Lesson 2-2 Laboratory Investigation 5

Splitting Hairs

Problem
Can you identify which hair samples are human?

Background
There was a break-in at a local animal clinic. People working at the clinic reported that valuable lab equipment and animals are missing. Investigators searched the crime scene and collected hair samples. Detectives have asked investigators to determine if any of the hair samples are human.

In this activity, you will prepare two types of microscope slides: a cuticle-impression slide and a whole-mount slide. A cuticle-impression slide shows the scale patterns on the cuticle. A whole-mount slide enables you to view the medulla. After you make the slides, you will observe the hair samples under the microscope. Your goal is to answer the detectives’ question: Are any of the samples human hair?

Skills Focus
observing, classifying, drawing conclusions

Materials
- black construction paper
- copy paper
- hair samples
- microscope slides
- clear fingernail polish
- plastic forceps
- grease pencil
- slide-mounting solution
- cover slips
- microscope

Safety First! Wear plastic gloves. Do not breathe the fumes from the fingernail polish or slide-mounting solution. Do not use fingernail polish near a flame. Follow your teacher’s instructions when you use the slide-mounting solution. Be careful when you focus the microscope that the lens does not touch the slide. Slides and cover slips are fragile, and the lens can break the slide. If a slide breaks, tell your teacher. Wash your hands with soap and warm water immediately after the activity.
Procedure

Part 1: Preparing Hair Sample Slides

In this part of the activity, your team will make a cuticle-impression slide and a whole-mount slide of one of the hair samples.

1. Your teacher will give you an envelope with hair samples. Make sure your work area and tools are clean and the area is well lit. Tape a piece of white copy paper onto one half of a piece of black construction paper. Use the appropriate black or white background to help you see the individual strands of hair you are handling.

2. To make a cuticle-impression slide, apply a thin coat of clear fingernail polish to a clean slide. Use forceps to place two hairs on the polish while the polish is still wet. After 45 seconds, use forceps to remove the hair.

3. Use a grease pencil to label the slide with the same label that is on the hair-sample envelope. Do not place anything on top of your cuticle-impression slide or the impression will be damaged.

4. To make a whole-mount slide place a drop of mounting solution in the center of a clean slide. Use forceps to place two hairs onto the drop of mounting solution. Do not get mounting solution on the forceps. Place the hairs next to each other. Do not let the strands overlap. Place a cover slip on top of the drop of mounting solution. Use forceps to press down gently on the cover slip to spread the mounting solution. (CAUTION: Pressing down on the cover slip with too much force will break the cover slip.)

5. Label the slide with the same label that is on the hair-sample envelope. Do not view the slide under the microscope until the mounting solution is completely dry.

6. Place the finished slides on a tray set aside by your teacher in the storage area.
Part 2: Analyzing Hair Samples
In this part of the activity, you will observe and identify the characteristics of each hair sample.

7. Refer to Appendix B: Using a Microscope on pages 152–153 of your textbook. Review the procedures for using a microscope.

8. Select one of the cuticle-impression slides and place it on the microscope stage. Record the slide label in the first column of the data table.

9. First view the cuticle impression under low power. Then view the impression under high power. There are three different cuticle shapes shown in Figure 1. Which sketch best represents the pattern you see in the impression? Record the shape of the cuticle in your data table.

10. Return the slide to the storage area and select another cuticle-impression slide. Repeat Steps 8–9 until you have observed all six cuticle-impression slides.

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11. Select one whole-mount slide and place it on the microscope stage.

12. View the hair sample under low power and then under high power. Does the hair have a medulla? If so, observe the thickness of the medulla compared with the thickness of the hair. If the medulla takes up less than half of the hair’s diameter, then the medulla is thin. If the medulla takes up more than half of the hair’s diameter, then it is thick. If you do not see a medulla at all, then it is absent. Record the thickness of the medulla in the data table. Be sure to use the row in your data table that matches the label on the whole-mount slide.

13. Observe the medulla again. Look at the sketches of different medulla shapes in Figure 2. Which sketch best represents the medulla shape for the hair you are viewing? Record the shape of the medulla in the data table. If you do not observe a medulla, write absent.

14. Return the slide to the storage area and select another whole-mount slide. Repeat Steps 12–13 until you have observed all six whole-mount slides.
Analyze and Conclude

1. Describe the difference between a cuticle-impression slide and a whole-mount slide. What structures of a hair are best seen in each type of slide?

2. What three characteristics can be used to tell the difference between human hair and animal hair?

3. Human hairs have scale-shaped cuticles. Which hair samples had scale-shaped cuticles?

4. Human hairs have thin medullas. Which hair samples had thin medullas?

5. The medullas of human hairs can be filled, broken, or absent. The medullas of some animal hairs have definite shapes, such as a chain or coil. Which hair samples had filled, broken, or absent medullas? Which hair samples had medullas that looked like coils or chains?

6. An operational definition defines the characteristics of an object. Write an operational definition that could be used to identify human hair.
Communicating

Write a lab report that would be helpful to detectives. Describe the methods you used to observe the hair samples. Also, include a brief description of how you determined which samples were human.