Hair Evidence

Parts of the Hair

Distal end

Proximal end

Cuticle

Follicle

Medulla

Cortex

Root

Cuticle

Medula

Cortex

Hair

Skin surface

Sebum

Follicle

Sebaceous gland

Medulla Types

Fragmented

Intermittent
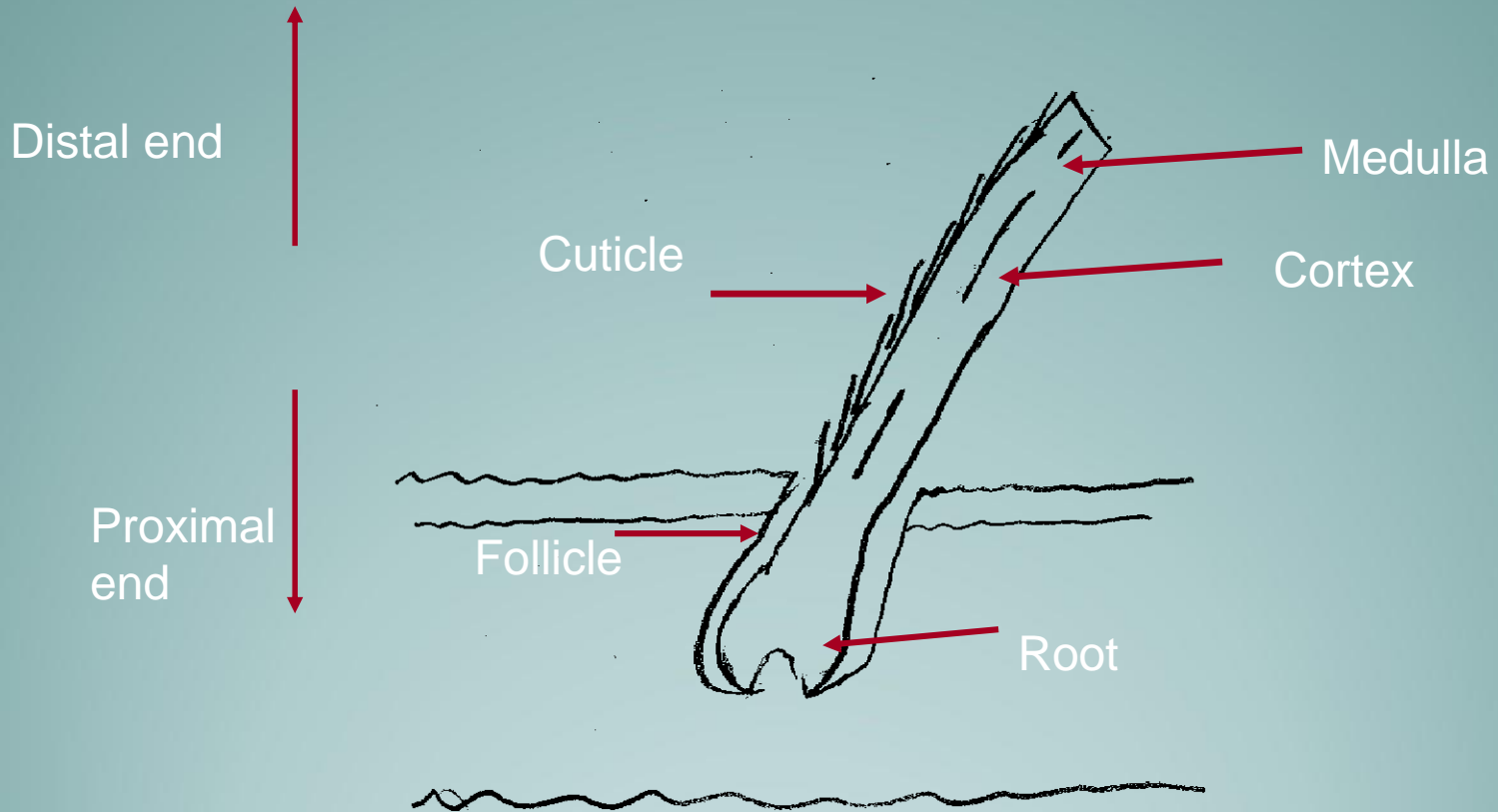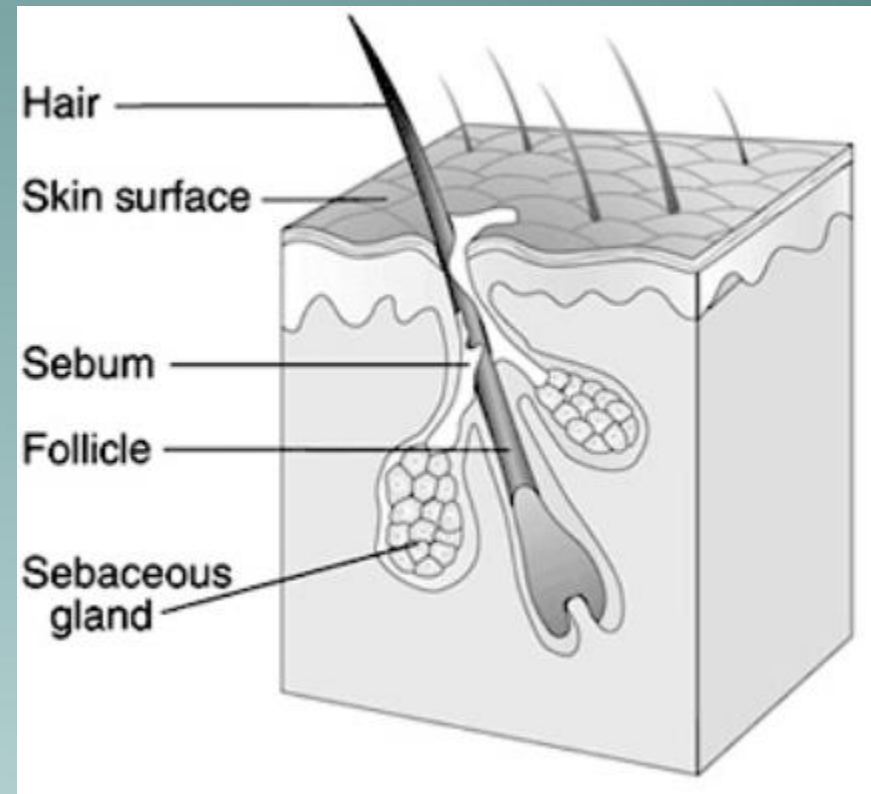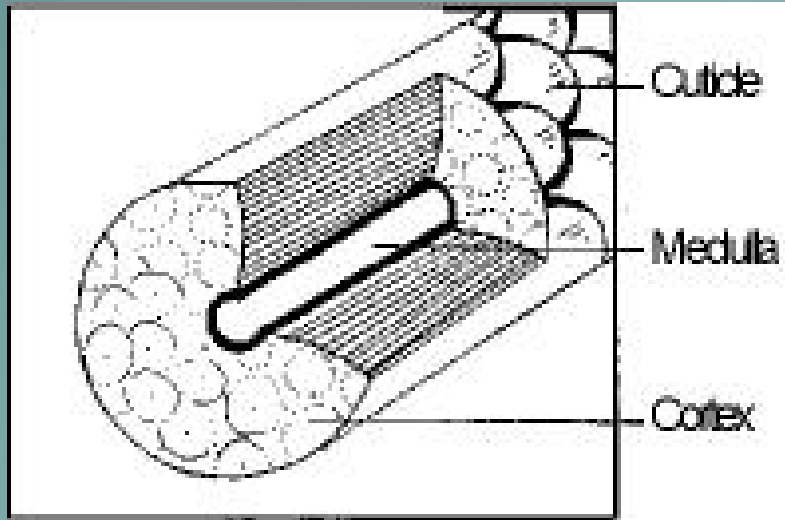
continuous
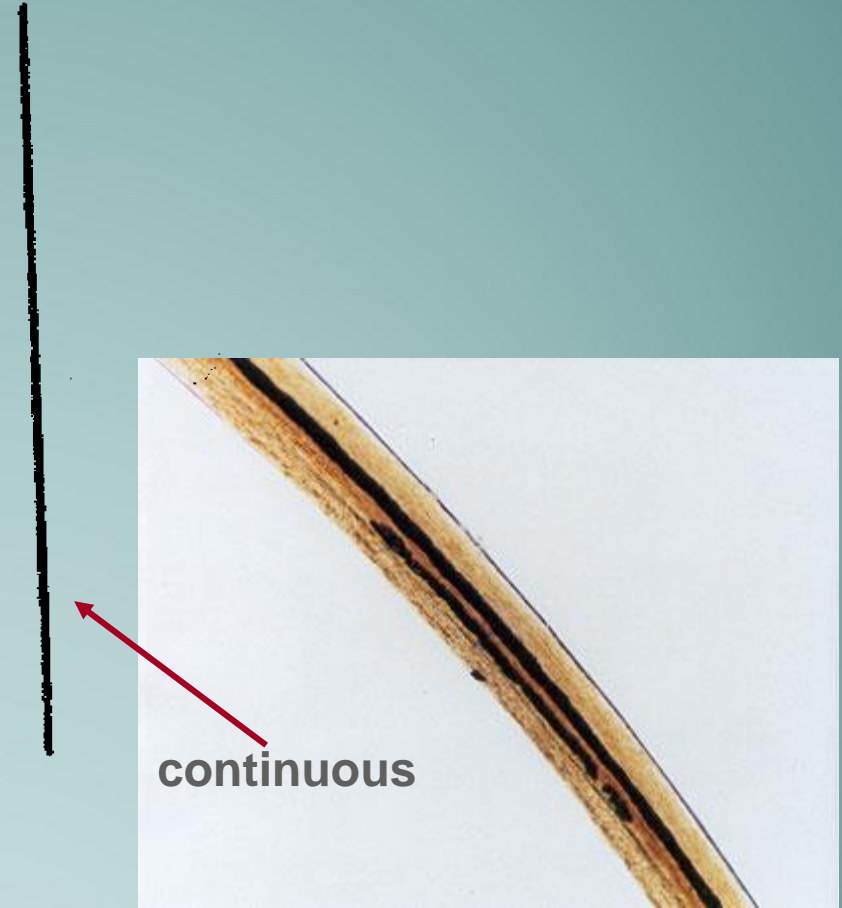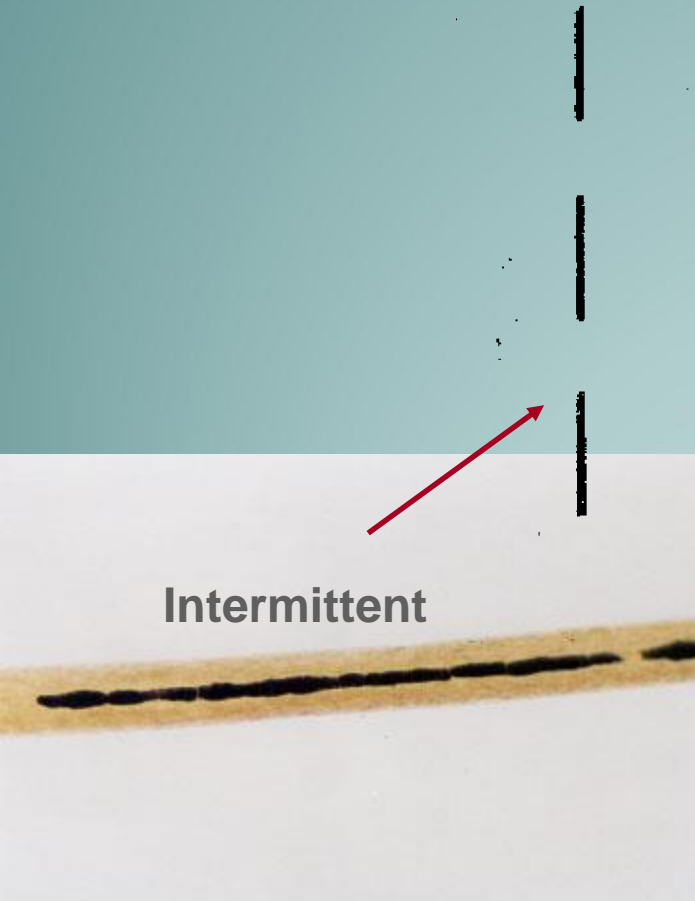
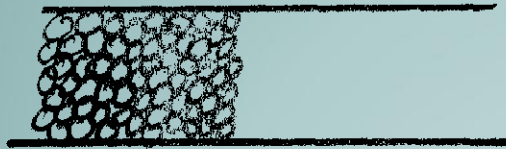# Medulla Patterns

Uniserial- cats

Multiserial- rabbits

Vacuolated- dogs

- deer

Amorphous- humans

Cuticle Types
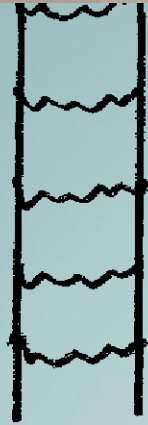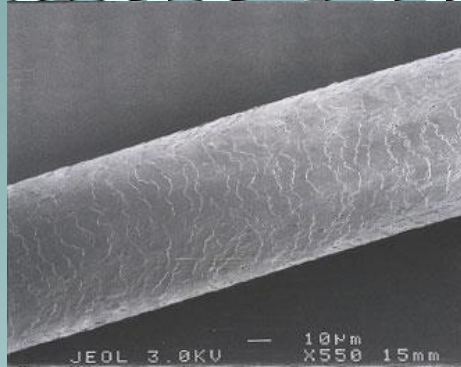
Coronal

Mouse
(nonhuman)

Imbricate

human

Spinous
cat

Medullary Index

- Width of the medulla/ width of the hair shaft
- If it is less than 1/3, it is human

Observe Cuticle

- Type of cuticle

- Is this **possibly** human?

- Damaged or undamaged

Cortex

- Contains pigment granules.

- Pigment distribution
  - **Dyed** hair
  - **Undyed** hair

- UNDEVELOPED OR MISSING pigments cause grey hair

Proximal End

- End nearest torso

- Root or no root?

Distal End

- End farthest from the torso

split →   blunt cut   oblique cut   rounded   ← tapered
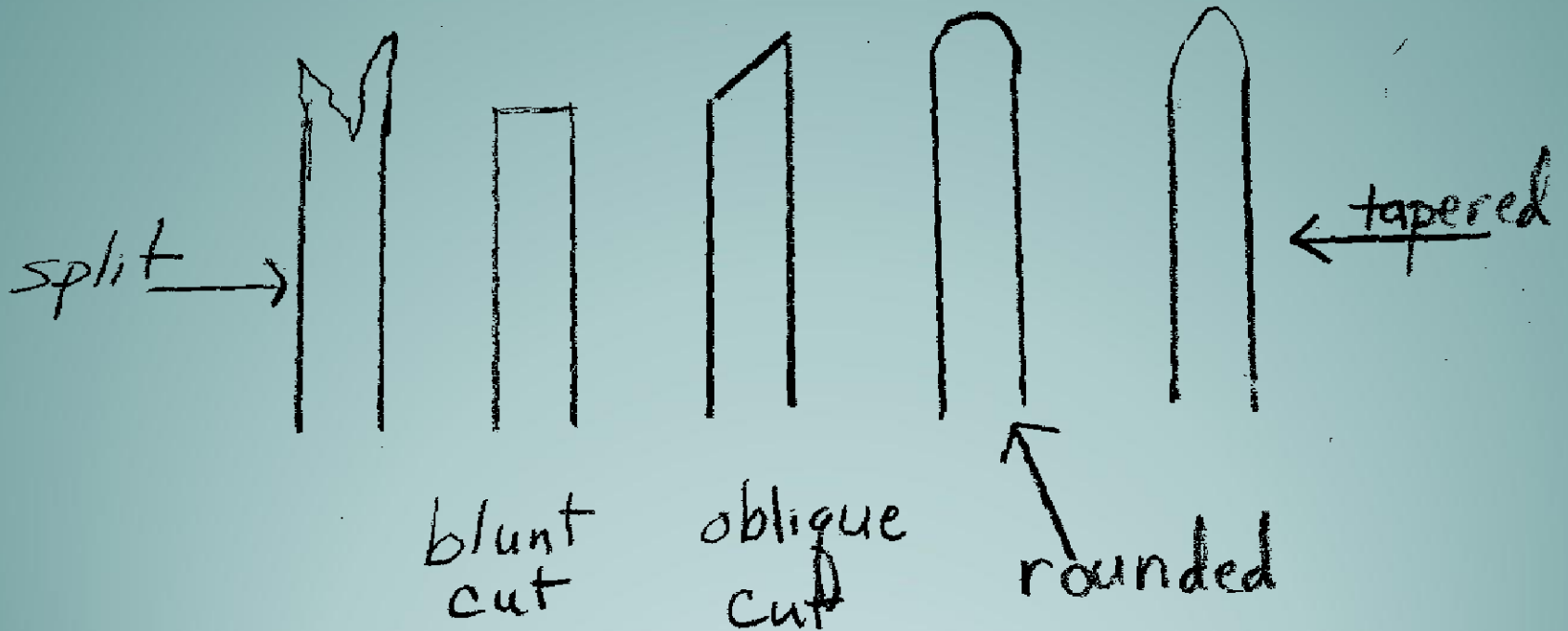
So How Do We Use Hair?

- Must look for special features
- Ex: Dyeing can leave lines where the hair has grown
- Ex: The tip of the hair can tell whether the individual has had a recent hair cut

Questions About Hair

- All hair on one head the same?
- Different on different body areas?
- Tell race of person from hair?
- Sex of person from hair?
- Age of person from hair?

Is it a Match?

- What makes a match? All the **characteristics** found on the known hair and the questioned hair must be identical.

- What does it mean to say they "match"?
  - **Class**
  - INDIVIDUAL

Matching Hair

- Hair has basically **class characteristics**
    - Matching distribution of pigment, medulla type and cuticle type can be found in many individuals.
- Cellar material present

    DNA???

Hair Collection

- Cellophane **tape** into Petri dish or
- **Vacuuming**
- Choose container that will **prevent loss**
- Label and
- Seal
- Receipt for evidence!!!

Control Samples

- Determine the source of evidence
- Uncontaminated
- From known source
- For hair-must be pulled
  - 50 from all over head
  - 24 from pubic area in case of sexual assault

Problems with using hair characteristics in criminal cases

- HAIR IS NOT UNIFORM!
- Hair is taken from different parts of the scalp.
- Even this is not enough, usually
- Even different parts on the same hair can look very different!

Fibers

Collection, Testing and Determination of Uniqueness

image from www.fbi.gov

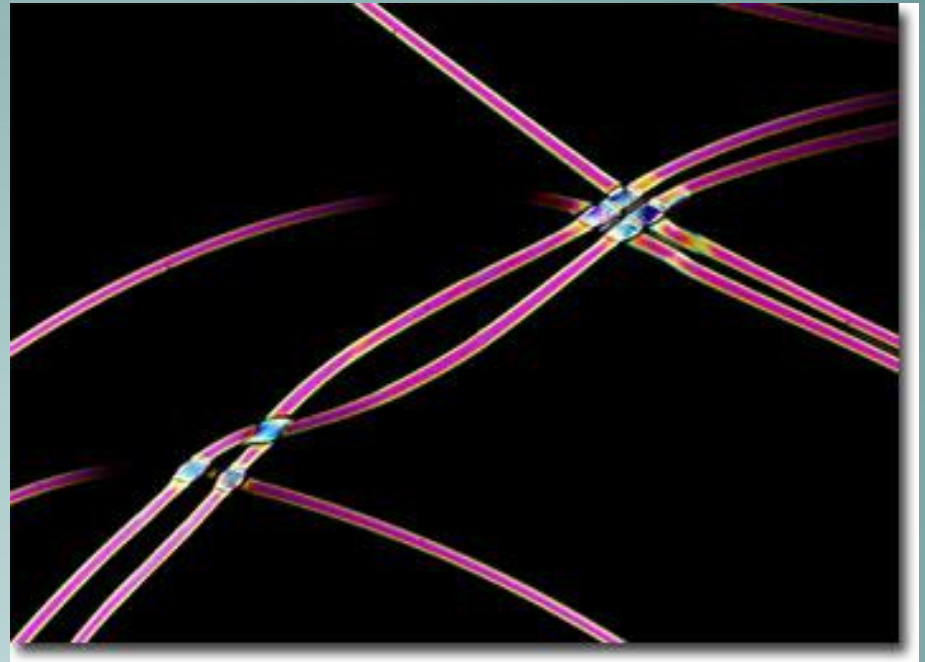# Types of Fiber

- **Natural-**
  - Any fiber that comes from plant or animal sources, examples?

- Image of cotton fibers from www.fbi.gov

Types of Fibers Cont'd

- **Synthetic-**
  - Any fiber that is made in a laboratory, examples?

- Image of nylon from www.fbi.gov

Testing

- Fibers are generally identified by type of cloth and color by
- Physical Properties
    - Burn test
    - Melting test
    - Solubility
    - Optical properties
    - Dye identification

Burning and Melting Tests

- Place the fiber in a flame and record the results.

- Heat the fiber on a hotplate and record the results.

- Changes in physical properties: color, smoke, smell, etc.

Solubility Test

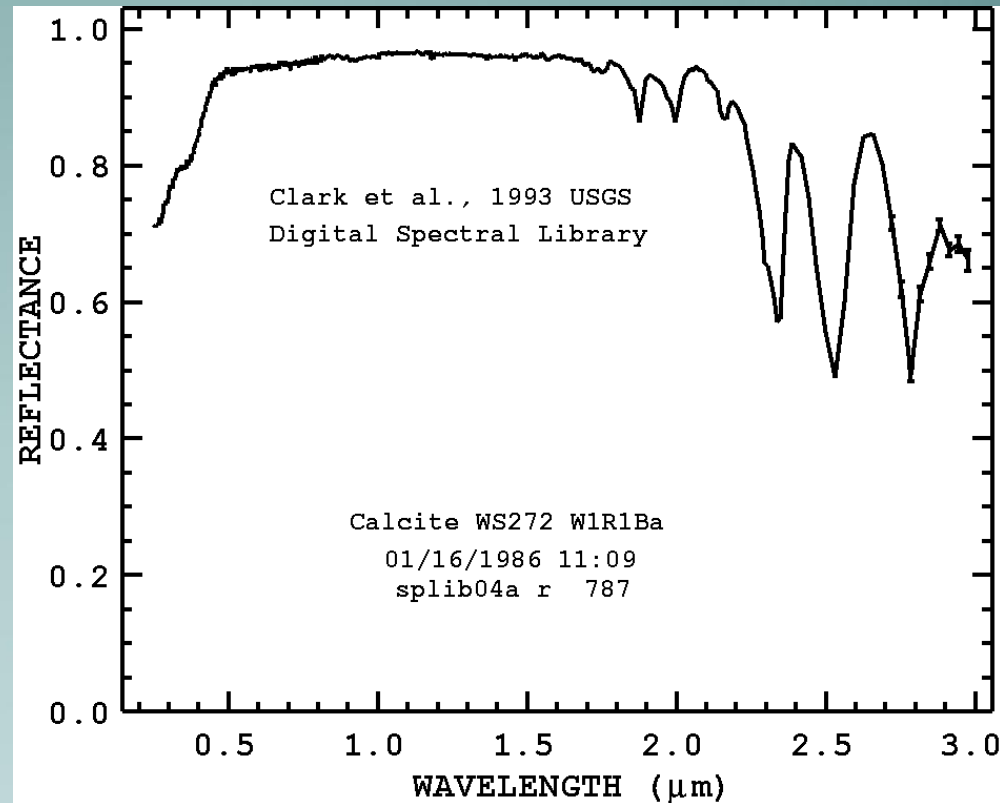- What is it soluble in?

  - Strong base

  - Strong acid

  - other

Optical Properties

- **Behavior in**
  - visible,
  - IR,
  - UV and
  - polarized light

- Image from www.usgs.gov/

Identification of Dye

- Thin Layer Chromatography
  - Separates molecules based on the affinity to the surface they are placed on versus their solubility in the solvent they are being dissolved in
  - Low solubility in solvent and high adhesion to the surface--- does not go very far

Known Cocaine | Known Heroin | Known Methamphetamine | Unknown From Case

■ Image from www.dps.state.ia.us

Is it a Match?

- What makes a match? All the ***characteristics*** found on the known fiber and the questioned fiber ***must be identical***.

- What does it mean to say they "match"?
  - Class
  - Individual

CHARACTERISTICS

Individual   Class

- Unique enough to be linked to one individual.

One of a kind? Very unusually made fiber made in very small amount with unusual dye

Or pieced into a cloth like a puzzle piece.

- Matches a group

Fiber Collection

- Cellophane tape into Petri dish or
- Vacuuming
- Choose container that will prevent loss
- Label and
- Seal

Control Samples

- From victim & suspects' homes and vehicles
- Uncontaminated
- Large enough to do testing needed