

TENNESSEE BUREAU OF INVESTIGATION
Forensic Services Division

Violent Crime Response Team Standard Operating Procedures
Forensic Biology



3 Forensic Biology

3.1 Scope

The collection of serology samples may include body fluids and other biological materials that may provide a DNA profile of a specific person.

Since DNA evidence may involve the identification of a victim and/or suspect, it is imperative that this evidence be properly collected and preserved. Reliable detection techniques, proper collection methods, and preservation processes are the tools needed to utilize DNA evidence to its fullest potential. Universal safety precautions will be observed when working with biological materials to reduce the chances of contamination and ensure the safety of the VCRT Members.

3.2 Detection

Visual examinations of materials and surfaces for the presence of biological stains can be conducted with natural light, intense white light, or an alternate light source, refer to VCRT 10.23 Alternate Light Sources. Blood normally appears as reddish-brown stains under natural or white light. Stains containing semen and saliva will normally fluoresce under UV and/or blue light. Blood, however, will absorb light in the ultraviolet region of the electromagnetic spectrum and may appear darker than the background or the surface on which the blood is deposited.

When potential DNA evidence is located, the VCRT Member should document the location of the item in the crime scene from which the biological material is to be collected, the location of the stain on the item, and the description of the item.

Evidence that is likely to contain saliva should be identified and collected (i.e., cigarette butts, beverage containers, and envelopes).

Clothing and other objects that may have had prolonged contact with skin can yield DNA profiles, (i.e., hat bands, shirt collars, handgun grips, etc). Document any information about who may have worn a particular item of clothing, if known, for later use by a DNA analyst.

Items that have been handled by a victim or perpetrator, especially when it involves some force, can also yield DNA profiles.

3.3 Presumptive Testing

VCRT Members should consider the value of applying a presumptive test at a crime scene as the test can eliminate some stains that appear to be blood. If presumptive testing of a suspected bloodstain will consume or compromise the stain, the sample should be collected without presumptive testing and recorded in the notes.

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3.3.1 Phenolphthalein (P) - Presumptive Test

The phenolphthalein test is a presumptive test that reacts with the heme molecule in blood. When there is a sufficient amount of questioned material present, presumptive tests should be conducted on all suspected bloodstains prior to collection. Very sensitive (1 part in 10,000), it is of great value as a negative test. Positive and negative controls must be tested before testing a suspected bloodstain at a crime scene. Refer to VCRT 10.3 Phenolphthalein Test for the procedure.

3.3.2 Tetramethylbenzidine (TMB)- Presumptive Test

The TMB test is used primarily as a screening or presumptive method for blood and is based on the peroxidase-like activity of hemoglobin. A negative test is conclusive evidence of the absence of blood in quantities sufficient for further examination. Plant peroxidases and/or other substances such as rust or grease or gun oil can give a false positive result. Refer to VCRT 10.4 Tetramethylbenzidine (TMB) Test for the procedure.

3.4 Enhancement of Possible Bloodstains

When processing crime scenes where the presence of blood is suspected but is not visible, the VCRT Member may use chemiluminescent compounds (e.g. BLUESTAR®) to assist in determining the presence and locations of suspected blood.

3.4.1 **BLUESTAR®**

BLUESTAR® is a presumptive test designed to reveal fresh, dried or cleaned blood, neat or diluted, in trace or sizeable amounts. This test operates by chemiluminescence, when BLUESTAR® FORENSIC latent bloodstain reagent comes into contact with the iron contained in the heme nucleus of hemoglobin found in blood, it is catalyzed by peroxidase activity and emits a light blue glow.

It is of most use at crime scenes which have been suspected of being cleaned to hide or destroy evidence.

Refer to VCRT 10.5 BLUESTAR® for the procedure.

3.4.2 **Fingerprints, Footwear Impressions and Other Patterned Prints in Blood**

Leucocrystal Violet and Amido Black are enhancement techniques that can be used to assist VCRT Members in the visualization of pattern evidence in blood. Refer to VCRT 10.6

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Leucocrystal Violet and VCRT 10.7 Amido Black (Water Based), respectively, for the testing procedures.

DNA sample collection should be accomplished prior to Leucocrystal Violet or Amido Black testing.

3.5 Documentation

Photographs should be made before collection is attempted. Refer to VCRT 2.5 for information on crime scene documentation photography. Refer to VCRT 10.34 Comparison Photography for additional information.

A description and the location of each item collected will appear in the notes.

Measurements of collected items should be documented for inclusion in crime scene diagram.

Results of control testing of reagents must be documented in the field notes.

Results of all presumptive testing both positive and negative must be recorded in the notes.

3.6 Collection

Proper collection prevents contamination from sources such as crime scene personnel and other samples from the crime scene. Proper preservation ensures that degradation due to bacteria, humidity, high heat and other environmental factors is limited.

All collected stains should be air dried before final packaging.

It is acceptable to transport wet evidence to the laboratory for immediate transfer to a drying cabinet. However, precautions should be taken to prevent contamination while transporting this evidence.

Refer to VCRT 10.21 Collection of Biological Samples for the methods used in recovering suspected blood or other biological specimens.

3.7 Packaging

Ensure that biohazard stickers are placed on the outer packaging, as needed.

All dried biological samples should be placed into a porous container, such as an envelope, paper bag, or cardboard box.

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All biological samples should be packaged to minimize the chance of cross-contamination.

Swabs collected from separate sources are to be packaged individually.

Hairs may be packaged in a petri dish, druggist fold and/or a manila envelope. All seams and corners of the envelope must be secured with tape to prevent loss.

Wet biological evidence may be temporarily packaged in a plastic bag for transportation to the laboratory where it shall immediately be transferred into a drying cabinet. After drying, the item and the plastic transport bag shall then be packaged in a porous container.

Liquid samples can be collected in a glass jar or plastic specimen cup.

Tissue, bones, and body parts can be placed into a plastic bag, or specimen cup, if appropriate, for transport to the Laboratory. These specimens should be refrigerated upon return to the laboratory.

All packages should be properly marked and sealed before leaving the crime scene. See 7.3 Sealing for additional information.

Condoms frequently contain both liquid and dried biological material and may have specimens on both the inside and outside surfaces. Used condoms should be:

- Handled minimally to avoid contamination of biological materials.
- Packaged in a glass jar or plastic specimen cup that is aerated and placed in an outer paper bag.