Cholera Conundrum

This activity was adapted heavily from the Science Take Out/University of Rochester Medical School activity, “Medical Mystery of Epidemic Proportions”, to reflect real-world scenarios in Haiti, as well as use more inquiry-based techniques. Written by Drew Joseph, with content expertise and ArcMap assistance by Thomas A. Weppleman

Meet the Menacing Microbe Activity

Materials:

- Set of “Giant Microbes” large enough for each student pair to share a microbe. Be sure that cholera is one of the microbes.
- Handout

Cholera Jigsaw

Materials:

- Either print out enough copies of the “Cholera Jigsaw” handout for each student in each group to have their group’s topic information, or have enough iPads/computers so that each group has 1-2 devices to look up the CDC website to read.
- Handout

Testing the Water

Materials:

- Strips of 4 pad pH indicator testing as the cholera dips ticks – enough per group to test all of the group’s water samples
- Tubes of “positive” for cholera samples using a pH 10 buffer, and “negative” for cholera using an acidic buffer (pH 4). These tubes should be labeled for each group’s camps, and filled with the appropriate buffer, depending on whether the camp should test positive or negative. The “Cholera Conundrum Camps” Teacher Key spreadsheet has this information for each group.
- Print out 1 copy of the “Cholera Conundrum Camps” Student spreadsheet, cutting out a set of camp names to be assigned to each student group.
- Although this activity is designed for 10 student groups, you can easily modify for more or fewer groups by giving each group fewer or more camps.
- The camps used are based on WFP Emergency Preparedness and Response Branch (ODEP)’s map of Port-au-Prince IDP (Internally displaced people) Camps and Main Distribution Sites, adjusted – available on accompanying PowerPoint
- Column G on the “Cholera Conundrum Camps” Teacher Key spreadsheet indicates which camps should test positive for cholera in the well water
Port-au-Prince map:

Print a large copy of the camp map (available on accompanying PowerPoint), and put up on a corkboard (for using pushpins), or a wall (for using sticky tabs). Alternatively, you can project this map onto a whiteboard, and have students mark the locations with whiteboard markers or sticky tabs, although the resolution may be too poor when projected to read the camp names.

What kind is it?

Materials:

- Print out antibody-antigen test circles on overhead/transparency sheets, 1 set per group/camp
- Use 2 colorless chemicals (saturated sodium bicarbonate solution – baking soda, and calcium chloride are two such chemicals) that will create a precipitate when combined (just a few drops), place one (that won’t react with water) in tubes labeled “O1 antibody”, and the other in a tube labeled “positive control”. In tubes labeled with the camp names or numbers, put either water or the precipitating solution, depending on whether it should test positive for the O1 antigen (with precipitate) or negative (water). Column H on the “Cholera Conundrum Camps” Teacher Key spreadsheet indicates which camps should test positive for O1 type cholera

Extensions:

After completion of this activity, many students will likely wonder how cholera can be prevented in the first place. The difficulty is that countries vulnerable to cholera epidemics have poor water and sanitation, and public health systems are lacking. To show students the extent of this problem, you can have them complete individual or group research projects on the nature of cholera epidemics. Possible topics include:

- Map out cholera outbreaks in the past 50-100 years, globally. Indicate the per capita income in each country, as well as the status of their sanitation and public health systems.
- Artistic representations of the sanitation and public health systems in countries that have recently experienced cholera outbreaks. This includes drawings, paintings, audio, and video (ex. public service announcements).
- Research CDC and/or WHO data on cholera outbreaks, particularly the recent outbreak in Haiti. Projects could include a public service announcement on preventative measures to help prevent the spread of cholera.
- Any of these projects should ask students to consider how the preventative measures might be difficult for citizens to implement due to cost, i.e. why adding bleach in water or boiling water might be too expensive for many Haitians
O1 Antibody
Positive control
Vibrio cholerae sample from patient

Vibrio cholerae sample from patient
Vibrio cholerae sample from patient
Vibrio cholerae sample from patient

Vibrio cholerae sample from patient
Vibrio cholerae sample from patient
Vibrio cholerae sample from patient