Neo/SCI™
Teacher's
Guide

New ideas for teaching science

Simulated Diabetes Lab

INVESTIGATION

#20-3883

Objectives

- ***Study*** **the types, causes, symptoms and treatments for diabetes**
- ***Perform*** **standard diagnostic tests on fictional patients using simulated blood and urine samples**
- ***Diagnose*** **the patient based upon the test results and their medical history**
- ***Develop*** **a plan for managing the patient's condition**

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Science Concepts

- Physiology
- Health
- Microbiology
- Disease

Kit Materials List

8 Spot plates

2 Glucose test strips, 50 count

3 Patient Initial Urine Samples (Patients A, B, C), 30ml each

3 Patient Final Urine Samples (Patients A, B, C), 30 ml each

3 Patient Initial Blood Samples (Patients A, B, C), 30 ml each

3 Patient Final Blood Samples (Patients A, B, C), 30 ml each

1 Blood Glucose Chart, sheet of 8

1 Urine Glucose Chart, sheet of 8

Time Requirements

Pre-Lab Preparation: 10 minutes
Activity 1: 25 minutes
Activity 2: 25 minutes
Activity 3: 25 minutes
Activity 4: 25 minutes
Activity 5: 25 minutes
Activity 6: 35 minutes
Activity 7: 25 minutes
Activity 8: 5 minutes

Safety & Disposal

Be sure to direct students to follow proper lab safety protocol.

Students should always wear safety goggles, gloves, and a lab apron to protect their eyes and clothing when working with any chemicals. Be sure that students keep their hands away from their face and mouth. Have students wash their hands before leaving the laboratory.

The blood and urine samples that students will test in this investigation are simulated. They contain no biological components but should be handled in a fashion similar to any chemical. Additionally, the dye in the simulated blood and urine may stain the skin and clothing. Clean up spills quickly to minimize staining.

Any simulated urine and blood waste from this lab may be disposed of by pouring it down the drain with copious amounts of water.

Pre-Lab Preparation

Enough materials are provided in this kit for up to 40 students working in 8 groups of 5.

Dispense the appropriate materials needed for each lab group to perform this investigation. Blood and urine samples will be shared.

Be sure to **shake well** each simulated blood and urine sample before use.

You will need to cut out the glucose charts for each lab group.

Important: *Be sure that both you and your students refer to the included glucose charts for the purposes of this lab rather than the glucose chart on the bag of glucose strips.*

Make sure that you follow the instructions on the bag of glucose strips.

Overview

The lab groups in your class are a team of doctors at the local hospital. Currently, they have three patients who are concerned that they may have diabetes. Students will go through the process of collecting background information, performing diagnostic tests, properly treating each patient, retesting, and devising a maintenance plan for each patient's condition. They will also take a diabetes risk test for themselves.

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Activity 1

Collecting Patient Background Information

What to do...

Step 1

Have students carefully read the following list of patients, their medical history, their nutritional habits and their symptoms.

Patient A: Mr. Adams is an overweight African-American 37 year old male who has suddenly, within the past week, experienced excessive thirst. He also claims that he has been extremely irritable lately. He has no history of diabetes in his family that he is aware of. He does not exercise regularly, and he recently started to eat more foods that are high in sodium, but other than that, he considers his diet to be well-rounded.

Patient B: Ms. Burns is a thin Caucasian 23 year old female. Within the past month, she has been waking up in the middle of the night, 2-3 times a night, to go to the bathroom. She has also been nauseous and vomiting for the past week or so. She thinks that one of her distant relatives may have had diabetes, but she is not sure. She exercises 1-2 times per week, and her diet consists of meat and potatoes.

Patient C: Mr. Canfield is a mildly overweight Native American 45 year old male. He has noticed a recent increase in thirst and urination. Also, over the past 3 years or so, he has noticed that his skin has become increasingly dry and itchy. He thinks that one of his grandparents may have had diabetes. He likes to eat lots of carbohydrates, and his favorite meal is dessert.

Questions

1. What are some common symptoms of diabetes?

   Excessive thirst, frequent urination, sudden weight loss, blurred vision, mood swings, fatigue, irritability

2. What are some of the risk factors for this disease?

   Family history of diabetes, low activity level, poor diet, excess body weight (especially around the waist), age greater than 45 years, high blood pressure, high blood levels of triglycerides (a type of fat molecule), HDL cholesterol of less than 35, previously identified impaired glucose tolerance, previous diabetes during pregnancy or baby weighing more than 9 pounds, certain ethnicities (African-Americans, Hispanic-Americans, Native Americans, and Pacific Island descendants).

3. What is the difference between Type 1 and Type 2 diabetes?

   There are physiological differences between Type 1 and Type 2 diabetes. Type 1 diabetes occurs when the immune system destroys the pancreas cells that produce insulin. Because Type 1 diabetics produce no insulin, they must receive regular insulin injections in order to control their blood sugar level. Type 2 diabetes occurs when muscle and fat cells are unable to use insulin properly — also referred to as insulin resistance. While some people who have Type 2 diabetes need to take insulin to control their blood sugar level, many others can keep their blood sugar at an acceptable level by modifying their diet, getting regular exercise, or taking medication that helps their body use insulin more effectively.

   Type 1 diabetes, once known as Insulin Dependent Diabetes Mellitus (IDDM) or child onset diabetes, is usually diagnosed before the age of 30 years old. Type 1 diabetic patients are lean, and may have diabetic ketoacidosis (which sometimes leads to a coma) or have high levels of ketones in their urine. People with Type 2 diabetes, once known as Non-Insulin Dependent Diabetes Mellitus (NIDDM) or adult onset diabetes, are most often diagnosed when they are over 30 and overweight. They usually do not have urine ketones.

4. Based on their backgrounds, predict which patients have diabetes.

   Based on the backgrounds alone, it seems as though all of the patients have some symptoms of diabetes. So, students may predict that each of the patients have diabetes.

5. Are patient backgrounds enough to diagnose diabetes? Why or why not?

   Patient backgrounds are not enough to diagnose diabetes. A blood test must also be performed to find out for sure that there is an elevated level of glucose in the bloodstream. A certain level of glucose in blood is enough to diagnose diabetes, while patient history helps to determine which type of diabetes it may be.

Notes

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Activity 2

Testing for Glucose in Urine Samples

What you need

Per group

- 1 Spot plate
- 3 Glucose Test Strips
- 1 Urine Glucose Chart

Shared

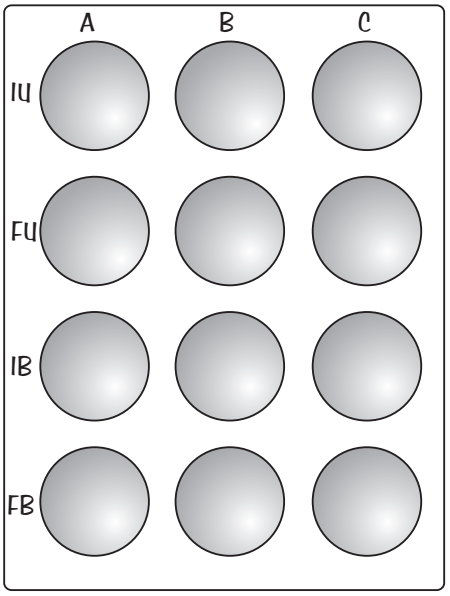
- 1 Patient A Initial Urine Sample
- 1 Patient B Initial Urine Sample
- 1 Patient C Initial Urine Sample

What to do...

Step 1

Students should obtain a spot plate. Using a wax pencil or other writing utensil, they should label the spot plate as noted below:

A,*B,* and *C* refer to the patients identity. *IU* refers to the initial urine sample, amd *FU* refers to the final urine sample. *IB* and *FB* are the initial and final blood samples, respectively.



Step 2

Students should obtain the initial urine sample of one of their designated patients. They should place 2-3 drops of this urine sample into the appropriate well on their spot plate.

Step 3

Students should repeat Step 2 for their other patients.

Important: *Be sure that students do not cross-contaminate the urine samples on their spot plate.*

Step 4

Students should obtain a glucose strip. They need to place the padded end of the strip into the first well for 1-2 seconds and then wait for two minutes. Students should compare the coloration on the pad to the Urine Glucose Chart. Have students record the glucose level in Table 1. They should discard the glucose strip into a receptacle that you designate.

Step 5

Direct your students to repeat Step 4 for their other patients making sure to use a NEW glucose strip for each patient.

Step 6

Students should share their results with the rest of the class.

IMPORTANT! *Glucose should not be detected in normal urine. Results of 100mg/dL or higher are considered to be significantly abnormal.*

Table 1

Patient	Initial Urine Glucose Level (mg/dl)	Normal or Abnormal Result?
Patient A	**50**	**Normal**
Patient B	**300**	**Abnormal**
Patient C	**50**	**Normal**

Questions

1. Why is it important to use a separate analysis strip each time you test for glucose?

   A separate glucose strip needs to be used each time because if you were to use the same strip for more than one patient, then you would not know which patient sample yielded which results. This is considered cross-contamination. It could lead to a misdiagnosis.

2. Why is it so important that urine from one patient was not placed into the wrong well or that it was mixed with the urine from another patient?

   If these situations occurred, it could lead to a misdiagnosis for the patient's samples that were involved. This is also considered cross-contamination.

3. In a diabetic patient, how do large amount of glucose get into the urine?

   A person who has diabetes will have a significant amount of glucose in their bloodstream because their body cannot synthesize it properly. This glucose may "spillover" into the urine. A urine glucose test would then indicate the presence of this glucose.

4. Do these results in Table 1 change your original predictions from Activity 1?

   Student answers will vary, however the urine glucose test should give them a better indication of which patients may or may not have diabetes.

5. What are ketones?

   If a person has Type 1 diabetes and has not been diagnosed and treated, their cells may become so starved for fuel that they break down the body's own fat for energy. Using fat for fuel can result in molecules called ketones building up to dangerous levels, which may eventually lead to a condition called ketoacidosis and even coma.

6. In your opinion, which patient has the greatest likelihood of having ketones in their urine?

   Patient B, Ms. Burns, most likely has the greatest likelihood. Based on her patient background, she seems to have Type 1 diabetes. And, Type 1 diabetics are very prone to ketones in their urine.

7. Is a urine glucose test enough proof to indicate to a doctor whether or not a person has diabetes? Why or why not?

   A urine sample is not enough proof to indicate whether a person has diabetes or not. High urine glucose levels give doctors a clue that something is wrong. But urine tests are not a good way to diagnose diabetes. Urine tests are not as accurate as blood tests. And, the level of blood glucose needed to make glucose appear in the urine is different for each person. Blood glucose levels could be high, yet high levels of glucose may not appear in the urine. So in diagnosing diabetes, doctors measure glucose in the blood.

8. What is the amount of glucose in urine that signals diabetes or a concern of diabetes?

   Glucose should not be detected in normal urine. Results of 100mg/dL or higher are considered to be significantly abnormal.

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Activity 3

Testing for Glucose in Blood Samples

What you need

Per group

- 1 Spot plate
- 3 Glucose test strips
- 1 Blood Glucose Chart

Shared

- 1 Patient A Initial Blood Sample
- 1 Patient B Initial Blood Sample
- 1 Patient C Initial Blood Sample

What to do...

Step 1

Students should obtain the initial blood sample from one of their designated patients. Direct them to place 2-3 drops of this blood sample into the appropriate well in their spot plate.

Step 2

They should now repeat Step 2 for their other patients.

Important: *Be sure that you do not cross-contaminate the blood and urine samples on your testing tray.*

Step 3

Students should obtain a glucose strip. Place the padded end of the strip into the first well for 1-2 seconds, then wait for two minutes. They should compare the coloration on the pad to the Blood Glucose Chart. Have students record the glucose level in Table 2. Students should discard the glucose strip into a receptacle that you designate.

Step 4

Direct your students to repeat Step 3 for their other patients making sure to use a NEW glucose strip for each patient.

Step 5

Students should share their results with the rest of the class.

Note: *During a real-life diabetes test, a patient would need to be tested twice (once on two separate days) before they could accurately be diagnosed with diabetes. Imagine, in this activity, that the results you get here are the same for both tests.*

IMPORTANT! *Results of 64-110 mg/dl are considered normal. A range of 110-126 mg/dl is considered to be pre-diabetic. A patient with blood levels within this range is considered to have impaired glucose tolerance, a precursor to diabetes. Blood levels at 126 mg/dl or higher are indicative of diabetes.*

Table 2

Patient	Initial Blood Glucose Level (mg/dl)	Normal or Abnormal Result?
Patient A	**115**	**Impaired Glucose Tolerance**
Patient B	**335**	**Abnormal**
Patient C	**225**	**Abnormal**

Questions

1. Why is it important to place the proper blood samples into the appropriate well?

   If the samples are put into the wrong wells, then the results you get will not be for the proper patient. This could lead to a misdiagnosis.

2. How do elevated levels of glucose get into the bloodstream of a diabetic patient?

   Insulin controls the blood sugar level. When insulin production or incorporation is compromised, then the blood sugar levels rise. In Type 1 diabetes, the immune system destroys the pancreas cells that produce insulin. In Type 2 diabetes, muscle and fat cells are unable to use insulin properly — also referred to as insulin resistance.

3. Does this blood glucose test give a better indication of diabetes than the urine test? Why or why not?

   Yes, a blood glucose test is more accurate than a urine glucose test. Urine glucose may not always be present, even in a diabetic person with high blood glucose levels. So, a blood glucose test is always the safest test to use to diagnose diabetes.

4. Why is it important that a patient fast at least 24 hours before a urine or blood glucose test?

   Fasting allows the body to cleanse itself of all that it has ingested. Fasting allows for a true measurement of glucose. For example, if a patient were to eat right before a glucose test, the glucose consumed from the food would interfere with the results. A true level of blood or urine glucose would not be able to be established.

5. During a real test for diabetes, how many blood tests must be performed before a definite diagnosis can be made?

   As a safeguard, two blood tests on two different days need to be performed in order to accurately diagnose diabetes.

6. How do these results compare to your predictions in Activity 1 and Activity 2.

   Student answers will vary, depending on their predictions. Some students may be surprised to find out that Patient C had a negative urine sample, but a high glucose level in the blood. This just reinforced that fact that blood tests are always more accurate in diagnosing diabetes than a urine test alone.

7. What may be a reason for any discrepancies?

   There may be discrepancies because some patients may have had no glucose in their urine, which may have led students to believe that they didn't have diabetes.

8. What is the amount of glucose in blood that signals diabetes?

   For a fasting glucose test it is 126 mg/dl on two separate occasions.

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Activity 4

Preparing Diagnoses

What you need

Information from Activity 1, 2 and 3

What to do...

Step 1

Using all of the information that they collected from Activities 1, 2 and 3, students should determine which patients do or do not have diabetes. If so, they should decide if they have Type 1 or Type 2. Students should record their answers in Table 3.

Important: *Even if a patient does not test positive for diabetes, continue with this patient throughout the following activities. There may still be a high risk for developing diabetes.*

Table 3

Patient	Diabetes: Yes or No?	If so, Type 1 or Type 2?	Conclusive Evidence
Patient A	No, but may be high risk for Type 2	None	Impaired glucose tolerance. Blood glucose levels are borderline, no glucose in urine. High risk because of patient background and blood glucose levels. Gradual onset of symptoms, overweight, over 30.
Patient B	Yes	Type 1	Elevated blood and urine glucose levels, immediate onset of symptoms, thin, under 30.
Patient C	Yes	Type 2	Elevated blood glucose levels, gradual onset of symptoms, overweight, over 30.

Questions

1. Which patients have diabetes? Which do not?

   Patient A does not have diabetes, but he may be at high risk. Patients B and C have diabetes.

2. Of those having diabetes, which have Type 1, if any? What information was critical in diagnosing this?

   Patient B has Type 1 diabetes. The sudden onset of symptoms described in the patient background information, as well as the elevated blood glucose levels, were critical in diagnosing Type 1 diabetes. The urine glucose level was also useful, to some extent.

3. Do any of these patients have Type 2 diabetes? If so, which ones? And, what information was critical in diagnosing this?

   Patient C has Type 2 diabetes. Patient background information, the gradual onset of symptoms, and the blood glucose test were critical in diagnosing this. The urine glucose test was also useful to some extent.

4. It is important for doctors to consider, not only the test results from a patient, but their medical history as well. Why?

   A patient's medical history will give a doctor a better indication of how advanced the diabetes is as well as whether this is Type 1 or Type 2 diabetes, based on how long the patient has had certain symptoms. It will also allow doctors to come up with treatment and maintenance plans based on their lifestyle habits.

5. Compare your results from Table 3 with the rest of the lab groups in your class. Are there any discrepancies? If so, what could be possible sources of error?

   Student answers will vary. All groups should get the same results, however, if there were errors in placing the samples in the proper wells, cross-contaminating samples, or using the glucose strips to test properly then there may be some discrepancies.

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Activity 5

Creating Treatment Plans for Diabetes

What to do...

Step 1

Based on what students have discovered so far about each patient, students should suggest several ways in which they would treat the patients' diabetes (or pre-diabetes).

Note: *Student answers to the following questions may vary. The provided answers will give you an idea of what to expect.*

Patient A:

Mr. Adams may be pre-diabetic because he has many of the symptoms and risk factors. It will be critical for him to keep a close eye on this condition. He should eat healthier and exercise more in order to lose some weight. He should go to his doctor for regular check-ups.

Patient B:

Ms. Burns has Type 1 diabetes which requires insulin injections to treat. She will need to make this a part of her everyday life. She will need to be educated on how to give injections, and how often, etc. She will also need to determine how to synchronize her insulin injections with her meals. Ms. Burns exercises once or twice a week as it is, so it is most important that she plans her insulin injections around her exercise schedule as well. She will also need to closely monitor her blood glucose on a regular basis.

Patient C:

Mr. Canfield has Type 2 diabetes which can usually be treated with exercise and diet if a person sticks to their treatment. Mr. Canfield likes to eat plenty of carbohydrates, so that is one part of his diet that he does not have to change. He just needs to make sure that they are complex carbohydrates. He loves to eat dessert, so he should cut this out of his diet because all of this sugar in his diet will not be good for his blood glucose levels. Since Mr. Canfield is mildly overweight, he will need to begin an exercise routine to shed some pounds.

Step 2

The students have advised their patients to start their treatments immediately. Students should remind their patients to call their doctor at any point if they have questions or concerns about their treatment. After 1 month, the students ask their patients to return to their office for a check-up. Here is what they discover after talking with each one:

Patient A: Mr. Adams did not follow his treatment plan at all

Patient B: Ms. Burns followed her treatment plan as scheduled

Patient C: Mr. Canfield sporadically followed his treatment plan

Questions

1. Why do you think it is difficult for some individuals to follow a treatment plan such as those that you devised in this investigation?

   This is an open-ended question for students, so their answers will vary. Some possible reasoning may include the idea that it is very difficult for some individuals to change their lifestyle habits. For example, if a doctor prescribes a healthier diet and more exercise, and a person is used to eating anything or has never done exercise before, then this can be a difficult change for a person. A person may not feel comfortable seeing a doctor so much, however because diabetes is a life-long disease, increased trips to the doctor are usually necessary. Some patients may also find themselves in denial. They just do not want to believe that they have diabetes, so they do not follow the advice of their doctor.

2. Why are these following medical professionals important to a diabetic?: exercise physiologist, nutritionist, nurse, and pharmacist.

   The exercise physiologist will make sure that a diabetic is following a customized exercise routine in order to shed pounds, if necessary. The nutritionist will work with the diabetic to create a healthy meal plan that is suitable and beneficial to the diabetic. The nurse is responsible for keeping track of blood tests, check-ups, dispensing medication, collecting patient background information, etc. A pharmacist is important to a diabetic who is insulin-dependent or who has to take medication. The pharmacist can answer questions and educate patients about filling prescriptions, proper dosage, drug interactions, side effects, etc.

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Activity 6

Retesting for Glucose in Urine and Blood Samples

What you need

Per group

- 1 Spot plate
- 6 Glucose test strips
- 1 Blood Glucose Chart
- 1 Urine Glucose Chart

Shared

- 1 Patient A Final Urine Sample
- 1 Patient B Final Urine Sample
- 1 Patient C Final Urine Sample
- 1 Patient A Final Blood Sample
- 1 Patient B Final Blood Sample
- 1 Patient C Final Blood Sample

What to do...

Step 1

Students should fill in Table 4 with the initial urine and blood glucose data from Tables 1 and 2.

Step 2

Students should obtain the final urine sample for one of their patients. Direct them to place 2-3 drops of this urine sample into the appropriate well on their spot plate.

Step 3

Students need to repeat Step 2 for their other patients.

Important: *Be sure that you do not cross-contaminate the urine samples on your spot plate.*

Step 4

Students should obtain a glucose strip. They should place the padded end of the strip into the first well for 1-2 seconds, then they should wait for two minutes. Have them compare the coloration on the pad to the Urine Glucose Chart. They should record the glucose level in Table 4. Have students discard the glucose strip into a receptacle that you designate.

Step 5

Students should repeat Step 4 for their other patients making sure to use a NEW glucose strip for each patient.

Step 6

Students should share their results with the rest of the class in order to fill in Table 4.

Step 7

Have students repeat Steps 2-6 for the final blood samples, making sure to use a NEW glucose strip for each patient. Make sure that students use the Blood Glucose Chart for comparison. They should record their data in Table 4.

Table 4

Patient	Initial Urine Glucose Level (mg/dl)	Final Urine Glucose Level (mg/dl)	Change (+ or -) in Urine Glucose Level	Initial Blood Glucose Level (mg/dl)	Final Blood Glucose Level (mg/dl)	Change (+ or -) in Blood Glucose Level	Opinion: Is this patient doing better or worse or the same after treatment?
Patient A	50	100	+50	115	225	+100	Worse
Patient B	300	50	-250	335	225	-100	Better
Patient C	50	50	0	225	225	0	Same

Questions

1. With the treatment plans in place, did any of the patients improve their urine glucose or blood glucose levels from the initial test? Did any of the patients become worse over time?

   Patient A became worse over time (increase in blood and urine glucose). His urine and blood glucose levels actually signal that he is now considered a diabetic. Patients B improved her blood glucose (by lowering it). Patient B also lowered her urine glucose levels as well. And, Patient C stayed at the same levels for blood and urine glucose.

2. What may be some possible reasons for the improvements or the setbacks for each patient? Explain.

   The main reason for improvements or setbacks with each patient is most likely due to the fact that the patient either did or did not follow the treatment plan that was prescribed for them. Or, the treatment plans may not have been effective plans to begin with.

3. Why is it so important to properly manage diabetes?

   Managing diabetes is very important because elevated glucose levels in the blood for long amounts of time can lead to serious health consequences.

4. Are treatment plans different for Type 1 and Type 2 patients?

   Each treatment has to address weight, nutritional habits, exercise and routine check-ups with the doctor. Type 2 diabetics can usually control their diabetes without medication, however Type 2 diabetics need to be concerned with insulin injections.

New ideas for teaching science

Activity 7

Creating Maintenance Plans for Patients

What you need

Information from Activities 1-6

What to do...

Step 1

Students should review all of the patient histories and the test results they determined for each patient throughout Activities 1-6. They should fill in the information that they already collected in Table 5.

Step 2

Now that students have an idea of how the original treatment worked or did not work for each patient, and whether each patient followed their treatment plan, they should devise a maintenance plan of their own for each patient. They should use all of the information that they have collected so far in order to come up with these plans. They should be sure to consider both short-term and long-term goals for maintenance.

Questions

1. Briefly summarize the procedure that you used to test for diabetes.

   Students collected patient background information, tested urine for glucose, and tested blood for glucose. Blood glucose is the best indicator for diabetes. The patient background information allows a doctor to determine whether it is Type 1 or Type 2 diabetes.

2. What are the acute, short term consequences and the major long term consequences if diabetes is not treated?

   One of the acute, short term complications of diabetes is a coma or ketoacidosis. The major long-term complications of diabetes include blindness, kidney disease, nerve damage, vascular disease, heart disease and stroke, amputations, sexual dysfunction, and increased risk of infection.

3. What types of lifestyle changes do people with diabetes have to make?

   Possible lifestyle changes include maintaining a healthier diet, creating a meal plan, exercising more in order to lose weight, and taking medication or injecting insulin each day.

4. Are there any ways to prevent diabetes?

   Preventive approaches include identifying people at high risk for the disorder and encouraging them to lose weight, be more physically active, and follow a healthy eating plan. Some diabetes prevention programs focus on preventing the disorder in high-risk populations, such as people with impaired fasting glucose, African Americans, Alaska Natives, American Indians, Asian and Pacific Islander Americans, Hispanic Americans, or women who have had gestational diabetes.

Table 5

Patient Name	Type of Diabetes	Followed Treatment Plan?	Improved Conditions after Treatment?	Short Term Goals	Long Term Goals
A: Mr. Adams	Pre-diabetes leading to Type 2	No	No	Stick to doctor orders. May need doctor supervision until he gets into routine.	Maintain blood glucose near normal level. Exercise and eat healthier to obtain target weight.
B: Ms. Burns	Type 1	Yes	Yes	Continue with original treatment. Get into routine of planning insulin injections around meals and exercise. Keep close eye on blood sugar levels due to insulin injections.	Maintain blood glucose near normal level. Continue to exercise and eat a more well-rounded meal each time.
C: Mr. Canfield	Type 2	Somewhat	The same	Stick to doctor orders. May need to visit doctor more to keep on top of. If condition continues to remain the same after treatment, may need to take medication.	Maintain blood glucose near normal level. Exercise and eat healthier to obtain target weight.

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Activity 8

Take a Diabetes Risk Test

What to do...

As stated earlier, 16 million Americans have diabetes - and one out of three doesn't even know it! Are you at risk for diabetes? Take the following test to find out. Circle "yes" or "no" for each of these questions.

DIABETES RISK TEST

Circle Yes or No to the following questions.

1. Are you between the ages of 40-64?

   Yes or No

2. Do you have a blood relative with diabetes?

   Yes or No

3. Have you had a baby weighing over 9 pounds?

   Yes or No

4. Do you rarely exercise?

   Yes or No

5. Does your waist measure over 100cm (males)/95cm (females)?

   Yes or No

6. Do you urinate excessively?

   Yes or No

7. Are you always thirsty?

   Yes or No

8. Have you lost weight for no reason?

   Yes or No

9. Do you have numbness or tingling in your legs or feet?

   Yes or No

10. Do you have blurred vision?

    Yes or No

11. Are you always tired?

    Yes or No

12. Are you of African-American, Latino, Native American, Asian-American or Pacific Island descent?

    Yes or No

If you have answered yes to three or more of the above questions, you may be at a high risk for diabetes. Share this test with your family members as well.

Optional

You may want to use any extra simulated blood, simulated urine, and glucose to design a diabetes lab of your own using different patient backgrounds and test results.

Assessment

Completion of data tables and analysis questions are general tools of assessment. In addition, designing new laboratories, Internet searches/projects, creative book reports, and oral presentations on findings are a few other ways of gauging understanding of the subject material at hand.

Cross Curricular Integration

Math

Diabetes is a disease in which blood sugar levels are very important. Blood sugar levels are often measured in mmol/l or mg/dl. At times, it might be necessary to convert between these two systems. You can use this information to teach your students about conversions in math. For example, to translate from mmol/l to mg/dl, multiply by 18. A blood sugar level of 7 mmol/l is 126 mg/dl.

History

Have students study the history of diabetes throughout the world.