**BIOL 104 Forensic Biology**

**Lab 4 Fingerprinting**

1. **Introduction**

Fingerprints can be used for identification due to their patterns of epidermal ridges called minutiae. Along the ridges are pores from eccrine, or sweat, glands that secrete a perspiration that is 98.5% water. The remainder of the perspiration is composed of organic materials, including fatty acids, lactic acids, sugars, ammonia and proteins, and inorganic materials, such as sodium, potassium, calcium, chloride, and phosphate ions. It is these secretions, along with oils from sebaceous glands, that are deposited on surfaces to form latent prints.

We will use several methods to develop latent prints. On hard or nonporous surfaces, like glass and metals, fingerprint powders are often used to develop prints that may then be lifted with tape. Cyanoacrylate, or superglue, fuming also works well on such surfaces, but is hard to remove. The moisture from fingerprints causes polymerization of the cyanoacrylate, but salt from the fingerprints may also play a role in forming the white prints. On porous surfaces, like paper, chemical methods such as ninhydrin or iodine are preferred. Ninhydrin reacts with amino acids, the building blocks of protein, to form pink/purple prints. It is thought that the iodine fumes may combine with fatty acids or interact with residual water to form a yellow/brown print. However, prints developed with iodine are not permanent and must be fixed with another solution.

Whether latent or direct, fingerprints must be compared to reference prints from 10-print cards, usually first by an Automated Fingerprint Identification System (AFIS), and then by a trained examiner.

1. **Materials & Methods**

**Wipe down your lab bench and wash your hands.**

1. Taking Fingerprints

1. Place the fingerprint card on the desk in front of you. The fingerprinter should be seated to the left of the fingerprintee.

2. The fingerprintee should curl all of his or her fingers except for

the one being recorded, which should be extended outward.

3. The fingerprinter begins by grasping the fingerprintee’s

extended **right** thumb between his or her right forefinger and

thumb.

4. The fingerprinter then rolls the fingerprintee’s right thumb from

right to left (inward) over the ink pad.

5. Then, using gentle pressure, the fingerprinter rolls the inked

finger over the proper space provided on the fingerprint card.

6. Steps 3 to 5 are repeated for each of the remaining fingers on

the right hand except each finger should be rolled from left to right (outward).

7. Steps 3 to 6 are repeated with the fingerprintee’s **left** thumb

being rolled from left to right (inward) and fingers rolled from

right to left (outward).

8. Normally, the 4 left fingers are then pressed simultaneously

onto the ink pad and fingerprint card followed by the 4 right fingers. This is followed by larger prints of the left thumb and right thumb.

9. The fingerprintee can now clean the ink from his or her hands

using soap and water or a waterless hand sanitizer.

10. Switch roles so each student has a chance to be the fingerprinter

and the fingerprintee.

1. When you have finished your fingerprint card, label it with at least your lab # in the top left hand corner and turn it into your instructor.
2. Making Fingerprints
3. Wearing gloves, obtain a clean glass microscope slide.
4. Using a marker, label this slide “A” in the top left hand corner.
5. Wearing gloves, obtain a piece of filter paper.
6. Using a pencil, label this filter paper “B” in the top left hand corner.
7. Wearing gloves, obtain two pieces of bond paper.
8. Using a pencil, label one piece of bond paper “C” in the top left hand corner.
9. Using a pencil, label a second piece of bond paper “E” in the top left hand corner.
10. Wearing gloves, obtain a metal spoon. Wash and dry your spoon.
11. Using a marker, label this plastic spoon “D” at the top of the handle.
12. Remove your gloves and run one of your thumbs or fingers down the side of your nose or through your hair to pick up additional oil.
13. Press the thumb or finger you chose down on your glass slide labeled “A.” Record which thumb or finger you chose in the results section (i.e. left/right thumb, index, middle, ring, little)
14. Place your slide in a plastic bag.
15. Choose a different thumb or finger to press down on your filter paper labeled “B.” Record which thumb or finger you chose in the results section.
16. Place your filter paper in a plastic bag.
17. Choose a different thumb or finger to press down on the bottom of your bond paper labeled “C.” Record which thumb or finger you chose in the results section.
18. Place your bond paper in a plastic bag.
19. Choose a different thumb or finger to press down on the back of your spoon labeled “D.” Record which thumb or finger you chose in the results section.
20. Place your spoon in a plastic bag.
21. Choose a different thumb or finger, press it down on an inkpad and then press it down on the bottom of your bond paper labeled “E.” Record which thumb or finger you chose in the results section.
22. Place your bond paper in a plastic bag.
23. Place all of your evidence in an envelope labeled with your lab #, date and time. Turn this into your instructor.
24. Dusting and Lifting Fingerprints
25. Obtain an evidence envelope and fingerprint card from your instructor.
26. Put on your gloves and safety glasses.
27. Remove the glass slide labeled “A.”
28. Dip a soft fingerprint brush into the carbon black or aluminum fingerprint powder. Then tap it against the top of the powder jar to shake off the excess powder.
29. With a circular, sweeping motion that barely touches the slide, brush across the surface until you see the fingerprint begin to appear.
30. Once you see the fingerprint, apply powder in a direction that

follows the ridge flow.

1. When the print is clearly developed, stop brushing (or you may destroy the fingerprint)!
2. If necessary, carefully shake off any excess powder from the

slide over the powder jar or trash can.

1. Unwind a piece of clear tape about 10 cm in length and place

the free end of the tape at a point about 7 cm from the top of the print on the slide. Smooth the piece of tape over the print with your finger, moving slowly from the free end of the tape to a point about 1 cm past the print.

1. When the print is entirely covered with tape, pull the whole piece of tape straight up at once, carefully removing the tape and print from the slide.
2. Transfer the print to a clean white index card and label the

card with the origin of the print, date and your initials.

1. Examine the fingerprint with a magnifying lens. Determine

the fingerprint pattern and as many minutiae as possible. Compare the lifted fingerprint to an inked fingerprint from the fingerprint card you were given. Can you make a definite match?

1. Developing Fingerprints

**Ninhydrin**

1. Put on your gloves and safety glasses.
2. Remove the piece of filter paper labeled “B” and tape it to a paper towel. Label the paper towel with your name.
3. Working in the fume hood, spray the filter paper with ninhydrin solution.
4. Allow the paper to dry and develop.
5. Examine the fingerprint with a magnifying lens. Determine

the fingerprint pattern and as many minutiae as possible. Compare the lifted fingerprint to an inked fingerprint from the fingerprint card you were given. Can you make a definite match?

**Iodine**

1. Put on your gloves and safety glasses.
2. Remove the piece of bond paper labeled “C.”
3. Tape it to the lid of the iodine fuming jar and then quickly close the lid.
4. Allow the paper to develop until a yellow/brown print appears.
5. Using tweezers, remove the fingerprint from the jar. Then, quickly replace the lid on the jar.
6. Examine the fingerprint with a magnifying lens. Determine

the fingerprint pattern and as many minutiae as possible. Compare the lifted fingerprint to an inked fingerprint from the fingerprint card you were given. Can you make a definite match?

1. Wearing gloves, immerse the fingerprint in a solution containing calcium chloride and potassium bromide in water.
2. Using tweezers, remove the fingerprint and tape it to a paper towel to dry. Label the paper towel with your name.

**Cyanoacrylate**

1. Put on your gloves and safety glasses.
2. Add super glue to the aluminum foil in the bottom of our superglue fuming chamber.
3. Remove the metal spoon labeled “D.”
4. Place the spoon in our cyanoacrylate fuming jar (but not in the superglue) and seal the jar with parafilm.
5. Allow the fingerprint to develop. This may take several hours.
6. Examine the fingerprint with a magnifying lens. Determine

the fingerprint pattern and as many minutiae as possible. Compare the lifted fingerprint to an inked fingerprint from the fingerprint card you were given. Can you make a definite match?

1. Analyzing Direct Prints
2. Direct prints do not need to be developed.
3. Examine the fingerprint with a magnifying lens. Determine

the fingerprint pattern and as many minutiae as possible. Compare the lifted fingerprint to an inked fingerprint from the fingerprint card you were given. Can you make a definite match?

**Return all materials to the bins. Wipe down your lab bench and wash your hands.**

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score:

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab 4 Fingerprinting**

1. **Results**

|  |  |  |
| --- | --- | --- |
|  | **Fingerprints You Made**  **Lab #** | **Fingerprints You Analyzed**  **Lab #** |
| **A. glass slide** |  |  |
| **B. filter paper** |  |  |
| **C. bond paper** |  |  |
| **D. metal spoon** |  |  |
| **E. bond paper** |  |  |

1. **Conclusions**
2. What are the components of fingerprints?
3. What is the difference between organic and inorganic materials?
4. What considerations are made for which type of fingerprint powder to use?
5. How does ninhydrin develop fingerprints?
6. How does iodine develop fingerprints?
7. Why must the fingerprints developed with iodine be preserved?
8. How does the cyanoacrylate develop fingerprints?
9. What are the benefits of using cyanoacrylate? What are the challenges of using cyanoacrylate?
10. Which developing technique worked best for you? Why?
11. Which developing technique worked least well for you? Why?
12. What influences the choice of developing techniques for fingerprints?
13. What were some of the challenges you faced in analyzing fingerprints for a thumb/finger match?