Urine the Know

Urine can tell you a lot about a person's health. If a person's urine contains too much glucose, it could mean that they have diabetes. If it contains protein, it could mean that something is wrong with their kidneys. Urine testing, or urinalysis, is a quick way to see if certain chemicals are present in urine. In this activity, you will compare water with artificial urine to see how urinalysis works.

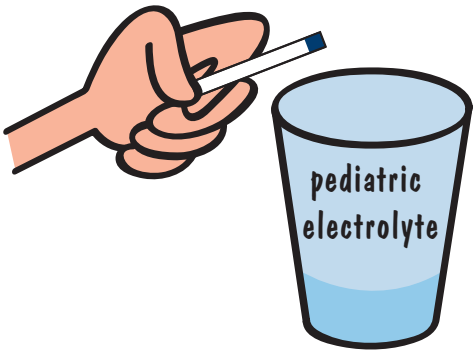
Materials

- Marking pen
- Distilled water
- Measuring cup (1 cup)
- 4 disposable plastic cups (6 oz.)
- Pediatric electrolyte solution
- Powdered milk
- Measuring spoon ($^1/_4$ teaspoon)
- 2 disposable plastic spoons
- 4 glucose test urinalysis strips (available at your local pharmacy) *
- Paper towel
- 4 multiple test urinalysis strips (available at your local pharmacy) †

NOTE: Powdered egg whites can be substituted for powdered milk. Tall, narrow cups are better than short, wide cups for this activity. If only glucose test strips are available, just the top row of the data table is relevant.

ADAPTATION *A magnifying glass may make the test pads and comparison charts easier to see. Wooden craft sticks can be taped to the test strips to make them easier to hold.*

SAFETY! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not test your own urine, or that of someone else. Do not eat or drink any of the materials in this activity.*



Procedure

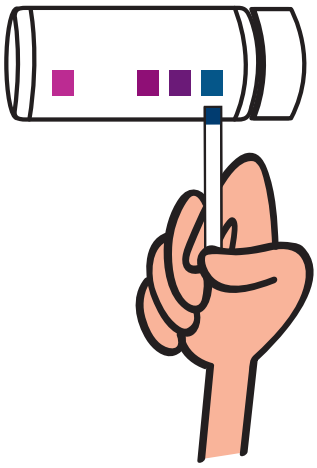
Test Sample Preparation

1. Label one cup "distilled water", the second cup "pediatric electrolyte", the third cup "water + milk" and the last cup "pediatric electrolyte + milk".

2. Pour $^1/_2$ cup distilled water in the cups labeled "distilled water" and "water + milk".

3. Pour $^1/_2$ cup pediatric electrolyte solution in the cups labeled "pediatric electrolyte" and "pediatric electrolyte + milk".

4. Add $^1/_4$ teaspoon powdered milk to the cups labeled "water + milk", and "pediatric electrolyte + milk". Using a different spoon for each, stir the mixtures until the powdered milk dissolves.



Glucose testing

5. Read the instructions for the glucose test urinalysis strips that you are using in this activity. General instructions are given in the next few steps, but they may need to be modified depending on the brand of strips you use. *

6. Hold the strip by the end opposite the felt pad. Dip the stick into the cup labeled "distilled water". Immediately pull the test strip out of the water and place the strip on the paper towel with the felt pad facing up.

7. Tilt the strip onto its longest side to allow the paper towel to dry any excess water remaining on the strip.

8. Watch the color of the felt pad to see if it changes. Compare the color on the pad with the chart on the side of the bottle for the glucose test urinalysis strips. If the color stays pink, then there is no glucose in the solution. If the felt pad turned purple, then glucose is present.

9. Record whether glucose is present in the solution by circling "Yes" or "No" in the "Glucose Test Urinalysis Strip Results" table in the "What Did You Observe?" section.

10. Repeat steps 6–9 with new test strips for the other three solutions, and record your results in the "Glucose Test Urinalysis Strip Results" table in the "What Did You Observe?" section.

Protein testing

11. Read the instructions for the multiple test urinalysis strips that you are using in this activity. General instructions are given in the next few steps, but they may need to be modified depending on the brand of strips you use. †

12. Hold the strip by the end opposite the felt pads. Dip the stick into the cup labeled "distilled water". Make sure that all the pads on the strip are wet, and immediately pull the test strip out of the water and place the strip on the paper towel with the felt pads facing up.

13. Tilt the strip onto its longest side to allow the paper towel to dry any excess water remaining on the strip.

14. Watch the colors of the felt pads to see if they change. Compare the color on the pad for the protein test with the chart on the side of the bottle for the multiple test urinalysis strips. Because the multiple test urinalysis strips have many different pads for many different tests, you will need to check the chart on the side of the bottle to see which pad shows the results for protein.

15. Record whether protein was present in the solution by circling "Yes" or "No" in the "Multiple Test Urinalysis Strip Results" table in the "What Did You Observe?" section.

16. Repeat steps 12–15 with new test strips for the other three solutions, and record your results in the "Multiple Test Urinalysis Strip Results" table in the "What Did You Observe?" section.

17. Pour all the liquids down the drain and throw away the rest of the materials. Thoroughly clean the work area and wash your hands.

Where's the Chemistry?

The urinalysis test strips that you used in this activity use a mixture of several different chemicals that react with each other to change the color of the felt pad when glucose or protein is present. Because the test looks at how much the color changes, it is called a "colorimetric" test. Colorimetric is a compound word, with the first part being "color", and the root of second part being "meter". Together, the word means color meter. Can you think of any other colorimetric tests around your home?

What Did You Observe?

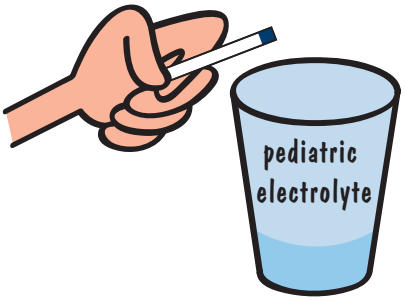
Circle "Yes" or "No" for each of the following.

Glucose Test Urinalysis Strip Results:
Is Glucose Present?

Distilled Water	Pediatric Electrolyte	Water + Milk	Pediatric Electrolyte + Milk
Yes / No	Yes / No	Yes / No	Yes / No

Multiple Test Urinalysis Strip Results:
Is Protein Present?

Distilled Water	Pediatric Electrolyte	Water + Milk	Pediatric Electrolyte + Milk
Yes / No	Yes / No	Yes / No	Yes / No



** Many brands of glucose test strips are available through your pharmacy, and all should work well in this experiment. Clinistix from Bayer HealthCare, Diagnostics Division were used in the preparation of this activity. The use of the Clinistix brand in this activity does not imply an endorsement of the product by the American Chemical Society.*

† Many brands of multiple test urinalysis strips are available through your pharmacy, and all should work well in this experiment. Multistix from Bayer HealthCare, Diagnostics Division were used in the preparation of this activity. The use of the Multistix brand in this activity does not imply an endorsement of the product by the American Chemical Society.

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The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".