Latent Print Section

Physical and Chemical Processing of Evidence for Friction Ridge, Footwear, and Tire Impressions

1. Scope

Impressions left by friction ridge skin, footwear or tires can be found on all types of surfaces. Prints can be deposited from secretions of the skin, from blood, dust or from other contaminants. Surface types, processes, and sequencing of processes will be provided to guide the scientist/technician when processing evidence.

2. Safety

2.1 Personal protection equipment such as lab coat, gloves, the use of a fume hood or mask and eye protection must be worn when mixing or using the chemicals. If additional safety requirements are necessary, they will be listed under the specific technique below. Most of the chemicals and powders are irritants and/or flammable. Chronic overexposure to any chemicals could have mutagenic effects. Many of the chemicals used in these processing techniques have not been thoroughly investigated**. Prevent exposure through the skin, lungs or other means by using the safety measures available.**

2.2 Scientists are encouraged to review SDS as needed to understand the hazards of the chemicals they are working with.

2.3 When using the UV light or another alternative light source use the appropriate eye wear.

2.4 When using the Leeds Spectral Vision (LSV) on evidence that is, or could be, biologically contaminated, wear a disposable face mask, eye protection, and the usual PPE to prevent contamination and exposure to biological material.

2.7 Seek immediate medical attention if any of the chemicals are ingested or cause irritation to the skin or respiratory tract.

3. Quality Assurance

3.1 Reagents are tested when they are prepared and again when they are used on evidence to ensure they are working properly. They are tested by placing a test impression on similar or the same type of material being tested. The reagent is then used on the test print. If processing multiple items/cases the same day this test need only be done once. If another processing technique in the sequence will be done, this same test print will be used for the second method. The test impression must follow the same development path as the evidence. If the impression does not develop as expected, conduct an additional test and/or discard the chemicals.

3.2 Deviation from the protocols may be necessary as each case is different, and the scientist/technician may choose to deviate if it is best for the evidence. Deviations require approval from the Technical Manager and will be noted in the case file.

3.3 When multiple processes will be used, the control print should be run alongside of the evidence in each step to verify the processes are working correctly.

3.4 Visual examination takes place before and after each step. Impressions that might be suitable for comparison should be captured following each processing.

Surface Types

4.1 For the purposes of this document, the surfaces will be divided into five categories:

- 4.1.1 Porous…… Section 5
- 4.1.2 Non-Porous…… Section 6
- 4.1.3 Adhesive…… Section 7
- 4.1.4 Wet or Previously Wet……. Section 8
- 4.1.5 Blood Impressions…… Section 9

5. Porous Surfaces

5.1 Porous surfaces are those surfaces that allow latent print residues to be absorbed in the material. Examples of porous surfaces include:

- Paper
- Untreated cardboard
- Tissue
- Unfinished/untreated wood
- Latex gloves*
- Thermal paper*

*These items have a specific processing technique

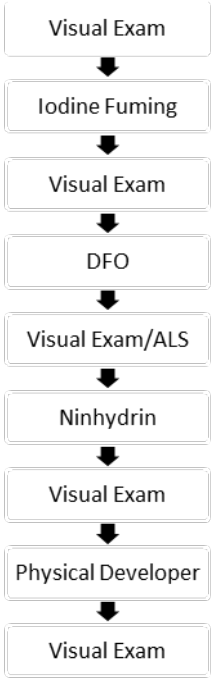
5.2 **General Considerations**

- 5.2.1 Writings or markings on documents shall be recorded prior to the application of any chemicals.
- 5.2.2 If applicable, indented writing should be collected with a gel lift prior to the application of any chemicals.

5.3 **Sequential Processing**

- 5.3.1 Processing porous items for friction ridge skin residues should be done in the following sequence. A step can be skipped; however, they cannot be performed out of order. The processes will be chosen at the discretion of the analyst.
- 5.3.2 The following techniques are provided as a general guide for processing porous items of evidence. It is up to the analyst/technician processing the evidence to determine the most efficient and effective method for processing.
- 5.3.3 Ridge detail that is developed and might be suitable for comparison should be captured between each step.

5.3.4 Sequence for Processing Porous Surfaces for Friction Ridge Skin Impressions:



5.4 Iodine Fuming

5.4.1 General Considerations

5.4.1.1 Iodine reacts with the oil present in friction ridge impressions. Prints developed using Iodine will turn a brownish color. This can interfere with subsequent tests for other bodily fluid.

5.4.1.2 Prints developed with Iodine fuming will fade over time. Re-treatment is possible. Useable prints should be photographed before any fading occurs.

5.4.1.3 Large surfaces can be processed by using a commercially available fuming gun. Follow the manufacturer's directions. Iodine also degrades the quality of the fuming gun. Inspect the gun before each use.

5.4.1.4 Iodine is toxic in any form

5.4.2 **Iodine Fuming Techniques**

5.4.2.1 **Active Fuming Method**

The glass tubing contains glass wool and calcium chloride crystals to absorb the moisture that is introduced into the tube when blowing into the apparatus. Attached to the rubber-stoppered glass tube is a thistle tube that holds the iodine crystals. Warm the crystals with your hand. This will change the crystals from a solid to a gas and this can be seen when purple smoke appears. Direct the fumes onto the surface of the item in a fume hood or well-ventilated area.

5.4.2.2 **Passive Fuming Method**
This is also known as the "Cold" method. The exhibit is placed into a plastic bag with a quantity of iodine crystals (the equivalent of a standard iodine ampoule). Make a temporary seal to the bag. Warm the crystals with your hand which will create purple smoke from the heat coating the surface of the item inside. The exhibit and test print are monitored by viewing through the bag to determine when the processing is done.

5.5 **1, 8-Diazofluoren-9-one (DFO)**

5.5.1 **General Considerations**

5.5.1.1 DFO is a synthetic analogue of ninhydrin and reacts with amino acids in latent print residue. Blood and other body fluids can be developed with DFO. DFO developed impressions will fluoresce with the use of an ALS or laser.

5.5.1.1.1 DFO can be used to develop impressions on clothing that were created by skin coming into contact with clothing through impact (e.g. hit by a car, stomped by a shoe)

5.5.1.2 DFO is a fluorescent technique and is the recommended choice when processing substrates that are multi-colored or patterned.

5.5.1.3 DFO is available as a premix solution. When a premix is used follow the manufacturer's instructions.

5.5.1.4 DFO requires dry heat and cannot be used after ninhydrin processing

5.5.2 **DFO Reagent Preparation** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

5.5.2.1 Preparation of Stock DFO Solution:

5.5.2.1.1 Combine the following ingredients and place on a stirring device for approximately 20 minutes until the DFO is dissolved:

5.5.2.1.2	DFO	1g
5.5.2.1.3	Methanol	200 mL
5.5.2.1.4	Ethyl Acetate	200 mL
5.5.2.1.5	Glacial acetic acid	40 mL

5.5.2.2 Preparation of Working DFO Solution

5.5.2.2.1 Dilute the stock solution to 2 L with petroleum ether. The working solution should be a clear gold color.

5.5.3 **DFO Method**

5.5.3.1 Immerse or spray the item with the reagent and allow to thoroughly dry.

5.5.3.2 Heat the item using an oven set at 100ºC and 0% humidity for 20 minutes. If an oven isn't available a dry iron can be used. The item should be monitored for fingerprint development.

5.5.3.3 Examine the item using an alternative light source and photograph any latent impressions that are suitable for comparison.

5.5.3.4 Faint impressions may be retreated with a second or third application of DFO.

5.5.4 **DFO Storage and Shelf Life**

5.5.4.1 Store reagents in a chemical cabinet in dark bottles

5.5.4.2 The reagents are good for more than 6 months, but a control should always be run alongside of the evidence.

5.6 **Ninhydrin**

5.6.1 **General Considerations**

5.6.1.1 Ninhydrin reacts with amino acids in latent print residue. Blood and other body fluids will be developed with Ninhydrin. Ninhydrin developed impressions will be purple in color.

5.6.1.1.1 Ninhydrin can be used to develop impressions on clothing that were created by an amino acid rich surface (skin, blood, etc.) coming into contact with clothing (e.g., hit by a car, stomped by a shoe)

5.6.1.2 Ninhydrin can be used in a variety of carrier reagents depending on the evidence to be processed. The choice of carrier is left to the discretion of the analyst/technician who is processing the evidence.

5.6.1.2.1 Acetone carrier ninhydrin will cause ink to run

5.6.1.2.2 Thermal paper and latex gloves have special processing methods

5.6.1.2.3 HFE7100 is the safest solvent

5.6.2 **Ninhydrin Preparations**

5.6.2.1 Ninhydrin is available as a premix solution. When a premix is used follow the manufacturer's instructions.

5.6.2.2 **Ninhydrin – HFE7100 Carrier** Solvent Preparation *(The Fingerprint Sourcebook, NIJ, 2011)*

5.6.2.2.1 Dissolve 25g of ninhydrin in 225mL ethanol, 10 mL ethyl acetate, and 25 mL acetic acid

5.6.2.2.2 Add 1000 mL HFE7100

5.6.2.3 **Ninhydrin – Heptane Carrier** Solvent Preparation *(Ninhydrin on Latex Gloves: An Alternative Use for an Old Technique" Jason Pressly Journal of Forensic Identification 49 (3) 1999)*

5.6.2.3.1 Dissolve 33 g of ninhydrin crystals in 220 mL of ethanol

5.6.2.3.2 Remove 200 mL of heptane from a 1-gallon (3.8L) bottle of heptane and set aside.

5.6.2.3.3 Add the ninhydrin and ethanol mixture to the 1-gallon bottle of heptane and mix thoroughly.

5.6.2.3.4 Add the 200 mL of heptane back into the 1-gallon bottle, mix thoroughly.

5.6.2.3.5 For latex gloves:

5.6.2.3.5.1 Dip the gloves into ninhydrin and hang to dry.

5.6.2.3.5.2 Examine the gloves every 30 minutes up to 120 minutes and then again, the next day.

5.6.2.3.5.3 Photograph impressions as they develop as over-development eventually occurs on all types of latex gloves, causing the entire glove to turn purple.

5.6.2.4 **Ninhydrin – Petroleum Ether Carrier** Solvent Preparation *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

5.6.2.4.1 Dissolve 5 g of ninhydrin in 30 mL of methanol

5.6.2.4.2 Add 40 mL of isopropanol

5.6.2.4.3 Add the mixture to 930 mL of petroleum ether

5.6.2.5 **Ninhydrin – Acetone Carrier** Solvent Preparation *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

5.6.2.5.1 Dissolve 6 g ninhydrin crystals in 1000 mL of acetone

5.6.3 **General Ninhydrin Processing Method**

5.6.3.1 The item should be saturated with the reagent by spraying, dipping or brushing the reagent onto the item and allowing the item to thoroughly dry.

5.6.3.2 The item can be left at room temperature or subjected to moist heat to speed the development. Moist heat can be applied using a climate chamber set between 70°C-80°C and a relative humidity set between 60-80%. If a climate chamber is not available, a steam iron can be used. All carrier solvents are highly flammable. The item should be thoroughly dry prior to placing it in the chamber.

5.6.3.3 The item should be monitored for fingerprint development and any impressions that develop that are suitable for comparisons should be captured

5.6.4 **Ninhydrin Reagents Storage and Shelf Life**

5.6.4.1 Store reagent in a chemical cabinet in dark bottles

5.6.4.2 The reagent is good for up to a year, but a control should always be run alongside of the evidence.

5.7 **ThermaNin (for processing thermal paper)**

5.7.1 **General Considerations**

5.7.1.1 ThermaNin is the method of choice for processing thermal paper (receipts, etc.)

5.7.1.2 Thermal paper will turn black if treated with polar solvents like alcohols, acetone, ether, or ethyl acetate so standard ninhydrin formulations cannot be used.

5.7.1.3 ThermaNin is designed to be used for processing thermal paper

5.7.2 **ThermaNin Preparation** *(BVDA America, last accessed 04March2020)*

5.7.2.1 In a 100 mL container (glass), dissolve 0.4-0.5g of ThermaNin in 0.5 mL isopropanol and 1.5 mL ethyl acetate

5.7.2.2 Add HFE7100 to make 100 mL solution

5.7.3 **ThermaNin Use**

5.7.3.1 Saturate the item with the reagent and allow to dry

5.7.3.2 Thermal paper will turn black if heated so development happens at room temperature, in the dark, and at elevated humidity (80%)

5.7.4 **ThermaNin Storage**

5.7.4.1 ThermaNin should be made when needed and not stored

5.8 **Physical Developer**

5.8.1 **General Considerations**

5.8.1.1 Physical Developer (PD) is the method of choice for processing porous substrates that are, or have been, wet.

5.8.1.2 Physical Developer is used after DFO or other ninhydrin processes.

5.8.1.3 Only glassware should be used during the PD process. No metal objects (trays or tweezers) should be used. Plastic tweezers can be used.

5.8.1.4 All glassware should be thoroughly dry when used. Any moisture in the glassware will cause the PD to degrade.

5.8.1.5 Physical Developer is available as a kit. When a kit is used follow the manufacturer's instructions.

5.8.1.6 Physical Developer is fatal if swallowed. It contains silver nitrate and absorption of this into the body may cause cyanosis.

5.8.2 **Physical Developer Mixing Procedures** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

5.8.2.1 **Solution 1 (Maleic Acid)**

5.8.2.1.1 Dissolve 25g of Maleic Acid into 1000mL of distilled water

5.8.2.2 **Solution 2 (Redox)**

5.8.2.2.1 30g of Ferric Nitrate

5.8.2.2.2 80g of Ferrous Ammonium Sulfate

5.8.2.2.3 20g of Citric Acid

5.8.2.2.4 Dissolve all into 1000mL of distilled water

5.8.2.3 **Solution 3 (Detergent)**

5.8.2.3.1 Dissolve 3g of n-Dodecylamine Acetate and 4g of Synperonic-N into 1000mL of distilled water

5.8.2.4 **Solution 4 (Silver Nitrate)**

5.8.2.4.1 Dissolve 200g of Silver Nitrate into 1000mL of distilled water

5.8.3 **Physical Developer Processing Procedure**

5.8.3.1 **Tray 1 — Maleic Acid Solution 1**

5.8.3.1.1 Place the specimen(s) in Solution 1 and submerge. All specimens must be left in this solution for 5 minutes. If a specimen begins to emit bubbles, it must be submerged in the solution until the bubbling action ceases.

5.8.3.2 **Tray 2 — Redox Working Solution**

5.8.3.2.1 Solution 2 ..... 1000 mL

5.8.3.2.2 Solution 3 ..... 40 mL

5.8.3.2.3 Solution 4 ..... 50 mL

5.8.3.2.4 The redox working solution **must** be combined in the order listed. Solution 2 is placed in a beaker on a stirring device. Solutions 3 and 4 are then added and mixed for 3 to 5 minutes.

5.8.3.2.5 Once mixed, it is then placed in Tray 2, which is in turn placed on an orbital shaker. The orbital shaker is set for a gentle rocking motion of the redox working solution to assist the development process. If an orbital shaker is not available, rocking Tray 2 back and forth manually can also be effective.

5.8.3.2.6 Submerge the specimen(s) for 5 to 15 minutes. The amount of time will depend on the number of specimens in the tray. Generally, the more specimens in the tray, the longer the reaction time will be. Approximately 15 check-sized

specimens can normally be processed with 1 L of redox working solution.

5.8.3.3 **Tray 3 — Water Rinse**

5.8.3.3.1 The specimen(s) removed from the redox working solution, Tray 2, must be rinsed with distilled water to remove the excess solution. If this is not done, when the specimen is dried, it will become brittle and may be easily damaged or destroyed.

5.8.3.3.2 The specimen(s) removed from this rinse (Tray 3) must be dried. This can be done by air drying or applying heat (e.g., a dry iron).

5.8.4 **Physical Developer Storage and Shelf Life**

5.8.4.1 Solution 1 — clear or dark bottles / 5 years
5.8.4.2 Solution 2 — clear or dark bottles / 5 years
5.8.4.3 Solution 3 — clear or dark bottles / 6 months
5.8.4.4 Solution 4 — dark bottles / 6 months

6. Non-Porous Surfaces

6.1 Non-porous surfaces are those substrates that do not readily absorb liquid, as such, the latent print residues remain on top of the surface and are not readily absorbed into the substrate. Examples of non-porous surface include:

- Plastic
- Glass
- Ceramic
- Metal
- Foil
- Painted or varnished wood
- Magazine paper*
- Glossy paper*

***these will absorb water if immersed; however, the surface is treated so latent residue sits on the surface. If a drop of water placed onto the surface would be absorbed quickly then treat item as porous.**

6.2 General Considerations

6.2.1 Many non-porous items have textured surfaces that could be swabbed for DNA. Sampling for DNA is left up to the discretion of the analyst/technician depending on the case requests, case synopsis, and condition of the evidence.

6.2 Methods for developing prints on non-porous surfaces can be done in the following sequence. Outside of the superglue step the order of processing is not critical.

- Cyanoacrylate Ester (Superglue) Fuming
- Dye Stain
- Fingerprint Powders (Regular, Magnetic or Fluorescent)

6.3 **Cyanoacrylate Processing**

6.3.1 **General Considerations**

6.3.1.1 Cyanoacrylate fumes are hazardous to the eyes, nose, and throat.

6.3.1.2 Heating of cyanoacrylates above 140ºC can lead to the production of hydrogen cyanide gas. Ensure all fumes have been evacuated from the chamber before opening. Avoid inhaling any residual vapors.

6.3.1.3 Cyanoacrylate ester is highly adhesive and bonds skin in seconds. Caution should be used while handling cyanoacrylate.

6.3.2 **Misonix CA-6000 - Cyanoacrylate Fuming Chamber**

6.3.2.1 Follow manufacturer's directions for the use of the chamber

6.3.2.2 Turn on the chamber using the main power switch located on the front panel

6.3.2.3 Press the unlock button and open the main door

6.3.2.4 Place the evidence inside the chamber along with a test print that can be monitored

6.3.2.5 Close the door and turn the handle to seal the chamber

6.3.2.6 Place a quarter size amount (approximately 1 to 1.5 grams) of cyanoacrylate ester in a heat resistant dish and place on the hot plate (behind the auxiliary door). Ensure the hot plate auxiliary door is properly closed.

6.3.2.7 Verify the chamber settings are correct

6.3.2.7.1 Settings will vary depending on the time of year and how many items are in the chamber. A test print should be used to monitor fuming.

6.3.2.7.2 Recommended humidity is 70%-80%

6.3.2.7.3 Recommended purge time is over 30 minutes

6.3.2.8 Verify the vent switch is set correctly and press the "Start" button. Once the humidity level reaches the set point, the hot plate will activate to begin vaporizing the liquid cyanoacrylate ester

6.3.2.9 Periodically check the test prints to monitor the fuming cycle. If the test print develops prior to the end of the fuming cycle, the fuming cycle can be stopped by pressing the "purge" button on the control panel.

6.3.2.10 Once the purge cycle is complete press the "unlock" button on the control panel to unlock the door and enable removal of the evidence.

6.3.3 **Lumicyano Fuming**

6.3.3.1 Lumicyano is a commercial cyanoacrylate with a separate powder additive that allows the cyanoacrylate to fluoresce under several different wavelengths of light.

6.3.3.2 Lumicyano is for use with non-porous surfaces. It can be used in place of traditional cyanoacrylate/dye stain or cyanoacrylate/powder processing and should be considered when wet chemistry processing and/or powder processing is not warranted or ideal.

6.3.3.3 Lumicyano was found during our laboratory testing to be unreliable with varnished wood surfaces. Varnished wood should be processed using traditional techniques.

6.3.3.4 Lumicyano can be followed by Basic Yellow dye staining if more fluorescence is required.

6.3.3.5 Lumicyano does not destroy DNA; therefore, evidence can be swabbed for DNA, if necessary, after Lumicyano processing.

6.3.3.6 Due to the Lumicyano needing a higher temperature to vaporize appropriately and at an optimal humidity range, the Misonix CA-6000 must be used for fuming with Lumicyano. The following settings and Lumicyano ratio should be used:

- 6.3.3.6.1 26 drops or 0.8g of the CA glue included with the kit (can not use other CA glue).
- 6.3.3.6.2 1 scoop of Lumicyano powder
- 6.3.3.6.3 80% humidity
- 6.3.3.6.4 15 minutes fuming time
- 6.3.3.6.5 20 minutes (minimum) purging time

6.3.3.7 Ridge detail will fluoresce using the blue (445nm) or green (532nm) laser with orange barrier filters. In laboratory testing it was found that the optimal wavelength depended on the color of the background. Both wavelengths should be considered when looking for print development.

6.3.3.8 The fluorescence could only last a few days to a week, so impressions should be preserved with digital photography or scanning as soon as possible.

6.3.4 **Cyanoacrylate Fuming (non-automated) Method**

6.3.4.1 If the automated fuming chamber is not available, smaller, stand-alone chambers can be used. Humidity can be added using hot water/steam. A hotplate can be used to heat the cyanoacrylate.

6.3.4.2 Some cyanoacrylate accelerants and/or kits (e.g. CYANO-SHOT™, HotShot™, CYANOWAND™) are commercially available. If used, follow manufacturer's instructions.

6.3.4.3 A test print should be run along with the evidence in the chamber to monitor the fuming process.

6.4 Dye Stains

6.4.1 These dyes will stain cyanoacrylate fumed latent impressions which can then be visualized with the aid of an ultraviolet or forensic light source.

6.4.2 The dye stains come as a premix or liquid concentrate. Use as directed by the manufacturer.

6.4.3 Most of the dye stains can be purchased or mixed in alcoholic or aqueous form. The choice of solvent will depend on the substrate being treated. Alcoholic solvents tend to destroy varnished surfaces and should be avoided when possible.

6.4.4 The following are the dye stains used by the Latent Print Section

- Ardrox
- Basic Yellow 40
- RAM
- Rhodamine 6G
- Sudan Black (does not fluoresce)
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6.4.3 **Ardrox Dye Stain** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

6.4.3.1 **Mixing Procedure** (Mix in order listed. Do not place on magnetic stirrer)

6.4.3.1.1 Mix 2 mL of Ardrox P133D with 10mL of Acetone
6.4.3.1.2 Add 25 mL of Methanol
6.4.3.1.3 Add 10 mL of Isopropanol
6.4.3.1.4 Add 8 mL of Acetonitrile
6.4.3.1.5 Add 945 mL of Petroleum Ether

6.4.3.2 **Processing Procedure**

6.4.3.2.1 Dip or Spray on item
6.4.3.2.2 View under long-wave UV light source

6.4.3.3 **Storage and Shelf Life**

6.4.3.3.1 Store in dark glass bottles for up to 180 after mixing

6.4.4 **Basic Yellow 40 Dye Stain** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

6.4.4.1 **Mixing Procedure**

6.4.4.1.1 Dissolve 2g of Brilliant Yellow 40 into 1L of Ethanol

6.4.4.2 **Processing Procedure**

6.4.4.2.1 Dip or spray items with the solution

6.4.4.2.2 Rinse with gently running water or Ethanol
6.4.4.2.3 View under a forensic light source

6.4.4.3 **Storage and Shelf Life**
6.4.4.3.1 Store in dark glass bottles for up to 180 after mixing

6.4.5 **RAM (Rhodamine 6G, Ardrox, MBD) Dye Stain** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*
6.4.5.1 **Stock Solution 1 (R6G) Mixing Procedure**
6.4.5.1.1 Dissolve 1g of Rhodamine 6G into 1000 mL of Methanol

6.4.5.2 **Stock Solution 2 (MBD)**
6.4.5.2.1 Dissolve 1g of MBD into 1000 mL of Acetone

6.4.5.3 **Working Solution** (Mix in order listed. Do not place on magnetic stirrer)
6.4.5.3.1 Mix 3 mL of Stock Solution 1 with 2 mL of Ardrox P133D
6.4.5.3.2 Add 7 mL of Stock Solution 2
6.4.5.3.3 Add 20 mL of Methanol
6.4.5.3.4 Add 10 mL of Isopropanol
6.4.5.3.5 Add 8 mL of Acetonitrile
6.4.5.3.6 Add 950 mL of Petroleum Ether

6.4.5.4 **Processing Procedure**
6.4.5.4.1 Dip or spray the solution on the items
6.4.5.4.2 View under a Laser or Alternate Light Source

6.4.5.5 **Storage and Shelf Life**
6.4.5.5.1 Dark glass bottles
6.4.5.5.2 Stock Solution 1 (Rhodamine 6G) — 5 years
6.4.5.5.3 Stock Solution 2 (MBD) — 5 years
6.4.5.5.4 RAM working solution is stable for approximately 30 days.

6.4.6 **Rhodamine 6G Dye Stain** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*
6.4.6.1 **Stock Solution**
6.4.6.1.1 Rhodamine 6G ..... 1 g
6.4.6.1.2 Methanol ..... 1000 mL
6.4.6.1.3 Combine the ingredients and place on a stirring device until all the rhodamine 6G is dissolved.

6.4.6.2 **Working Solution** (Mix in order listed. Do not place on magnetic stirrer)
6.4.6.2.1 Rhodamine 6G stock solution ..... 3 mL

6.4.6.2.2 Acetone ..... 15 mL
6.4.6.2.3 Acetonitrile..... 10 mL
6.4.6.2.4 Methanol ..... 15 mL
6.4.6.2.5 Isopropanol ..... 32 mL
6.4.6.2.6 Petroleum ether ..... 925 mL

6.4.6.3 **Processing Procedure**

6.4.6.3.1 The rhodamine 6G working solution can be applied by either dipping or using a sprayer or squirt bottle.

6.4.6.3.2 This solution is applied to the specimen(s) after the cyanoacrylate process and followed by examination under a laser or alternate light source.

6.4.6.4 **Storage and Shelf Life**

6.4.6.4.1 Dark bottles
6.4.6.4.2 Stock solution — indefinite
6.4.6.4.3 Working solution — up to 6 months

6.4.7 **Sudan Black Dye Stain** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

6.4.7.1 Sudan black is a dye that stains sebaceous perspiration to produce a blue-black image. It is best used for developing oily or greasy impressions.

6.4.7.2 **Mixing Procedure**

6.4.7.2.1 Dissolve 15g of Sudan Black into 1000 mL of Ethanol
6.4.7.2.2 Add 500 mL of distilled water and stir

6.4.7.3 **Processing Procedure**

6.4.7.3.1 Dip or spray the solution on the items
6.4.7.3.2 Let item soak for approximately 2 minutes
6.4.7.3.3 Rinse with water (tap or distilled)
6.4.7.3.4 Let the item dry

6.4.7.4 **Storage and Shelf Life**

6.4.7.4.1 Reagent can be stored in glass bottled indefinitely

6.4.8 This chart is for starting reference. When using a variable wavelength light source (Crimescope ®) a series of wavelengths and filters should be checked to determine which setting gives the best contrast with the background

Barrier Filter	Wavelength Range (nm)
Clear/None	350
Yellow	350-445
Orange	415-475
Red	475-700
Red or IR	700-1100

6.5 **Fingerprint Powder Method of Enhancement** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

6.5.1 Fingerprint powders are used to process untreated, cyanoacrylate fumed, and sometimes bloody latent prints. They can be used to develop footwear and tire impressions on non-porous surfaces (floors, countertops, etc.)

6.5.2 The color of the powder selected depends on the background. A contrasting powder should be selected.

6.5.3 **Nonmagnetic Powder Processing Procedure**

6.5.3.1 Pour needed amount of powder into a small pile.

6.5.3.2 Dip tips of bristles of brush into powder.

6.5.3.3 Apply a small amount of powder onto the surface and begin to brush.

6.5.3.4 Brush in the direction of any ridges that begin to appear.

6.5.3.5 Build powder onto ridges and stop when latent print reaches point of sufficient clarity.

6.5.3.6 Clean excess powder from between ridges using a clean brush.

6.5.4 **Magnetic Powder Processing Procedure**

6.5.4.1 Place magna brush wand with magnet engaged into container of magnetic powder. This will produce a bristle-like effect at the end of the wand when withdrawn.

6.5.4.2 Apply in a circular motion to the surface being examined. Make sure that only the magnetic powder touches the surface, not the wand.

6.5.4.3 Excess powder can be removed using the magnetic wand.

6.5.5 **Fluorescent Powder Processing Procedure**

6.5.5.1 Fluorescent powders are best on multi-colored or dark backgrounds.

6.5.5.2 When using fluorescent powders an ostrich/feather brush is used.

6.5.5.3 Dust the item under the alternate light source while wearing the appropriate goggles. This will prevent over-application of the fluorescent powder.

6.5.5.4 Prints developed with fluorescent powders are photographed utilizing the alternate light source and filters as needed.

6.5.6 **Storage**

6.5.6.1 Powders can be stored in their original container

6.5.6.2 A desiccant pack can be placed in the container to help keep the powders dry

7. Adhesive Surface Processing

7.1 General Considerations

7.1.1 The following techniques are provided as a general guide for processing adhesive surfaces. Due to the vast number of brands and compositions of tape, and the number of ways adhesive surfaces are received by the latent print section, it is up to the examiner/technician processing the evidence to determine the most efficient and effective method and sequence for processing.

7.1.2 Regardless of processing sequence, as each processing technique is applied, the evidence will be visually examined for the presence of latent prints. Useable ridge detail will be digitally captured before the next phase of processing.

7.2 Processing Guide

7.2.1 Visual Examination

7.2.2 Apply techniques for the processing of the non-adhesive surfaces:

7.2.2.1 If necessary, cyanoacrylate fume the entire item. When the tape is wrapped around something (or balled together) the whole item can be fumed intact prior to separating the adhesive.

7.2.3 If necessary, separate strips/items using Un-Du, freezing, or heat/steam (see below)

7.2.4 Apply techniques for processing the adhesive surfaces:

7.2.4.1 Cyanoacrylate fume the exposed adhesive and Basic Yellow dye stain/Alternative Light Source (Optional) AND/OR

7.2.4.2 Gentian Violet AND/OR

7.2.4.3 Powder Suspension

7.3 Release and Separation of Adhesives

7.3.1 It is often necessary to separate adhesive surfaces from other surfaces, or themselves, during the processing of the evidence. There are various methods available for releasing adhesives from another surface. These methods include freezing, heat, and releasing agents such as Un-Du. Which method is chosen will depend on the surfaces needed to be released.

7.3.2 Precaution should be exercised when choosing an adhesive release method and a quality control test with similar tape should be performed before application to casework. The following methods have been shown to be affective:

7.3.2.1 Tape backing from adhesive: While tape is designed to be removed readily from the non-adhesive sides of tape, assistance may be needed to prevent

distortion or adhesive loss. A releasing agent such as Un-Du, freezing using liquid nitrogen, a freezer, or an inverted compressed air can be used.

7.3.2.2 Adhesive from adhesive: An adhesive layer bound to another adhesive layer can be difficult to separate. Factors such as the thickness and composition of the adhesive layers will affect the amount of separation without loss that can be achieved. A releasing agent such as Un-Du or freezing using a freezer or inverted compressed air can be used. Assistance while using either method may be needed, as constant and consistent force may be needed to separate the layers. It should be noted that even if the adhesive layers are too bound to be separated for latent survival, the process could reveal additional evidence such as trace or areas suitable for swabbing for DNA.

7.3.2.3 Adhesive from paper: For tape or stamps on paper or other non-porous products, a releasing agent such as Un-Du should be used. It does not inhibit Ninhydrin and is the recommended process for this situation. Freezing does not adequately separate the adhesive from the fibers in paper products. Heat from a hair drier or steam can also be used but precautions should be taken to prevent the paper from overheating or becoming so wet that is becomes damaged.

7.4 Adhesive Processing Methods

7.4.1 Gentian/Crystal Violet Preparation and Method (water-based)

7.4.1.1 Thoroughly dissolve 0.5 g of Gentian Violet powder into 500 mL of distilled water (quantity of the batch made depends on need)

7.4.1.2 Pour the Gentian Violet solution into a suitably-sized glass or stainless-steel tray.

7.4.1.3 The adhesive can be processed by applying the Gentian Violet to the surface of the adhesive for 1-2 minutes. Floating the adhesive side on the solution, dipping the tape in the solution or pipetting the solution across the adhesive surface all work well.

7.4.1.4 The adhesive is then rinsed with cold water (tap or distilled) and examined for any developed latent prints.

7.4.1.5 Developed impressions are purple in color. The staining may be repeated to darken the impressions.

7.4.1.6 Storage: Indefinite shelf life

7.4.2 Powder Suspension "Paint On" Preparation and Method

7.4.2.1 Mix a solution of water and the wetting agent (Kodak Photo-Flo, Liqui-Nox or liquid detergent) in a glass beaker in a 1:1 ratio.

7.4.2.2 Mix a quantity of Sticky-Side Powder or fingerprint powder (as needed) in a beaker with the water/liquid detergent to make a liquid that has a consistency of paint.

7.4.2.3 Paint the solution onto the adhesive surface with a brush and allow it to remain on the surface for approximately 10 to 20 seconds then gently rinse with water. This process can be repeated if necessary.

7.4.2.4 Storage: Indefinite shelf life

7.4.3 **Powder Suspension "Submersion" Preparation and Method**

7.4.3.1 Fill a glass tray to an appropriate depth with water then the powder suspension solution is added to the water. Some of the powder will suspend in the water.

7.4.3.2 The water should be agitated or stirred to allow the maximum amount of the powder to suspend. Insert the adhesive surface (adhesive side up) in the tray, the particles of powder will settle onto the surface being examined. The surface is removed from the water after twenty minutes (or longer, at the scientist's discretion) and rinsed with water if necessary. This procedure can be repeated if desired.

7.4.3.3 Storage: Indefinite shelf life

7.5 **Sources**

7.5.1 Champod, C. et.al., Fingerprints and Other Ridge Skin Impressions. CRC Press. Boca Raton, Fl. 2004 pp 160-163

7.5.2 Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2001

7.5.3 Boston Police Department Latent Print Unit, Latent Print Processing, LPU-SOP Rev 2019.0, Section 4.5

7.5.4 Lacey, L. "Stick it to 'Em. Guide to Processing Tape Evidence" presented at the International Association for Identification Educational Conference, Reno NV, August 2019.

8. Wet or Previously Wet Surfaces

8.1 These methods may be employed when items are, or have been, wet

8.1.1 Small Particle Reagent (SPR) for wet non-porous items. If dry, it can be processed as a non-porous item, see section 6.

8.1.2 Physical Developer for wet or previously wet porous items.

8.2 **Small Particle Reagent**

8.2.1 **General Considerations**

8.2.1.1 Small Particle reagent is a suspension of fine molybdenum disulfide in a detergent. It adheres to the fatty constituents of latent print residue to form a black (or white) deposit.

8.2.1.2 Although the process is sensitive, it is much more effective on fresh fingerprints than older ones.

8.2.1.3 SPR spray application is suitable for all non-porous surfaces but is recommended for those that are wet and/or oily/greasy.
8.2.1.4 SPR may also be used on non-porous surfaces such as polystyrene foam, ceiling tiles, and packaging foam.
8.2.1.5 Small Particle Reagent is available in a pre-mixed form (black or white). Follow manufacturer's instructions for use.

8.2.2 **Small Particle Reagent "Dipping" Method**
8.2.2.1 Stir the SPR thoroughly and put the solution into a tray.
8.2.2.2 Agitate the solution in the tray and add the item to be processed to the solution. Particles of MoS_2 will settle on the surfaces being examined.
8.2.2.3 Repeat, if necessary, to other sides
8.2.2.4 After two minutes, remove the item from the SPR and gently rinse with tap water.
8.2.2.5 Allow the surface to dry in a vertical position

8.2.3 **Small Particle Reagent "Spray" Method**
8.2.3.1 Put the SPR into a spray bottle and shake thoroughly. The bottle needs to be shaken often during the application to keep the MoS_2 in suspension.
8.2.3.2 Spray the SPR onto the item being examined.
8.2.3.3 Gently rinse the processed area with tap water
8.2.3.4 Dry in a vertical position to prevent water spotting
8.2.3.5 Inspect the area that was processed, photograph and lift any suitable latent prints.
8.2.3.6 Prints can be lifted while the object is still wet. This is done by applying the tape with a squeegee.
8.2.3.7 The squeegee may also be used when applying the lift to the backer.

8.3 **Physical Developer Preparation and Method**
8.3.1 See Section 5.8 for instructions on the preparation and use of Physical Developer

9. Blood Impression Enhancement

9.1 General Considerations
9.1.1 **Blood Enhancement Chemicals**
9.1.1.1 There are several different techniques that can be used to enhance impressions in blood. The technique chosen will depend on the substrate color and composition as well as any additional forensic tests that might need to occur with the evidence. The choice is left to the discretion of the analyst/technician processing the evidence.
9.1.1.2 Protein Stains
9.1.1.2.1 Acid Yellow (fluorescent/yellow stain)
9.1.1.2.2 Amido Black (dark blue to black stain)

9.1.1.3 Hemoglobin-Reactant Techniques
- 9.1.1.3.1 Bluestar® (chemiluminescent)
- 9.1.1.3.2 Leucocrystal Violet (LCV) (dark purple stain)
- 9.1.1.3.3 Luminol (chemiluminescent)

9.1.1.4 Amino Acid Reactant Techniques
- 9.1.1.4.1 DFO (fluorescent)
- 9.1.1.4.2 Ninhydrin (dark purple stain)

9.1.2 **Blood Fixatives for Processing**

9.1.2.1 Blood is water soluble and needs to be "fixed" in place to prevent it from running when chemicals are applied. Many kits and pre-mixes come with the fixative already in solution. Some fixatives that can be used are:
- 9.1.2.1.1 5-Sulfosalicylic acid solution fixes the blood by precipitating the proteins
- 9.1.2.1.2 Methanol fixes the blood by dehydrating it

9.1.3 **Additional Forensic Testing Considerations**

9.1.3.1 If there is a request to examine an item for blood, the item should first be examined by the Forensic Chemistry Section. Contact a Forensic Chemist if blood is suspected on an item, and it had not been seen by the Forensic Chemistry Section.

9.1.3.2 Discretion should be utilized when applying chemicals to blood impressions as this may dilute a faint stain further reducing the possibility of obtaining enough DNA to produce a profile. When possible, swab an area of the stain prior to chemical treatment.

9.1.4 **Substrate Precautions**

9.1.4.1 Solvents such as methanol can damage painted or varnished surfaces

9.1.5 **Kits and Premixes**

9.5.5.1 Many of the enhancement chemicals and processes can be purchased as a kit or in a pre-mix. When using kits or pre-mixes, follow the manufacturer's instructions for preparation and use.

9.1.6 **Standards and Controls**

9.1.6.1 A known blood standard should be used as a control during processing to verify the techniques and procedures are working as desired.

9.2 **<u>Protein Stains</u>**

9.2.1 **<u>Acid Yellow 7 (AY7) Reagent</u>** *(BVDA America, accessed 05Mar2020)*

9.2.1.1 General Considerations

9.2.1.1.1 AY7 is a reagent for staining impressions in blood. After treatment with this dye solution the prints will be stained yellow. Stained prints will fluoresce under blue/green light between 400 to 505nm.

9.2.1.1.2 In-house testing found AY7 did not perform well on porous surfaces as it is so difficult to rinse. If used on a porous surface, consider how it will be rinsed.

9.2.1.2 **Blood Fixative** (1000 mL of solution)

9.2.1.2.1 20 g of Sulfosalicylic acid dehydrate

9.2.1.2.2 1000 mL of distilled water

9.2.1.3 **Acid Yellow 7 Working solution** (1000 mL of solution)

9.2.1.3.1 Add 1 g acid yellow to 50 mL of acetic acid

9.2.1.3.2 Add 250 mL of ethanol

9.2.1.3.3 Add 700 mL of distilled water

9.2.1.3.4 STIR FOR 30 MINUTES

9.2.1.4 **Wash** (1000 mL of solution)

9.2.1.4.1 50 mL of glacial acetic acid

9.2.1.4.2 250 mL of ethanol

9.2.1.4.3 700 mL of distilled water

9.2.1.5 **Fixing Process**

9.2.1.5.1 Fix the blood prints first. Use an absorbent material such as paper, filter paper or paper towels. It should be large enough to cover the print or surface to be treated. Gently place the edge of the absorbent material on the area and moisten, allowing the paper to adhere to the surface while wetting with the fixative.

9.2.1.5.2 Try to prevent air from becoming trapped under the material. Tap out bubbles or do this on an angled surface.

9.2.1.5.3 Leave the moistened paper over the print for a minimum of three minutes. When the blood is a thick layer, leave the paper there for 5 minutes or more.

9.2.1.5.4 Fresh blood will change color from red to dark brown when fixed.

9.2.1.6 **Staining**

9.2.1.6.1 The AY7 can be applied by washing or submerging. If spraying the solution, take measures to prevent inhalation of the aerosols, particularly the ethanol vapor.

9.2.1.6.2 One could also use an absorbent material such as paper, filter paper or paper towels to cover the impression and soak the area such as what was done in the fixing step. It should be large enough to cover the area to be treated. The absorbent material is placed gently over the area and moistened, allowing the material to adhere to the surface.

9.2.1.6.3 The stain should remain in contact with the blood for 1-3 minutes.

9.2.1.7 **Washing**

9.2.1.7.1 Wash the print with the prepared wash solution. Water may be used but will create more background staining.

9.2.1.7.2 If the surface is horizontal, such as a floor, the excess wash may be removed by blotting with paper towels or by using a wet/dry vacuum.

9.2.1.8 **Capturing**

9.2.1.8.1 The enhanced blood prints may be examined directly with an alternate light source and photographed.

9.2.1.8.2 The stained prints will fluoresce between 400 – 505 nm and with long-wave UV. The barrier filter used will depend on the excitation wavelength.

9.2.1.8.3 The impressions can also be lifted with a gel lifter once *completely* dry. Leave the lifter on the print no longer than one minute. Photograph the prints after the lifting within an hour or two as the dye will slowly diffuse into the gel.

9.2.1.8.4 The prints can also be re-treated with the stain and lifted multiple times.

9.2.1.9 **AY7 Storage and Shelf life**

9.2.1.9.1 Dark glass bottles away from light

9.2.1.9.2 Indefinite

9.2.2 **<u>Amido Black - Methanol Based Solution Preparation</u>** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

9.2.2.1 General Considerations

9.2.2.1.1 Amido Black works well on non-porous, light-colored surfaces. If used on a porous surface consideration needs to be given to how it will be rinsed.

9.2.2.1.2 Amido Black is a dark stain. Consideration should be given to the color of the background and the level of contrast that will be produced.

9.2.2.1.3 The methanol solvent can destroy painted or varnished surfaces

9.2.2.2 **Stain Solution**

9.2.2.2.1 Dissolve 2g of Amido black in 100 mL of acetic acid
9.2.2.2.2 Add 900 mL Methanol

9.2.2.3 **Rinse Solution**

9.2.2.3.1 100 mL acetic acid in 900 mL of methanol

9.2.2.4 **Methanol-based Amido Black Processing**

9.2.2.4.1 Dip or spray the stain over the impression
9.2.2.4.2 Allow to sit for 30 seconds to 1 minute
9.2.2.4.3 Apply rinse
9.2.2.4.4 Repeat if needed

9.2.2.5 **Methanol-based Amido Black Storage and Shelf Life**

9.2.2.5.1 Glass bottle
9.2.2.5.2 Indefinite

9.2.3 **Amido Black – Aqueous Based Solution** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2001)*

9.2.3.1 General Considerations

9.2.3.1.1 Amido Black works well on non-porous, light-colored surfaces. If used on a porous surface consideration needs to be given to how it will be rinsed.
9.2.3.1.2 Amido Black is a dark stain. Consideration should be given to the color of the background and the level of contrast that will be produced.

9.2.3.2 **Stain Solution**

9.2.3.2.1 500 mL Distilled water
9.2.3.2.2 20 g 5-Sulfosalicylic acid
9.2.3.2.3 3 g Amido Black
9.2.3.2.4 3 g Sodium Carbonate
9.2.3.2.5 50 mL Formic acid
9.2.3.2.6 50 mL Glacial acetic acid
9.2.3.2.7 12.5 mL Kodak Photo-Flo™ Solution
9.2.3.2.8 Dilute to 1L using distilled water

9.2.3.2 **Aqueous Amido Black Processing**

9.2.3.2.1 Dip or spray the stain over the impression

9.2.3.2.2 Allow to sit for 3 to 5 minutes
9.2.3.2.3 Rinse with tap water
9.2.3.2.4 Repeat if needed

9.2.3.3 **Aqueous Amido Black Storage and Shelf Life**
9.2.3.3.1 Glass bottle
9.2.3.3.2 Indefinite

9.3 Hemoglobin Reactant Techniques

9.3.1 General Considerations
9.3.1.1 Generally only one of these techniques can be used because they each react with the same components of blood.

9.3.2 Bluestar® *(Bluestar-forensic, accessed 06Mar2020)*

9.3.2.1 General Considerations
9.3.2.1.1 Bluestar® produces a very bright and long lasting blue chemiluminescence that does not require total darkness to be visible; however, for dilute bloodstains, the luminescence will be more obvious in total darkness.
9.3.2.1.2 False positive reactions may occur due to the presence of certain household detergents, chlorine, copper and other contaminants in certain plants or soils.
9.3.2.1.3 Best results are obtained when the product is used within 24 hours of mixing

9.3.2.1 **Bluestar® Preparation**
9.3.2.1.1 Bluestar is available as a kit. Follow the manufacturer's instructions for use.

9.3.2.2 **Bluestar® Use**
9.3.2.2.1 Spraying as a fine mist is the most effective way to apply Bluestar®.
9.3.2.2.2 Indoor: Close all windows, block all outside light sources, and turn off all the lights.
9.3.2.2.3 Outdoors: Wait for night time and turn off all area lights in an urban environment. If necessary, screen off distant light sources, or even a very bright moon, and work facing away from parasite lights.

9.3.2.3 **Capturing Impressions Developed with Bluestar®**
9.3.2.3.1 Developed impressions should be photographed immediately.

9.3.2.6 **Storage and Shelf Life**

9.3.3.6.1 3- year shelf life prior to mixing

9.3.3.6.2 Mixed Bluestar® should not be stored

9.3.3 **Leucocrystal Violet** *(Processing Guide for Developing Latent Prints, Federal Bureau of Investigation, 2000)*

9.3.3.1 General Considerations

9.3.3.1.1 Leucocrystal Violet (LCV) is a colorless form of crystal violet that turns dark purple when it contacts blood.

9.3.3.1.2 LCV is very sensitive. Caution should be taken when applying to visible blood as it can react heavily and over develop any impressions.

9.3.3.3 **LCV Preparation**

9.3.3.3.1 Hydrogen peroxide 3% ..... 1000 mL

9.3.3.3.2 5-Sulfosalicylic acid ..... 20 g

9.3.3.3.3 Sodium acetate ..... 7.4 g

9.3.3.3.4 LCV ..... 2 g

9.3.3.3.5 Combine ingredients in the order listed and place on a stirring device for approximately 30 minutes.

9.3.3.4 **LCV Processing**

9.3.3.4.1 Spraying as a fine mist is the most effective way to apply LCV.

9.3.3.4.2 The more visible the blood, the more the LCV will react (bubble and fizz), and the more it reacts the more likely the impression will be damaged. A reaction can be stopped by spraying the area with water.

9.3.3.4.3 The area can be blotted with a tissue or paper towel

9.3.3.4.4 The procedure can be repeated if necessary

9.3.3.5 **Capturing LCV Developed Impressions**

9.3.3.5.1 Enhanced blood impressions should be photographed immediately.

9.3.3.6 **Storage and Shelf Life**

9.3.3.6.1 Store in dark bottles for up to 30 days

9.3.4 **Luminol** (*Footwear Impression Evidence, Second Ed., Bodziak)*

9.3.4.1 General Considerations

9.3.4.1.1 Luminol is a chemiluminescent reaction used to detect and enhance impressions deposited in blood.

9.3.4.1.2 False positive reactions may occur due to the presence of certain household detergents, chlorine, copper and other contaminants in certain plants or soils. False reactions differ from those of the typical reaction on blood as they are usually dimmer and whiter.

9.3.4.2 **Luminol Preparation**

9.3.4.2.1 0.1g of Luminol
9.3.4.2.2 Add 5g of Sodium Carbonate
9.3.4.2.3 Add 100ml of water and mix until dissolved
9.3.4.2.4 Just before using add 0.7g of Sodium Perborate and mix thoroughly

9.3.4.3 **Luminol Processing**

9.3.4.3.1 Spray with fine mist as lightly as possible
9.3.4.3.2 Document and record any details necessary

9.3.4.4 **Storage and Shelf Life**

9.3.4.4.1 Do not store

9.4 Amino Acid Reactant Techniques

9.4.1 General Considerations

9.4.1.1 These reagents react with amino acids so can be used to process porous items to enhance blood impressions

9.4.2 1, 8-Diazofluoren-9-one (DFO)

9.4.2.1 DFO is a fluorescent technique and, if used, should be used prior to ninhydrin
9.4.2.2 Refer to Section 5.5 for instructions on the preparation and use of DFO

9.4.3 Ninhydrin

9.4.2.1 Ninhydrin reacts with amino acid to produce a purple product.
9.4.2.2 Ninhydrin should be used after DFO and before Physical Developer if other enhancement techniques are to be used.
9.4.2.3 Refer to Section 5.6 for instructions on the preparation and use of ninhydrin