3.6 Fiber Sampling and Sample Collection

3.6.1 Introduction

3.6.1.1 General Considerations

Fibers and the fabrics from which they originated may comprise some of the major pieces of evidence found during the crime scene investigation. Large numbers can be shed and transferred in accordance with the Locard exchange principle.

Fibers can be divided into two categories, natural and man-made. Each category contains a wide variety of generic classes and subclasses. The forensic scientist has to be not only knowledgeable in fiber classification but also knowledgeable in fiber transfers, fiber collection, fiber and fabric manufacture, and methods of fiber identification and comparison.

Comparison of fibers is a painstaking process. The examiner can approach the fiber comparison by setting out to show that the samples are not similar. The failure to detect any significant differences, after exhausting the methodology available to the examiner, necessitates the conclusion that the fibers could have the same origin.

3.6.1.2 Physical and Chemical Properties

The properties which can be examined and compared are color and shade, longitudinal shape and size, internal characteristics, generic class and subclass, cross-sectional shape, refractive index/indices, birefringence, interference colors, pleochroism, sign of elongation, fluorescence, damage, common contaminants, and any processing. Along with those properties, fabrics can be examined for weave pattern, thread count, dye pattern, and thread twist direction.

These properties can be observed or measured using magnifying glass, linen counter, vernier calipers, cross-sectioning kit, FTIR, solubility schemes, melting point apparatus, refractive index liquids, and stereo, polarizing, comparison and fluorescence microscopes.

3.6.2 Safety Considerations

Standard Laboratory Precautions - See FSD Health & Safety Manual
Biohazard Precautions, if applicable

3.6.3 Sample Collection

The order of preference for the recovery of fibers is manual removal with forceps followed by taping with clear tape or Post-it type notes (or another low tack tape). Gentle scraping may be necessary in certain instances. Vacuuming is rarely, if ever, performed because the debris recovered represents far more than recent fiber transfers. However, fibers recovered with these methods, when submitted as evidence, will be examined to the best of the laboratory's ability.

- Use separate laboratory coats and evidence collection rooms, if available, for examining materials from victim and suspect to prevent possible cross-transfer contamination.
- If possible, the victim's evidence and suspect's evidence should be examined in separate rooms. If this is not possible, then the separation of victim and suspect evidence in time and/or space will be necessary. Document in case file notes.
- There should be only one exhibit opened at a time, unless two separate areas exist for this purpose.
- The examiner shall change gloves and clean their tools between examining the evidence from the victim and the evidence from the suspect.
- The examiner shall change the examination paper between victim and suspect or scene exhibits. The examiner may change the paper between multiple victim, suspect or scene items, as necessary.
- Avoid drafts around the examination area.

3.6.4 Minimum Standards & Controls - Sampling

Also reference **Trace Evidence Sampling and Sample Selection Information**

The scientist should analyze a representative sample of fibers that display the range of variation seen within the known sample. This is based upon the knowledge, skills, and training of the examiner and on any limitation(s) of the sample (such as: size, contamination, additional analysis by other experts, etc.

3.6.4.1 Known Samples

When an entire known sample is submitted and is either a textile and/or a sample of fibers selected by crime scene personnel/investigator the scientist can assume homogeneity. Knowledge of the manufacturing process for the types of fiber evidence encountered in casework, similar color, garment construction, upholstery, cordage/ropes etc.) aids in choosing an appropriate representative known sample.

Known samples should consist of fibers from the warp, weft, course, wale, and the stitching of the fabric. Examination of the entire cross section of a yarn may be necessary to reveal the presence of different fiber types that may make up the yarn. Several areas of a known may have to be sampled due to fabric

construction differences, fading, etc. Consideration should be given to collecting fibers from the victim's and the suspect's environments.

Fills, felted and non-woven fabrics need to be carefully sampled to obtain a representative known sample.

3.6.4.2 Questioned Samples

When numerous fibers are present in the unknown sample, the fibers should be evaluated on a case by case basis and an attempt should be made to examine a representative sample of fibers. This should be based on color, size, shape, twist and crimp.

If the evaluation of the known sample shows more than one fiber type, care should be taken to appropriately examine the questioned sample(s) for all the possible fiber types for comparisons.

3.6.5 Instrumentation

Stereomicroscope

Bright light

Magnifier

Alternate Light Source

3.6.6 Procedure

Use bright light, magnifiers or alternate light sources to aid in visualizing fibers for collection, if applicable.

If using forceps, care should be taken to minimize damage to the fibers. Fibers can be placed into paper folds or onto Post-it notes to protect them.

Items collected from different sources, such as victim and suspect, shall be stored inside separate packaging.

Refer to Appendix 3.6 A: Fiber Sampling for guidelines

3.6.7 References

- Scientific Working Group For Materials Analysis http://www.swgmat.org/trace.htm. Reference Fibers documents

- DeVore, Jay L and Peck, Roxy. Statistics: The Exploration and Analysis of Data. Third Edition, Wadsworth Publishing

- Any reliable textile book or internet sites dealing with the manufacturing of fibers and the construction of fabrics. Example:

The "Complete Textile Glossary" ©2001 Copyright Celanese Acetate LLC. available at www.celaneseacetate.com/textile_glossary_filament_acetate.pdf