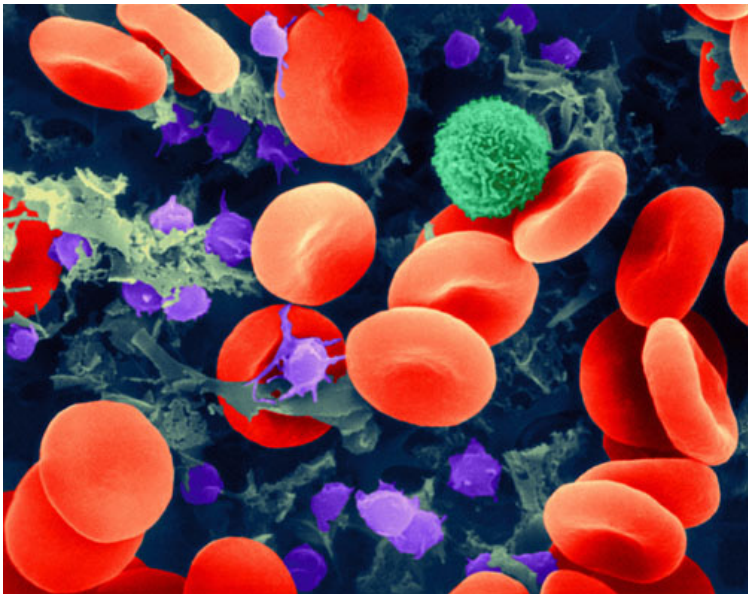
Unit 1: Introduction to Infectious Diseases

Instructional Activities for Teens



PKIDs' Infectious Disease Workshop

Made possible by grants from the Northwest Health Foundation,
the Children's Vaccine Program at PATH and PKIDs.

PKIDs' Infectious Disease Workshop

Acknowledgements

Producing this workshop has been a dream of ours since PKIDs' inception in 1996. It has been more than two years since we began work on this project, and many people helped us reach our goal. It's not done, because it is by nature a living document that will evolve as science makes strides in the research of infectious diseases, but it's a great beginning.

There are people who've helped us whose names are not on this printed list. That omission is not deliberate, but rather from our own clumsiness in losing important pieces of paper, and we apologize.

Without the funding and support of the Northwest Health Foundation and the Children's Vaccine Program at PATH (Program for Appropriate Technology in Health), this would have been an impossible task. Dr. Katherine Vaughn, PKIDs' Medical Director and Dr. Karen Steingart, scientific advisor to PKIDs, provided excellent guidance through their editorial oversight and knowledgeable contributions to the Infectious Disease Workshop.

On PKIDs' staff are three individuals without whom this publication would never have been finished—Franji Mayes, Mylei Basich and Christine Kukka, all of whom gave their very best to ensure this workshop is accurate and user-friendly.

We are indebted to the following individuals who cheerfully gave us hours of their time and access to their resources: the American Society for Microbiology; Kathy A. Bobula, Ph.D., Coordinator, Early Childhood Education, Clark College, Vancouver, Wash.; Claudia Bratt, elementary school teacher, Truman Elementary, Vancouver, Wash.; Sue Campbell, Early Childhood Educator, Kindercare; many wonderful and helpful people at the Centers for Disease Control and Prevention, Atlanta, Georgia; Rachel Coyle, Case Aide and Residential Care Staff Lead, Jonathan's Place; Tammy Dunn, Early Childhood Director, Portland Christian Schools, Portland, Oregon; Bruce Gellin, M.D., Director of the National Vaccine Program Office in the Office of the Assistant Secretary for Health, Department of Health and Human Services; Shannon Harrison, M.D., Internal Medicine and Infectious Diseases, Teton Hospital, Jackson, Wyoming; the Immunization Action Coalition; Brad Jensen, M.D., Southwest Washington Medical Center Pathology Department; Edgar Marcuse, M.D., Professor of Pediatrics, University of Washington and Director of Medical Services, Seattle Children's Hospital and Regional Medical Center; Zack Mittge, law student, University of Oregon; the National Network for Immunization Information; Paul Offit, M.D., Chief, Section of Infectious Diseases and the Henle Professor of Immunologic and Infectious Diseases at The Children's Hospital of Philadelphia; Carol Porter, Red Cross health room volunteer, Garland Independent School District, Garland, Texas; Sarah Theberge, Curriculum Instructor, Early Childhood Education, Clark College, Vancouver, Wash.; James Whorton, Ph.D., Professor, Department of Medical History and Ethics, University of Washington School of Medicine.

We thank the following for providing nonprofit rates for their microscopic images: Dennis Kunkel Microscopy, Inc., and Science Photo Library/Photo Researchers, Inc.
(Cover photo: Dennis Kunkel Microscopy, Inc./www.denniskunkel.com.)

Additional funding for this project provided by PKIDs (Parents of Kids with Infectious Diseases).

Table of Contents

Warning: This section contains certain disease-related images/terms that may not be suitable for young children.

To navigate this document, use the bookmarks to the left or select an item on this page.

Click here to go back to the PKIDs' IDW website.

Introduction

PKIDs (Parents of Kids with Infectious Diseases) is a national nonprofit agency whose mission is to educate the public about infectious diseases, the methods of prevention and transmission, and the latest advances in medicine; to eliminate the social stigma borne by the infected; and to assist the families of the children living with hepatitis, HIV/AIDS, or other chronic, viral infectious diseases with emotional, financial and informational support.

Remaining true to our mission, we have designed the ***Infectious Disease Workshop*** **(IDW)**, an educational tool for people of all ages and with all levels of understanding about infectious diseases. In this workshop, you will learn about bacteria and viruses, how to prevent infections, and how to eliminate the social stigma that too often accompanies diseases such as HIV or hepatitis C.

We hope that both instructors and participants come away from this workshop feeling comfortable with their new level of education on infectious diseases.

The IDW is designed to "train-the-trainer," providing instructors not only with background materials but also with age-appropriate activities for the participants. Instructors do not need to be professional educators to use these materials. They were designed with both educators and laypersons in mind.

The IDW is comprised of a master Instructor's Background Text, which is divided into six units: Introduction to Infectious Diseases, Disease Prevention, Sports and Infectious Disease, Stigma and Infectious Disease, Civil Rights and Infectious Disease, and Bioterrorism and Infectious Disease.

For each unit, instructors will find fun and helpful activities for participants in five age groups: 2 to 6 years of age, 6 to 9 years of age, 9 to 12 years of age, 13 to 18 years of age and adults.

We welcome any questions, comments, or feedback you may have about the IDW or any other issue relating to infectious diseases in children.

PKIDs
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WEBSITE: www.pkids.org

Dear Parents,

Our class will soon be studying infectious diseases. We will learn about what germs are and ways we can keep from spreading germs. We will also learn that people who have infectious diseases don't have to be treated differently or singled out just because they have a disease.

The workshop we will use has been created by PKIDs (Parents of Kids with Infectious Diseases), a national nonprofit organization dedicated to supporting families touched by infectious diseases.

Your child may have questions about germs or may come home with new ideas about preventing the spread of germs. Here are a few ways you can stay informed:

View PKIDs' website. PKIDs' website can be found at www.pkids.org. You may also request information by calling PKIDs at 1-877-55-PKIDS.

View the instructor's background text for the Infectious Disease Workshop (IDW). The primary purpose of this text is to provide teachers with background information on infectious diseases. It is a good text for anyone seeking general information on infectious diseases. The text provides information about specific diseases, methods of disease prevention, and civil rights for those affected by infectious disease. Visit www.pkids.org for a link to the IDW background texts in PDF format.

View descriptions of the activities we will be doing in class. Visit www.pkids.org for a link to the activities and handouts in PDF format.

The world becomes smaller every day and germs from near and far continue to threaten our health. It is extremely important to educate our young people, equipping them with prevention methods to protect their health and stop the spread of disease.

As always, please feel free to contact me with any questions!

Sincerely,

ABOUT INFECTIOUS DISEASES
Making a Reference Notebook

LEVEL
Teens

OBJECTIVE
- Students will summarize main characteristics of several prominent infectious diseases.
- Students will compare and contrast this information.

MATERIALS
- One spiral-bound notebook, or section of a binder and loose-leaf paper, for each student.
- PKIDs' Infectious Diseases visual aids—*click here to link to the visual aids in PDF.*

PREP
1. Decide how infectious diseases should be covered—one disease each day, or all in one class period.
2. Setup visual aids (included) for students to view during lecture.
3. Prepare lecture (e.g., highlight desired portions of text) using specific disease information from the PKIDs' IDW instructor background text.
4. List the Assessment questions on the board/overhead.

INSTRUCTIONAL COMPONENTS
1. Instruct students to prepare their notebooks.
2. On the first page of their notebook, they should write down the questions that need to be answered about each disease. (See the "Assessment" section for these questions.)
3. Start a new page of notes for each disease.
4. Work through each disease.
5. At the end of the lecture, have students answer the follow-up questions (written or verbal format, as instructor determines).

ASSESSMENT
For each disease, the following suggested questions may be answered/addressed:
1. **Name** of disease.
2. Is the pathogen that causes this disease a **virus or bacteria**?
3. List one **historical fact** about this disease (e.g., where it was first discovered).
4. How **prevalent/common** is this disease?
5. How is this disease **transmitted**?
6. What are the major **symptoms** of this disease?
7. Is this disease **vaccine-preventable**?

Follow-up questions for the end of the lecture:
1. Which pathogen type is more common: virus or bacteria? Hypothesize why.

2. How many diseases can be prevented with vaccines? (_____ out of _____)
3. How many diseases cause few or no symptoms when they are contracted? (___ out of ___)
4. How can you tell if a person has one of these infectious diseases if they show no symptoms? (you can't)

MICROBES
Talking Big About Small Things

LEVEL
Teens

OBJECTIVE
Students will translate microbe size into larger, visual representations.

MATERIALS
- Large sidewalk area (10 meters in length) that can be written on, or long sheet of butcher paper.
- Chalk (for sidewalk) or markers (for butcher paper).
- Meterstick.
- Handout on size ratios (1 for every group).

PREP
Secure the area to be used for the project.

INSTRUCTIONAL COMPONENTS/ASSESSMENT
1. Explain to students that the following project will demonstrate how small microbes like viruses and bacteria really are by examining their sizes relative to the width of a human hair. "If a human hair were this big (10 meters wide), this is how big these microbes would be."
2. Be sure students understand that these are only a few of many types of disease-causing (pathogenic) microbes.
3. Divide students into groups (1 group for each object to be measured off, including the hair).
4. On the area to be marked off (sidewalk or butcher paper), have the groups mark off and label their object, starting with the human hair.
5. After labeling the hair (10m), be sure to discuss with students how much larger this is than in reality. Have them look at a hair of their own, and then try to imagine that hair 10 meters *wide* (not long). Explain that the rest of the activity will be magnifying the various microbes to that extent as well.
6. The column, "ACTUAL SIZE," is the actual size of the named microbe as measured in mm (millimeters; 1mm = 0.001 meter), μm (micrometers; 1μm = 0.000 001 meter), or nm (nanometers; 1nm = 0.000 000 001 meter). These measurements are included for reference; students should focus on measurements in the "MODEL SIZE" column.
7. Measurements shown in parentheses are the measurements of actual and model size in meters. These measurements are included as a "common denominator" to show how actual measurements were converted to model measurements.
8. It may help to discuss each microbe's relative size as it is marked off. "If a human hair were this wide, then a red blood cell would be this big. Imagine how small it is in real life – it would take 10 blood cells in a row to be as wide as this strand of hair!"

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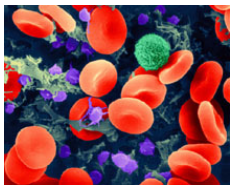
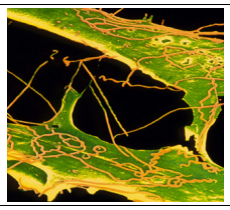
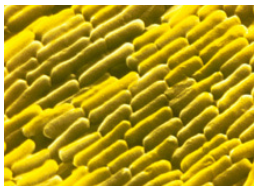
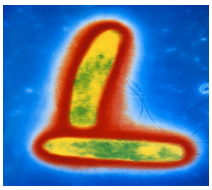
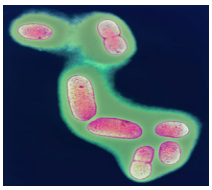
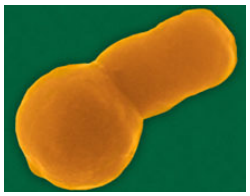
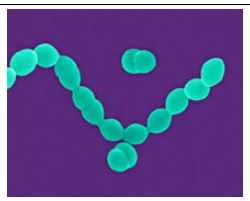
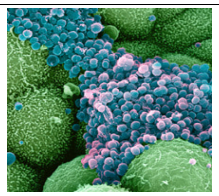
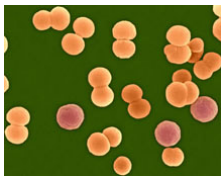
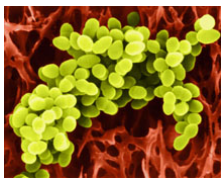
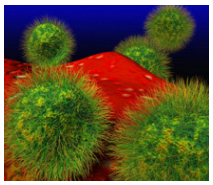
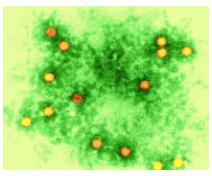
SPL/Photo Researchers Inc. (2, 3, 5, 6, 9, 10, 13)
Dennis Kunkel Microscopy Inc./denniskunkel.com (1, 4, 7, 8, 11, 12, 14)

MICROBES: Talking Big About Small Things

Photo	Name/Description	Actual Size	Model Size
	Human hair	0.1mm wide	10m
1 	Red blood cell	10µm (.000 010m)	1m
2 	*Treponema pallidum,* bacteria causing syphilis, a sexually transmitted disease	5—20µm, coiled in spirals (.000 005m)	50cm—2m (.5—2m)
3 	*Bacillus anthracis,* bacteria that produces spores causing anthrax, a disease of the lungs or skin	5—10µmlong (.000 005m) 1—3µmwide	50cm—1m (.5—1.0m)
4 	*Corynebacterium diphtheriae*, bacteria producing toxin, causing diphtheria, attacking respiratory system	1.0—8.0µm long (.000 001m) 0.3—0.8µm wide	10—80cm (.1m—.8m)
5 	*Mycobacterium tuberculosis*, bacteria causing tuberculosis, a disease of the lungs	0.5—4.0µm long (.000 000 5m) 0.3—0.6µm wide	5—40cm (.05—.4m)
6 	*Escherichia coli* O157:H7, bacteria that cause diarrhea	1.0—3.0µm long (.000 001m) 0.1µm wide	10—30cm (.1—.3m)
7 	*Haemophilus influenzae* type b, bacteria causes inflammation of the membranes of the spinal cord and brain	0.5—2.0µm long (.000 000 5m) 0.2—0.3µm wide	5—20cm (.05—.2m)

MICROBES: Talking Big About Small Things

Photo	Name/Description	Actual Size	Model Size
	Human hair	0.1mm wide	10m
8 	*Streptococcus pneumoniae*, bacteria causing pneumonia, an inflammation of the lungs	0.5—1.25µm sphere (.000 000 5m)	5—12.5cm (.05—.125m)
9 	*Bordetella pertussis*, bacteria causing whooping cough	1.0µm long (.000 001m) 0.2—0.3µm wide	10cm (.1m)
10 	*Neisseria gonorrhoeae*, bacteria causing gonorrhoeae, a sexually transmitted infection	0.6—1µm sphere (.000 000 6m)	6—10cm (.06—.1m)
11 	*Neisseria meningitidis*, bacteria causing inflammation of the membranes of the spinal cord and brain	0.6—1µm sphere (.000 000 6m)	6—10cm (.06—.1m)
12 	*Staphylococcus aureus*, bacteria producing toxins causing food poisoning	0.5µm (.000 000 5m)	5cm (.05m)
13 	Average virus, viruses are usually < 1µ (< 1,000nm)	100nm (.1µm) (.000 000 100m)	10mm (0.01m)
14 	Poliovirus, causes polio, a potentially paralyzing disease	20nm (.02µm) (.000 000 02m)	2mm (0.002m)

TRANSMISSION MODES QUIZ

LEVEL
Teens

OBJECTIVE
Students will identify various types of infectious disease transmission.

MATERIALS
Each student needs a piece of notebook paper and pencil.

PREP
None

INSTRUCTIONAL COMPONENTS
1. Read students the "Transmission" section of the "Standard and Transmission-Based Precautions" instructor text. Instruct students to take brief notes on the 5 types of disease transmission:
   Contact (direct or indirect)
   Droplet
   Airborne
   Common vehicle
   Vectorborne
2. Instruct students to label the following scenarios with the correct mode of transmission and briefly explain why they selected that mode.

ASSESSMENT
1. A rabid bat bites a human, infecting him with rabies. (Vectorborne transmission—the bat acts as the vector, or carrier, of the disease.)
2. You contract the flu after your friend, who has the flu, sneezes on you. (Droplet transmission—you inhale the sneezed droplets containing the influenza virus.)
3. A woman cleaning her garage is infected with the hantavirus. (Airborne transmission—the virus, which is present in deer mouse feces, is stirred up in the dust.)
4. One child contracts scabies after play-wrestling with another child infected with the scabies parasite. (Direct contact transmission—skin-to-skin contact is required to transmit the disease.)
5. A person contracts herpes type 1 by kissing another person who is infected with herpes. (Direct contact—skin-to-skin.)
6. You and your friends take a trip to the beach and stay overnight. You discover you've forgotten your razor. There's no way you're going out without shaving, so you borrow your friend's razor. You nick yourself slightly while shaving, but don't think much of it. Unfortunately, some of your friend's dried blood was on the razor, even though you couldn't see it. Your friend has hepatitis B, and you are not vaccinated. (Indirect contact transmission—contaminated body fluids transmitted to and from a shared object.)

7. You decide to give IV drugs a try and contract hepatitis C from the previous user's needles. (Indirect contact transmission—germs transmitted to and from a shared object.)
8. You have a friend who never washes her hands and is infected with hepatitis A. She fixes a salad for you and your family and you all contract hepatitis A. (Common vehicle transmission—germs transmitted to a group from a shared object.)
9. One person contracts genital warts and HIV by having sex with another person who is infected with these diseases. They were probably not using a condom. (Direct contact transmission.)
10. A person with an active tuberculosis disease passes through the room you are in. You then contract tuberculosis. (Airborne transmission—particles that travel significant distance through the air.)
11. You contract the West Nile virus after being bitten by a mosquito carrying the virus. (Vectorborne transmission—the mosquito is the vector, or carrier, of the disease.)
12. After a family reunion, several members of your family get sick after eating burgers contaminated with *E. coli* O157:H7. Apparently the contaminated burgers weren't fully cooked. (Common vehicle transmission—germs transmitted to a group from a shared object.)

THE MYSTERY OF THE MALIGNANT MICROBES

LEVEL
Teens

OBJECTIVE
Students will create a presentation utilizing their knowledge of infectious diseases and the transmission of infectious diseases.

MATERIALS
Students will need access to infectious disease information. Sources include:
- Information contained in PKIDs' Infectious Disease Workshop.
- CDC's index of health issues.
- National Center for Infectious Diseases.
- National Institutes of Health information index.
- CDC's information on epidemiology.
- The library!

You will also need copies of the handout describing the assignment, 1 for each student.

PREP
1. Predetermine student working groups, if desired. Groups should have 3-6 members each. Group size may depend on the type of presentation the group selects.
2. Select several infectious diseases for students to choose from. A sample list might include:
    - Influenza (the flu)
    - Pertussis, Rubella, Mumps or Measles
    - Diphtheria
    - Chickenpox
    - Polio
    - Hepatitis A, B or C
    - HIV
    - Tuberculosis
    - Malaria, cholera or dengue fever
    - *E. coli O157*
    - Pneumonia

INSTRUCTIONAL COMPONENTS
1. Give each student a copy of the handout and let them read it.
2. Explain that before they can actually start the assignment they will need to learn basic information about the diseases.
3. Formulate groups, as is appropriate.
4. Determine method of selection of the diseases for each group (e.g., teacher assignment, student selection, random draw).
5. Instruct the groups to select a method of presentation.

6. Allow class time for research and project planning, even though the projects will most likely need to be completed outside of class time.

ASSESSMENT

1. Did the students show basic knowledge of their chosen disease? Did they accurately present information about the disease?
2. Were the students able to successfully apply their knowledge of the disease to the situation?
3. Were the students able to develop a plan that assisted them in completing the project?
4. Were the students able to combine their knowledge and skills into a cohesive presentation?

The Mystery of the Malignant Microbes

You are an epidemiologist. A what? An epidemiologist is a special sort of detective—the kind that solves microbe mysteries. Anywhere there's a mysterious disease cropping up, you can bet you'll find an epidemiologist trying to solve the puzzle. Where did this disease come from? How and where did it start? How does it spread? How can we stop it from spreading?

How DO They Do It?

According to Dr. Cindy Friedman, an epidemiologist at the Centers for Disease Control and Prevention, there are SIX basic steps to solving a microbe mystery:

1. Find out what you can about the microbial crime, or *outbreak*.
2. Figure out where the outbreak originated by interviewing the people who got sick.
3. Get as much evidence as you can from the site of origin.
4. Take your evidence back to the lab and analyze it.
5. Estimate how many people have been infected.
6. Tell people what you know and stop those malignant microbes from spreading!

Your mission, should you choose to accept it...

You and your team will invent an outbreak to investigate. (You will be able to do this once you have researched your disease and understand how it operates.) Essentially, you are the authors of a short mystery story. You will need to show how the epidemiologists in your story follow the crime-solving steps listed above to figure out what happened. Will your fellow students be able to solve your microbe mystery before it ends?? You will need to document your problem-solving process and your findings. Possible types of formats include (but aren't limited to):

- Videos.
- Posterboards.
- Written paper and presentation of paper.
- Comic book.
- Live presentations, with visual aids.

Things to consider...

Your presentation, in whatever format you choose, must address the following:

1. Basic information about the disease—type of organism (e.g., virus), symptoms it causes, how it is transmitted, where it is found, etc.
2. Is the disease vaccine-preventable? If so, you may want to place your outbreak in an area where the population, for some reason, is largely unvaccinated.
3. Your characters and story may be fictional, and may be even funny, but your facts may not!

INFECTIOUS DISEASE WORD JUMBLE

LEVEL
Teens

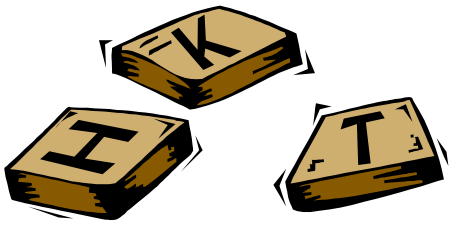
OBJECTIVE
Students will identify infectious disease terminology.

MATERIALS
One copy of the word jumble handout (included) per student.

PREP
None

INSTRUCTIONAL COMPONENTS
Allow students time to unscramble the terms provided.

ASSESSMENT
Answer Key:
1. Virus
2. Sex
3. Herpes
4. Disease
5. Germs
6. Hepatitis
7. AIDS
8. Transmission
9. Immunization
10. Bacteria
11. Fungus
12. Bloodborne



Infectious Disease Word Jumble

Unscramble each word and write it on the line.

1. irvus _____

2. xse _____

3. rehpse _____

4. iedssae _____

5. sgmer _____

6. ahiespitt _____

7. adsi _____

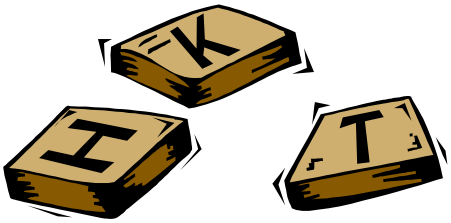
8. srmintnsoasi _____

9. uzniiamomnti _____

10. etirbcaa _____

11. gfunsu _____

12. nooobdlber _____



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Jensen, Brad, M.D., Southwest Washington Medical Center Pathology Department

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Marcuse, Ed, M.D., Professor of Pediatrics, University of Washington and Director of Medical Services, Seattle Children's Hospital and Regional Medical Center

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The World Book Medical Encyclopedia. Rush-Presbyterian-St. Lukes Medical Center. World Book Inc. 1994

World Health Organization
www.who.int

Additional Activities and Resources for Teachers, Students, and Parents

Access Excellence at the National Health Museum: Activities and resources for health and bio-science teachers and students.
www.accessexcellence.org

BAM! (Body and Mind!): Colorful website sponsored by the CDC providing information and activities for kids dealing with variety of health topics.
www.bam.gov

Discoveryschool.com: Lessons for science curriculum.
school.discovery.com

Fight Bac! Keep Food Safe from Bacteria: Food safety curriculum (including visual aids) for educators; activities for kids.
www.fightbac.org

KidsHealth.org: Health topics and games for kids and adolescents.
www.kidshealth.org

Stalking the Mysterious Microbe: Colorful and interactive website with activities for kids teaching basic microbiology and germ prevention.
www.microbe.org

USDA/Food Safety and Inspection Service: Safety Coloring Book
www.foodsafety.gov/~dms/cbook.html