Instructor Notes

Lesson: Personal Hygiene – integrating the science and practice of maintaining health into the classroom curriculum.

Objectives: In this lesson, the participants will:

- Utilize various critical thinking skills related to learning about hygiene across the curriculum.
- Understand the importance of good hygiene in everyday life.
- Connect the importance of good hygiene and good health

Subjects: Reading, writing, science, math, social studies and critical thinking

Procedure:

1. Read *"Fighting Germs in the Workplace".* **Workforce Extension:** Discuss this in coordination with what makes a good employee. After completing the discussion on workplace, discuss a workplace out of this world – the International Space Station. There is some interesting information on how the individuals living there take care of their daily needs including the area of grooming. This could lead back to some enlightening about the importance of good hygiene.
2. To demonstrate how germs travel, do the *"Glittering Germs"* or *"Potato Experiment".* The "potato experiment" is a great way to show the science involved in hygiene.
3. After reading *"How Germs Travel"* aloud, discuss it with your students. Have them role play the different ways germs can travel. **Art Extension**: Create a germ. *(This activity is also found in the Home Visits Notes.)* **Math Extension:** Explore the mathematical concept of doubling. *(There is a coordinating activity in the Home Visits Notes.)*

***Use the following four lessons to focus on soap and water, the foundation of good hygiene. These exercises can be used separately or as a whole unit. Finish up with giving out the free soap samples in the kit. If you wish, you may hand out the *"High Five"* coupons and let students redeem them for small prizes or for free soap or shampoo. *"High Five"* coupons are from the website: www.healthyhands.com.

4. Complete *"How Soap Works"* activity. (This activity is repeated in the Home Visit Notes.)

5. Try the *"How Many Drops of Water Can Fit on a Penny"* experiment. This is a simple and inexpensive way to introduce students to making a hypothesis and to the concept of a control group and an experimental group. It also is a way to use soap and water without really discussing hygiene.
6. Complete *"Soap Clouds--The Incredible Expanding Soap Trick"* and then read the handout *"Ivory Soap—A Mistake?"* Discuss how sometimes even mistakes can turn into something positive. Look at advertising images and slogans in magazines or newspapers and discuss how advertising affects our ideas and our spending habits. Ask students to write an advertising slogan for themselves. If they are hesitant to write about themselves, ask them to write something positive about each other or perhaps write something special for each of them yourself. Talk about how self-image messages they are constantly sending themselves can and do reflect in how they act and feel. Discuss how they need to "sell themselves" to perspective employers in a job search.
7. Complete another basic experiment *"Pepper on Parade"* to show the effects of soap.
8. Complete *"The Unsinkable Potato and Other Amazing Characteristics of Ice and Water"* activity. This activity will promote critical thinking and give the students a hands-on visual for what water looks like.
9. Hold a spa day. Often adult education students have not had anyone care for them or have not been encouraged to care for themselves. Pamper your students by using the included home recipes for facials, shampoo, deodorants, etc. Use this day as a reward for hard work or to make gifts for family members. A set of luxury gifts consisting of bath salts wrapped in a pretty wash cloth is included to make the day complete. Don't forget the males in class who may not be interested in spa day. Give them an option of another activity or perhaps they want to make a gift for someone special. Several of the ideas included are not necessarily for women (aches & itches bath salts and oh, my aching feet) however, you may have some convincing to do.
10. A poetry activity that the class will actually like! Complete the " *Wellness Classroom Activity."*
11. Play the game *"Lose a Million Bacteria".* Students will retain more if they are having fun while they are learning and what better game than a popular game show.
12. Do the *"Handing Out Germs"* activity. Spend some time discussing related issues in the extensions suggested.

13. Germs are everywhere and are too tiny to be seen with the naked eye. They can only be seen under a microscope. *"Germ-ometry"* gives students a visual instruction to germs – both helpful and harmful.
14. Complete *"Microbe Math"* for another visual way of looking at bacterial growth and for some very compelling math practices.
15. Use the *"Germ-bustin"* Word Hunt and the *"Crossgerms"* Crossword Puzzle to reinforce concepts taught. Have the students decipher the *"Secret Code"*. All of these activities where found at www.healthyhands.com.
16. You and your students probably haven't given a lot of thought to flies. This activity uses the power of observation and some critical thinking skills to predict why flies act the way they do. We know flies are dirty or are they? Why do they act the way they do? Have a good time with the fly activity and learn some amazing new information about one of our least favorite creatures.
17. Yeast is an example of a fungus that can be helpful and harmful. Complete the *"Yeast: A Helpful Fungus"* and extension activities.
18. Read the handout "Lousology". *(This same handout and additional activities can also be found in the Home Visits Notes.)* If you have access to a computer and the internet, more information as well as online games can be found at the following website: www.headlice.org/kids/headgames/index.htm
19. Read about the importance of hygiene in *"China Steps Up to the 20th Century"*.
20. Construct a *"Healthy Collage"*. Students can take their collages home to share what they have learned with their families.
21. So you want to be a journalist? First analyze and criticize three newspaper or magazine articles and then try your hand at writing an article about a current health concern in *"Germs and Journalism"*.

Living and Working Aboard the International Space Station

The first space station crew members will spend a lot of their time setting up the station, building its components and conducting various scientific experiments and Earth observations. The crew will live in the service module at first. This module has spartan living quarters, but provides everything the crew needs -- personal sleeping quarters, a toilet, hygiene facilities, a kitchen with a table, a treadmill and a stationary bicycle. Astronauts will have to exercise frequently to keep from losing bone and muscle mass, which happens with prolonged weightlessness.

Sleeping
Sleeping in space is quite different from sleeping on Earth. Instead of a bed, you have a wall-mounted sleeping bag that you slip into and zip up. The bag is also equipped with arm restraints to prevent your arms from floating above your head while you sleep.

Bathing
While stations such as Skylab and Mir have been equipped with a shower, most astronauts take sponge baths using washcloths or moistened towelettes. This reduces the amount of water consumed. Each astronaut will also have a personal hygiene kit with a toothbrush, toothpaste, shampoo, razor and other basic toiletries.

Eating
The food on the ISS will be mainly frozen, dehydrated or heat-stabilized, and drinks will be dehydrated. Astronauts will collect food trays and utensils, locate their individually-packaged meal from a storage compartment, prepare the items (rehydrate if necessary), heat the items (microwave, forced-air convection oven), place them in the tray and eat. After the meal, they will place the used items in a trash compactor, and clean and stow the utensils and trays. Interestingly, astronauts get to select their menus approximately five months before their flight.

Exercising
In weightless conditions, the body loses bone and muscle mass. To counter these losses, astronauts will have to exercise daily. The service module is equipped with a treadmill and a stationary bicycle. Astronauts must strap themselves onto these devices so that they do not float away while exercising.

Working
Once the ISS is completed, work will involve maintaining the station (fixing broken equipment, repairing structures, etc.) and conducting scientific experiments and observations. The station will have six scientific laboratories. Closet-sized racks along the walls of the laboratory module will hold the equipment, and the astronauts will use footholds and restraints so they won't float away while working. The experiment racks will also have remote video and data links so that scientists on the ground will be able to monitor the experiments on-board the ISS continuously. The Japanese laboratory

module will have a platform open to space, for determining the effects of the space environment on materials.

Moving Around on the ISS
Working in weightlessness, or **microgravity**, is very different from what we are used to. For example, as I write this article at my computer, I do not have to worry about floating off of my chair, or having the papers on my desk float away. This is not the case in the ISS. As we have mentioned above, many places (experiment racks, kitchen area, crew quarters) will have restraints to keep the astronauts and equipment from floating away. And while I can walk the corridor in my office with no trouble, astronauts on the ISS will have to use handholds mounted on the walls of the station to keep themselves stable as they move around.

Spacewalks
The crew will have to perform spacewalks during construction and maintenance of the ISS. Initially, the crew will perform spacewalks from the Russian service module using Russian spacesuits. Because spacesuits operate at lower pressures than the station, the astronauts will have to reduce the air pressure of the entire station prior to the spacewalk, so that the spacewalker's body can adjust; otherwise, the spacewalker might get the bends.

Fighting Germs in the Workplace

Sometimes we get sick of working, but what about when we get sick at work (or school)? Since the office is filled with surfaces that everyone shares, germs can easily spread through cross-contamination—the transfer of germs from one surface, food or person to another. The average adult catches two to four colds a year, resulting in millions of lost workdays. To help you stay healthy in the office, follow these simple tips:

Handwashing

- Proper handwashing is the best way to avoid spreading germs. Rub your hands together with soap and water for at least 20 seconds. Rinse your hands thoroughly and dry them completely using clean paper towels to help wipe up and throw away germs.

Work Spaces

- Help remove germs in your personal work environment by wiping surfaces frequently with paper towels and disinfectant for added protection. The phone, keyboard, computer mouse and doorknobs are surfaces that are important to keep clean since they are frequently touched by you and your co-workers.

Office Supplies

- Keep items like pencils and pens out of your mouth. Germs that are present on these items can easily spread to your hands and mouth, potentially making you sick.
- The fax and copier as well as other communally shared equipment can expose you to germs from many people. Avoid touching your eyes, nose or mouth when you come into contact with any of these areas. Proper handwashing throughout the day and especially before eating can help reduce your risk of becoming sick.

Sick Days

- Cover your mouth and nose with disposable paper products when sneezing or coughing. Use paper tissues, towels or napkins to help prevent germs from spreading to your hands.
- Your cold is most infectious during the first few days. If possible, stay at home during this time to avoid exposing your co-workers to your germs.
- Since a cold or flu may be contagious for as long as 5-10 days after you first experience symptoms, be especially aware of proper hygiene practices during this time. Keep in mind that germs can easily spread because of cross-contamination in close quarters.

Kitchens

- The sponges and dishcloths in your office kitchen can harbor billions of germs. Instead, use wet paper towels and soap to wash utensils and coffee cups. Then dry items with a disposable paper towel to avoid contaminated drain boards.

- Use paper towels to wipe the tops of canned goods and soda and juice cans to help remove potentially contaminating microorganisms before you open them.
- All produce should be rinsed and wiped with paper towels or napkins to help remove germs before eating. Laboratory tests show that rinsing an apple with water may only remove approximately 75% of contaminating germs, while rinsing and drying with a paper product can remove up to 99% of the germs.
- Do not share cups and utensils with others, as sharing these items can potentially spread harmful germs.

Home Spa Recipes

Basic Bubble Bath

Ingredients:

- 5 drops fragrant oil or essential oil (your choice)
- 1 quart water
- 1 bar castille soap (grated or flaked)
- 1 ½ ounces glycerin

Mix all ingredients together. Store in a container. Pour in running water.

Basic Bath Salts

Ingredients:

- Salt - (your choice: Epsom, Sea or Kosher Salt)
- Baking soda (softens your skin)
- Essential oil of your choice
- Food coloring optional

Pour the salt, the essential oils, and a few drops of food coloring into the bowl. Fill the jar. When it's time to use the bath salts, pour the mixture into the bathtub and add warm water. Stir the water so the salt dissolves.

Ocean Blue Bath Salt Recipe

Ingredients:

- 1 cup epsom salt
- 1 cup baking soda
- 4 drops blue food coloring
- 3 drops Jasmine fragrant or essential oil
- 4 drops vanilla
- 2 tablespoons glycerin

Combine dry ingredients, mix well. Add color and scents one at a time. Keep stirring until mixed well. Break up any clumps. Keep mixing until you have a semi fine powder. Add glycerin & mix well.

Minty Fresh Bath

Ingredients:

- 1 cup fresh or 1/4 cup dried mint (chop up finely if its fresh)
- 1 cup fresh bay leaves -finely chopped
- 1 teaspoon coconut oil
- 1 teaspoon of almond extract

Mix ingredients together then place in a mesh bag such as cheesecloth. Place under hot running water. Sit back & enjoy.

Milk Bath

- 3 cups powdered milk
- 1/4 cup oatmeal
- 1/4 cup dried orris root (has a soft violet scent)
- 1/3 cup almond meal
- 1 capsule vitamin E (break open into dry ingredients)
- 1/3 cup cornstarch

Makes enough for a few baths. Combine ingredients and make sure it's completely mixed. Store in a container. When you are ready to add it to your bath, scoop the desired amount of the mixture and tie securely in a muslin bag or even a facecloth will do. Tie to the faucet allowing the warm water to run over the bag.

* To make almond meal: Using a blender, grind up blanched or slivered almonds to a powdered consistency.

Fields Of Gold

Ingredients:

- 4 cups powdered milk
- 1 cup boiled water
- 1/2 cup dried chamomile or 5 chamomile tea bags

Steep chamomile in water for 20 minutes Strain liquid. Mix liquid with milk and add to bath water. Especially nice after a long days work.

Aches & Itches Bath Salt Recipe

Ingredients:

- 1/2 cup baking soda
- 1/2 cup dry milk
- 1 cup epsom salt
- 1 cup sea salt

Mix all ingredients together in a large ziploc bag.

Apple Honey Facial Mask

Ingredients**:**

- 1 medium size apple (grated)
- 5 tablespoons of honey

Mix the grated apple and mix with honey to make a mask. Smooth over skin then let sit for 10 minutes, rinse off with cool water.

Cucumber Hair Drench

If you swim in a chlorinated pool for exercise on a regular basis, the same damage you've noticed happening to your skin and bathing suit, is happening to your hair, as well. Try this treatment at home to keep chlorine damage to a minimum.

- 1 egg
- 1 eggshell's worth of olive oil
- 1 quarter of a peeled cucumber

Blend the egg, olive oil and peeled cucumber. Spread evenly through your hair, leave on for 10 minutes, and then thoroughly rinse. For the best results year-round, continue this treatment monthly.

Honey Oatmeal Facial

- 1/4 cup plain yogurt or buttermilk
- 1/2 cup oatmeal
- 2 tablespoons of honey

Finely grind or process the oatmeal in a blender or food processor. Set aside. In a small bowl, stir together honey and yogurt, and then add ground oatmeal. Mix thoroughly until a smooth paste consistency has been reached. Smooth over your face and neck, leave on for fifteen minutes, and rinse off with warm water. Can be used daily.

SPA BATH COOKIES

- 2 cups finely ground sea salt
- 1/2 cup baking soda
- 1/2 cup cornstarch
- 2 T light oil
- 1 tsp vitamin E oil
- 2 eggs
- 5-6 drops essential oil of your choice

Preheat your oven to 350 F. Combine all the listed ingredients and form into a dough. Using a teaspoon or so of dough at a time, roll it gently in the palm of your hand until it forms a ball. Form all dough into one teaspoon balls, and gently place them on an ungreased cookie sheet. Consider sprinkling the bath balls with herbs, flower petals, cloves, citrus zest and similar aromatic ingredients. Bake your bath cookies for ten minutes, until they are lightly browned. Do not over bake. Allow the bath cookies to cool completely. To use, Drop 1 or 2 cookies into a warm bath and allow to dissolve. Yield: 24 cookies, enough for 12 baths.

Oh My Aching Feet

- 1T olive oil
- 1 tsp of Aloe Vera
- 1 tsp wheat germ oil
- 20 drops of peppermint essential oil
- 20 drops of eucalyptus essential oil

Mix together and massage feet gently with this soothing ointment, or, add to a basin of very warm water, and soak. Finish by lightly dusting them in corn starch.

Glittering Germs

Often, it is not enough to simply explain to students that germs are everywhere. Because germs are so tiny and can't be seen, children will quickly dismiss that they exist at all. To reinforce just how prevalent germs really are, try out one of the exercises below with your students. Beware though - this will also enforce in your own mind the existence of germs in your classroom.

Materials:

- Glitter
- Glue
- Pencil

Procedure:

1. Cover a pencil with glue, then sprinkle glitter all over the glue.
2. Pass the pencil around the room (yes, it is messy!) and watch the glittering "germs" spread from one student to the next.
3. Wipe the pencil off with a paper towel and notice that some of the “germs” still remain. Explain that this is why it is important to actually WASH the pencil (and everyone's hands) with soap and water to effectively remove the germs. You can expect at least one of your students to touch something else once they have glitter on their hands. Glitter on a desk, one their face, or in their hair is an even better example of how easy it is to spread germs.

Potato Experiment

This experiment will demonstrate the importance of personal hygiene by conducting a science experiment with potatoes.

Materials:

- Hygiene Potato Graph worksheet (attached)
- 1 pair rubber gloves (wear while peeling the potatoes so that no germs touch the potato during the peeling process)
- 3 potatoes peeled
- 3 Ziploc type baggies

Procedure:

1. Students will watch as the instructor peels 3 potatoes. The teacher will explain that rubber gloves are being worn so that no germs will touch the potatoes.
2. The first potato will go into a baggie as is. (This is the control group)
3. The second potato will be passed around the class. Have students look at it closely to see if they can see any germs. They can look for dirty spots or other identifying marks. **The purpose is for the potato to be exposed to many hands and many germs. This detail should not be brought up to students at this point however.**
4. The second potato will be put into a baggie and labeled after all students have handled it sufficiently.
5. The students should all wash their hands AFTER they have touched the 2nd potato, but BEFORE they touch the 3rd potato. After students have washed their hands, they will pass around the 3rd potato in the same manner. Again, tell them to look for germs or other identifying marks.
6. The third potato will finally be put into a baggie and labeled.
7. Students will fill out the "Hypothesis - Make A Guess" section of the worksheet. You can have the students work independently or in cooperative groups.
8. Next, students fill out the DAY ONE section for "Observations -Take a look; Data - Write it down; and Graphs - Make it a picture.
9. For Days 2-6 students will observe and fill out the appropriate days on their worksheets. At the end of the last day students will discuss and fill out the "Conclusions - Decide what it means" section of the worksheet.

<u>Discussion</u>

Sometimes during the 6 days of the experiment, the instructor (or an outside presenter) can discuss personal hygiene. As a whole group, students should be led in a discussion about proper hand washing, how germs are spread (body fluids i.e.. saliva, mucus, blood), and why it is important not to touch other people's body fluid. They should be led to the conclusion that washing hands is the easiest and best way to stay germ-free.

Soap Clouds
The Incredible Expanding Soap Trick

Ivory Soap… it's the soap that floats. But why? You will uncover the secret behind this floating sensation by cooking the whole bar of soap in the microwave. That's right… the microwave oven! You won't believe your eyes as the soap begins to grow and expand.

Materials:

- Bar of Ivory soap
- Various bars of another brands of soap
- Deep bowl of water (or a plastic tub)
- Paper towel
- Microwave oven *(Exercise caution when using the microwave.)*

Procedure:

1. Fill the bowl with water.
2. Drop the bars of soap in the bowl of water. Notice how all of the bars of soap sink except for the Ivory brand soap. Why?
3. Remove the Ivory soap from the water and break it in half to see if there are any pockets of air hiding in the middle of the bar. *(By the way, there are no pockets of air! Hmmmm?)*
4. Place the bar of Ivory soap in the middle of a piece of paper towel and place the whole thing in the center of the microwave oven.
5. Cook the bar of soap on HIGH for 2 minutes. Don't take your eyes off the bar of soap as it begins to expand and erupt into beautiful puffy clouds. Be careful not to over cook your soap soufflé.
6. Allow the soap to cool for a minute or so before touching it. Amazing… it's puffy but rigid.

Discussion:

Why does the soap expand in the microwave? The secret is actually a demonstration of Charles' Law. When the soap is heated, the molecules of air in the soap move faster causing them to move far away from each other. This causes the soap to puff up and expand to an enormous size. Charles' Law states that as the temperature of a gas increases so does its volume. Other brands of soap without whipped air tend to heat up and melt in the microwave.

Ivory Soap—A Mistake?

Ivory soap is one of the few brands of bar soap that floats in water. If it floats in water, it must mean that it's less dense than water. When you broke the bar of soap into several pieces, no large pockets of air were discovered. Ivory soap floats because it has air pumped into it during the manufacturing process.

The air-filled soap was actually discovered by accident by an employee at Proctor and Gamble. For four years, the company had been developing a formula for a high quality soap at an affordable price. Having perfected the formula, they began production of "White Soap" in1878.

Several months later the accident occurred.

While mixing up a batch of "White Soap", the employee forgot to turn off his mixing machine before taking his lunch break. When he returned, he found that air had been worked into the mixture. He decided not to discard the batch of soap because of such a small error, and he poured the soap into the frames. The soap hardened and it was cut, packaged, and shipped.

A few weeks later, letters began arriving at Procter & Gamble asking for more of the soap that floated. The workman's error had turned into a selling point!

Harley Procter came up with the name Ivory while listening to a Bible reading at church one morning in 1879.

Ivory Soap is now over a hundred years old and still 99 44/100 percent pure. But best of all, it still floats!

If Ivory Soap is 99 44/100 percent pure, what's in it that is 56/100 percent impure?
And the answer is…

Uncombined alkali	0.11%
Carbonates	0.28%
Mineral matter	0.17%

Approximately 30 billion cakes of Ivory Soap have been manufactured

Some information obtained from the book "Mistakes that Worked" by Charlotte Foltz Jones.

Wellness Classroom Activity

Here is a writing activity that will get your class writing poetry.

1. Write a word on the board vertically and discuss the meaning of the word. For example:
G
E
R
M

2. Beginning with the first letter, ask class to think of an adjective that begins with that letter and describes or relates to the concept of the word. For example:
G — grimy

3. Continue in this fashion until the word is complete. The final letter of each word should be a naming word, or **noun,** so the list presents a complete picture. Thus, the ideal string of words is a series of adjectives concluding in a noun, such as:
G — grimy
E — ever-growing
R — rude
M — menace

4. Brainstorm as a group and have the class come up with a list of health-related words. Have each student choose a word and write their own acrostics.

5. Share the poems with the class.

Examples:

B — bad
A — airborne
C — collecting
T — tiny
E — evil
R — rabid
I — irritating
A — ailment

S — safe
A — antiseptic
N — neat
I — important
T — tested
I — interactive
Z — zero germs
E — excellent
R — remedy

Extensions

- Collect the poems and assemble into a book and distribute to the class. Feature some of the poems on a decorative background on the classroom bulletin board.
- Ask students to write a paragraph, essay or story about health and personal hygiene that uses at least 5 of the words the class came up with during this activity.
- See how many other words students can create out of some of the health-related words that have been discussed. Print each letter of the word on a 3" X 5" card so that the students can manipulate the letters. For example: SANITIZE would be on 8 different cards. Award a prize to the student who creates the most words. Some of the words that can be formed from sanitize are:
  1. tan 2. zit 3. sane 4. tin 5. eaten 6. ants 7. sit 8. seat 9. size

Activity # 20

Healthy Collage

We know that germs live all around us. They can live in our homes, schools and even on the pen you are writing with!

Materials:

- Magazines and newspapers
- Scissors
- Glue
- Construction paper

Procedure:

1. Fold a piece of construction paper in half. Either way you fold it is fine as long as you have two equal sections.
2. Next, look in magazines and newspapers for pictures of places or objects where potentially harmful germs might be hiding. The pictures can have something to do with being sick or things that could make a person sick i.e. sponge, remote control, a kitchen sink or counter top, a toilet, light switch, public phones, toothbrush, unwashed produce, a sick person, or a garbage can. Hint: Look in the advertisement section of the newspaper
3. Cut out at least 5 pictures and glue them on one side of the folded paper and label it.
4. Now look for things that remind you of being healthy or things that could help get rid of germs, i.e. paper towels, toilet paper, paper napkins, antibacterial soap, running water, waste basket, or healthy foods.
5. Cut out at least 5 of these pictures and glue them on the other side of the paper and label it.

Adapted from: www.gphealthsmart.com

Activity # 21

Germs and Journalism

There has been much discussion about germs in the news. Look through a current newspaper or magazine and find three articles covering the same health issue. As a group answer the following questions:

- How do the different media publications cover the story? Why might the articles use different angles to cover the same story?
- What has each reporter done to capture the reader's attention? Have the reporters been unbiased in their coverage? Is the coverage informative? Does it create a panic for the reader or a call to action?
- Was any important information left out of the articles? Could the reporter have been more thorough in covering the issues (i.e., by including an interview with a doctor, government official or corporate executive?
- Are the articles appropriate for the publications in which they appeared? Why/why not?

Assignment: Students are journalists covering a fictional outbreak of E. coli 089:D5 leading to the recall of "Cowlicious" hamburger meat in your town. Help them identify who they would interview, where they could conduct research and the "who," "what," "where," "when," and "why" of the story. Help them to develop an informative, unbiased article.

Idea taken from www.gphealthsmart.com

Lose a Million BACTERIA—The Game

"Lose a Million (Bacteria)" is a fun, interactive game based on the popular TV game show, *"Who Wants to be a Millionaire."* The game begins with a million bacteria. The object of the game is to lose all the bacteria. This game encourages class participation and promotes cooperative learning while introducing students to safe food handling practices.

Procedure:

- Food safety questions are provided on overhead transparencies to use for the game. *A variation would be to prepare trivia questions based on concepts or vocabulary you want to review. You do not need to provide multiple choice answers, they can just be standard open-ended questions.*

- Divide the class into two teams and number off on each team. Each team starts with a million bacteria. For every correct answer, the amount of bacteria decreases by 200,000-- from 1,000,000 to 800,000 to 600,000 to 400,000 all the way down to "Winner". Keep score on the board for each team.

- Each team gets three options, each of which can only be used once during the game. Write the following three options on the board: 50/50, ASK A FRIEND ON YOUR TEAM, OR ASK THE ENTIRE CLASS. Once the team uses an option, it is erased.

- Determine which team will start the game. Put the first transparency on the overhead and cover all the questions. Uncover one question and have the host (usually the instructor) read the question and four possible answers. If the player knows the answer, he/she can answer. If the player is correct, the team score is reduced by 200,000 bacteria and player # 1 is replaced by player # 2. Play then continues with the other team.

- If the player does not know the answer, he/she may choose an option. If the student chooses 50/50, the host will remove two of the answer choices. If the student chooses ASK A FRIEND ON YOUR TEAM, he/she can choose **one** person to help out with the answer. If the student chooses ASK THE ENTIRE CLASS, the instructor opens up the question to the class and the player may choose any of the answers given. *Remember, once an option is used, it is erased and cannot be used again by that team.* When no more options remain, the players must try to answer their own question even if they don't know it. Play continues even if an incorrect answer is given. However, the score remains unchanged with an incorrect answer.

- The game is over when all of the questions are gone or one team loses all of its bacteria.

Lose a Million Bacteria Page 1

1. Pathogens that were not previously known to cause human illness are called:

- ☐ **a)** Energetic
- ☐ **b)** Egyptian
- ☐ **c)** Emerging
- ☐ **d)** Elemental

2. Botulism is most commonly caused when this home activity is done improperly:

- ☐ **a)** Canning
- ☐ **b)** Baking
- ☐ **c)** Grilling
- ☐ **d)** Vacuuming

3. This bacterium is the leading cause of diarrhea in the U.S., resulting in up to 6 million illnesses each year.

- ☐ **a)** *Lactobacillus*
- ☐ **b)** *Campylobacter jejuni*
- ☐ **c)** *E. coli* O157:H7
- ☐ **d)** *Vibrio cholerae*

4. What mathematical value is used to calculate the reduction of bacteria in order to make food safe?

- ☐ **a)** Quotient
- ☐ **b)** Square Root
- ☐ **c)** Radius
- ☐ **d)** Logarithm

Lose a Million Bacteria Page 2

1. Which of these is not one of the "4 Cs" of proper food safety behavior?

- ☐ **a)** Clean
- ☐ **b)** Chill
- ☐ **c)** Cook
- ☐ **d)** Contaminate

2. This government agency regulates food safety of all products made from produce, dairy, eggs, and seafood.

- ☐ **a)** CDC
- ☐ **b)** NIH
- ☐ **c)** FDA
- ☐ **d)** USDA

3. Which of these foods is not kept safe through the process of pasteurization?

- ☐ **a)** Milk
- ☐ **b)** Orange Juice
- ☐ **c)** Tomato
- ☐ **d)** Egg

4. Which of these is not a cause of emerging pathogens?

- ☐ **a)** DNA Mapping
- ☐ **b)** Transduction
- ☐ **c)** Transformation
- ☐ d) Conjugation

Lose a Million Bacteria Page 3

1. Which of these would not be found on a food label?

- ☐ **a)** Expiration Date
- ☐ **b)** Sell by Date
- ☐ **c)** Blind Date
- ☐ **d)** Use by Date

2. The growth of this foodborne pathogen is of greatest concern at refrigerator temperatures.

- ☐ **a)** *Listeria*
- ☐ **b)** *Salmonella*
- ☐ **c)** *E. coli*
- ☐ **d)** *Shigella*

3. Which of the following conditions have food safety implications?

- ☐ **a)** Curdled Milk
- ☐ **b)** Freezer Burn
- ☐ **c)** Prepared food left out at room temperature for more than 2 hours
- ☐ **d)** Raw eggs that float in water

4. What percentage of people say they wash their fruits and vegetables before eating them? (1998 FDA survey)

- ☐ **a)** 52%
- ☐ **b)** 79%
- ☐ **c)** 65%
- ☐ **d)** 97%

Lose a Million Bacteria Page 4

1. What businesses employ the greatest number of high school students?

- ☐ **a)** Supermarkets
- ☐ **b)** Movie Theatres
- ☐ **c)** Delis
- ☐ **d)** Fast Food Restaurants

2. What food temperatures constitute the "Danger Zone"?

- ☐ **a)** 0° F - 32° F
- ☐ **b)** 40° F -140° F
- ☐ **c)** 140° F - 180° F
- ☐ **d)** 180° F - 210° F

3. How does irradiation make food safe?

- ☐ **a)** It sterilizes it.
- ☐ **b)** It damages the bacteria's DNA.
- ☐ **c)** It makes it glow in the dark.
- ☐ **d)** It boils all the water out of the food.

4. How long does it take for *Salmonella* to grow from 10 bacteria per gram to 1,000,000 per gram at room temperature?

- ☐ **a)** 13 hours
- ☐ **b)** 24 hours
- ☐ **c)** 48 hours
- ☐ **d)** 72 hours

Lose a Million Bacteria Page 5

1. Which of these groups is typically not at high risk for foodborne illness?

- ☐ **a)** Children under age one
- ☐ **b)** Teenagers who rollerblade
- ☐ **c)** Women who are pregnant
- ☐ **d)** Adults over age 65

2. What percentage of people say they do not wash their hands after handling raw meat? (1998 FDA Survey)

- ☐ **a)** 25%
- ☐ **b)** 10%
- ☐ **c)** 44%
- ☐ **d)** 50%

3. How many cases of gastrointestinal illnesses caused by food does the CDC estimate each year? (CDC MMWR)

- ☐ **a)** 76,000,000
- ☐ **b)** 5,200
- ☐ **c)** 323,000
- ☐ **d)** 500,000

4. What process did NASA adopt in the 1970s to ensure that food is safe for astronauts in space?

- ☐ **a)** Pasteurization
- ☐ **b)** Acidification
- ☐ **c)** HACCP
- ☐ **d)** Biotechnology

Answer Key

Answers to Page #1

1. c) Emerging
2. a) Canning
3. b) *Campylobacter jejuni*
4. d) Logarithm

Answers to Page #2

1. d) Contaminate
2. c) FDA
3. c) Tomato
4. a) DNA Mapping

Answers to Page #3

1. c) Blind Date
2. a) *Listeria*
3. c) Prepared food left out at room temperature for more than 2 hours
4. d) 97%

Answers to Page #4

1. d) Fast Food Restaurants
2. b) 40° F - 140° F
3. b) It damages the bacteria's DNA
4. a) 13 hours

Answers to Page #5

1. b) Teenagers who rollerblade
2. a) 25%
3. a) 76,000,000
4. c) HACCP

Handing Out Germs

1. Mark three 3" X 5" cards in some way that is not conspicuous and then pass out three 3" X 5" cards to each student. Make sure the three "marked" cards are handed out to different students. Have each student write his or her name on each card.
2. Play music while the students walk around the room. Stop the music and each student should trade a card with another student, and then state one thing about him or herself (such as their favorite color, food or book). Repeat two more times. This simulates germ transmission that occurs when people interact.
3. Tell the students to check their cards to see if it is marked. Tell them to stand up. Tell the class that they should pretend that each of the people with a marked card is getting sick.
4. Have students check their cards to see if they exchanged cards with the "sick" students. If they did, they should stand up too. Have these students read the names of the students they exchanged cards with and have those students stand up too. Continue until all the students who had direct or indirect content with the sick students are standing.
5. Have the class look around to see the number of people who have been "handed" an illness. Discuss what this means.

Follow up questions:

- You saw how many students were "infected" by the three students. How many students would have gotten "infected" if the three people who were getting sick had stayed home instead of coming to school?
- How could we reduce the spread of disease if such germs can be dispersed so readily?
- What do our bodies do to handle germs since we don't live in a germ-free world? [Answer: *Make antibodies, make white blood cells, build up immune system.*] How can good hand hygiene help?

Extensions

1. **Math extension**: Have the students make a chart with the following data: a) the number of people in the class, b) the number of people who were "sick"

before the first "germ" exchange [three], and c) the number of people who got "sick" after the exchanges.

2. **Social Studies extension:** research some of the great plagues in history and how lack of knowledge contributed to the spread of these diseases. Where did they occur? Is the recent outbreak of SARS something we should be concerned with? What diseases used to regularly kill people but now we have vaccines for them? What are the new killers?
3. Talk about sexually transmitted diseases such as AIDS. How is the spread of AIDS the same as "sick germ"? How is it different?
4. Discuss how impressions or assumptions about others can sometimes be incorrect and can lead to problems. Write about an incident when assumptions led to difficulties and how you would propose a better way to handle the situation.

Activity # 4

How Soap Works

Did you ever wonder how soap works?

Materials:

- Jar
- Oil
- Water
- Dishwashing liquid

Procedure:

1. Put some cooking oil and some water in a jar, then secure the lid tightly.
2. Shake the jar, and notice how the water and oil stay separated.
3. Now put a few drops of dishwashing liquid into the jar, and secure the lid again.
4. Shake the jar once again, and notice how a cloudy mixture has been created.

What happened?

The dishwashing liquid breaks up the oil into smaller drops, which just float in the water, creating the cloudy mixture. When cleaning, soap allows oil and grime to be washed away better!

How Many Drops of Water Can Fit on a Penny?

Materials:

- 2 eyedroppers
- 2 pennies
- Cup—labeled WATER
- Cup —labeled SOAPY WATER
- Water
- Soapy water *(Add a tablespoon of dish soap to a cup of water. GENTLY stir the mixture—don't make too many bubbles.)*

Take a Guess: How many drops of water can fit on one side of a penny? _____

Perform a CONTROL test for comparison with later results.
Step 1: Rinse a penny in tap water and dry completely.
Step 2: Place the penny on paper towel.
Step 3: Use an eye dropper to place drops of WATER on the penny (one at a time) until ANY amount of water runs over the edge of the penny.
Step 4: Record the number of drops for that trial in the table.

Repeat steps 1 - 4 three more times (for the other trials) before calculating your average.

Substance	Trial 1	Trial 2	Trial 3	Trial 4	Average
CONTROL					

Perform tests with the TESTING LIQUID.
Step 1: Rinse a penny in tap water and dry completely.
Step 2: Place the penny on a paper towel.
Step 3: Use the second eye dropper to place drops of SOAPY WATER on the penny (one at a time) until ANY amount of water runs over the edge of the penny.
Step 4: Record your observations and the number of drops for that trial in the table.

Repeat steps 1 - 4 three more times before calculating the average.

Substance	Trial 1	Trial 2	Trial 3	Trial 4	Average
Penny covered in soap					

What's Happening?

You just saw three important forces tugging on the water: gravity, cohesion, and adhesion. Gravity flattens the droplets, cohesion holds the droplets together, and adhesion holds the drops on the surface of the coin.

The cohesive force is the pull of the water molecules on themselves. Each successive drop sticks to the water that's already on the coin. We often call this cohesive force "surface tension". It's what makes water drops look like they're wrapped in invisible skins. Soap reduces the cohesive force, and breaks the surface tension. Soapy water makes smaller drops than plain water. Since soapy drops are smaller, more soap drops will fit on a penny than plain water drops.

Answer each question related to the experiment.

1. Explain your results in terms of cohesion and surface tension. Did the penny hold as many drops as you first thought?

2. Compare your results with other groups. Did they have the same results? Why or why not? Give at least one reason.

3. How could this be applied to your daily life? Why is this information important to know?

Activity # 14

Microbe Math

Objectives:

- Apply math skills to learn about optimal conditions for bacterial growth
- Learn about the exponential speed at which bacteria can multiply
- Learn abut the role of bacteria in promoting decay

Materials:

- Modeling clay, one or two colors
- Graph sheets

Procedure:

1. Ask students for examples of decay they have seen, such as food left in the refrigerator too long or a dead animal in the yard. Explain that bacteria and fungi cause most of the decay.
2. Explain that an individual bacterium is far too small to be seen by our eyes alone; most are about 1/1000 of a millimeter in diameter.
3. Divide the class into groups of four. Give each group a fist-sized piece of clay that represents a single bacterium. Every 30 to 60 seconds, have each group divide its “bacteria”: first two, then four, then eight, then 16, then 32. Track the bacterial growth of the class on a class graph sheet or on the board.
4. Explain that real bacteria – including strains that make us sick – divide every 20 minutes under optimal conditions. The real bacterium would have gone from one to 32 in 100 minutes. Now ask them to calculate how many bacteria there would be after two hours, three hours and four hours at this fission rate.
5. Ask them to consider why such unchecked growth does not actually happen. (Finite food supply, limits of suitable living space, propensity for crowded bacteria to poison themselves with their own waste, antibiotics that are created by competing fungi, ability of humans and many animals to produce antibodies).

Interesting fact: In just 12 hours, one bacterium could multiply to over 8.5 billion under perfect conditions. After three days, with no bacteria dying, there would be enough of them to cover the entire earth.

Adapted from: www.healthyhands.com

Activity # 7

Pepper on Parade

Materials:

- Bowl
- Water
- Pepper
- Dishsoap

Procedure:

1. Sprinkle a dash of pepper in a dish of water.
2. Add a drop of liquid dish soap and watch what happens. The pepper scurries away from the soap. Maybe it just doesn't like baths!

Actually, the soap breaks the surface tension of the water and the tension on the rest of the water pulls the floating pepper away from the soap. Neat!

Germ--Bustin' Word Search

Hunt through the puzzle to find the words at the bottom of the page. Circle each one when you find it. Words can be spelled out horizontally, vertically, or diagonally—even backwards.

K E Z O N L S D H Z H Y X T I Z B Y J M
S V N A Z J K T L M G P L N A Y U Q N I
T I E R G I G V Z T U I N I Z C C C J F
U L A L O E E M V R O V Y J J S F Y E E
C S A E S B S E I A C K K W P V M V V D
Q M V F F I R S O N D I S E A S E R K L
D G Q S N F H I N S I G N U F R G L E K
X P F A W Y L C A M A I R E T C A B N G
K B G B G C J R G I J W K G F S M B Q H
E R G I E Z E E N S G S I S A B I B L V
O I E H I P D X N S P L O N V A C H E S
D N F A R B O E P I N H I A T I R F F G
E F L N E T Y X K O A T E Y P L O C T L
E K O D V S K I N N I P Q A S H B R E Z
I M F S K S O U S Z I V Q C L J E S P Y
C G I C C Q Q K E O N K I Z H T D M F M
H D I Q B C D Z J K A G A R I S H W G O
J S H I S D R E F R C K Q N U M L Y V D
N E A R U A J C Z I U Y C G M S Q A V B
P L K W I A D V K A Q A Y E Z S F U F E

ACHES
AIRBORNE
BACTERIA
CLEAN
COUGH
CUTS
DISEASE
EXERCISE
FEVER
FUNGI
GERMS
HANDS
HEALTHY
HYGIENE
MICROBE
ORGANISM
SANITIZE
SICK
SKIN
SNEEZE
SOAP
TRANSMISSION
VIRUS
WASH

THE UNSINKABLE POTATO & OTHER AMAZING CHARACTERISTICS OF ICE AND WATER

Here's a cool trick that will show why it's easier for an object to float in the ocean than it is in a fresh-water pond.

First, fill a large glass to within a couple inches of the rim with hot tap water. Using a spoon, ease a fresh potato slice into the water. It will come to rest at the bottom of the glass because it has a greater density than water. Next, stir some table salt into the water until the potato slice rises. The salt increases the water's density, making it heavier, volume for volume, than the potato slice. As a result, the potato slice now floats.

Amazing Items to Discuss Concerning Water and Ice

- Discuss the interesting concept of floating. What floats and why? Try it out. Can your students guess what will float and what will sink? Does it make a difference what the liquid is that you're using to float the solid? Think about density and how dense the liquid is to answer this question.
- Ask if anyone has seen David Letterman try floating all kinds of objects on his show in a big pool of water on stage.
- Why does ice float? Usually solids are heavier than liquids. Why is water so special? The reason why ice is lighter than water is that a certain mass of ice occupies more space than the same mass of water. This is related to "hydrogen bonding".

Hydrogen bonding

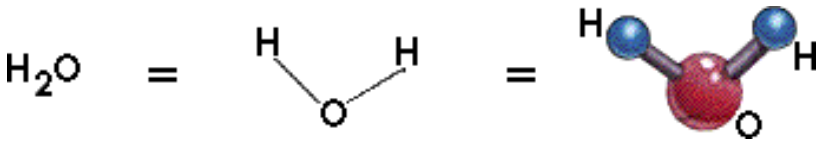
A water molecule is composed of two hydrogen atoms (H) and one oxygen atom (O). The atoms of hydrogen and oxygen are bound by sharing their electrons with one another. This bond is called a "covalent bond". However, since oxygen atoms pull electrons more strongly than hydrogen atoms, the oxygen atom in a water molecule has a slightly negative charge and the hydrogen atoms have a slightly positive charge. So adjacent water molecules are attracted to one another through the slightly negatively charged oxygen atoms and the slightly positively charged hydrogen atoms. This interaction is called "hydrogen bonding". Hydrogen bonding is much weaker than covalent bonding, however, this type of bonding has a large total effect because there are so many hydrogen bonds.

- Make water molecule models using clay and toothpicks. *Form little balls out of the clay using one color for hydrogen atoms and one color for oxygen atoms. Then use the toothpicks to connect the "atoms" together to form a water molecule. (This activity can also be done using gumdrops instead of clay.)* This will help show the qualities of the atoms comprising the water molecule.

  What does a water molecule look like? All substances are made up of millions of tiny **atoms**. These atoms form small groups called **molecules**. In water, for

example, each molecule is made up of two hydrogen atoms and one oxygen atom. The formula for a molecule of water is **H2O**. "H" means hydrogen, "2" means 2 hydrogen atoms, and the "O" means oxygen. Here is a picture of what water looks like.



- Discuss the movie Titanic and the floating iceberg that hit the ship and brought it down.
- What would happen if ice didn't float? How would that affect the polar ice caps?

Fight BAC!® Secret Code Puzzle

This is BAC for bacteria. He is an invisible bad guy that can make you real sick. The more you learn about him . . . the easier it will be to keep him away. Use the BAC!®-detector code to uncover his secrets!

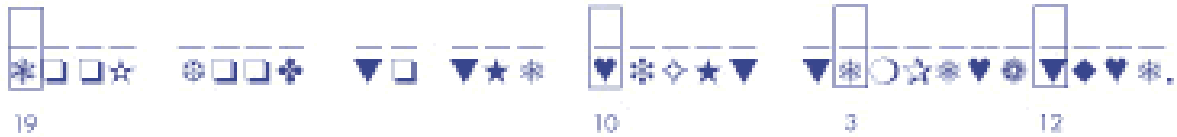
Decipher the Code:

1. BAC is like a funny joke. He loves to be passed along! YOU can stop him in his tracks if you...

2. BAC loves to travel! A cutting board is like his very own bus stop. YOU can keep him from moving around if you...

3. Do you like chilly weather? BAC sure doesn't! YOU can give BAC the cold shoulder if you...

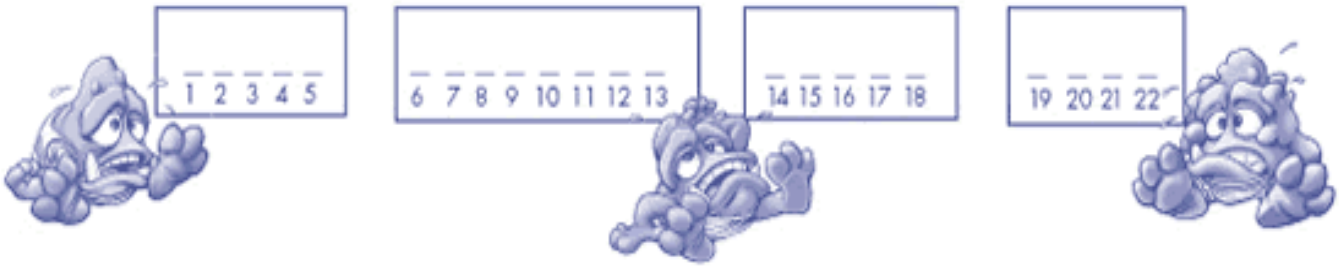
4. A food thermometer can be BAC's worst enemy! YOU can keep him away by using one to...



Unlock the Four Messages:

Good job! You've gotten the inside scoop on how to Fight BAC!®

Now, take the secret letters that are marked 1 to 22 above, and place them in the numbered spots below. These are the four things you and your family can do to make sure BAC doesn't try to visit YOUR home!



Way to go! BAC is no match for you now!

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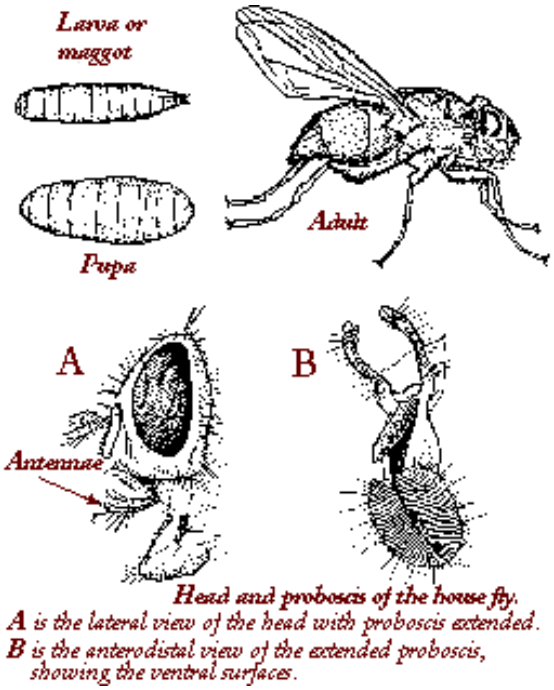
* Distributed May 2002 for use in September 2002 as part of the International Food Safety Council's *National Food Safety Education Month*.

Phylum, Arthropoda; **Class**, Insecta; **Order**, Diptera



Head and proboscis of the house fly.
A is the lateral view of the head with proboscis extended.
B is the anterodistal view of the extended proboscis, showing the ventral surfaces.

Identifying Features

Appearance (Morphology)

- Three body parts: head, thorax, abdomen
- One pair of fully developed wings
- Hind wings are reduced to halteres (small knob-like structures) used to maintain equilibrium.
- Adult mouth parts are sponging, lapping, or piercing
- All adults look like flies, but some may have a metallic color (blue bottle fly).
- Antennae may be difficult to see.

Adult Males and Females
Males and females are hard to distinguish. Females are usually larger and can extend the tip of the abdomen to form an ovipositor which is used to lay eggs. Sometimes males have enlarged eyes which meet on top of the head.

Immatures (different stages)
Flies are holometabolous *(Refers to insects that have a pupal stage in between the larval and the adult form.)*, therefore they have four distinct morphological stages; egg, larva (maggot), pupa and adult. After hatching from the egg, larvae molt twice as they grow. Molting of maggots is difficult to see. Larvae are maggots with a legless soft body except for the dark mouth hooks. Pupae are dark, and look like a small barrel.

Natural History

- **Food—**Larvae feed on decaying meat and feces. Adult flies feed on sugary food of any kind, including nectar and rotting fruit.
- **Habitat—**Flies live in garbage and wherever animal feces are available. Dead animals attract flies within hours after death. Most flies are diurnal (the opposite of nocturnal).
- **Predators—**Many birds, bats, spiders, and insects such as dragonflies eat the parasitic insects eat the larvae.

Interesting Behaviors

- The eyes of flies are among the most complex in the insect world. They are compound eyes with many individual facets, each representing a separate light-detecting unit. The light reflected from the eye of a horsefly can form a rainbow.
- Flies taste, smell, and feel with the hairs that cover their bodies. The hairs on the fly's mouth parts and feet are used for tasting. Flies taste what they walk on. If they walk onto something tasty, they put down their mouth and taste it again.
- Flies use other hairs to tell them when they touch something. These hairs bend when touched.
- The eyes of a fly do not have eyelids, so flies rub their eyes with their feet to keep them clean.
- A fly cleans itself constantly.
- Flies walk on smooth surfaces using sticky soft pads that act like glue. This allows them to walk on vertical glass surfaces and upside down.

Impact on the Ecosystem

Positive
Flies and other insects, such as burying beetles, are very important in consuming and eliminating dead bodies of animals. Flies are also essential in the conversion of feces and decaying vegetation to soil. Flies serve as prey to many other animals. Some flies aid in pollination.

Negative
Because of their habits of being attracted to feces and decaying meat, flies have been implicated in transmission of disease such as dysentery, typhoid fever, and cholera.

Collecting Live Insects

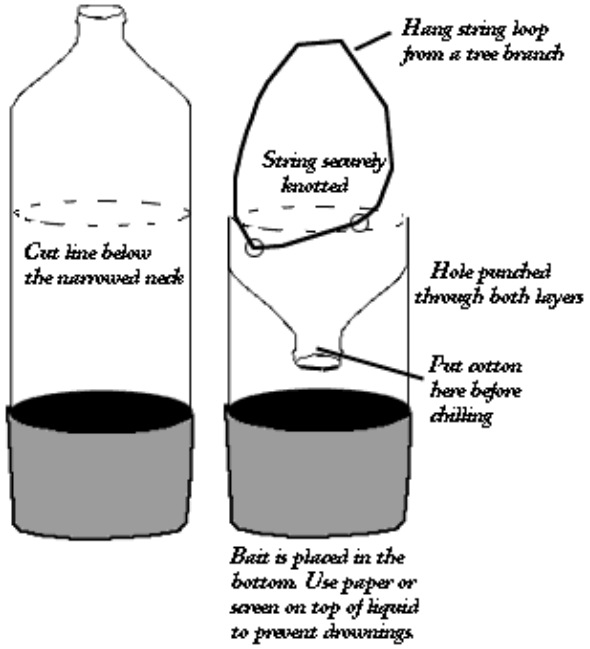
Where to find
Flies live around rotting food, decaying meat and animal feces. Horse stables, feed lots and restaurant trash bins are a few of the fly-frequented areas. Flies are more common in warm weather.

How to collect
Placing the fly trap in these areas should be successful. If there are many flies flying around a certain area, use an insect net. Quickly move the net back and forth in the area (i.e., outside a trash bin). With each motion the flies go to the bottom of the net. When you stop moving the net, quickly close the top of the net so that flies do not escape. If you catch flies with a net, place them in the fly trap for observation activities.

How to Make a Fly Trap

Materials:

- 2 liter plastic soda bottles (have students bring these to class)
- Heavy scissors
- 24" lengths of string
- Hole punch
- Bait: Raw meat soaked in a small amount of water (or old beer); old piece of fruit, like ripe banana
- Cotton ball



Making the Fly Trap

(For student participation, have all elements prepared for assembly--depending on abilities)

1. Using 2 liter plastic soda bottles, remove label and rinse out with water.
2. With heavy scissors separate the top of the bottle from the bottom (see diagram). The cut may need to be started with a razor blade or knife.
3. Invert the top into the bottom part of the bottle.
4. On opposite sides of the container, punch holes using a hole punch.
5. Lace 24" of string through the holes and tie with a secure knot to create a hanger, or you can use string with paper clips attached to each end.

Trapping Flies

- To add the bait, slide the top up the string and drop in bait. If your bait is runny, place a piece of paper (or wire screen) under the bait so that insects do not drown.
- Set trap in a tree so that rodents (or children) will not be enticed. To protect the flies from heat stress, place the trap in a shaded area. Depending on the , the bait and the amount of time the trap is left outside, the other insects. Be watchful for honey bees.

Handling Flies

- After retrieving the trap, place it in a refrigerator or ice chest (with ice) for

one hour until the flies fall to the bottom. Prolonged chilling may kill them. All the insects in the trap will be chilled and not fly away. Work quickly as the insects may recover rapidly. At this time, separate the flies and other insects from the bait and dispose of bait appropriately. You can handle the insects with tweezers being careful not to pinch off wings, legs or squeezing them too hard. Release other insects outside and place flies in observation chamber and leave at room temperature to resume normal activity.

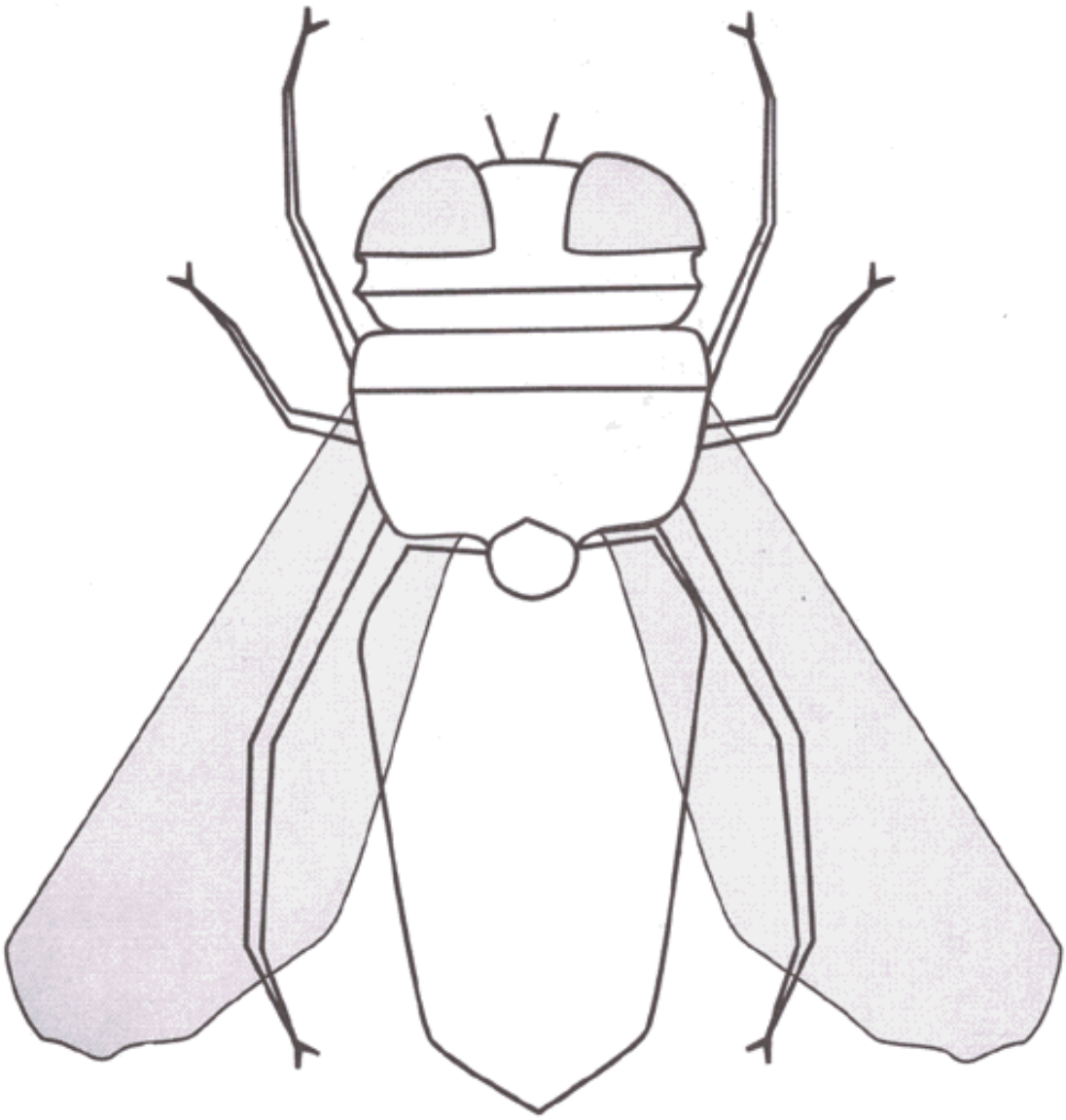
- After completing the observation and activity, release the flies. If you need to use flies for experiments the next day, place a piece of apple or wet raisins in the container for the adult flies.

Precautions

Flies are harmless.

Adapted from Wisconsin Bottle Biology Project. For additional information write: Bottle Biology Program, c/o Wisconsin Fast Plants, University of Wisconsin, Dept. of Plant Pathology, 1630 Linden Drive, Madison, WI, 53706.

Grooming is a Good Thing



Flies

Overall Objective: The students will demonstrate an understanding of hygiene by observing and recording insect grooming, and by predicting its importance. They will construct a fly trap, use it to collect house flies, and observe the flies grooming. They will compare and contrast the fly's grooming techniques and their own.

Grooming is a Good Thing

Introduction Activity

Read **Old Black Fly** by Jim Ayelsworth, **A Fly Went By** by Marshall McClintock, **There Was an Old Lady Who Swallowed a Fly,** or any other book about flies and discuss what the class knows about flies. Record the answers on a flip chart or black board.

Exercise # 1

- Divide the students into teams.
- Let each team construct a fly trap (see handout). With this fly trap, they will be able to collect their own flies and observe them.
- If you use two or more kinds of bait to attract the flies, ask the students to predict which bait they think will attract the most flies. Put bait inside the trap and set them up outside to collect flies.

Exercise # 2

Referring to the Fly drawing, have the students discuss and brainstorm ways that flies might groom themselves. Record the answers on the board. Retrieve the fly traps and place a cotton ball in the opening. In teams, have the students observe the flies. Using the fly drawing, have the students color in all parts of the fly that they observe being groomed. Have each group share their drawings.

Have the students chart their observations to mark if the student saw the fly wash its head (face), legs (hands), body, etc. Brainstorm and compare predictions about why grooming is important to the fly. Record the answers on the board. Lead the students into discovering why it is important for flies to groom (see Information Sheet). Flies taste, smell, and feel with the hairs that cover their bodies. (Compare this to how a person tastes, smells, and feels.) The hairs on the fly's mouth parts and feet are used for tasting. Flies taste

what they walk on. If they walk into something tasty, they put down their mouth and taste it again. ("How many of you have seen flies walking on food before? What are they doing? What do you think they 'tasted' before landing on your food?") Flies also use other hairs to tell them when they touch something. These hairs bend when touched. The eyes of a fly do not have eyelids to keep them clean so you might see a fly rubbing its eyes with its feet. The fly is not tired. It is keeping its eyes clean. Compare this to how your eyes stay clean. A fly is always cleaning itself so that its hairs and eyes can do their job. (See drawing on Information Sheet.)

Exercise # 3

Invite a speaker to class to talk about the importance of clean hair and combing hair. Be sure to have a discussion about lice including prevention and eradication.

Closing Exercise

Brainstorm how we groom ourselves and why it is important. Compare and contrast this with flies. "What would happen if we didn't groom? What would happen if the fly didn't groom”?

Yeast: A Helpful Fungus

Yeast is what causes bread to rise. Yeast is a **fungus** in the same major microbial group as mold, mildew and mushrooms. Sometimes fungi grow plant-like root systems and resemble plants, but they have no chlorophyll and cannot produce their own food. Yeast is found naturally in the air. Sugar can act as food for yeast, since the yeast can change it into alcohol, causing the release of carbon dioxide gas and energy. The bubbles in the experiment are carbon dioxide.

Definitions: Chlorophyll is a special substance that causes plants to have a green color. Chlorophyll lets plants make their own food.

Materials for each group:

- 1 package of powdered yeast
- Clean empty liter soda bottle
- Balloon
- Plastic bowl
- Funnel
- Spoon
- 1 packet or 1 teaspoon of white sugar
- Warm water
- Measuring cup

Procedure:

1) Pour half-cup of warm water into the bowl, add yeast and sugar and stir carefully.
2) Pour mixture into soda bottle. Add another half-cup of warm water.
3) Stretch the balloon over the top of the bottle and set in a warm, dark place for 3 to 4 days.
4) Predict what you think may happen to the balloon.
5) Draw or write observations each day.

Questions:

1) What happened to the balloon? Why?

2) What did you notice happening inside the bottle?

Extensions:

- Yeast (a fungus) makes bread rise. Other bacteria help us make cheese and vinegar, and break down dead plants and animals to fertilize the soil. These tiny living things can actually help us. Tell students that some medicines doctors prescribe come from good fungus. One example is penicillin.
- Yogurt is also full of good bacteria (acidophilus). Have the students research the process of making yogurt and other foods, such as cheeses, that use bacteria.
- If you have access to an oven or bread machine, you might want to try baking bread with the students. Recipes can be found in many cookbooks.
- Read the *"History of Yeast".*
- Research Louis Pasteur. What discoveries is he famous for. *Some possible answers: Louis Pasteur is one of the greatest benefactors of humanity. He solved the mysteries of rabies, anthrax, chicken cholera, and silkworm diseases, and contributed to the development of the first vaccines. He debunked the widely accepted myth of spontaneous generation, thereby setting the stage for modern biology and biochemistry. He described the scientific basis for fermentation, wine-making, and the brewing of beer. Pasteur's work gave birth to many branches of science, and he was singlehandedly responsible for some of the most important theoretical concepts and practical applications of modern science.*
- Yeast is not always the good guy. Pertaining to hygiene, yeast can be the cause of a vaginal infection for women. Small numbers of these tiny fungi (Candida) normally live on the skin and inside the vagina. An infection can occur when there is overgrowth of yeast in the vaginal environment. For more information about yeast infections, symptoms, and cures, check the following website: http://www.aafp.org/afp/091596/960915d.html

Answer key:

1) The balloon should have begun to expand as if being blown up. This is caused by the action of the yeast and the sugar. As the yeast uses the sugar for food, carbon dioxide is released. The carbon dioxide causes the balloon to expand.
2) You should be able to see bubbles and lots of foam inside the bottle as the yeast and sugar interact.

Adapted from: www.gphealthsmart.com

History of Yeast

Yeasts can be considered man's oldest industrial microorganism. It's likely that man used yeast before the development of a written language. Hieroglyphics suggest that that ancient Egyptians were using yeast and the process of fermentation to produce alcoholic beverages and to leaven bread over 5,000 years ago. The biochemical process of fermentation that is responsible for these actions was not understood and undoubtedly looked upon by early man as a mysterious and even magical phenomenon.

It is believed that these early fermentation systems for alcohol production and bread making were formed by natural microbial contaminants of flour, other milled grains and from fruit or other juices containing sugar. Such microbial flora would have included wild yeasts and lactic acid bacteria that are found associated with cultivated grains and fruits. Leaven, referred to in the Bible, was a soft dough-like medium. A small portion of this dough was used to start or leaven each new bread dough. Over the course of time, the use of these starter cultures helped to select for improved yeasts by saving a "good" batch of wine, beer or dough for inoculating the next batch. For hundreds of years, it was traditional for bakers to obtain the yeast to leaven their bread as by-products of brewing and wine making. As a result, these early bakers have also contributed to the selection of these important industrial microorganisms.

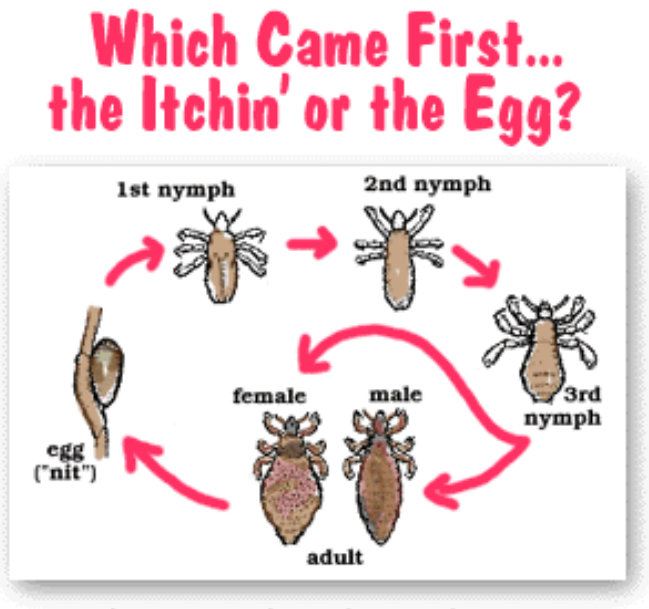
Louis Pasteur
1822-1895

It was not until the invention of the microscope followed by the pioneering scientific work of Louis Pasteur in the late 1860's that yeast was identified as a living organism and the agent responsible for alcoholic fermentation and dough leavening. Shortly following these discoveries, it became possible to isolate yeast in pure culture form. With this new found knowledge that yeast was a living organism and the ability to isolate yeast strains in pure culture form, the stage was set for commercial production of baker's yeast that began around the turn of the 20th century. Since that time, bakers, scientists and yeast manufacturers have been working to find and produce pure strains of yeast that meet the exacting and specialized needs of the baking industry.

From: http://www.dakotayeast.com/yeast_history.html

Lousology 101

Biology of Head Lice



(The Life-Cycle of the Head Louse)

- Nits (the eggs of the head louse) are small yellowish-white, oval-shaped eggs that are "to the side of a hair shaft glued" at an angle.
- Nits must be laid by live lice. You cannot "catch nits."
- Once laid, it takes 7-10 days for a nit to hatch, and another 7-10 days for the female to mature and begin laying her own eggs.
- Head lice are clear in color when hatched, then quickly develop a reddish-brown color after feeding.
- Head lice are about the size of sesame seeds.
- Head lice have six legs equipped with claws to grasp the hair.
- Head lice are crawling insects. They cannot hop, jump, or fly.
- Head lice do not thrive on pets.
- Head lice are small, wingless insects which feed on human blood. They need human blood in order to survive.
- Head lice live for approximately 30 days on a host and a female louse may lay up to 100 nits (eggs).

Head lice off of their human hosts will starve. The NPA suggests that, in most cases, a head louse will not survive for more than 24 hours off of its human host.

How can you tell if you have head lice?

Head lice are difficult to find just by looking in the hair. If you suspect head lice, it is best to do 'detection combing' (described below). Some people advise that you do this to children's hair regularly, about once a week.

- Wash the hair in the normal way with ordinary shampoo.
- Rinse out the shampoo and put on lots of ordinary conditioner.
- Comb the hair with a normal comb to get rid of tangles.
- When the hair is untangled switch to a detection comb. This is a special fine toothed comb that you can buy at pharmacies. (The teeth of normal combs are too far apart.)

- Slot the teeth of the detection comb into the hair at the roots so it is touching the scalp gently.
- Draw the detection comb through to the tips of the hair.
- Repeat this in all directions until you have combed all the hair.
- Check the comb for lice after each stroke. A magnifying glass may help.
- If you see any lice, clean the comb by wiping it on a tissue or rinse it before the next stroke.
- Comb over a white surface such as white paper. This is so that any head lice that are flicked out by the comb are easy to see.
- After the whole head has been combed, rinse out the conditioner.
- While the hair is still wet, use an ordinary comb to get rid of tangles.
- Repeat the detection combing in the rinsed hair to check for any lice that you might have missed the first time.
- It takes about 10-15 minutes to do detection combing properly, depending on how thick the hair is.

What are the treatment options for head lice?

Treatment is only needed if you see one or more live moving lice. Nits (empty eggshells) do not always mean infection. Nits stick to hair even when lice are gone (after treatment).

TREATMENT WITH LOTIONS OR CREAM RINSE

You can buy lotions or a cream rinse which kills lice from pharmacies. You can also get them on prescription. Head lice shampoo is not very effective and is not advised. Lotions come in water or alcohol bases. Alcohol based lotions work slightly better than water based lotions. But, do not use alcohol based lotions if you have asthma, eczema, or broken skin. **Alcohol based lotions are flammable so do not use near naked lights, cigarettes, fires, or flames. Be careful with children near fires who have alcohol lotion in their hair.** Some tips include:

- Follow the instructions on the packet carefully. This may include the following.
    - **For lotions**: apply to dry hair. Part the hair near the top and pour a few drops onto the scalp. Rub well into the hair. Part the hair again a little further down and repeat. Repeat this until the scalp and roots of the hair are saturated. Apply down to where a pony tail band would be. Leave on for 12 hours (overnight) and then wash off. About 50ml of lotion is needed per person. Up to 150ml is needed for thick hair.
    - **For cream rinse:** apply to damp hair so that the scalp and roots of the hair are saturated. One tube is usually enough. Leave on for 10 minutes and then rinse off.
- Do not go swimming before applying a lotion. The chlorine from the swimming pool may stop it working.
- Do not use a hairdryer to dry hair after applying treatment.

- Re-apply the same treatment after 7 days. (Although lice are usually killed by one application, not all eggs may be. The second application makes sure that any lice that hatch from eggs that survived will be killed before they are old enough to lay further eggs.)
- Inspect the hair by detection combing 2-3 days after the second application. If you find any live moving head lice, despite treatment, then see a doctor or nurse for advice.

WET COMBING TREATMENT USING THE BUG BUSTING METHOD

'Bug busting' is a way of removing head lice without having to use a lotion or cream rinse to kill them. Use the Bug Busting method as described in the section above 'How can you tell if you have head lice'. Do this on every member of the household that has been found to have head lice. (The detector comb removes the lice which cannot grip hair that is slippery with conditioner). You need to do the wet combing routine every 4 days for at least 4 sessions (2 weeks).

- The first combing session should remove all hatched head lice, but does not remove eggs.
- Any young lice that hatch from eggs after the first session are removed at the second, third and fourth sessions. This is why it is important to do the full 4 sessions.
- If you see full-grown lice at the second, third, or fourth session, this means that some had been missed on the first session, or re-infection from someone else has occurred. If this occurs, you should increase the number of sessions. In effect, following any session where you find adult head lice, you should do 3 further sessions at 4 day intervals where you do not see adult lice.

Fuller details of wet combing treatment ('Bug Busting') can be obtained from: Community Hygiene Concern: www.nits.net

Do family and friends need treatment?

All people in the same home, and other close 'head to head' contacts of the previous 4-6 weeks should be contacted. Tell them to look for lice. Only people with head lice should be treated. (It used to be advised to treat all close contacts even if they had no symptoms. This has changed to just treating people with definite head lice infection.) All people with head lice in the same home should be treated at the same time. This stops lice being passed around again.

What about school?

Children with head lice should carry on going to school. Contrary to popular belief, head lice do not spread quickly through schools. Alarming 'head lice letters' from schools are unhelpful. Close head-to-head contact is needed to pass lice on to others. Young

children who are 'best friends' and play closely together may pass lice on. A common sense approach is to tell the parents of the close friends of an affected child to look out for lice in their children.

Can head lice be prevented?

There is no good way of preventing head lice. Lice repellent sprays are not very effective. Regular detection combing of children's hair will detect lice infection early. This means treatment can be started early, which means less chance of passing them on to others.

Some other points about head lice

- Use an anti-lice lotion or cream rinse only when you are sure that you or your child have head lice. Do not use them to prevent head lice, or 'just in case'. Frequent use may cause a build up of small amounts of the active medication in the body. The risk of harm from this is very small, but it is best to use these treatments only when infected.
- A common reason for head lice to recur in one person is because close contacts (family and close friends) are not checked and treated if they also have head lice. The treated person is then likely to get head lice back again from untreated family or friends.
- After treatment and the lice have gone, it may take 2-3 weeks for the itch to go fully.
- Nits may remain after lice have gone. They are empty egg shells and stick strongly to hair. They will eventually fall out. A fine toothed 'nit comb' can remove them if you prefer.

A final reminder - alcohol based lotions are flammable. Some children have been badly burnt as their hair caught fire whilst being treated. Keep children away from fires, cigarettes, flames, etc, whilst lotion is in their hair.

information adapted from www.prodigy.nhs.uk and www.headlice.org

Activity # 19

China Steps up to the 20th Century
(a.k.a. the importance of hygiene)

During the early years of the Republic, many reformist thinkers tried to fathom why Chinese were not respected by foreigners. One of these thinkers was Sun Yatsen, who was convinced that "competent governance of the body's natural functions" was a "necessary condition for competent government". As long as Chinese were "lacking in personal culture", they would not be respected. Sun and others called for an end to the practice of growing fingernails to an unseemly length, they advocated regular brushing of the teeth, criticized the practice of farting at will, and tried to educate the people that hawking and spitting was simply "not done". Keeping oneself tidy became part of a new style of personal self-management that was considered essential to show the world that the Chinese people had woken up.

The stress on personal hygiene remained an important aspect of raising the Chinese consciousness during the 1930s and 1940s. After the founding of the People's Republic in 1949, education in hygiene was stepped up even further, often in form of Patriotic Hygiene Campaigns, the first of which took place in 1952. Observing hygienic rules even came to be seen as patriotic. The eradication of diseases and the public and private behavior or conditions that caused them was considered equally important as national construction, ferretting out class enemies, or making revolution, to establish the identity of New China. This often took the form of mass campaigns, such as the Eradicate Four Pests Movement (*chu si hai yundong*) during the Great Leap Forward, and the various schistosomiasis eradication campaigns that took place in 1955-1959.

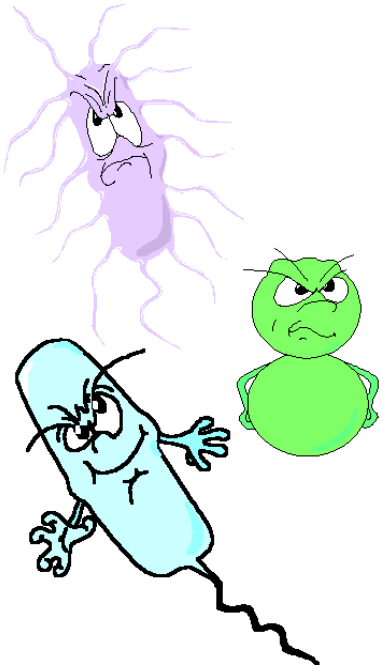
In the early 1980s, personal hygiene was again equated with a sense of having culture. Moreover, due to the changes that were taking place in the political arena and the economy with Deng Xiaoping taking over, there was a general feeling that from that point on, things would be handled differently. This idea was strengthened by the spate of posters produced in those years that showed people (usually women and children) cleaning windows. It almost seemed to indicate that all things—including politics—would become more transparent, more visible.

The use of symbols pointing to type of political hygiene was quickly replaced by a more regular approach. Posters showing children washing their hands almost became a standard subject of the educational posters aimed at inculcating Socialist Spiritual Civilization. Another type of unhygienic behavior that was addressed frequently in propaganda posters was spitting, but without apparent success.

In the 1990s and beyond, the calls for personal hygiene, relatively safe from a political perspective, have continued. They remain part and parcel of the Socialist Spiritual Civilization campaigns, which are periodically directed at primary and secondary school students.

Information taken from: **www.iisg.nl/~landsberger/ ws.html**

How Germs Travel



Germs love to take trips and travel though our bodies. Although you cannot see them, they travel on surfaces, toys, furniture and even people.

Here are some of germs favorite ways to travel:

1. Some germs like to see the world on your hands. After shaking hands with someone, wash your hands with soap and warm water as soon as it is convenient. Dry your hands completely with paper towels. Also, avoid touching food or putting your hands near your eyes or mouth until you have washed them well.

2. Other germs think they are expert swimmers. They like to travel on sponges and dishcloths or any other wet or moist item. It is safer to use a paper towel to dry a clean surface than a sponge or dishcloth. This way, you can pick up the germs with the paper towel and throw them away so no one else can get the germs.

3. Germs hang out in your nose and mouth. Always cover your nose and mouth with a disposable tissue or paper napkin when you sneeze or cough. This will help to throw the germs away and prevent others from getting sick. Also, don't forget to wash your hands often when sneezing or coughing a lot.

4. Many germs love to travel from hands onto food, and because they are so small, you cannot see them. Washing your hands well before eating meals or snacks can help you avoid germs that can make you sick. It is especially important to wash your hands after going to the bathroom.

5. Germs even love to be carried around by your pets. This is especially true of lizards, turtles, but also of dogs, cats, mice, hamsters, guinea pigs and birds. After you pet or play with pets, wash your hands with warm soapy water. Also, be sure to dry them completely with paper towels.

Extensions:
Germs are everywhere and are too tiny to be seen with the naked eye. They can only be seen under a microscope. What do you think germs look like under a microscope? This is your chance to create an imaginary germ!

Materials:

- Elbow macaroni, pony beads, or sequins
- Cardboard
- Crayons or markers.
- Construction paper
- Tissue paper
- Scissors
- Glue

Procedure:
Cut the cardboard in any "germie" shape. Then use your imagination to decorate your germ. Your germ can be any color, shape, and size you want. Be creative! Give your germ a name when you are finished.

Math Extension:

Germs multiply quickly. Have students work in small groups and use manipulatives to demonstrate the mathematical concept of doubling. You can use beans (Pinto or Navy work well), pennies, or any other small object. Provide containers of varying sizes, such as nut cups, margarine tubs or other containers that come in 8-ounce and 16-ounce sizes. Also have some plastic quart, half-gallon, and gallon containers. Designate the number of times to double the items. (for example, doubling beans ten times is 512 beans.) Students will need to estimate the size of the container they need to hold the items they are doubling. At some point, they may decide to double the containers rather than individual beans. **Parenting extension**: Read *"One Grain of Rice"* by Demi with your child and discuss why it was a good plan for the girl to ask the pharaoh to double the amount of rice every day.