



### **A200 HAIRbase: An Online Resource for the Forensic Analysis of Mammalian Hair**

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The goal of this presentation is to introduce the professional trace community to HAIRbase™; a valuable online reference tool for the discrimination of mammalian hair characteristics. As a result of attending this talk, potential users will have learned a fast and reliable method of accessing morphological information regarding the microscopic and macroscopic characteristics of the hair of many species across the class Mammalia.

This presentation will impact the forensic science community by explaining how HAIRbase™ offers a wealth of information regarding the structural characteristics of mammalian hair and goes beyond traditional reference atlases in its coverage of both species and individuals.

The microscopic examination of guard hairs is paramount to a wildlife forensic identification. Although primary guard hairs are often used, secondary guard hairs are more variable and, therefore, have the potential to be more diagnostic. Furthermore, the class Mammalia contains approximately 5,400 species that display incredible morphological variation. The range of variation displayed in available reference materials is lacking, because the species characterized are limited and coverage of hair grades, as well as variation on the specimen does not lend itself to forensic identification. HAIRbase<sup>®</sup>, a digital database of mammalian primary and secondary guard hairs from three

different body regions (dorsal, ventral, and tip of tail), has been constructed using bright field and scanning electron microscopy images.

Animal specimens were obtained from the collections at the U.S Fish and Wildlife National Forensic Laboratory in Ashland, Oregon and the Biology Department at California State University, Fresno. Hair was collected from each specimen by either plucking or cutting as close to its base as possible with a sterile razor blade. Hair was collected from three body regions: (1) the dorsal region, between the shoulder blades; (2) the ventral region, on the midline between the forelimb and the hind limb; and, (3) at the tip of the tail. Approximately 20-25 hairs were collected from each body region of each animal, for a total collection of approximately 60-75 hairs from each animal. After the hair from each body region was collected, it was placed in separate sterile sealable bags. Approximately three to five primary and secondary guard hairs were selected from each collection bag. Several hairs of each type were then plated onto individual glass microscope slides using a commercial mounting medium with a refractive index close to that of hair. Each hair on each slide was examined and photographed in a manner that documented microscopic fields containing the most representative hair characteristics for the particular hair type and section under view. A transmitted light microscope coupled with a Camera was used to acquire digital images of the basal, sub-shield and shield portions of the hair of each specimen at 200-400 X magnification. Macroscopic and microscopic evaluations of each specimen were conducted. The macroscopic characteristics recorded included hair color, form, and banding pattern. Microscopic observations, such as medullar, cuticle, and cortex characteristics, were then recorded. A user interface was created that allows the publishing of website content quickly and easily.

HAIRbase<sup>®</sup> will aid investigators by giving them a reliable reference that contains diagnostic information regarding the structure of mammalian hairs, such as traits of the hair shield, medullary configurations, and cuticle scale patterns that can be used for identification. Using the information contained in HAIRbase<sup>®</sup> one can distinguish particular traits, thereby aiding in the generation of investigative leads and possible identifications in crimes involving animals. The potential user groups for such an atlas include wildlife forensic scientists, animal welfare investigators, trace analysts, ecologists, and food contaminant inspectors.

HAIRbase<sup>®</sup> will be readily available on the Internet, allowing the addition of specimens and the accommodation of the needs of the forensic trace evidence community in real time. Currently, the database contains over 250 species from 16 orders and 62 families of the class Mammalia. Through the addition of relevant specimens and the ability to adapt to the changing needs of its user groups, HAIRbase<sup>®</sup> will remain relevant and remain a valuable resource to investigators and researchers across multiple scientific disciplines.

#### **Hair, Morphology, Trace Evidence**