

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need:

Describe the need:

Hair examiners are looking to better understand the extent that hairs on an individual change over time. Is there a period of time in someone's life when hair changes more? After what duration of time do microscopical hair comparisons become limited in nature? Is there a point where hair comparisons have no value? How much does a hair change over a growth cycle? And when comparing anagen to catagen to telogen hairs what differences are observed? Trotter studied hairs from participants from birth to maturity but there have been no longitudinal studies of changes in hair microstructure or morphology over time in adults (20-45) and older adults to understand potential limitations.

Keyword(s):

Submitting subcommittee(s): **Date Approved:**

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

Linch, C. A., & Prahlow, J. A. (2001). Postmortem microscopic changes observed at the human head hair proximal end. *Journal of Forensic Science*, 46(1), 15-20.

Chang, B. S., Hong, W. S., Lee, E., Yeo, S. M., Bang, I. S., Chung, Y. H., ... & Shin, D. H. (2005). Ultramicroscopic observations on morphological changes in hair during 25 years of weathering. *Forensic science international*, 151(2-3), 193-200.

Koch, S. L., Shriver, M. D., & Jablonski, N. G. (2019). Variation in human hair ultrastructure among three biogeographic populations. *Journal of structural biology*, 205(1), 60-66.

Koch, S. (2018). *Variation in Human Hair Morphology and Microstructure* (Doctoral dissertation, Pennsylvania State University).

Trotter hair data - measurement data from cross-sections of hairs sampled from adults

<https://scholarsphere.psu.edu/resources/711ffa5c-8aa4-4989-900b-1840e7ee56ff>

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

Determination of accuracy and reliability of forensic analyses and conclusions, including potential sources of error. Fundamental understanding of how environmental factors can affect trace evidence.

5. In what ways would the research results improve current laboratory capabilities?

This research will help hair examiners to understand the extent of variation within an individual's head hair and the potential for visible differences in microstructure among the hairs growing out of different follicles on a person's head. They also may be able to better target case scenarios when they will conduct microscopical comparisons (e.g., if several years have passed between collection of a known sample and when the crime occurred), be better able to express the limitations of comparisons, the potential for others to share similar microscopic characteristics, and more clearly explain what conclusions from comparative examinations mean for hairs.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

By knowing the variation in hair microstructure that can happen over time and among the many hairs on an individual's head we can improve our understanding of potential strengths and limitations to microscopical hair analysis and better support conclusions reached from comparative examinations based on similarities or exclusionary differences to known hair samples.

7. In what ways would the research results improve services to the criminal justice system?

By having more reliable information on how much variation in microscopic characteristics is present in an individual and the extent that hair microstructure can change over time (to the point that a sample might not be determined to be microscopically similar) is important for hair examiners to know when interpreting evidence and explaining their examinations in court. Little is known about the extent hairs change during adulthood.

8. Status assessment (I, II, III, or IV):

II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.