**Raleigh/Wake City-County**

**Bureau of Identification**

**Investigations Division**

**Chemical Processing Technical Procedure Manual**



**July 2013**

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**Chapter 1: Laboratory Safety**

**1.1 Purpose**

To establish general safety and precautionary procedures for employees working in or around CCBI Laboratories.

**1.2 Chemical Handling**

1.2.1. General precautions which shall be followed for the handling and use of all chemicals are:

1. Skin contact with all chemicals shall be avoided.

2. All employees shall wash all areas of exposed skin prior to leaving the lab.

3. Mouth suction for pipetting or starting a siphon is prohibited.

4. Eating, drinking and all tobacco products in the laboratory is prohibited.

5. All chemicals should be considered toxic.

6. All containers shall be property marked as to indicate the item in the container.

**1.3 Laboratory Equipment and Glassware**

1.3.1. Each employee shall keep the lab clean and uncluttered. All chemicals and equipment shall be properly labeled. At the completion of each work day or operation, the work area and equipment shall be thoroughly cleaned and stored.

1.3.2. Brown Kraft paper shall be placed on the tabletop to prevent cross contamination. If a biohazard item is examined, the workstation will be cleaned with a bleach solution.

**1.4 Personal Protective Equipment**

1.4.1. Safety eyewear and gloves should be work during chemical transfers. Lab coats and gloves shall be used while processing evidence. Contact lens users should wear protective eye care. In the event of a chemical splash in the eyes, the removal of the contact lens can become difficult.

**1.5 UV Protection**

1.5.1. When using ultraviolet lights, the eyes must be protected from direct or indirect exposure. Prolong exposure to the skin should also be avoided.

**1.6 Fire Hazards**

1.6.1. Flammable or combustible materials such as methanol, acetone and ether, ignite easily when exposed to air and an ignition source. When working with ninhydrin and the iron, sealed the ninhydrin container and removed the working solution prior to plugging in the iron.

**1.7 Housekeeping**

1.7.1. Each employee is directly responsible for the cleanness of the laboratory and for restocking of supplies. If chemicals or other supplies are needed, it is the employee’s responsibility to notify a supervisor.

1.7.2.All spills in the lab shall be immediately cleaned and property disposed of.

1.7.3. All floors, aisles, exits, fire extinguishers and eyewashes shall remain unobstructed.

**1.8 Safety and Emergency Equipment**

1.8.1. A fire extinguisher is located on the wall in the Vehicle Examination area, to the right of the Dry Lab door. A first aid kit is located on the counter in the Wet Lab, next to the Air Clean station.

1.8.2. The eye wash stations are located at both sinks in the Wet Lab, and at both sinks in the Dry Lab, at the sink in the Trace Lab.

1.8.3. Emergency face wash stations are located on the wall next to the sink in the Trace Lab, on the wall next to the rear door in the Dry Lab, and on the wall next to the rear door of the Wet Lab.

1.8.4. The showers are located in the Vehicle Examination area, next to the Dry Lab door, in the Dry lab next to the rear door, in the Trace lab next to the rear door, in the Wet Lab next to the rear door, and in the Decontamination Room in the Evidence Receiving area.

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**Chapter 2: Reagent Log**

**Good Laboratory Practices**

All prepared reagents will be properly identified and labeled with the following information:

1. Reagent name
2. Hazard labels
3. Date prepared or received initials of preparer/receiver
4. Lot and/or kit/batch numbers/set numbers
5. Expiration dates (if applicable)

In the event of any question regarding the proper processing method or chemicals to be used, the Crime Scene Supervisor or designated representative will be consulted.

**1.1 Purpose**

To establish the actions necessary to document the testing of chemicals/reagents used in the processing of crime scenes. The logbook will describe the procedures to test each reagent with positive and negative controls and the desired reaction.

**1.2 Materials**

1. Personal protective equipment
2. Log book
3. Writing Implement
4. Control Samples
5. Reagent Chemicals

**1.3 Procedures**

1. Wear suitable protective clothing, gloves and goggles.
2. At the time of preparation, the documentation within the reagent logbook will include the chemical/reagent name, lot number, bottle number (if applicable), date of preparation or opening for initial use, initials of the person who prepared the reagent and the person testing the chemical and the results of tests with both positive and negative controls. The dates that each reagent goes into service and when they are taken out of service will also be recorded within the reagent log.
3. Test results will be indicated by a ‘+’ for positive result or a ’-‘, indicating a negative result. If the reagent test result is negative, repeat with a second control sample. If the result of the second test is also negative, the solution should not be used for processing. Discard the solution and prepare a new reagent.
4. Before using a chemical/reagent, positive and negative control tests will be conducted to ensure that the chemical is working properly.
5. During field use, the results of the positive and negative control tests will be documented in the Crime Scene Investigator notes along with the reagent name and lot number or in lieu of reagent names and lot numbers a set number (which encompasses all reagents and lot numbers) may be utilized.
6. In the event that set numbers are to be utilized the set numbers will be indicated in the reagent log in correspondence with those reagents that are within each set as well as all formerly indicated information. Set numbers will be created in a consecutive series until the maximum number of 50 has been reached at which point the numeration cycle will be restarted. The dates that each set goes into service and when they are taken out of service will also be recorded within the reagent log.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation while mixing and using chemicals.

Wear suitable protective clothing, gloves and goggles.

**1.5 Quality Control**

All reagent-working solutions will be quality control tested at the time they are prepared and recorded in the Reagent Log. They will be tested prior to use on actual evidence and the results will be noted in the case file. This quality control testing is to ensure the accuracy of the mixture and that the desired reaction is being obtained.

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# BLOOD ENHANCEMENT/TESTING CHEMICALS

# Chapter 3: Acid Yellow 7

**1.1 Purpose**

To establish a list of actions in the use of Acid Yellow 7 as an investigative aid that can assist in enhancing bloodstain fingerprints and footwear impressions on non-porous surfaces.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Sulfosalicylic Acid Solution
8. Absorbent paper (i.e. Tissue, filter paper, paper towel, etc…)
9. Alternate light source
10. A stock solution of Glacial Acetic Acid, Water, and Ethanol
11. Heat lamp or heat gun

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Fix the impressions with a Sulfosalicylic Acid Solution for five minutes or thoroughly heat and dry the impressions with a heat lamp or heat gun.
3. The following is recommended method of fixing the staining.
4. To make sure the print in blood is thoroughly fixed, it is recommended the following method using absorbent paper (i. e.: filter paper, tissue paper, or paper towels) and a wash bottle containing sulfosalicylic acid solution.
5. Take a dry piece of the absorbent paper that is sized to cover the print(s). Hold it directly over the print-area, parallel to the surface and just slightly above the surface. To begin fixing, drop one edge of the paper to the surface and moisten heavily along its entire length, so that it is anchored and will stay in place.
6. Starting from that edge, wet the paper progressively further while smoothing the wet part onto the print and minimizing trapped air bubbles. Work carefully from one edge to the other. When possible, with an object or with a print on an angled surface, start from the top and work downwards.
7. Once the wet paper entirely covers the print, leave it there for a minimum of three minutes. When the blood is a thick layer, leave the paper there 5 minutes or more.
8. Remove the paper. An excess of fixative can be rinsed away with water, but this is not necessary. When the blood is relatively fresh, you will notice that fixing changes its color from dark red to dark brown.
9. Apply the Acid Yellow 7 to the impression by using a spray bottle. Allow the stain to react with the impressions for 2 to 3 minutes or until the impression become stained a yellow color.
10. In order to stop the staining action and to remove any staining in the background, spray the impression with a stock solution of Glacial Acetic Acid, Water and Ethanol.
11. The stained impression can also be viewed using an Alternate Light Source at a wave length of 400 to 490nm.
12. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual

1. After photographing the impression, lift with a white gelatin lifter.

**1.4 Safety Considerations**

Acid Yellow 7 solution contains ethanol and Glacial Acetic Acid. Ethanol is highly flammable.

Glacial Acetic Acid can be caustic and will damage your eyes either through splashing or from evaporation vapors.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

Acid Yellow 7 should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like linoleum, glass, tiles, painted surfaces or PVC floor covering.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 4: Amido Black 10B (Methanol Base)

**1.1 Purpose**

To establish a procedure to use Amido Black for the development or enhancement of latent prints, footwear, and tire impressions in suspected blood containing protein residue on porous and non-porous items.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
5. Memory card
6. Naphthol Blue Black (also known as Amido Black 10B or Buffalo Black NBR)
7. Spray bottle
8. Absorbent towels
9. Known blood standard-positive control
10. Blank substrate-negative control
11. Phenolphthalein Test Kit

**1.3 Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. All visible prints or impressions of potential value in blood should be photographed prior to processing using the techniques as outlined in the Impression Photography procedure of this manual.
3. Collect a sample of blood for DNA analysis.
4. Prior to application, it will be verified that the suspected blood is completely dry or fixed on the item to be processed.
5. Apply the developer to the specimen by dipping, spraying, or the use of a wash bottle.
6. Completely cover the target area until the desired development has been obtained.
7. Rinse the target area with the rinse solution to remove the background stain.
	1. These steps can be repeated to improve the development and contrast.
	2. If the background color is still too intense, the second (optional) rinse may be applied.
8. Allow the specimen to dry
9. All prints or impressions of potential value should be collected and/or should be photographed using the techniques as outlined in the Impression Photography procedure of this manual.
10. Prior to application at the scene, the reagent shall have a positive and negative control performed on known standards.
	1. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.
11. Prior to application of any reagents, test the area with Phenolphthalein, a presumptive test for suspected blood, following the procedures as previously indicated in this manual.
	1. If the results are positive, a small sample should be collected form the stain near the ridge detail with care taken not to damage or destroy the impression.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Avoid contact with skin and eyes.

Wear suitable protective clothing, gloves, and goggles.

Follow proper safety precautions.

**1.5 Limitations**

The use of Amido Black is limited to items that are contaminated with suspected blood. It should be noted that this is a protein stain and not a specific blood stain.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or working solutions prepared by and received from another section in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 5: Amido Black 10B (Water Base Formula)

**1.1 Purpose**

To establish a procedure for use of Amido Black for the development or enhancement of latent prints, footwear, and tire impressions in suspected blood containing protein residue on porous and non-porous items.

*The Amido Black water based formula is used in place of the methanol-based formula when there is a question about, or a problem with, a painted surface.*

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
5. Memory card
6. Naphthol Blue Black (also known as Amido Black 10B or Buffalo Black NBR)
7. Distilled water
8. Kodak Photo Flo 600
9. Spray bottle
10. Absorbent towels
11. Known print-positive control
12. Blank substrate-negative control
13. Phenolphthalein Test Kit

**1.3 Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. All visible prints or impressions of potential value in blood should be photographed prior to processing using the techniques as outlined in the Impression Photography procedure of this manual.
3. Test the suspected stain with Phenolphthalein Test Kit to determine if the stain in suspected blood.
4. Collect sample of suspected blood for DNA testing.
	1. Prior to application, it will be verified that the suspected blood is completely dry or fixed on the item to be processed.
5. Apply the developer to the specimen by dipping, spraying, or through the use of a wash bottle.
6. Completely cover the target area until the desired development has been obtained.
7. Rinse the target area with the rinse solution to remove the background stain.
	1. These steps can be repeated to improve the development and contrast.
8. After maximum clarity is achieved, apply the rinse solution again.
9. Allow the specimen to dry.
10. All prints or impressions of potential value should be collected and/or should be photographed using the techniques as outlined in the Impression Photography procedure of this manual.
11. Prior to application at the scene the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.
12. Prior to application of any reagents, test the area with Phenolphthalein, a presumptive test for suspected blood, following the procedures as previously indicated in this manual. If the results are positive, a small sample should be collected form the stain near the ridge detail with care taken not to damage or destroy the impression.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Avoid contact with skin and eyes.

Wear suitable protective clothing, gloves, and goggles.

Follow proper safety precautions.

**1.5 Limitations**

The use of Amido Black is limited to items that are contaminated with suspected blood. It should be noted that this is a protein stain and not a specific blood stain.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or working solutions prepared by and received form another section in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Reagent Log.

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# Chapter 6: Bluestar

**1.1 Purpose**

To establish a list of actions in using the chemical Bluestar as an investigative aid that can assist in determining the presence of blood.

The employee using Bluestar will have been trained in the proper application and photography documentation of the results.

**1.2 Materials**

1. Personal protective equipment
2. Camera with close up capability (digital camera)
3. Other items for documentation (i.e., notepads, paper, pens, etc.)
4. Memory Card
5. Tripod
6. Distilled Water
7. A spray bottle equipped with an adjustable spray nozzle
8. Bluestar tablets (one white and one beige)
9. Measuring device
10. Known blood standard-positive control
11. Unstained substrate-negative control
12. Phenolphthalein test kit

**1.3 Procedure**

Working solution:

To prepare the working solution, you will need to dissolve a pair of tablets (white and beige) in a bottle with 4 ounces of distilled water. Do not shake, but swirl the bottle until both tablets completely dissolve.

1. Prior to application at the scene, the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.
	1. **Indoors:**
		1. Close all the windows, block all outside light sources, and turn off all the lights.
		2. Outdoors – wait for night time.
		3. Always spray lightly, horizontally ahead of you, NOT pointing toward the ground in a side to side sweeping motion.
		4. Always spray from waist height in a fine mist.
		5. For the positive control, use a rubbing/cutting of a known blood standard. For the negative control, use an unstained substrate.
		6. Do not saturate walls and vertical surfaces in order to prevent the creation of drippings.
		7. Test any reactive stains with Phenolphthalein Test Kit.
		8. The suspected blood evidence will be marked as to area collected, packaged, and transported to the laboratory.
	2. **Outdoors**
		1. Do not spray into the wind, but use it to carry a light cloud over the area.
		2. For the positive control, use a rubbing/cutting of a known blood standard. For the negative control, use an unstained substrate.
		3. The chemical should react to a suspected blood stain when sprayed; resulting in a positive reaction. A positive reaction is exhibited by an intense blue luminescence.
		4. The chemical should not react to an area where blood is not present. A negative reaction exhibits no luminescence.
		5. Test any reactive stains with Phenolphthalein Test Kit.
		6. The suspected blood evidence will be marked as to area collected, packaged, and transported to the laboratory.
2. **Photography**
	1. The chemo luminescence is bright enough that no special equipment is needed.
	2. Place a measuring device next to suspected bloodstained area.
	3. Prepare the camera with tripod and cable/wireless shutter release.
	4. Digital cameras should be set with the ASA at least 400.
	5. Open aperture to the widest exposure, example: f4.
	6. Set the camera on the manual setting.
	7. Spray working solution on suspected bloodstain area, in total darkness.
	8. Open shutter in total darkness at various time lengths, example: 30 – 60 seconds.

**1.4 Safety Considerations**

Appropriate safety precautions should be taken and proper personal protective equipment worn (including safety goggles, gloves, dust respirator, protective clothing) when working with hazardous or potentially hazardous materials.

Clean measuring device and equipment that comes into contact with the chemical prior to placing the contaminated item in your vehicle.

The MSDS sheets should be consulted prior to conducting these tests.

All samples can potentially contain biological hazards and should be treated as such.

**1.5 Limitations**

“False” reactions may occur due to the presence of certain household detergents, chlorine, copper, and other contaminants in certain plants or soils. These are easily identifiable by the trained staff member because they are typically dimmer and whiter in color than true reactions.

The reagent does have a shelf life and should be used within three hours after mixing tables with water.

**1.6 Quality Control**

For casework, the reliability is checked when in use. The results of the positive and negative controls are recorded in the case file.

A positive and negative control is also performed when a new lot is received.

Upon the submission of samples collected from area where Bluestar was applied, a notation shall be made in the evidence submission documents so that the DNA Analyst will be made aware of this fact.

**1.7 Literature References**

Bluestar Forensic Latent bloodstains reagent, Bluestar Forensics Product Insert.

Research-Evaluation-Validation of Bluestar Forensic Through Practical Experimentation. Aycock, Johnnie; Goertz, Blake; Marek, Joyce. October 2004

Luminol vs. Bluestar: A Comparison Study of Latent Blood Reagents. Webb, Samantha; Saint Louis Metropolitan Police Department.

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# Chapter 7: Hexagon OBTI

**1.1 Purpose**

To establish a procedure for the probable identification of human blood utilizing a commercially prepared detection card.

**1.2 Materials**

1. Personal protective equipment
2. Items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
3. Hexagon OBTI two part test: A collection tube for the blood sample and a test bar.
4. Distilled water

**1.3 Procedure**

1. Swab the suspected stain with a sterile swab.
2. A sample of the presumed human blood trace is transferred into the tube with a swab.
3. Ensure the cap is tight and gently mix the contents in the tube of 10 seconds.
4. Break the tip of the collection tube and fill the reservoir with the liquid in the collection tube.
5. A positive sample is typically detected within 2 to 5 minutes
6. A single red\pink line means the testing liquid is working fine, but no human blood has been detected. Two red/pink lines mean the test detected human blood.
7. The kit or lot numbers of the test will be recorded in the case notes.
8. The results of the test will be documented in the notes and the test strip depicting the results will be photographed.

**1.4 Safety Considerations**

Appropriate safety precautions should be taken and proper personal protective equipment worn when working with bio-hazardous or potentially bio-hazardous materials. The MSDS sheets should be consulted prior to conducting these tests.

**1.5 Limitations**

Human hemoglobin in the sample reacts with the reagent consisting of red colored particles and monoclonal anti-human HB antibodies.

The test detects whole blood up to the dilution of 1 : 2,000,000. As little of 250 red blood cells are required for a positive result.

The blood of the following animals did not react with the Hexagon OBTI: cattle, pig, sheep, goat, horse, rabbit, chicken, duck, goose, turkey, guinea pig, red deer, cat and dog.

Primate and ferret blood will give a positive result in the Hexagon OBTI.

**1.6 Quality Control**

The lot number of test kits received into the Laboratory will be quality control tested at the time they are received. A positive and negative control test will be performed on a representative sample of the lot to verify that the kits are reacting as expected and the results recorded in the Reagent Log.

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# Chapter 8: Leucocrystal Violet (LCV)

**1.1 Purpose**

To establish a procedure to develop or enhance latent prints at a crime scene. LCV(Leucocrystal Violet) is used to enhance and develop latent prints, footwear, and tire tracks deposited in suspected blood on porous and non-porous surfaces.

* 1. **Materials**

1. Personal Protective Equipment

2. Camera(Digital)

1. Leucocrystal Violet
2. Sulfasalsylic Acid
3. Sodium Acetate
4. Hydrogen Peroxide
5. Spray bottles
6. Funnel
7. Coffee filter
8. Mixing bottle
9. Known blood standard-positive control
10. Blank substrate-negative control

**1.3 Procedure**

1. The formula for LCV is mixture of 4 grams of Sulphosaliylic Acid (A), 3 grams of Sodium, Acetate (B) and .4 grams of Leuco Crystal Violet (C) with 230ml of Hydrogen Peroxide (H2O2).
2. Mix A in H2O2 and shake vigorously for approximately one minute. Then add B and shake follow by C.
3. Strain the mixed solution a coffee filter and funnel into the sprayer.
4. Wear suitable protective clothing, gloves, and goggles.
5. All visible prints or impressions of potential value in blood should be photographed prior to processing.
6. Spraying is the most effective method of application. When spraying, use the finest mist possible because excess application may cause overdevelopment or running of the blood print. Spray the target area. Development will occur within 30 seconds.
7. After spraying, blot the area with a tissue or paper towel. After the area is dry, the preceding steps can be repeated to possibly improve the contrast.
8. All prints or impressions of potential value should be photographed.
9. Prior to application at the scene the reagent shall have a positive and negative control performed on known standards.
	1. The lot numbers, as well as the results of the control tests shall be referenced in the case notes.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Follow proper safety precautions.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

LCV is limited to the development or enhancement of suspected blood. When using the LCV process in direct sunlight, any prints that are developed should be photographed as soon as possible in as much as photo-ionization may occur, resulting in unwanted background development.

LCV has a limited shelf life and should be made prior to use.

Cyanoacrylate fuming may be detrimental to this process.

Various protein stains, such as Amido Black, etc., can be used after the LCV process.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

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# Chapter 9: Luminol

**1.1 Purpose**

To establish a list of actions in using the chemical Luminol as an investigative aid that can assist in determining the presence of blood.

Prior to the use of Luminol, the employee will have had training on the proper application process and the ability to appropriately document the scene.

**1.2 Materials**

1. Personal protective equipment
2. Spray bottle
3. manufactures pre-made solution of powder (A) and liquid (B)
4. Camera (digital camera)
5. Tripod
6. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
7. Memory card
8. Measurement device
9. Known blood standard-positive control
10. Unstained substrate-negative control
11. Phenolphthalein Test Kit

**1.3 Procedures**

1. When evaluating a scene where the possibility exists than an attempt was made to remove or conceal blood evidence, the use of Luminol should be considered.
2. Luminol should be prepared at the crime scene just prior to use. To mix, pour the “A” powder into the “B” solution. Replace the cap to the bottle and shake until the powder is completely dissolved.
3. Prior to application at the scene the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as wells as the results of the control tests shall be referenced in the case notes.
4. Prepare the camera with the tripod and cable shutter release.
	1. Digital cameras should be set the ASA at least 400.
	2. Open aperture to the widest exposure, example f 4.
	3. Set the camera on the manual setting.
5. Place measuring device next to suspected bloodstained area.
6. Spray working solution on suspected bloodstain area, in total darkness.
7. Open camera shutter in total darkness at various time lengths, example: 60 – 90 seconds.
8. Perform Phenolphthalein test on areas that show luminescence.
9. The suspected blood evidence will be marked as to area collected, packaged, and transported to the laboratory.

**1.4 Safety Considerations**

The use of the chemicals to create Luminol will be used in accordance with the Material Safety Data Sheets.

**1.5 Limitations**

The use of Luminol will give false positive reactions to such items as metals, vegetation, and some cleaning products.

Both a negative and a positive control test should be performed prior to the use of Luminol to ensure chemicals are working properly.

Luminol does have a shelf life and the working solution will be discarded after use.

**1.6 Quality Control**

For casework, the reliability is checked when in use. The results of the positive and negative controls are recorded in the case file.

Upon the submission of samples collected from areas where Luminol was applied, a notation shall be made in the evidence submission documents so that the DNA Analyst will be made aware of this fact.

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# Chapter 10: Lumiscene

**1.1 Purpose**

To establish a list of actions in using the chemical Lumiscene as an investigative aid that can assist in determining the presence of blood.

**1.2 Materials**

1. Personal protective equipment
2. Spray bottle
3. Camera (digital camera)
4. Tripod
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Measurement device
8. Known blood standard-positive control
9. Unstained substrate-negative control
10. Phenolphthalein Test Kit
11. Lumiscene mixture

**1.3 Procedures**

1. When evaluating a scene where the possibility exists than an attempt was made to remove or conceal blood evidence, the use of Lumiscene should be considered.
2. Prior to application at the scene the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as wells as the results of the control tests shall be referenced in the case notes.
3. Prepare the camera with the tripod and cable shutter release.
	1. Digital cameras should be set the ASA at least 400.
	2. Open aperture to the widest exposure, example f 4.
	3. Set the camera on the manual setting.
4. Place measuring device next to suspected bloodstained area.
5. Spray working solution on suspected bloodstain area, in total darkness.
6. Open camera shutter in total darkness at various time lengths, example: 60 – 90 seconds.
7. Perform Phenolphthalein test on areas that show luminescence.
8. The suspected blood evidence will be marked as to area collected, packaged, and transported to the laboratory.

**1.4 Safety Considerations**

The use of the chemicals to create Lumiscene will be used in accordance with the Material Safety Data Sheets.

**1.5 Limitations**

The use of Lumiscene will give false positive reactions to such items as chemical oxidants, catalysts, copper and nickel. Other items that may reveal false positives include iodine, rust, bleach, formalin, horseradish, citrus fruits, bananas, watermelon and numerous vegetables.

Both a negative and a positive control test should be performed prior to the use of Lumiscene to ensure chemicals are working properly.

**1.6 Quality Control**

For casework, the reliability is checked when in use. The results of the positive and negative controls are recorded in the case file.

A positive and negative control is also performed when a new lot is received.

Upon the submission of samples collected from areas where Lumiscene was applied, a notation shall be made in the evidence submission documents so that the DNA Analyst will be made aware of this fact.

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**Chapter 11: Phenolphthalein Test (Kastle-Meyer Test)**

**1.1 Purpose**

To establish a list of actions in the use of Phenolphthalein, a presumptive test for blood.

**1.2 Materials**

1. Stock solution of Phenolphthalein (Kastle-Meyer Reagent)
2. Methanol (MEOH)
3. 3% Hydrogen Peroxide solution
4. Sterile water
5. Filter paper/Sterile swabs
6. Gloves
7. Known blood standard-positive control
8. Unstained substrate-negative control

**1.3 Procedures**

1. Prior to application on a suspected stain the test reagents shall have a positive and negative control performed on known standards. The reagent kit number and/or lot numbers or set numbers as well as the results of the control tests shall be referenced in the case notes.
2. The suspected stain is sampled either by rubbing with a swab (moistened with distilled water if necessary) or piece of filter paper (swabs preferred).
3. One or two drop(s) of the working solution of Methanol is applied to the transferred material on the swab/filter paper.
4. One or two drop(s) of working solution of Phenolphthalein is applied to the transfer material of the swab/filter paper
5. After waiting to ensure that no color develops at this stage, two or three drops of 3% Hydrogen Peroxide are applied to the transferred material on the swab/filter paper.
6. An immediate intense pink color is a positive presumptive test for blood.

**1.4 Safety Considerations**

Personal safety equipment should be utilized when a possible biohazard exposure is present.

**1.5 Limitations**

Phenolphthalein will give a positive reaction to blood other than human. It is intended to aid in the determination of which stains to collect and submit to the laboratory for analysis. No conclusions should be made at the scene as to the source (donor) of the stains based upon this test.

It should be noted that bloodstains do not always present as red or red brown stains. Due to environmental conditions and time, they may present in a variety of colors (i.e., yellow, black, green). This must be taken into consideration when screening for possible bloodstains.

In the event that the substrate the suspected stain is on is either a dark color or one which is similar to the results of a positive test reaction, care should be exercised. Due to the nature of the material there may be a transfer of color from the substrate to the swab/filter paper. This could lead the tester to an error in their interpretation of the test results.

**1.6 Quality Control**

In the event that the phenolphthalein reagent is part of a pre ordered and prepared kit from a vendor then the reagents must be checked quarterly during the calendar year to verify that the chemicals are working properly. The reactivity and sensitivity of the reagents will be checked to at least a 1:100 dilution of known blood. The results will be recorded in the reagent log.

Both a negative and a positive control test will be performed prior to the use of the phenolphthalein to ensure the chemicals are working properly. The results will be recorded in the case notes.

In the event that the processing entailed involves the detection of dilute or partially cleaned up suspected blood, then an additional positive control test should be performed prior to the use of phenolphthalein using a 1:100 dilution standard to ensure the chemicals are working properly. The results will be recorded in the case file.

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# Chapter 12: Phloxine

**1.1 Purpose**

To establish a list of actions in the use of Phloxine as an investigative aid that can assist in enhancing bloodstained fingerprints and footwear impressions on non-porous surfaces.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Phloxine mixture
8. Sulfosalicylic Acid Solution
9. A stock solution of water and methanol
10. Heat lamp or heat gun

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Fix the impressions with a Sulfosalicylic Acid Solution for five minutes or thoroughly heat and dry the impressions with a heat lamp or heat gun.
3. Apply the Phloxine to the impression by using a spray bottle. Allow the stain to react with the impressions for 2 to 3 minutes or until the impression become stained a reddish-orange colored stain.
4. In order to stop the staining action and to remove any staining in the background, spray the impression with a stock solution of water and methanol.
5. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

Phloxine should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet. It works well on non-absorbent backgrounds such as linoleum, glass, tiles, painted surfaces or PVC floor covering.

Always test a small area with Phloxine to determine if this enhancement chemical is best suited for the item you are processing.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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**LATENT PRINT PROCESSING CHEMICALS**

**Chapter 13: ARDROX Dye Stain**

**1.1 Purpose**

To establish a list of actions in the use of ARDROX Dye Stain as an investigative aid that can assist in developing latent evidence on non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. ARDROX Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off the item with distilled water if over staining has occurred.
5. After the dye stain has dried, view the prints with a yellow filter and Alternate Light Source at a wave length of 400 to 490nm.

1. All prints of potential value should be documented using the techniques as outlined in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

ARDROX mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

The vapors produced by the evaporation of ARDROX solution are heavier than air and can travel along the ground to a source of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

ARDROX should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 14: Basic Yellow Dye Stain

**1.1 Purpose**

To establish a list of actions in the use of Basic Yellow Dye Stain as an investigative aid that can assist in developing latent evidence on non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. Basic Yellow Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off with distilled water and then followed up by Methanol if over staining has occurred.
5. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.

1. All prints of potential value should be documented using the techniques as outlined in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The Basic Yellow mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

Basic Yellow Dye stain should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 15: Cyanoacrylate Fuming (Cyanosafe)

**1.1 Purpose**

To establish a list of actions in the use of Cyanoacrylate Ester as an investigative aid that can assist in developing latent prints on nonporous surfaces.

The Cyanosafe is designed to optimize the conditions of cyanoacrylate fuming while protecting the user from harmful fumes. It is a semi-automatic polypropylene chamber that provides a controlled area while fuming and safe removal of the cyanoacrylate fumes once the fuming process is complete

The Cyanosafe is equipped with circulation fans. By increasing the circulation of the cyanoacrylate polymers, the development time of latent prints is decreased due to more distribution of the polymers around a sample. The circulation fans are activated automatically once the process button has been pressed and continue to run until the chamber is purged.

The Cyanosafe monitors humidity with the ability to elevate the humidity within the chamber. Two solid-state heating elements are located in the chamber. One element is used to elevate the humidity level while the second element is used to accelerate the cyanoacrylate fuming process.

**1.2 Materials**

1. Personal protective equipment

2. Camera (digital camera)

3. Tripod

4. Scale

5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)

6. Memory card

7. Cyanoacrylate ester (liquid compound or pouch), super glue wand

8. Blank area on substrate-negative control

**1.3 Procedures**

1. Turn on the power to the unit.

2. Locate and add water to the dish-type heating element.

3. Arrange items to ne fumes in the chamber. Place a control test print, black backing card, in the front clip located at the door opening. This is to monitor the development of your evidence.

4. Place a foil tray on the flat heating element. Add cyanoacrylate to the tray.

5. Close and lock the chamber. The display should read ‘READY”.

6. Press the quick key “PROCESS”. This activates the circulation fan and heating elements.

7. A few drops of adhesive are then placed into the aluminum weigh boat.

8. The chamber will cycle until the operator stops the process by pressing either the PURGE key or E STOP. The E STOP should only be used in the case of emergency.

9. Once desired development has occurred, press the PURGE key. This removes the cyanoacrylate fumes before the chamber is unlocked. The blower is automatically turned off once the chamber is fume free.

10. An alternative to manually controlling the time an item is processed is by setting the time that the chamber is run. This is done by pressing the set time until the desired time is lit on the LCD screen.

11. Display symbols during operation:

B- The purge blower has been activated to exhaust cyanoacrylate fumes.

W- Humidity elevation in process.

L- Interior vapor-proof light is activated ON

G- Cyanoacrylate vapor accelerator activated

S- Door locked

F- Circulation fan activated

12. Quick key reference guide.

Process: Pressing this key enables the chamber and starts the fuming process.

Purge: This key must be pressed before the operator is allowed back into the chamber.

Light: Each time this key is pressed, the vapor-proof light turns On or OFF.

Time: Built in lab even timer. This allows the operator to set a time and walk away.

 Alarm sounds once the timer has cycled completely.

E Stop This button is an emergency override. The pressing of this button stops the fuming

 Process, activates the purge function and releases the door. This button should only

 Be used in the case of emergency.

**1.4 Safety Considerations**

Cyanoacrylate fumes can irritate eyes and nasal passages. Exposure to fumes should be avoided.

Contact of the skin with Cyanoacrylate Ester liquid should be avoided.

Refer to Material Safety Data sheets for additional information.

**1.5 Limitations**

Cyanoacrylate fuming is limited in use to non-porous items or semi-porous items that have a shiny or coated finish, such as the cover of a telephone book.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

**1.7 Literature References**

Processing Guide for Developing Latent Prints, 2000, U. S. Department of Justice, Federal Bureau of Investigation, Laboratory Division.

Cyanosafe operators manual

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# Chapter 16: Cyanoacrylate Fuming (Cyanowand)

**1.1 Purpose**

To establish a list of actions in the use of Cyanoacrylate ester as an investigative aid that can assist in developing latent prints on nonporous surfaces.

The Cyanowand is a self-igniting, butane-powered heat tool and is used as a flameless heat tool with a variable temperature control. The Cyanowand is a portable, hand-held heat generator that uses disposable cyanoacrylate cartridges, which, when exposed to the heat generated by the wand, emit the vapor needed for developing latent fingerprints.

The Cyanowand is designed for use at outdoor crime scenes, processing vehicles, portable cyanoacrylate chambers and indoor fuming chambers.

Cyanoacrylate vapor polymerizes on most latent prints found on non-porous surfaces. This chemical reaction produces a visible, white deposit.

**1.2 Materials**

1. Personal protective equipment

2. Camera (digital camera)

3. Tripod

4. Scale

5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)

6. Memory card

7. Cyanowand

**1.3 Procedures**

1. Ensure that the Cyanowand gas ON/off switch is in the OFF position.

2. Ensure the instrument is cool to the touch.

3. Hold the instrument bottom side up. Press the nozzle of the butane fuel cyclinder downward onto the refill nozzle and apply firm pressure. When the instrument is full, fuel will vent through the overflow value.

4. Cyanoacrylate cartridges are to be attached to the tip of the Cyanowand. The chemical cartridges emit a control cyanoacrylate vapor for two minutes to an hour, depending which cartridge is used.

5. While holding the instrument horizontally, with the tip facing away from your body, set the temperature regulator to the maximum.

6. Slide the gas ON/OFF switch to its ON position. The sound of escaping gas may be audible.

7. Slowly press back and hold the ignition button for three (3) seconds. Then slowly release the button, allowing the gas interrupt function to extinguish the flame. This enables the catalytic burner to take over combustion control. Extend the instrument to arm’s length and look into the tip. An orange/red glow should be visible.

8. Place the lit Cyanowand into the area in which needs to be fumed. The portable fuming chamber has an opening designed for the Cyanowand.

9. If the Cyanowand is to be used in a vehicle, wear proper PPE when placing the Cyanowand in the vehicle and when removing the instrument.

**1.4 Safety Considerations**

Cyanoacrylate fumes can irritate eyes and nasal passages. Exposure to fumes should be avoided. Do not wear contact lens when operating the Cyanowand.

Always used in a well-ventilated area.

Do not refill with gas or store the instrument near open flame, furnaces, heaters or combustible materials.

Contact of the skin with Cyanoacrylate Ester liquid should be avoided.

Refer to Material Safety Data sheets for additional information.

**1.5 Limitations**

Cyanoacrylate fuming is limited in use to non-porous items or semi-porous items that have a shiny or coated finish, such as the cover of a telephone book.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

**1.7 Literature References**

Processing Guide for Developing Latent Prints, 2000, U. S. Department of Justice, Federal Bureau of Investigation, Laboratory Division.

Sirchie Cyanowand Technical Information

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# Chapter 17: DFO(Diazafluoren-9-one)

**1.1 Purpose**

To establish a list of actions in the use of DFO as an investigative aid that can assist in developing latent fingerprints on paper and cardboard.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. DFO mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Be sure that the evidence is dry and all examinations of ink or handwriting have been completed. With the evidence item inside of the AirClean Workstation, use a spray bottle to apply the DFO formula to the evidence
3. Allow the item to dry.
4. To accelerate development, place the evidence in the oven at 212 F (100 C) for 10 to 20 minutes.
5. The stained impression can also be viewed using an Alternate Light Source at a wave length of 400 to 490nm.
6. All prints of potential value should be documented using the techniques as outlined in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

DFO should be used prior to reprocessing with ninhydrin.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 18: Iodine Fuming

**1.1 Purpose**

To establish a list of actions in the use of Iodine Fuming as an investigative aid that can assist in developing latent fingerprints on paper, raw wood, and cardboard.

**1.2 Materials**

1. Personal protective equipment
2. Iodine crystals or Iodine Fuming Gun
3. Iodine fixative
4. Camera (digital camera)
5. Tripod
6. Scale
7. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
8. Memory card

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. In the AirClean Workstation, place the item to be fumed in a plastic bag.
3. Warm the Iodine ampoule in the palm of the hand for at least one minute.
4. Open the ampoule and pour crystals into bag, but not directly on the item of evidence and seal the bag.
5. Shake the bag moving the crystals over the item, but do not allow the crystals to remain still on the item.
6. If using a fuming gun, break ampule and blow through gun and onto the evidence being processed.
7. Latent fingerprints should be visible shortly after the application of the fumes. Re-fume the faint prints.
8. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.
9. Apply a “Dishcaps DCA11 Iodine Enhancer” to fix the latent evidence that was developed.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

Iodine fumes are highly toxic. Processing evidence with Iodine must be performed in the AirClean Workstation or well-ventilated area.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 19: Ninhydrin

**1.1 Purpose**

To establish a list of actions in the use of Ninhydrin as an investigative aid that can assist in developing latent prints on porous surfaces such as paper, cardboard, and wood.

*Ninhydrin reacts with amino acids commonly found in latent print residue to form a purple compound, yielding visible latent prints. Ninhydrin may be considered as an enhancement for blood.*

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
5. Memory card
6. Commercially prepared reagent such as Chemprint or laboratory prepared mixture
7. Known print-positive control
8. Blank substrate-negative control
9. Phenolphthalein Test Kit

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Ninhydrin solution may be applied to the item by spraying, dipping, brushing or by the use of a chemical was bottle inside a fume hood.
3. In field use the application should only proceed if the area has sufficient ventilation for a safe working environment if this is not available then ninhydrin processing in the field should not be attempted.
4. Let the item completely dry in the field with regular monitoring of the surface for the development of prints.
5. Post application environment for items processed with ninhydrin is critical to ensure an optimum chemical reaction.
6. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual or scanned directly into the Dataworks Plus Crime Scene Photomanager System as TIFF or RAW files.
7. Prior to application at the scene for suspected blood enhancement, the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

Evidence documentation is essential and should be accomplished as soon as possible due to the fact that reacted areas tend to fade over time.

The ninhydrin process must be used prior to the physical developer process if both processes are being used.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 20: MBD

**1.1 Purpose**

To establish a list of actions in the use of MBD as an investigative aid that can assist in developing latent fingerprints on non-porous surfaces.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. MBD mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.
5. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

MBD fumes are highly toxic. Processing evidence with Iodine must be performed in the AirClean Workstation or well-ventilated area.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 21: Physical Developer

**1.1 Purpose**

To establish a list of actions in the use of Physical Developer as an investigative aid that can assist in developing fingerprints on porous surfaces and is very effective on wet paper products.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Physical Developer mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Use non-metal tongs or forceps when handling the item.
3. Rinse the tray with distilled water to ensure that no residue is present.
4. To make the Maleic Acid solution, add 25 grams of Maleic Acid to 1000ml of distilled water. Stir vigorously until Maleic Acid is dissolved.
5. Make the working solutions according to how much solution is needed.

Solution “A” Solution “B”

5ml 90ml

20ml 360ml

50ml 900ml

1. Place the item in a tray of Maleic Acid solution for five minutes or until no bubbles appear on the item.
2. Place the item in a tray of working solution for five minutes and agitate. Watch for prints to become visible. If no prints are visible, leave the item in the tray of working solution for about 15 minutes. You will need to gently rock the tray back forth manually during this process.
3. Remove the item from the working solution and place in a new tray of distilled water (not the original tray of distilled water). Leave the item in the working solution for several minutes to remove the working solution. This will prevent further developments.
4. Allow the item to dry.
5. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

Various components of the formula are corrosive and toxic. Silver nitrate is especially toxic and acids used for the pre-wash are corrosive. Always wash hands before leaving the lab. The physical developer working solution will cause black stains to appear on skin and clothing.

The working solution has no shelf life. Dispose of the working solution following processing.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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**Chapter 22: RAY Dye Stain**

**1.1 Purpose**

To establish a list of actions in the use of RAY Dye Stain as an investigative aid that can assist in developing latent evidence on non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. RAY Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off the item with Methanol if over staining has occurred.
5. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.
6. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The RAY Dye Stain mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

RAY Dye stain should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 23: Red-Yellow Dye Stain

**1.1 Purpose**

To establish a list of actions in the use of Red-Yellow Dye Stain as an investigative aid that can assist in developing latent evidence on non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. Red-Yellow Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off the item with Methanol if over staining has occurred.
5. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.
6. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The Red-Yellow mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

Red-Yellow Dye stain should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 24: Rhodamine 6G (Water Based)

**1.1 Purpose**

To establish a list of actions in the use of Rhodamine 6G (Water Based) Dye Stain as an investigative aid that can assist in developing latent evidence on non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. Rhodamine 6G (Water Based) Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off the item with water and alcohol if over staining has occurred.
5. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.
6. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The Rhodamine 6G (Water Based)mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

Rhodamine 6G (Water Based) Dye stain should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 25: Small Particle Reagent (Molybdenum Disulfide)

**1.1 Purpose**

To establish a procedure to use Small Particle Reagent (SPR) to develop or enhance latent prints that are wet, are on wet surfaces or contain residues that would make processing with a brush difficult.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
5. Memory card
6. Scales
7. Wash bottle
8. Spray bottle
9. Molybdenum Disulfide (SPR)
10. Alternate Light Source (for use with luminescent SPR)
11. Known fingerprint-positive standard
12. Blank substrate-negative control

Premixed SPR reagent is available commercially in black, white, and luminescent solutions.

Follow manufacturer’s instructions for commercially prepared solutions.

**1.3 Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. For best results, use the manufactures spray bottle to process the item.
3. The solution is simply sprayed over the surface in a spraying motion and followed by a second wash of clear tap water.
4. For outdoor application of very large items, such as a wet automobile, a garden sprayer can be used.
5. Generally light to moderate flows of rinse water will not dislodge the SPR particles.
6. The developed impressions should be photographically preserved and or lifted.
7. If necessary, the impressions can be lifted while the surface is still wet; however, it is easier if the surface can be allowed to dry.
8. Prior to application at the scene the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.

**1.4 Safety Considerations**

SPR presents no real health hazard although skin irritation may occur with prolonged contact.

Refer to appropriate Material Safety Data Sheets.

**1.5 Limitations**

Molybdenum disulfide is produced in various particle sizes, which are generally not listed. Smaller particle size is more effective.

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**Chapter 26: Sodium Rhodizonate Chemical Testing**

**1.1 Purpose**

To establish a list of actions in the use of Sodium Rhodizonate, a test for the presence of lead.

**1.2 Materials**

1. Personal protective equipment
2. Sodium Rhodizonate solution
3. Buffer solution
4. Items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
5. Large pieces of filter paper or coffee filters
6. 15% solution of acetic acid in deionized water
7. Iron
8. Spray units
9. Known lead standard-positive control
10. Blank substrate-negative control

**1.3 Mixing Instructions:**

**1.4 Sodium Rhodizonate:**

Dissolve Sodium Rhodizonate in 100 ml of distilled water until solution turns the color of dark tea.

pH buffer solution (optional)

Dissolve 29.3 grains of sodium bitartrate (optional) and 23.1 grains of tartaric acid per 100 ml of distilled water. This usually requires heat and agitation to complete in a reasonable period of time. A combination hot plate/magnetic stirrer is convenient for this and saves a great deal of time and effort.

Store the solution in an uncontaminated and sealed container. Contaminated containers and water, or simply containers left open to the air can allow the formation of what appear to be microscopic life forms, which may cloud the solution. While these do not interfere with the specificity or reliability of the test, they do tend to clog up reagent spraying equipment. Allow such material to settle before spraying.

**5% Hydrochloric Acid Solution**

Combine 5 ml of concentrated acid with 95 mm of distilled water. Remember to gently pour the acid into the water to preclude potential spattering of undiluted acid. Store the solution in an uncontaminated and sealed bottle.

**1.5 Procedure**

**1.6 Direct Application to an Item of Evidence**

1. Wear suitable protective clothing, gloves, and goggles.
2. Prior to application at the scene, the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.
3. Spray the appropriate area of the questioned item with a previously prepared saturated solution of sodium rhodizonate in water.
4. Spray the same area of the questioned item with the previously prepared tartaric acid/sodium bitartrate buffer solution (optional). This solution will eliminate the general yellow background color caused by the sodium rhodizonate and will establish a local pH of 2.8 and turn any lead, and a few other metals, which may be present, to a pink color.
5. Treat the affected area with the previously prepare dilute hydrochloric acid solution. The presence of lead is specifically determined wherever the previous pink color fades out and leaves a blue-violet color in its place. This indicates lead and only lead. Be very aware of the fact that a positive (blue-violet) result may abruptly fade out. Take good notes immediately after applying the dilute hydrochloric acid solution.

**1.7 Bashinsky Transfer Method**

1. Wear suitable protective clothing, gloves, and goggles.
2. Prior to application at the scene, the reagent shall have a positive and negative control performed on known standards. The reagent kit number or lot numbers as well as the results of the control tests shall be referenced in the case notes.
3. Uniformly dampen the filter paper while on the questioned item by spraying with a 15% solution of acetic acid.
4. Place a piece of filter paper or coffer filter over the appropriate area of the questioned item.
5. Mark the paper to indicate the location where it was placed on the time.
6. Cover the dampened filter paper with several layers of dry filter paper. Apply a hot iron to the filter paper and iron until the paper is dry. If an iron is not available, constant and even pressure for several minutes is acceptable.
7. Remove the filter paper, which was in direct contact with the evidence item, and process the paper with the direct application method. Note that any positive indications are a mirror image of the deposited materials on the questioned item.

**1.8 Safety Considerations**

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Avoid contact with skin or eyes.

Wear suitable protective clothing, gloves, and goggles.

**1.9 Limitations**

Sodium rhodizonate has a very short shelf life and must be prepared just prior to use.

**1.10 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or working solutions prepared by and received from another section in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Reagent Log.

**1.11 Literature References**

Gunpowder and Gunshot Residue, U.S. Department of Justice

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# Chapter 27: Sticky-Side Powder

**1.1 Purpose**

To establish a list of actions in the use of Sticky-Side powder as an investigative aid that can assist in developing fingerprints on the sticky side of tape and adhesives.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Sticky-Side Powder mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Place one teaspoon of sticky side powder into a beaker.
3. Pour one ounce of distilled water and one ounce of Photo-flo into the beaker.
4. The solution is stirred in the beaker to the consistency of shaving cream with small bubbles.
5. The solution is then applied to the adhesive side of the tape with a small camel hairbrush and is allowed to remain on the tape 10-15 seconds.
6. The mixture is then rinsed off the tape with a slow stream of water, and then allowed to dry. The tape may also be placed in a tray of distilled water and agitated to remove excess solution.
7. All prints of potential value that will be destroyed during the lifting stage should be documented using the techniques as outlines in the Impression Photography procedure of this manual.
8. The developed latent print can be lifted from the surface by applying a fingerprint lifting tape against the print, or other lifting medium, and pulling it away in a steady motion.
9. The tape is then placed on a latent lift card of contrasting color.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

White and black powders are available and you should use the one that will offer the most contrast against the tape.

**1.6 Quality Control**

Commercially obtained powders will be quality control tested upon receipt or preparation and the results recorded.

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# Chapter 28: Sudan Black

**1.1 Purpose**

To establish a list of actions in the use of Sudan Black powder (liquid) as an investigative aid that can assist in developing fingerprints smooth or rough non-porous surfaces contaminated with greasy or sticky surfaces. Sudan black works best on glass, metal or plastic surfaces. It can be used on waxy surfaces such as candles, milk cartons or wax paper.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Sudan Black mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. Pour the solution over the item to be processed and then rinse with cool running tap water.
3. Allow to dry.
4. All prints of potential value that will be destroyed during the lifting stage should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

Refer to Material Safety Data Sheets.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

**1.5 Limitations**

Sudan Black should not be used on porous or absorbent items, as the entire item will be stained.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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# Chapter 29: White Star Dye Stain

**1.1 Purpose**

To establish a list of actions in the use of White Star Dye Stain as an investigative aid that can assist in developing latent evidence on dark non-porous surfaces (i.e. metal, glass, plastic).

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. White Star Dye Stain mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the dye stain using a wash bottle or submerge the item into the solution. Do not spray the solution. Apply a small amount of the dye stain and let dry. Additional dye stain can be applied if not enough detail is observed.
4. Excess stain can be washed off the item with distilled water if over staining has occurred.
5. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 400 to 490nm.
6. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The White Star Dye Stain mixture contains highly flammable solvents and therefore should be kept away from fire or other sources of ignition.

Over exposure may cause eye, skin and respiratory irritation.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

White Star Dye stain should not be used on absorbent surfaces like paper, carton materials, bed sheets or carpet, but works well on dark non-absorbent backgrounds like metal, glass, and plastics.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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**Chapter 30: 1,2 Indanedione**

**1.1 Purpose**

To establish a list of actions in the use of 1,2 Indanedione as an investigative aid that can assist in developing latent evidence on thermal paper and other paper products.

**1.2 Materials**

1. Personal protective equipment
2. Camera (digital camera)
3. Tripod
4. Scale
5. Other items for documentation (i.e., notepads, paper, graph paper, pens, etc.)
6. Memory card
7. Alternate light source
8. 1, 2 Indanedione mixture

**1.3 Processing Procedure**

1. Wear suitable protective clothing, gloves, and goggles.
2. First, super glue the item(s) of evidence to “fix” the latent prints.
3. Using gloves and inside of the AirClean Workstation, apply the solution using a spray the bottle. Be sure that the evidence is dry and all examinations of ink or handwriting have been completed.
4. Cover the entire surface with an even spray in the vented workstation and allow to dry.
5. To accelerate development, place the evidence in the oven at 212 F (100 C) for 2 to 5 minutes. It is recommended that thermal paper be dried at room temperature (excessive heat will discolor the paper).
6. After the dye stain has dried, view the prints with an orange filter and Alternate Light Source at a wave length of 515 for most papers.
7. All prints of potential value should be documented using the techniques as outlines in the Impression Photography procedure of this manual.

**1.4 Safety Considerations**

The 1, 2 Indanedione mixtures must be used in a well-ventilated area.

Refer to Material Safety Data Sheets for specified chemicals.

Use proper ventilation.

Wear suitable protective clothing, gloves, and goggles.

Avoid contact with skin and eyes.

**1.5 Limitations**

1, 2 Indanedione has a limited shelf life (no more than several weeks) and should be mixed only when evidence is to be processed. While it works good on thermal paper, it may not work well on other papers.

**1.6 Quality Control**

Commercially obtained reagents and working solutions will be quality control tested upon receipt or preparation and the results recorded in the Reagent Log.

Reagents and/or solutions prepared in the lab should have the lot number and quality control information generated by that section recorded in the Crime Scene Section Reagent Log.

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