



Student Lab: Comparison of Animal and Human Hair

The first question asked in studying hair evidence is whether it is human or animal hair. It is estimated that there are 70,000,000 cats in the United States, 60,000,000 dogs, and millions of other domesticated animals. The following lab will explore how animal hairs differ from those of humans.

Materials

- Animal hairs
- Human hair
- Compound microscope
- Microscope slides
- Cover glasses
- Mineral oil or glycerin
- Alcohol
- Tissues
- Clear nail polish

Procedure

1. Use animal hair that you have collected, or obtain a sample from another student or your teacher. Place the hair sample on a microscope slide and add a drop of mineral oil or glycerin (water will do in a pinch). Anchor it with a cover glass.
2. Examine the sample. Draw and label what you observe. Be sure to note the animal involved.
3. Measure or estimate the medullary index (MI). This is the ratio of the diameter of the medulla to the diameter of the hair. Animal hairs have indices greater than $\frac{1}{3}$. (MI = diameter medulla/diameter hair)
MI (human) $< \frac{1}{3}$
MI (animal) $> \frac{1}{3}$
4. If possible, obtain slides of other animal hairs and make drawings of cat, dog, horse, deer, and two others of your choice. Don't forget to make the drawings twice as large as what you see. Measure the MI for each sample.

The cuticle of human hair is difficult to observe under a microscope because it is close-packed, transparent, and fine. Its structure can be delineated, however, by making a cast of hair.

5. Clean a strand of your hair by pulling it through a folded tissue moistened with alcohol to remove grease and oil.
6. Coat a microscope slide with clear nail polish and press your hair into it. After the polish becomes sticky but not dry, remove the hair and examine the cuticle impression at 40× or 100×. Draw a picture of what you observe.
7. The cuticles of different animal hairs can be quite varied and are generally much coarser than those of humans. Make a cast of your animal hair for comparison and draw it. Compare the drawing of the cuticle from your animal hair to those of other animals from your class.

Conclusions

1. How do animal hairs differ from the human hairs you have observed?
2. What is the value of the medullary index as found in step 3 of the Procedure section?
3. What is the value of the medullary index for each sample you observed in step 4 of the Procedure section?
4. How does the drawing of the cuticle from your animal hair compare to the drawings of others in your class?



Forensic Activity: Dognapping

Ms. Abigail Beauceron, proud owner of the grand-prize winner at the prestigious 2003 Westminster Kennel Club Dog Show, was leaving Madison Square Garden in the late afternoon when someone came up behind her, knocked her down, bundled FuFu in a blanket, and quickly ran out the nearby exit to the parking garage. FuFu is a Black Russian Terrier with dark-gray hair.

The event was captured on a security video, but the only description obtained was that the perpetrator was wearing a dark jacket and a baseball cap. Police found a rather smelly wool blanket by an empty parking spot near the exit in question. cursory examination by the officers showed some hair sticking to the fabric.

Early next morning, Ms. Beauceron received an unwelcome e-mail Valentine demanding \$20,000 for the safe return of FuFu, with details of the exchange to be sent at a later time. The police quickly traced the message back to an Internet room maintained for patrons of the public library. At the time the e-mail was sent, library records showed that seven people had used the facility so far that day. While the library's time records were not precise, they did keep a sign-in sheet of each day's users.

The police detectives doggedly paid a visit to each suspect on the list and, brandishing a warrant, searched each residence and vehicle. They also took samples of scalp hair and any facial hair. By the end of the day, they were dog-tired, but satisfied with the information they had obtained.

The following facts about each suspect were taken from the police report:

- George Shepherd. DOB 4-13-79. White male. Ht 5-8. Wt 160 lbs. Eyes brown. Hair brown. Occupation: Assistant manager of a fast-food restaurant next to the Coliseum. Pets: One cat.
- Patricia Barbet. DOB 2-18-42. White female. Ht 5-4. Wt 110 lbs. Eyes blue. Hair white. Occupation: Real-estate broker. Pets: Three cats and a turtle.
- Helmut Weimaraner. DOB 7-2-65. White male. Ht 5-7. Wt 305 lbs. Eyes brown. Beard brown. Occupation: Accountant. Pets: None.
- William Setter. DOB 5-28-72. Black male. Ht 5-11. Wt 185 lbs. Eyes brown. Hair black. Occupation: Security guard at the Coliseum. Pets: Light-brown collie and a parrot.

- Akita Lau. DOB 8-7-70. Asian female. Ht 5-3. Wt 107 lbs. Eyes brown. Hair black. Occupation: Graphic designer. Pets: Doberman Pinscher.
 - Fred Basset. DOB 8-28-61. White male. Ht 5-9. Wt 175 lbs. Eyes blue. Hair blonde. Occupation: Insurance salesman. Pet: Scottish Terrier with dark-gray hair. This dog was runner up for the last two years at the Westminster Show.
 - Maurice Spaniel. DOB 9-14-78. White male. Ht 5-8. Wt 170 lbs. Eyes blue. Hair bald, no other facial hair. Occupation: Professional boxer. Pets: Irish setter with brown hair and a golden retriever with orange-brown hair.
1. Based on what you know now, do you have any thoughts on who would be your prime suspect(s)? Why?
 2. Each investigative group will receive a package of evidence containing eight envelopes of hair samples. Your job is to ascertain if the evidence submitted can lead to the kidnapper. A Crime Report form must be completed independently by each investigator in each group with the realization that any one member of the group may be called as an expert witness at trial. Therefore, any conclusions must be justified and able to withstand cross-examination.
 3. Can you tell what color a cat is from examination of several of its hairs?