

Welcome to Biology! Thank you for volunteering your time and sharing your talents.

Goal: In this module, the students will have 2 different patient scenarios to analyze. They will then perform several lab tests based on the scenarios. Through performing these lab tests, students will experience what it is like to be a Lab Technician or Scientist. Feel free to offer your perspective, real-life examples, and experiences as you go through the tests with them.

Introduce yourself and briefly share your career/education background.

Opening Comments: Tell the students that we have two sick patients and they are going to do some lab tests to diagnose the illnesses and figure out who is sick.

Patient #1

Have students go over the symptoms for Patient #1. They can look at the Patient # 1 Scenario sheet. The symptoms are:

- Excessive thirst
- Blurry vision
- Frequent urination
- Unexplained weight loss
- Extreme hunger
- Numb or tingling hands
- Fatigue
- Slow healing sores

Discuss what these symptoms could be a sign of. After discussing some options (dehydration, underactive thyroid, exhaustion, etc.) let's do some tests to see if the patient has diabetes. Diabetes is a chronic health condition when your blood sugar (glucose) is too high. This effects your body's energy.

LAB TEST 1: URINALYSIS

Ask if anyone is familiar with this test. If glucose is present in the urine, then our patient may have diabetes.

- Show the students the simulated urine.
- Tell the students that by using a special test strip, they can determine if glucose or protein is present in the urine sample.

- Take one test strip out of the container. Pass the test strip around so the students can see the strip before dipping into the urine sample. Point out the protein and glucose squares.
- You will then dip the test strip into the simulated urine. Pass the strip around again with the empty test strip container. Ask the students if they notice any changes in color on the test strip and compare it to the label on the container. Remind them they are trying to see if glucose or protein is present in the urine. After everyone has had a chance to look, ask them what they found. (The result should be glucose is present).
- Based on the color of the test strip do you think the glucose levels are high or low?

LAB TEST 2: COLOR REACTION TEST

Now that we know there is glucose present, let's do another test to determine the amount of glucose present. We will be using a Color Reaction Test to represent a blood sugar test after our patient has been fasting for at least 8 hours. An iodine solution will be added to the patient's sample to determine the amount of glucose present. Then we can decide if there is a diagnosis of diabetes.

First, we will create a control solution as a baseline. This is very common in lab work. Scientists need to create a baseline to represent what is "normal". Using the water bottle, fill the first test tube with water, about 4 mL then add 2 drops of the iodine solution. The color should be a golden/reddish color. This will indicate that our baseline test is good, and we can proceed to testing the sample from the patient.

Next let's test a sample of our patient. Using a pipette, fill the second test tube with the Sample from Patient #1 (starch solution), about 4 mL (this represents taking a sample of the patient's blood), now add 2 drops of the iodine solution. Once added the solution should drastically change color to a dark blue/purple/blackish color. This represents the concentration of glucose. Looking at the color chart on the Patient #1 Scenario sheet, determine the range of glucose present. The solution should be a dark blue/purple meaning that the patient is in the diabetic range with a glucose level greater than 126 mg/dL.

PLEASE BE CAUTIOUS WITH THE IODINE, IT WILL STAIN.

DISCUSSION FOR PATIENT #1:

Talk about what the next steps would be for this patient. Consult a specialist, look at treatment options. Treatment may be regulating glucose through insulin and/or diet modifications, but doctors and specialists will determine the best course of action.

Is diabetes contagious? No diabetes is not contagious. Diabetes is caused by other factors such as genetics, diet, environmental impacts, etc.

Now let's look at another patient scenario.

Patient #2

Have students go over the symptoms for Patient #2. They can look at the Patient #2 Scenario sheet. The symptoms are:

- Sore throat
- Fever
- Painful swallowing
- Red and swollen tonsils
- Headache
- Nausea

Discuss what these symptoms could be a sign of. After discussing some options (cold, flu, allergies, etc.), let's do a test to see if the patient has strep throat. Strep throat is an infection in the throat and tonsils caused by bacteria.

LAB TEST 3: LATEX AGGLUTINATION

This type of test is used to determine if bacteria or antibodies are present (like a throat culture).

- Starting with the **SPECIMEN** (milk), students will use the pipette marked with an S and put a nickel-sized drop in their petri dish. This represents taking a culture from the patient.
- Students will then use the pipette marked with an R and put a nickel-sized drop of **REACTANT** (vinegar) on top of the SPECIMEN already in their petri dish.
- Have students observe what happens to the specimen when the reactant is added. You can have them gently swirl the petri dish. They should notice curdling or **COAGULATION** which indicates a bacterial infection.
- This patient is positive for strep throat.

DISCUSSION FOR PATIENT #2:

Talk about what the next steps would be for this patient. Consult a specialist, look at treatment options, most commonly an antibiotic medication. Is strep throat contagious?

Strep throat is a contagious infection. So now let's do a test in **EPIDEMIOLOGY** to see how the illness can be transmitted and spread.

LAB TEST 4: EPIDEMIOLOGY

Before each session, make sure the test tubes are filled with a simulated saliva sample. Pick one of the test tubes numbered 1 to 4 to be the tainted sample. The test tube with the tainted sample should be filled with sodium bicarbonate (white lid). All other test tubes should be filled with water (simulated saliva).

- Epidemiology is a branch of medicine used to find the causes of health outcomes and diseases.
- Ask the students if they have heard of epidemiology and to think of a real-world example where it is used.

- Give each student a numbered test tube, keeping them in order as you go around the table. Tell them this is a (simulated) saliva sample they would provide to be tested. Also give them each a pipette.
- Going around the table, have each student use their pipette to draw a sample from their test tube and put in their respective numbered spot in **Row A** of the testing well.
- Then have the students exchange a sample with someone else and then put their tainted sample in a new row of the micro wells.
- Students will continue to exchange samples until several rows are complete.

The reveal: *You will add one drop of the indicator* into each sample in the testing well starting with Row A. Immediately the person that is 'sick' will turn pink and then as you proceed placing a few drops in the subsequent rows of the testing well, the students will see how the person who was 'sick' spread the illness to the others that they shared their sample with.

Conclusion: Discuss with students what they just learned through the activities. You can talk about contagious versus noncontagious disease/illnesses. Discuss other types of lab tests that students may know about.

End of the Day:

- **JA staff and student volunteers will restock and pack the bins, so all items should be left on your table.**

Thank you for making a difference today!