

## Teacher Activity Resource Sheet

### High School Biology/Health Curriculum

#### Fast Activities (to do during the lesson)

- » Balloon Popping Exercise: To demonstrate germ transmission with an uncovered sneeze.  
Instructions:  
Put a small amount of water into a balloon (a few drops is all you need). Blow up the balloon and tie it off. Gather some of the students into a circle; hold the balloon above their heads, count to three and pop the balloon. Water droplets will disperse through the air, just like an uncovered sneeze.
- » Glo Germ Activity: To demonstrate proper hand washing technique. Use Glo Germ lotion and a black light to demonstrate how germs spread from person to person.  
Instructions:  
Place a little bit of Glo Germ lotion (<http://www.glogerm.com>) on the first student's hands in each row. Have the student rub it in and shake hands with the person next to him, repeating the handshaking to the end of the row. Turn off the lights in the room. Turn on the black light and hold it over the students hands to illuminate the white lotion. Just like germs, the lotion is spread by hands touching.

#### Videos

- » Flu Attack! How A Virus Invades Your Body  
This 3½ minute animated video from NPR shows how viruses in your body can multiply and make you sick. <http://www.npr.org/blogs/krulwich/2011/06/01/114075029/flu-attack-how-a-virus-invades-your-body>
- » The Evolution of Bacteria on a “Mega-Plate” Petri Dish (Kishony Lab)  
This 2 minute video from Harvard Medical School provides the first large-scale glimpse of the maneuvers of bacteria as they encounter increasingly higher doses of antibiotics and adapt to survive - and thrive - in them. <https://www.youtube.com/watch?v=pIVk4NVIUh8>
- » What causes antibiotic resistance? – Kevin Wu  
This 4 ½ minute TED Ed video describes the trillions of microorganisms in and on our bodies and the few strains of ‘super bacteria’ and how they are growing resistant to our antibiotics. Kevin Wu details the evolution of this problem that presents a big challenge for the future of medicine. <https://www.youtube.com/watch?v=znnp-lvj2ek>
- » The Antibiotic Apocalypse Explained

- » Streptomycin: A Pioneer Antibiotic  
This 10 minute video (from The Waksman Foundation) talks about Streptomycin and the development/testing of antibiotics. <https://www.youtube.com/watch?v=aiXoguk-FUI>
- » Emerging and Re-emerging Infectious Diseases  
The National Institute of Health offers this high-school curriculum supplement. Student activities include lab experiments with bacteria, accompanied by online video support for experiments. <https://science.education.nih.gov/supplements/nih1/diseases/default.html>

### Lab Exercises

- » How Many Microbes? (Dilution Plating Technique)  
Marine Biological Laboratory - Uses samples of soil, compost, and others to try to get an idea of how numerous and diverse bacteria are in these environments. <http://www.waksman-foundation.org/labs/rochester/dilution.htm>
- » Skin Cleanliness  
Louisiana State University - Demonstrates "transient" versus "normal" flora of the skin, host defenses and the effects of washing/disinfecting. <http://www.waksman-foundation.org/labs/lisu/skin.html>
- » Determining the Effectiveness of Handwashing  
Summer Research Program for Science Teachers - Students grow bacterial colonies and determine 1) the effectiveness of handwashing 2) the effectiveness of antibiotics in killing the bacteria. <http://www.scienceteacherprogram.org/biology/Rokach99.html>
- » "Bugs" That Produce Drugs To Kill "Bugs"  
Science in The Real World: Microbes in Action Program - Demonstrates how certain microorganisms produce antibiotics that inhibit the growth of other microorganisms. <http://www.umsl.edu/~microbes/pdf/Bugs%20That%20Kill%20Bugs.pdf>
- » Antibiotic Resistance in E. Coli  
Summer Research Program for Science Teachers - Tests the concept of antibiotic resistance using two strains of E. Coli. <http://www.scienceteacherprogram.org/biology/Webster02.html>
- » Is Bleach a Good Disinfectant?  
Science in The Real World: Microbes in Action Program - Determines the concentration of household bleach that effectively kills E. coli. <http://www.umsl.edu/~microbes/pdf/bleach.pdf>

- » Which Household Cleaners or Soaps Work Best Against Bacteria?  
Summer Research Program for Science Teachers - Tests the effectiveness of various household cleaning products or soaps for their antibacterial ability.  
<http://www.scienceteacherprogram.org/biology/Pittis00.html>

### **Additional Lesson Plans**

- » Why Does Evolution Matter Now?  
Public Broadcasting Service - In this lesson plan for high school, students investigate the growing problem of antibiotic resistance.  
<http://www.pbs.org/wgbh/evolution/educators/lessons/lesson6/act1.html>
- » Microbes: Too Smart for Antibiotics?  
This lesson focuses on examining why microbes become resistant to antibiotics, as well as their roles in human health and the environment.  
[http://www.actionbioscience.org/evolution/lessons/meade\\_callahanlessons.pdf](http://www.actionbioscience.org/evolution/lessons/meade_callahanlessons.pdf)

### **Useful Links for Student Research**

- » Microbe Zoo - An interactive web site, where students can click on an environment to find the microbes that live there.  
<http://commtechlab.msu.edu/sites/dlc-me/zoo>
- » National Institutes of Health  
<http://www.niaid.nih.gov/topics/antimicrobialresistance>
- » Centers for Disease Control and Prevention  
<http://www.cdc.gov/drugresistance/index.html>
- » Food and Drug Administration  
<http://www.niaid.nih.gov/topics/antimicrobialResistance>
- » World Health Organization  
<http://www.who.int/drugresistance/en>
- » Alliance for the Prudent Use of Antibiotics  
<http://www.tufts.edu/med/apua>

### **Glossaries**

- » Bioremediation and Phytoremediation Glossary  
<http://bioremediation.tripod.com>
- » Glossary of Environment & Microbiology Terms (high school level)  
<http://www.alken-murray.com/glossarybug.html>