

4-2016

Hair Analysis in Motor Vehicles

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Humrich, Jaelyn E. and Barksdale, Larry, "Hair Analysis in Motor Vehicles" (2016). *UCARE Research Products*. 114.
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Hair Analysis in Motor Vehicles

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Abstract

In the words of Dr. Edmond Locard, "Every contact leaves a trace." (Forensic Science Central, 2015.) Trace evidence, including hair and fiber, is a key part of forensic science. FBI agent Deedrick states, "Because hairs can be transferred during physical contact, their presence can associate a suspect to a victim or a suspect/victim to a crime scene." (FBI, 2011) This means that forensic investigators can get a lot of information about a person or crime scene just by the presence of hair itself without even analyzing for DNA.

The purpose of this research was to examine the frequency of human and animal hair in motor vehicles in the Lincoln, NE area. We were looking specifically at animal hair to see if there is a significant difference in the distribution between pet-owner vehicles and non-pet owner vehicles. Finding a significantly high distribution of animal hair in pet owner vehicles would lead us to believe that an association could be made between a suspect owning an animal and their presence at a crime scene. Our null hypothesis is that there is no significance in the distribution of cat/dog hairs found in motor vehicles in the Lincoln, Nebraska geographical area.

Microscopy

- Microscopy was done with both a compound light microscope and a phase light microscope. After going through the animal hair library, I decided a compound microscope was all that was necessary.
- The compound scope used was an Amscope T690C

Tape Collection Method

Inexpensive masking tape from ShopKo was used as the collection medium. The tape was tabbed on both ends and then pressed repeatedly on the vehicle front seat area. The exemplar was then placed in an 8 1/2 x 11 plastic bag.

Results

Chi-square tests were done to test the significance of the results. I ran two different tests. One test was for all six categories of results: pet owner vehicles with and without animal hair, non-pet owner vehicles with and without hair, and unknown vehicles with and without hair. I calculated the p-value of this test to be $.9 < p < .75$ which is above the .05 significance level, failing to reject the null hypothesis that there is no significance in the distribution of the hairs. The other test was run of just the known vehicles. I calculated the p-value to be $p > .99$ which is above the .05 significance level, failing to reject the null hypothesis that there is no significance in the distribution of the hairs.

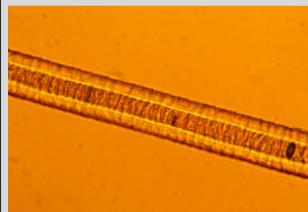
Hair Counts for known vehicles

Sample #	Human Hair	Animal Hair	Pet Owner
1	1	0	No
2	8	0	Yes
3	3	2	Yes
4	11	8	Yes
5	9	25	Yes
6	4	5	Yes
7	16	7	Yes
8	6	2	No
9	21	16	Yes
10	16	3	No
11	4	5	Yes
12	1	4	Yes
13	5	1	No
14	17	0	No
15	10	18	Yes
16	11	2	No
17	20	40	Yes
18	19	9	No
19	0	1	Yes
20	4	10	Yes
21	0	2	Yes
22	1	2	Yes
23	1	0	Yes
24	1	1	Yes

Hair Counts for unknown vehicles

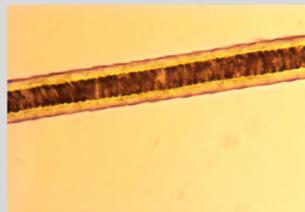
Sample #	Human Hair	Animal Hair
1	3	3
2	4	15
3	6	17
4	8	6
5	13	22
6	17	7
7	1	1
8	9	11
9	1	0
10	1	0
11	11	13
12	1	1
13	4	10
14	6	3
15	9	6
16	7	5
17	6	16
18	1	2
19	7	5
20	1	2
21	5	25

Animal and Non-Animal Hair from my Reference Library



Canine Hair

400x Compound Light



Feline Hair

400x Compound Light

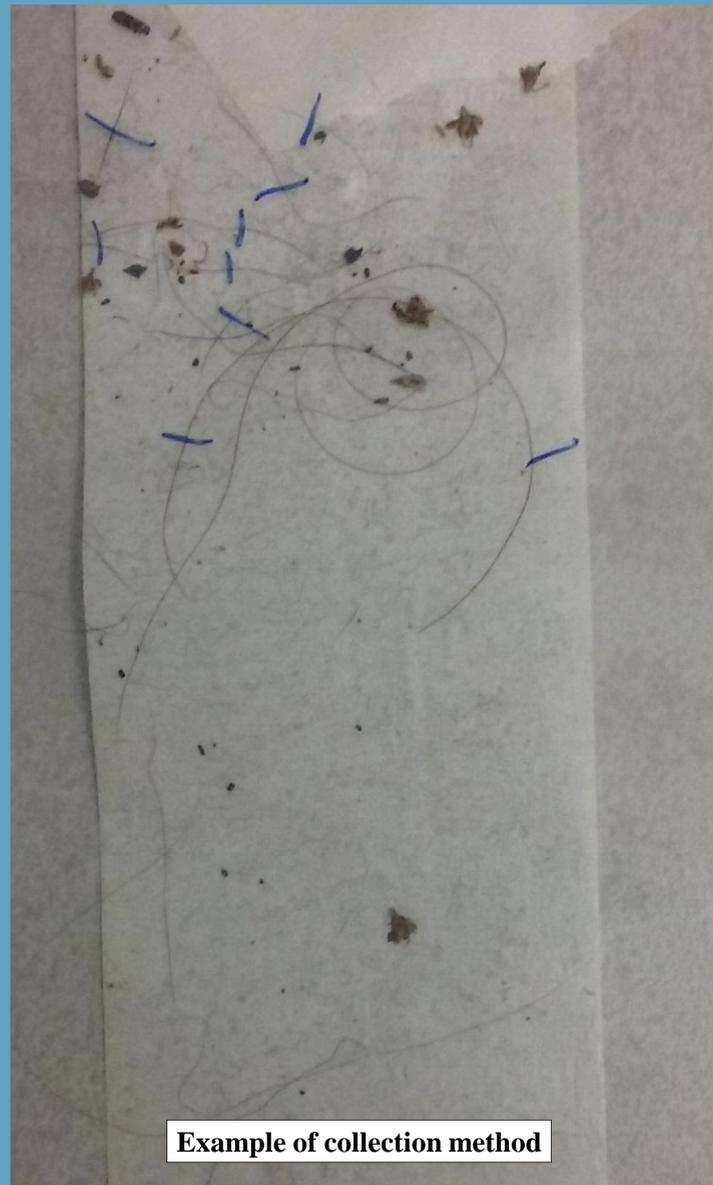


Human Hair

400x Compound Light

Method

- I began this project by setting up a sample collection of cat and dog hair as a comparison library. This was done by collecting hairs shaved from animals at a vet clinic. I mounted the animal hair on slides and took pictures with microscope software.
- Next I collected samples from vehicles by taping the front seats. I collected twenty-four samples from known pet or non-pet owner vehicles and twenty-one from unknown vehicles.
- I viewed the samples with a microscope and identified them as human or animal by looking at the medulla. The medulla of animal hair stands out much more than medulla of human hair.
- Finally, I set up tables of what I found and used a chi-square test to analyzed the data.



Example of collection method

Conclusion

The results of the research tell us that there is no significant difference in the distribution of animal hair between cars that are owned by pet owners or not. What this means to forensics is that animal hair is not good evidence to associate a person to a place. Animal hair is too easily spread from person to person and through the air to be linked only to pet owners. Further research for this project could be done to look further into the results. Having more vehicles, higher power microscopes, and a more efficient method of collecting the hair could contribute to higher levels of research.

References

1. "Forensic Science Central." - Edmond Locard. Web. 6 Mar. 2015. <<http://forensicsciencecentral.co.uk/edmondlocard.shtml>>.
2. FBI. FBI, 1 Mar. 2011. Web. 5 Mar. 2015. <<http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/july2000/deedric1.htm>>.

Acknowledgments

Thanks to Dr. Gengenback at A4-Animal Hospital and Kendle's Auto Salvage