A. PURPOSE:

To identify human hair(s) in collected trace evidence and prepare human hair(s) for DNA analysis.

B. RESPONSIBILITY:

Forensic Science Examiner / Connecticut Career Trainee who has successfully completed training.

C. SAFETY:

The appropriate measures for the proper handling of biohazard materials, sharps instruments and chemicals will be used according to SOP-GL-02.

D. PROCEDURE: Examination of Known Hair Samples

1. Known hair samples may be examined when deemed appropriate for the case scenario or when a biological known is needed for comparison purposes.
2. Hair evidence will be examined in such a manner as to prevent the loss or contamination of the evidence.
3. Record all written information on the appropriate Quality Record Worksheet.
4. Digital images may be used to aid in the examination/documentation process.
5. The approximate number of hairs and their macroscopic morphological characteristics such as length, color and texture will be documented.

E. PROCEDURE: Examination of Questioned Trace Evidence / Identifying Human Hairs

1. Materials:
   a. Stereomicroscope
   b. Compound microscope
   c. Glass microscope slides
   d. Cover slips
   e. Deionized water
   f. Disinfecting solution
   g. Digital imaging device

2. Questioned trace evidence may be collected in the Forensic Biology Unit or in other units of the Laboratory and transferred to the Forensic Biology Unit for examination.
3. Trace evidence will be examined in such a manner as to prevent the loss or contamination of the evidence.
4. Record all written information on the appropriate Quality Record Worksheet.
5. Digital images may be used to aid in the examination/documentation process.

6. Examine the collected trace material stereoscopically, identifying any hair-like fibers. Some animal hairs may be identified at this magnification. Human tissue-like material may be observed at this magnification. Examination at a higher magnification is usually necessary.
7. The appropriate glass microscope slide and cover slip will be used based on the length and morphology of the hair-like fiber evidence and parameters of the microscope.
8. Temporarily mount the chosen hair-like fiber(s) in "Milli-Q"-purified H_2O, or other appropriate medium, one per slide. The ends should be easily located.
9. The mounted hair-like fiber(s) will be examined with a compound microscope at ~ 100x magnification.
10. The examiner will determine if the hair-like fiber is indeed a hair and whether the hair is of animal origin or human origin.
11. The examiner will document observations that support the hair identification conclusion.
    a. Examples of this documentation may include descriptions of root features, color features, cortex features, pigment features, cuticle (scale) features, tip features, medulla features or gross morphological features. The examiner will use their knowledge, training and experience to identify and characterize these features.
    b. A digital image (~100x) may be substituted for the written description.
12. The somatic body area and other microscopic characteristics of human hairs may be documented, if deemed appropriate.
13. The presence of tissue-like material on human hairs will be photo-documented using an appropriate digital imaging devise.
14. The hair-like fibers will be removed from the temporary mounting.

F. Procedure: Preparing Hairs for DNA Analysis

1. Materials:
    a. Sterile microcentrifuge tube(s)
    b. Sterile scalpel(s)
2. Nuclear DNA (nDNA) Analysis:
    a. The examiner will use their experience and training to choose the most suitable hairs for nDNA analysis. These human hairs may be the hairs that possess the greatest amount of tissue-like material at the root and/or possess morphological characteristics of interest in relation to the known hair sample.
    b. The examiner will measure and record the length, in centimeters, of the human hair(s) that are chosen for DNA analysis.
    c. The examiner will use a sterile scalpel to excise the root portion of the hair. This root portion will be placed in a sterile microcentrifuge tube.
    The tube will be labeled with the Lab#, Item # and examiners initials. (See also *Itemizing*, below)

d. The remaining shaft will be retained separately in appropriate packaging for possible future mtDNA analysis. The package will be labeled with the Lab#, Item #, length of hair remaining and examiners initials. (See also *Itemizing*, below).
e. The remaining portion of questioned trace material shall be returned to its packaging, sealed, initialed and retained at the Laboratory.

3. Mitochondrial DNA (mtDNA) Analysis
   a. If the nDNA analysis of a human hair root does not yield significant results, the retained shaft portion of the hair may be forwarded to the DNA Unit, in its entirety, for mtDNA analysis.
   b. If a chosen human hair does not possess tissue-like material at the root, the entire hair will be packaged, labeled appropriately and forwarded to the DNA Unit for mtDNA analysis.

G. Procedure: Itemizing

1. A trace evidence collection is given a sub-item number and documented in LIMS, according to SOP-GL-04 (Example: #1S1).
2. Human hairs that are chosen for DNA analysis from that trace evidence collection are further sub-itemized (example #1S1-1).
3. A root portion that possesses tissue-like material that is chosen for nDNA analysis will be labeled with an asterisk (example: #1S1-1*). The shaft portion from which that root has been removed and retained for potential mtDNA analysis, will remain itemized as above (example: #1S1-1).

H. Procedure: Report Writing

1. The majority of human hair identifications will fall in the category of "FB sample prep" in LIMS where no report is necessary.
2. On the rare occasion when it may be necessary to generate a Report, a competent hair examiner from the Laboratory or another ASCLD accredited laboratory may act as the Technical Reviewer of a report which includes hair identifications.
3. The report may include statements such as:
   a. Animal hairs were observed in item #1S1.
   b. Human hairs were observed in item #1S1.
   c. No tissue-like material was observed on these hairs.
   d. Tissue-like material was noted on the root portion of some of these human hairs.
   e. The root portions of these human hairs were forwarded to the DNA Unit for nuclear DNA analysis.
   f. The shaft portions of these human hairs were forwarded to the DNA Unit for mitochondrial DNA analysis.

I. **REFERENCES:**

1. Hicks, J. Microscopy of Hairs: A Practical Guide and Manual, FBI Laboratory, 1977.
2. Saferstein, R. Forensic Science Handbook, Prentice Hall, 1982. Chapter 5: The Forensic Identification of and Association of Human Hair.
3. Saferstein, R. Forensic Science Handbook, Prentice Hall, 1982. Chapter 9: Foundations of Forensic Microscopy.

***Additional hair related articles are available.**