

BIOLOGY EXPERIMENT

When the students arrive, please have them sit at a table, put on their lab coats and safety glasses. For the next 30 minutes they are going to be Medical Laboratory Technicians. They will work together to diagnose an illness and determine WHO is the person that is sick at their table.

As a Medical Laboratory Technician, the students will observe and perform a urinalysis, determine hydration level, and perform a Latex Agglutination test to diagnose the illness. They then will perform an Epidemiology (spread of disease) screening to determine which student has the illness and see how they may have spread the illness to others in the group.

STEP 1:

Inform the students that one of them has an illness. The symptoms presented lead to one of three different illnesses: Mononucleosis (mono), Diabetes or Strep Throat.

Inform the students of the symptoms presented. We have a **Symptom Chart** to show the students.

Inform the students of the indicators they should look for in diagnosing each of the possible illnesses:

Diabetes: normal hydration, glucose in the urine, very tired, extremely thirsty, weight loss, frequent urination

Mono: very tired, swollen lymph nodes, possible protein in the urine, dehydrated, sore throat.

Strep Throat: very tired, sore throat, swollen lymph nodes, protein in the urine, dehydrated, when a throat culture is performed, organisms or bacteria will be present as shown by coagulation..

STEP 2:

The students will perform the following tests to diagnose the illness.

TEST 1: URINALYSIS Reassure the students that this is simulated (fake) urine.

The students will be testing the urine sample taken from the “sick” person (who is yet to be identified). They will be testing for the presence of protein and glucose in the urine sample.

1. Dip a fresh glucose/protein test strip into the urine sample.
2. Read the test by comparing it to the chart. You will be taking a reading for both glucose and protein.
3. Record the results on the **Urinalysis Data Chart**.

TEST 2: HYDRATION

1. Arrange the Urine Hydration Samples by level of dehydration using the Dehydration Color Chart as a guide. Correlate the colors of the samples with how much water a person should drink to reduce their level of dehydration. Have the students fill out the **Hydration Activity Data Chart** using the dry erase marker.
2. Examine the urine diagnostic sample for color. Record in the **Urinalysis Data Chart**.
3. Examine the urine diagnostic sample for clarity. Note if the sample is transparent (clear) or cloudy. You may use the Urine Hydration Sample set as a comparison to clear samples. Record the clarity of the urine sample in the Urinalysis Data Chart.
4. Compare the urine diagnostic sample to the Dehydration Urine Color Chart. Classify the degree of hydration using a scale of 1-5, with 1 being hydrated and 5 being severely dehydrated. Record the level of dehydration in the **Urinalysis Data Chart**.

After completing these four tests, the students can rule out Diabetes as the possible illness because the urine sample shows protein and not glucose in the urine which is indicative of both Mono and Strep throat but not Diabetes. The hydration test also points to being dehydrated which is indicative of Mono and Strep Throat but not Diabetes. They will now need to determine whether the illness is Mono or Strep Throat.

TEST 3: LATEX AGGLUTINATION

Latex Agglutination is the medical term used to identify and detect antibodies that are produced in response to a variety of viruses and bacteria. Agglutination techniques are also used in definitive diagnosis of group A streptococcal infection (strep throat)

1. Each student will get one petri dish.
2. The student will fill each dish with several drops of the bodily serum marked "Specimen" (which is milk.) The volunteer can pass the bottle with the "Specimen" and the pipette marked with an S.
3. The student will then add a few drops of the "Reactant" (which is white vinegar) to the petri dishes. The volunteer can pass the bottle with the "Reactant" and the pipette marked with an R.
4. Since the culture shows coagulation or presence of bacteria, the students will determine that our illness is Strep Throat...as presented on the Symptom Chart. Explain to the students that coagulation means to change from a liquid into a thickened mass...it will curdle.

At this point the students have determined that the illness is Strep throat. They will now determine who the carrier is and how the illness can be spread to others through an Epidemiology Experiment. Epidemiology deals with the incidence, distribution and possible control of diseases, illnesses and other health related events.

TEST 4: EPIDEMIOLOGY

In this activity, the students will simulate the risk of contracting a contagious illness following interaction with other students. In this case, the simulation represents the transfer of saliva. One randomly selected student in each group has a test tube filled with simulated infected saliva indicating that they are infected with a contagious illness.

1. Have each student take a numbered test tube filled $\frac{1}{2}$ way full with clear solution and a plastic pipette. The solution in the test tube represents the student's saliva and is actually water. One student unknowingly has simulated infected saliva in their tube to simulate an infection.

Between each session please prepare these test tubes for the next group by filling each test tube $\frac{1}{2}$ full with simulated saliva (water) Fill one test tube half way with the "bacteria" which is Sodium Bicarbonate . Make sure to add to a different numbered test tube for each group of students. When choosing a test tube to add the sodium bicarbonate to, choose numbers 1 through 4. (That way if you have 4 students or less in your group you are sure to have one of them infected.) You also will need to number each test tube 1 through 6 depending on how many students you have in your group. Use the dry erase marker to do this. You can store them in the test tube holder.

Have the students add their name to the **Disease Transmission Record Sheet** next to the corresponding test tube number using the dry erase marker.

2. Begin by having each student donate 4 drops of saliva from their test tube into the well corresponding to their test tube number in **Row A** of the 24-well test plate. The wells in this plate will be tested for infection results at the end of the activity.

3. Have the students exchange fluids with one other student by pipetting half of the fluid in one test tube into the other person's test tube. This person will gently draw the solution in and out of the pipet to mix the fluids, then pipet half of the fluid back, such that they both have equal amounts of fluid and then gently mix their fluids.

4. Have each student donate four drops of solution from their test tube into the corresponding well number in **Row B** of the test plate. Have the student record the number of the test tube they exchanged with in the column labeled Exchange #1.

5. Have the students exchange fluids with a second student by pipetting half of the fluid from one test tube into the other person's test tube, mixing, then pipetting half of the fluid back, such that they both have equal amounts of fluid and then gently mix their fluids.

6. Have the students donate four drops of solution from their test tube to the well corresponding to their tube number in **Row C** of the test plate for obtaining Test Results at the end of the activity. Have the student record the number of the test tube they exchanged with in the column labeled Exchange #2.

7. Have the students exchange fluids with a third student by pipetting half of the of the fluid from one test tube into the other person's test tube, mixing the solutions, then pipetting half of the fluid back, such that they both have equal amounts of fluid and then gently mixing their fluids.

8. Have the students donate four drops of solution from their test tube to the well corresponding to their tube number in **Row D** of the test plate for obtaining Test Results later. Have the student record the number of the test tube they exchanged with in the column labeled Exchange #3.

9. The volunteer will now test the saliva to determine who tests positive for transmission of the illness by adding **ONE** drop of Indicator Solution (bottle with the pink cap) to each well of the 24-well test plate. A pink color indicates a positive test

10. The person who originally was infected with Strep Throat will have a bright pink well in Row A. Other wells that show a pink color have also been infected by contact with the original infected person. You can explain to the students that Strep Throat could have been spread by sharing a water bottle, kissing, coughing or sneezing on someone

