

US EPA ARCHIVE DOCUMENT

Lead Blockers

- **Grade Level**
K-8
- **Subject Areas**
Science
Health
Physical Education
- **Duration**
20 min for introduction
15 min for activity
10-15 min for wrap-up
- **Setting**
Discussion: Classroom
Activity: Outdoors
- **Skills**
Gathering information
Interpreting information
Communication
- **Vocabulary**
lead
exposure
absorption
- **Related Websites**
www.epa.gov/lead
www.epa.gov/children

Summary

Students will learn about the health effects of lead. They will explore how the absorption of lead can be reduced with a proper diet.

Objectives:

Students will:

- Understand the health effects of lead.
- Model how lead absorption can be reduced with certain nutrients.

Materials:

K-4 Activity

- Laminated cutouts or pictures of various foods, including those listed as containing vitamin C, iron, and calcium, enough for 5 teams of students
- Cones or rope for marking boundaries
- 1 box or container for each team

5-8 Activity

- Tag identification cards
- Cones or rope for marking boundaries

National Science Content Standards:

- Unifying Concepts and Processes
-Evidence, models, and explanation
- Science in Personal & Social Perspectives
-Personal health
-Science and technology in local challenges

Background:

Lead is a naturally occurring element (symbol Pb) that has been used in a variety of products and industries; however when humans, especially children, are exposed to very low levels of lead, it can cause harm and lead to

serious health consequences.

The most common sources of lead poisoning are deteriorating lead-based paint, lead contaminated dust, and lead contaminated residential soil. Lead was commonly used in a variety of ways, including in paints, gasoline, and plumbing materials. Homes built before 1978 likely contain lead-based paint. When this paint peels, chips, or cracks, the lead can become airborne, or settle in dust. In 1978, EPA banned the manufacture and use of lead-based paint and lead-based paint products. Leaded gasoline began to fade from use in 1975, but wasn't banned from use until 1996 when the Clean Air Act banned leaded gasoline for use in on-road vehicles. Aviation fuel still uses leaded gasoline. Lead can leach from old pipes in buildings built before 1930 into drinking water. It is important to test drinking water in the home or at school for the presence of lead.

Lead dust from renovation projects disturb painted surfaces can create dust and endanger children and adults. Federal law requires that contractors performing renovation, repair and painting projects that disturb painted surfaces in homes and schools (where children under 6 years of age visit regularly) built before 1978 be certified and follow specific work practices to prevent lead contamination.

Children under the age of 6 are most at risk for health effects from exposure to lead, but health effects also occur in older children and in adults. Children are exposed to lead by breathing or swallowing lead dust, or by eating soil or paint chips containing lead.

For example, children playing in an area where lead-contaminated dust is present may pick up the dust on their hands and put their hands in their mouths, thereby ingesting the lead.

The brain and nervous system are most vulnerable to the damaging effects of lead. As children are still developing, lead can have detrimental effects on the growth and development of those organs. If not detected early, lead can cause behavior and learning problems, slowed growth, hearing problems, and headaches in children. Symptoms of lead poisoning include headaches, stomachaches, nausea, tiredness and irritability. However, since these symptoms are similar to those of the flu or a virus, a doctor needs to test blood for signs of lead poisoning.

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High level exposure in men can damage the organs responsible for sperm production.

Lead poisoning can be prevented. Find out if a child has elevated blood lead levels by having a pediatrician give the child a blood test. Lead poisoning can be prevented when you know what to do. For example, it is important to keep lead-based paint in good condition and free of dust. If you plan to renovate, make sure you use a Lead-safe Certified contractor who follows lead-safe work practices. Learn more about what parents can do at http://leadfreekids.org/my_kids/index.php#!/checklist_for_parents.

Additionally, children who are fed balanced, healthy diets, containing vitamin C, calcium, and iron, absorb less lead than children who do not eat healthy meals. These nutrients minimize the absorption of lead in the body.

Foods containing Vitamin C include:

Citrus fruits and juices (oranges, grapefruits)

Green peppers

Tomatoes and tomato juice

Foods containing Iron include:

Eggs

Cooked beans

Lean red meats

Fish

Chicken

Dried fruits (raisins, prunes)

Foods containing Calcium include:

Cheese

Yogurt

Milk

Green leafy vegetables (spinach, kale, collard greens)

For more information on lead and a healthy diet, visit <http://www.epa.gov/lead/pubs/nutrition.pdf>

Procedure:

Warm-Up:

Use the background information provided to introduce students to the sources and health effects of lead. Discuss what constitutes a balanced, healthy diet.

Activity for K-4

1. Students will be modeling how a healthy diet can minimize the absorption of lead in their bodies with a relay race.
2. Cut out various food items. Be sure to include some of the items listed in the background information as containing vitamin C, iron, and calcium. Also include various foods that are popular with children, including pizza, cookies, etc. Include drink items, including sodas, juices, and milk.
3. Mark off the boundaries of an area outdoors to do a relay race. Spread cut-out images of food items around one end of the area. Be sure there is enough for each student to grab one item.

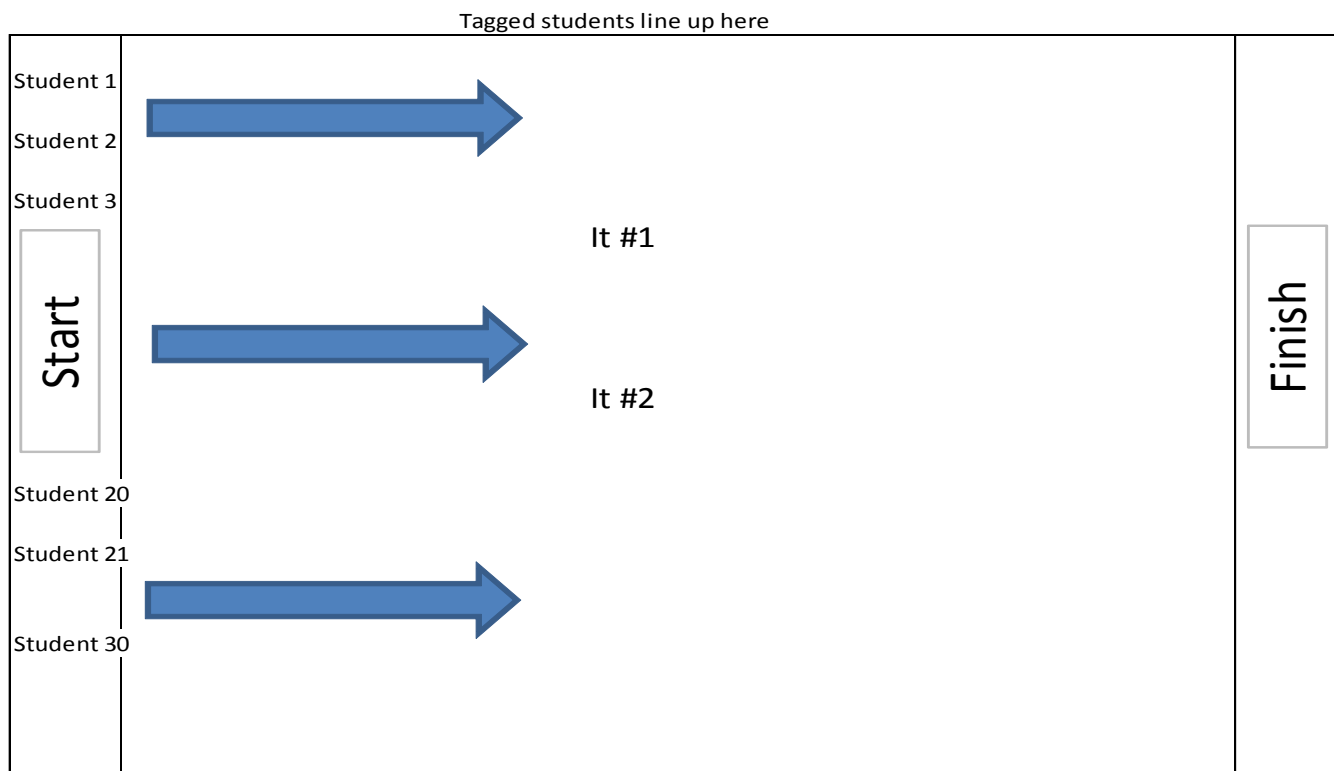


Figure 1: A representation of the playing field for grades 5-8.

4. Divide students into 5 teams of 5 (based on class size of 25 students).
5. Tell students they will be doing a relay race to gather food and drink items. Each team should line up, and have a container next to their line. This is where each member of the team will put his/her food/drink item.
6. On your mark, the first students in line will race to the other end of the area and grab one food item. As soon as he/she grabs the item, race back to his/her team and place the item in the team box. After he/she has put the item in, the next member of that team may go. Students who have already gone should sit down in line.
7. Go until all students have collected 1 item. Note the order in which each time finished.
8. Starting with Team 1, ask the students what food/drink items they collected. Have them divide the items into 2 piles, healthy and not-so healthy, noting which ones are lead blockers.
9. Continue until all teams have shared what they collected.
10. Announce which team finished the race first. Then announce what team had the most lead blockers. That team is the winner.
11. Review what items are lead blockers (generally the healthy foods).

Activity for 5-8

1. Students will be modeling how certain nutrients (iron, vitamin C, and calcium) can minimize the absorption of lead by playing a game of tag.
2. Mark off the boundaries of a field. Use a large playing area, but clearly state the boundaries to the students. Cut out tag identification cards. Laminate if you wish them to be permanent.
3. Depending on your class size and size of field, select two students to be "it." The "it" students represent lead. (Note: if you have a small class size, only select one student. If you have a very large class size (over 35, you may select three students to be it). Give the students who are "it" the appropriate tag identification card.
4. The rest of the students will represent themselves (i.e.: children). For the first round, all students will be able to move freely across the playing field. On the second round, give each student an identification card. Each students will receive a card telling them what to do as they move across the field. This card will tell students what they had to eat that day.

Children with a not-so-healthy item (i.e.: pizza, cookies, soda) must perform the task on their card while moving across the field.

5. Have students gather on one end of the marked boundary. Explain that the 2 “it” students are lead trying to tag the other students to “contaminate” them. The it students will position themselves halfway between the start and finish areas (See Figure 1).
6. In Round 1, on your mark, students may move freely across the field. In round 2, students must perform the instructions written on their card as written (i.e.: pausing every 3 steps). The “it” students will try to tag as many students as they can. Once a student has crossed the boundary line at the other end of the field, he or she is safe and cannot be tagged. Students who are tagged must line up along the edge of the playing field.
7. At the end of the first round, ask the students how many students were contaminated by the lead. Remember or write down this number. Do the same for each subsequent round. Compare this number with the number of students tagged during Rounds 2 & 3.
8. For Round 3, any students who were tagged but had a lead blocker card (a star in the upper right corner of their card), may re-enter the starting line. This means that the item he/she had eaten was a lead blocker. Any students who were tagged, but did not have a lead blocker sit out. This means that those students absorbed the lead when they were tagged. Students who were not tagged also go back to the starting line.
9. Perform Round 3 as in previous rounds.
10. After the round is complete, observe which students were tagged, and how many where along the sidelines.

Wrap Up

K-4 Wrap Up

1. What foods/drinks were healthy? Which ones were lead blockers?
2. What are other foods/drinks that can help prevent lead from absorbing in your body that you don't see here?
3. What are some ways you can keep yourself safe from lead?
4. How can we prevent lead from being in our homes and schools?

5-8 Wrap-Up

1. Which students were easier to tag? The students with the healthy diets or the students with the not-so-healthy diets? Why?
2. What did the task the not-so-healthy students had to do represent?
3. What food/drinks are high in iron, calcium, and vitamin C? How would these help protect you from lead poisoning?
4. How can we prevent lead from entering our homes and schools?

Assessment:

Assess students based on their performance in the activity. Use the wrap-up questions to evaluate the student knowledge gained in this activity.

EPA Resources and Related Links:

Children's Health Protection.
<http://www.epa.gov/children>

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

Lead and a Healthy Diet.
<http://www.epa.gov/lead/pubs/nutrition.pdf>

Student and Teacher Resources.
<http://www.epa.gov/students/>

Lead Blocker Tag Identification Cards: Grades 5-8

You are It.

Tag as many students as you can !

You are It.

Tag as many students as you can !

You drank milk with
lunch. 

Run as fast as you can!

You drank soda with
lunch.

Stop every 3 steps for 5 seconds.

You ate grilled chicken
for lunch. 

Run as fast as you can!

You ate pepperoni pizza
for lunch.

Stop every 3 steps for 5 seconds.

Lead Blocker Tag Identification Cards: Grades 5-8

You ate cookies for
snack.

Stop every 3 steps for 5 seconds.



You ate an orange for
snack.

Run as fast as you can!

You ate french fries with
lunch.

Stop every 3 steps for 5 seconds.



You ate a salad with
spinach and green
peppers with lunch.

Run as fast as you can!