

BIO LAB: Simulating Viral Infections (Year 9)



LEVEL:
Year 9



TOPIC:
General Science



TIME REQUIREMENT:
60 mins

CURRICULUM ALIGNMENT

- *Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community*
- *Considering how ideas about disease transmission have changed from medieval times to the present as knowledge has developed*

BACKGROUND

A virus can be spread through a diversity of ways, such as contaminated water, body fluids or animal bites. Viruses frequently pass from one host to another in highly populated environments through the exchange of bodily fluids. For this reason, viruses are a frequent occurrence in schools and hospitals. Sneezing is capable of spreading viruses across surprisingly long distances.

The aim of this practical is to simulate viral transmission through the use of test tubes. A 'basic' solution is placed in one test tube while the remainder of the test tubes contain deionized or distilled water. Students are asked to exchange their solution with three other students; mimicking viral transference in a population. Phenolphthalein Indicator Solution is used to reveal which students have become 'infected' with the simulated virus.

PREPARATION - BY LAB TECHNICIAN

General Preparations

- 1 Number 1 test tube and 1 pipette for each student.
- 2 Choose 1 test tube to be the "carrier" and record the tube number.
- 3 Fill all other tubes with 5ml of distilled water.
- 4 Fill the "carrier" tube with 5 mL of 0.2 M Sodium Hydroxide.
- 5 Place each numbered pipette into its respective test tube.

METHOD - STUDENT PRACTICAL

Spreading the Viral Infection

- 1 Collect a test tube with a pipette and an index card.
- 2 Write down the number of your test tube on the index card.
- 3 Select a partner and record their name and test tube number on the index card.
- 4 Using a pipette, draw up roughly half of the solution in your test tube and transfer it to your partner's test tube.
- 5 Your partner will now transfer half of their solution to your test tube. Mix the contents of the test tube by carefully stirring with your pipette.
- 6 Repeats steps twice more while moving throughout the classroom. Be sure not exchange fluids with the same person twice.



MATERIALS

- 0.5% Phenolphthalein Indicator Solution (5 mL)
- Index card
- 0.2 M Sodium Hydroxide Solution(5 mL)
- Marker
- Distilled Water
- Paper Towels
- Test Tube
- Test tube Racks
- Pipette



SAFETY PRECAUTIONS

- Wear appropriate personal protective equipment (PPE).
- Ensure that students know and follow all regulatory guidelines for the disposal of laboratory wastes.
- Thoroughly clean all test tubes to remove traces of Sodium Hydroxide and Phenolphthalein, as these materials may interfere with future results if the experiment is repeated.
- Wash hands thoroughly before and after the practical.

- 7 After 3 transfers, your teacher will add 2 drops of Phenolphthalein Indicator Solution to your test tube. Stir the solution with your pipette.
- 8 Identify whether your solution carries the virus. If the solution remains clear or turns yellow, the solution is negative for the "virus." If the solution turns red or pink, the solution is positive for the "virus."

Identifying the Initial Carriers

- 1 If you tested negative, write the number of your test tube on the board.
- 2 Cross out the numbers of the "negative" students on your index cards, as they cannot possibly be the original "carrier."
- 3 List the remaining possible carriers on the board. This will be everyone who tested "positive."
- 4 "Negative" students who exchanged solution with a "positive" student will be asked to identify themselves. If this applies to you, raise your hand.
- 5 Cross out the numbers of these "positive" students from the possible "carrier" list and add their numbers to the "negative" list on your index card
- 6 After this, 1 or 2 student numbers should remain. These are the final possible original carriers.
- 7 When two are remaining, one is the original carrier and the other is the first infected student.

OBSERVATION AND RESULTS

Following this procedure, students should be able to identify one to two remaining students as the original carrier. When two are remaining; one is the original carrier and the other is the first infected student.

INVESTIGATIONS

- Being able to identify the original carrier is a critical skill for epidemiologists. When faced with epidemic viral infections, an epidemiologist will work backwards to identify the viral source. Ask students to consider how finding the "original carrier" in your class population compares to real cases of global epidemics.
- Discuss whether it would be possible to identify who the "original carrier" was without the addition of Phenolphthalein Indicator Solution.
- Explore other possible applications for this practical. Discuss whether this procedure could be used to identify an infected person with a cold or hepatitis.
- Challenge students to consider why bed rest is such a common recommendation for people ill with a bad cold or the flu.
- Ask students to imagine the simulation involved the entire school population. Then, ask students to consider whether tracing back to the original carrier would be more or less difficult.

EXTENSION EXERCISES

- Task students with researching how international flights impact the spread of viruses around the globe.
- Task students with researching a bacterial borne pathogen. A good example is Typhoid Mary.