation, and difficulties with memory.

The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues, and thus more damage. All forms of mercury can cause kidney damage if large enough amounts enter the body. If the damage caused by the mercury is not too great, the kidneys are likely to recover once the body clears itself of the contamination.

## Assignment 2 – Student version

Read the adapted “Toxicological Profile for Mercury” and answer the following questions.

- 1) **What are the three ways you could be exposed to mercury?** (Hint: Go back to Segment 1 if you don’t remember the three routes of exposure!)

- 2) **Underneath each sentence taken from the reading, write down the route of exposure.**

After you eat fish or other foods that are contaminated with methylmercury, the methylmercury enters your bloodstream easily and goes rapidly to other parts of your body.

**Route of exposure?**

Only small amounts of methylmercury enter the bloodstream directly through the skin, but other forms of organic mercury can rapidly enter the body through the skin.

**Route of exposure?**

Organic mercury compounds may evaporate slowly at room temperature and may enter your body easily if you breathe in the vapors.

**Route of exposure?**

- 3) **In section 1.3 “How can mercury affect my health” the reading lists two ‘target’ organs. Target organs are parts of the body that are affected by toxins. For example, cigarette smoke affects the lungs. What are the two target organs of mercury exposure?**

1)

2)

## Section 3: 4-8 Activities

### Assignment 2 – Teacher version

Read the adapted “Toxicological Profile for Mercury” and answer the following questions.

- 4) What are the three ways you could be exposed to mercury?** (Hint: Go back to Segment 1 if you don’t remember the three routes of exposure!)

Inhalation (Breathing)

Dermal (Touching)

Ingestion (Eating/drinking)

- 5) Underneath each sentence taken from the reading, write down the route of exposure.**

After you eat fish or other foods that are contaminated with methylmercury, the methylmercury enters your bloodstream easily and goes rapidly to other parts of your body.

**Route of exposure?** Ingestion (eating)

Only small amounts of methylmercury enter the bloodstream directly through the skin, but other forms of organic mercury can rapidly enter the body through the skin.

**Route of exposure?** Dermal (skin)

Organic mercury compounds may evaporate slowly at room temperature and may enter your body easily if you breathe in the vapors.

**Route of exposure?** Inhalation (breathing)

- 6) In section 1.3 “How can mercury affect my health” the reading lists two ‘target’ organs. Target organs are parts of the body that are affected by toxins. For example, cigarette smoke affects the lungs. What are the two target organs of mercury exposure?**

**3)** Brain (nervous system)

**4)** Kidneys

### **Activity 1: Human Anatomy Art Project**

In this activity, you will create a drawing of the human body and mark the following:

- (1) Target organs
- (2) Where mercury is metabolized
- (3) Where mercury is excreted.

Watch one of the following videos to learn more about one of the target organs, the central nervous system (your brain!)

How the Brain Works – Part 1 (10 mins)

<http://www.youtube.com/watch?v=I5ao8mvMeFE>

OR

How the Brain Works (9 mins)

[http://www.youtube.com/watch?v=Y4O\\_Wkv66b0](http://www.youtube.com/watch?v=Y4O_Wkv66b0)

#### *Instructions*

- 1) Get a big piece of construction paper and draw an outline of your body
- 2) Mark the different routes of exposure with an arrow and the name of the type of exposure
- 3) Label organs with their name and whether they are a target, excretion or metabolism organ.  
Option 1: Use colored markers to draw in organ systems  
Option 2: Using patterns, cut out organs from construction paper and paste them onto your cut out.

Target organs:

- a. Nervous System (Brain and Spinal column)
- b. Renal system (Kidneys)

Excretion organs: Renal system

- a. Kidneys
- b. Ureter, Urinary Bladder and Urethra

Metabolism organs: Digestive system

- a. Tongue and Salivary glands
- b. Esophagus
- c. Liver
- d. Gall bladder
- e. Stomach
- f. Large and Small Intestines
- g. Rectum
- h. Pancreas

**Resources:**

- A. Toxicological Profile for Mercury class readings
- B. Picture of the nervous system: <http://healthfavo.com/nervous-system-diagram.html>
- C. Picture of the digestive system: <http://healthfavo.com/digestive-system-for-kids.html>
- D. Information (and diagrams) of the renal system:  
[http://www.teachengineering.org/view\\_lesson.php?url=collection/cub\\_/lessons/cub\\_human/cub\\_human\\_lesson08.xml](http://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_human/cub_human_lesson08.xml)
- E. Excretion of mercury



### Assignment 3: Mercury and Human Health Case Study

Many people are exposed to methylmercury from eating fish, such as tuna. Below is a true case study of a 54-year-old man that ate one can of tuna every day for five years.

Average weight of a can of tuna: 5 ounces  
(It takes 16 ounces to equal 1 pound)

Number of days in a year: 365

**1) Calculate (and show) how many cans of tuna the man ate during that time:**

**2) Calculate how many pounds of tuna the man ate over five years**

**3) After five years, the man went to the doctor, where his blood was tested for levels of methylmercury. The only way to reduce mercury is to stop being exposed. On his first visit, he was told to stop eating tuna. The man stopped eating tuna and continued going to the doctors. Each time he visited the doctors, the amount of methylmercury was measured in his blood to see if it was being excreted.**

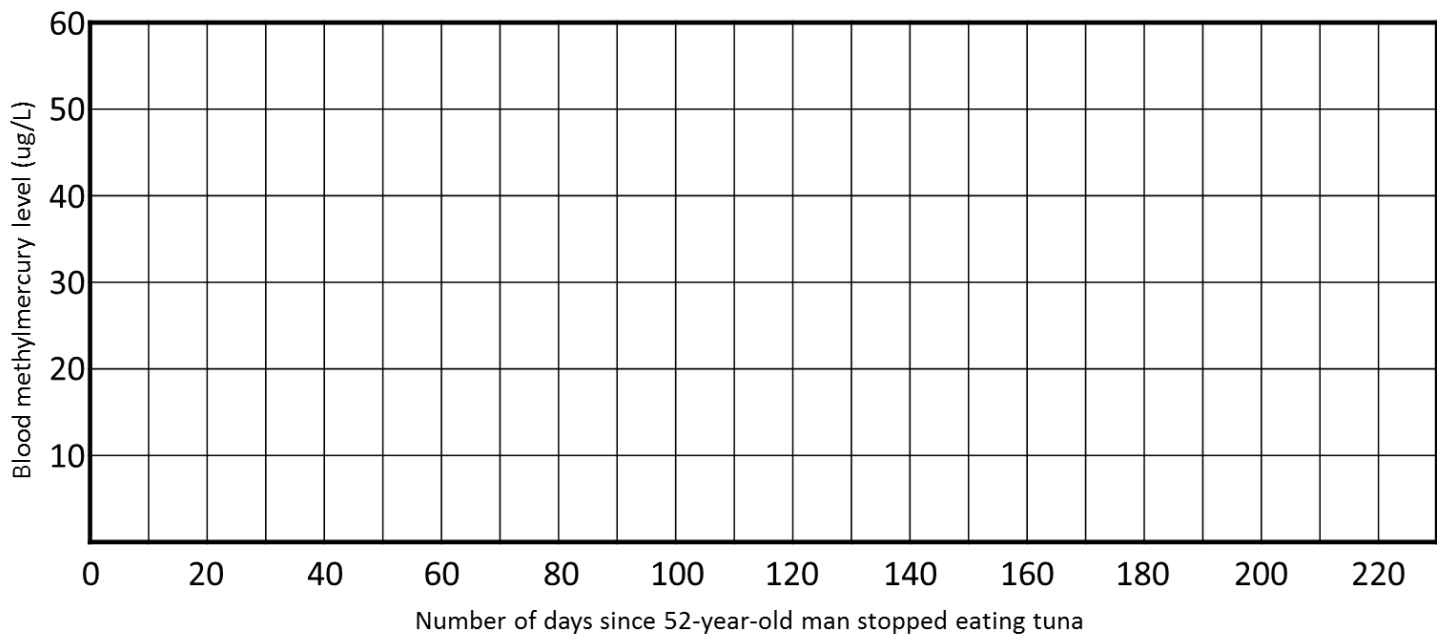
This table shows how the level of mercury in his blood changed over time.

Day of test	Level of methylmercury in blood (ug/L)
Day 0 (first doctor's visit)	52 ug/L
Day 7	50ug/L
Day 100	22 ug/L
Day 225	7 ug/L

**4) On the chart on the next page, plot this data to show the rate at which the methylmercury was excreted once the man stopped eating canned tuna. Once you have plotted all of the points, draw a line between all the points.**

**5) What happened to the amount of methylmercury in the man's body after he stopped eating canned tuna every day?**

**6) Using your graph of blood methylmercury and time, estimate how many days it took the amount of methylmercury to be half of what it was at day 0. This is the half-life of this compound in blood.**



## Section 3: 4-8<sup>th</sup> Grade Activities

### Assignment 3: Mercury and Human Health Case Study – Teacher version

Many people are exposed to methylmercury from eating fish, such as tuna. Below is a true case study of a 54-year-old man that ate one can of tuna every day for five years.

Average weight of a can of tuna: 5 ounces  
(It takes 16 ounces to equal 1 pound)

Number of days in a year: 365

#### 1) Calculate (and show) how many cans of tuna the man ate during that time:

The basic equation: 1 can X 5 years  
Substitution 1 year = 365 days  
5 years X 365 days = 1825 days

Rewrite the equation 1 can X 1825 days = **1825 cans of tuna**

#### 2) Calculate how many pounds of tuna the man ate over five years

Solve for ounces first: 5 ounces/day X 1825 cans of tuna = 9125 ounces of tuna

Convert to pounds: 9125 ounces X 1 pound/16 ounces = **570.3 pounds of tuna**

**3) After five years, the man went to the doctor, where his blood was tested for levels of methylmercury. The only way to reduce mercury is to stop being exposed. On his first visit, he was told to stop eating tuna. The man continued going to the doctors, and his blood was measured each time to see if the mercury in his body was being excreted.**

This table shows how the level of mercury in his blood changed over time.

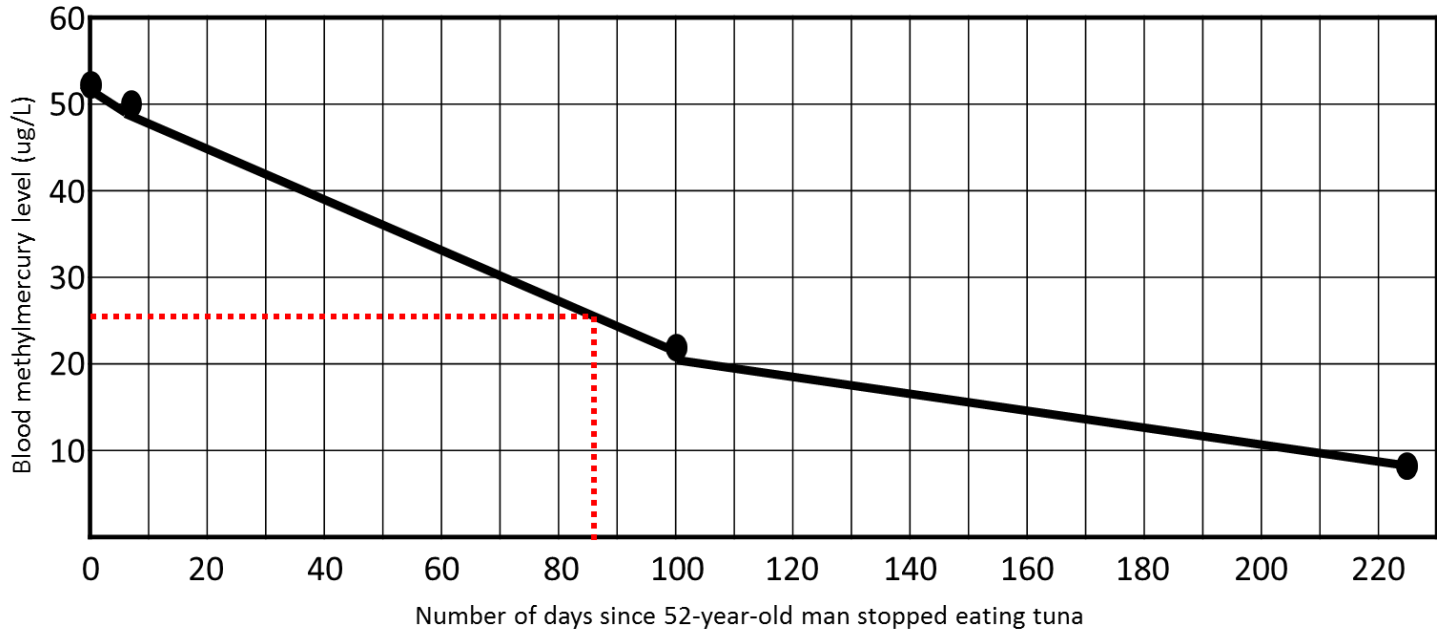
Day of test	Level of methylmercury in blood (ug/L)
Day 0 (first doctor's visit)	52 ug/L
Day 7	50ug/L
Day 100	22 ug/L
Day 225	7 ug/L

**4) On the chart on the next page, plot this data to show the rate at which the methylmercury was excreted once the man stopped eating canned tuna. Once you have plotted the points, draw a line between all the points.**

**5) What happened to the amount of methylmercury in the man's body after he stopped eating canned tuna every day? The amount of methylmercury decreased in the man's body.**

### Section 3: 4-8<sup>th</sup> Grade Activities

6) Using your graph of blood methylmercury and time, estimate how many days it took the amount of methylmercury to be half of what it was at day 0. This is the half-life of this compound in blood. It took about 87 days for the amount of methylmercury to be half of what it was at day 0 (26ug/L)





# Final Projects

Listed below are a few options for projects the students could present at the science fair:

## Report:

Write a 3 to 4 page report on the history of the Black Butte Mine. This report could discuss the following:

- History of the Black Butte Mine
    - When was it constructed? What did it produce? What was the demand for mercury?
  - What is mercury?
    - Historical uses
    - Current uses
  - How are humans exposed to mercury from the Black Butte Mine in Cottage Grove?
  - What are the current projects going on to address the mercury contamination in Cottage Grove?
- \*\*This could also be broken up into short sections for multiple projects or group projects. Students should be creative, using art to help tell the history\*\***

## Oral History:

- Interview Cottage Grove residents to understand the history of the Black Butte Mine

## Timeline:

- Create a timeline of the Black Butte Mine

## Projects:

- Create a mercury food chain diagram for a place in Cottage Grove
- Present the results of citizen science project sampling
- Create a multimedia project (video, PowerPoint, etc.) about safety procedures in the field
- Short stories about mercury in the environment, history of Black Butte Mine, etc.

## Events:

- Host a science fair for the community
- Invite special guests from the EPA, OSU, CD Smith, or older residents who remember the mine to share resources, information, or judge students' posters.

## Art:

- Create artwork related to mercury and the Black Butte Mine to have on display at the school or local library.
- Take digital photos of the art and share it on-line.
- Create a storybook with the artwork about mercury and the mine to share with other schools.

## Resources:

**Black Butte Mine** (*Environmental Protection Agency*) <http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/bbm> [Date accessed: 05.14.14]

**Case Study: Black Butte Mercury Mine Lane County, OR** (*Interstate Technology & Regulatory Council*)  
[http://www.itrcweb.org/miningwaste-guidance/cs16\\_black\\_butte.htm](http://www.itrcweb.org/miningwaste-guidance/cs16_black_butte.htm) [Date accessed: 05.14.14]

**Black Butte Mine** (*Oregon Department of Environmental Quality*)  
<http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=1657&SourceIdType=11> [Date accessed: 05.14.14]

“**History of Black Butte Mine in Cottage Grove, OR**” produced by Oregon State University.  
<http://superfund.oregonstate.edu/mercury>

**Black Butte Mine – Lane County** (Oregon Health Authority, Public Health)  
<http://public.health.oregon.gov/healthyenvironments/trackingassessment/environmentalhealthassessment/pages/bbmsite.aspx> [Date accessed: 05.14.14]

**EPA proposes putting Oregon’s Black Butte mercury min on Superfund cleanup list.** (OregonLive.com)  
[http://www.oregonlive.com/environment/index.ssf/2009/09/epa\\_to\\_put\\_oregons\\_black\\_butte.html](http://www.oregonlive.com/environment/index.ssf/2009/09/epa_to_put_oregons_black_butte.html) [Date accessed: 05.14.14]

**Black Butte Mine Summary** (Oregon Health Authority)  
<http://library.state.or.us/repository/2012/201205011330382/index.pdf> [Date accessed: 05.14.14]

**Public Health Assessment: Black Butte Mine** (Oregon Health Authority Environmental Health Assessment Program)  
<http://www.atsdr.cdc.gov/HAC/pha/BlackButteMine/BlackButteMinePHAPC04252012.pdf> [Date accessed: 05.14.14].

Very dense report, but excellent pictures and historical overview

**Black Butte Mine Superfund Project Update #3** (Environmental Protection Agency)  
<http://www.cottagegrove.org/oldupdates/BBM+Update+3+Aug+2013a.pdf>

**Mining records – Lane County** (Oregon Historical Mining Information)  
<http://www.oregongeology.org/sub/milo/archive/MiningDistricts/LaneCounty/BlackButteDistrict/BlackButteMine/BlackButteMineLetters.pdf> [Date accessed: 05.14.14]

EPA has established an Information Repository at the Cottage Grove Library

### **Cottage Grove Library**

700 Gibbs Avenue  
Cottage Grove, OR



# Credits

## **Oregon State University Superfund Research Program**

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## **Acadia Learning for Participatory Science**

<http://participatoryscience.org/>

### Section 2

- Mercury Sources in the US (K-3; 4-8)
- Mercury in the Food Chain (K-3; 4-8)
- Road to Toxicity (4-8)
- Mercury in the Field Site (4-8)

## **Agency of Toxic Substances and Disease Registry**

<http://www.atsdr.cdc.gov/>

Section 2: Toxicological Profile for Mercury

## **Centers for Disease Control, National Institutes of Occupational Health and Safety**

<http://www.cdc.gov/niosh/>

Section 3: Alice's Mad Hatter and Work-Related Illness

## **Massachusetts Water Resources Authority**

<http://www.mwra.state.ma.us/>

Section 2: Field Testing Procedures and Notes

## **National Institutes of Health; Environmental Health Student Portal**

National Institutes of Health, National Library of Medicine, Environmental Health Student Portal

<http://kidsenvirohealth.nlm.nih.gov/>

### Section 1

- Sharon Finds the Environment (K-3)
- Crabby Kathy (K-3)
- Sharon Cleans Up (K-3)
- What's Wrong Whiskers? (K-3)
- Reduce, Reuse, Recycle (K-3)

Section 3: The Basics

## **National Science Teachers Association**

<http://www.nsta.org/>

Section 2: Safety in the Science Classroom

## **Oregon State University Environmental Health Sciences Center**

<http://ehsc.oregonstate.edu/>



#### Section 1

- Your Health, Your Environment (4-8)
- Label reading activity (4-8)
- Experimenting with Dose (4-8)
- Careers in Environmental Health (4-8)

#### **Oregon State University Superfund Research Program**

<http://superfund.oregonstate.edu/>

Section 1: Careers in Environmental Health (K-3; 4-8)

#### **QUEST: The Science of Sustainability**

<http://science.kqed.org/quest/>

Section 3: Mercury in San Francisco Bay

#### **Southern California Environmental Health Sciences Center**

<http://hydra.usc.edu/scehsc/index.html>

Section 1: Name that Environmental Hazard (4-8) adapted from "Name that Poison."

#### **United States Environmental Protection Agency**

<http://www.epa.gov/>

#### Section 1

- Healthy Homes (4-8)
- Recycle City (4-8)
- Home Chemical Survey (4-8)

#### Section 2

- How the Water Cycle works (K-3; 4-8)
- Mercury in Fish (K-3; 4-8)

#### **University of Washington Center for Ecogenetics & Environmental Health**

<http://depts.washington.edu/ceeh/>

Segment 2: The Quicksilver Question

#### **University of Wisconsin Extension's Solid and Hazardous Waste Education Center**

<http://www.mercuryinschools.uwex.edu/>

Segment 2: Mercury in Schools (K-3; 4-8)

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***Careers in Environmental Health Sciences Video***

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***The Black Butte Mine Video***

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