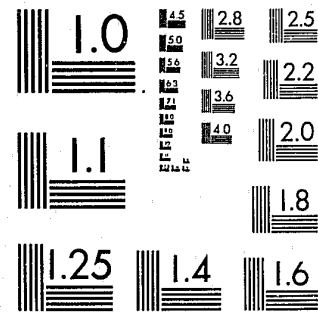


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Contents

- Cooperation** 1 **Spokane's Robbery Education Program** 73774
By John D. Moore, Crime Prevention Officer/Program Coordinator, Police Department, Spokane, Wash.
- Investigative Techniques** 6 **Nonverbal Communications in Interrogations** 73775
By Merlin S. Kuhlman, Special Agent, U.S. Army Criminal Investigation Command, Fort Riley, Kans.
- Facilities** 10 **Problems of Today—Solutions for Tomorrow: Cities Within Cities** 73776
By Sheriff Gene Barksdale and Lt. W. Lee Forbes, Sheriff's Planning Unit, Shelby County, Tenn.
- Forensic Science** 16 **Obtaining Saliva Samples from Bitemark Evidence** 73777
By Roger E. Mittleman, M.D., Office of Medical Examiner, Miami, Fla., Willard Carl Stuver, M.S., Public Safety Department, Dade County, Fla., and Richard Souviron, D.D.S., A.B.F.O., Dade County Medical Examiner's Office, Miami, Fla.
- Terrorism** 20 **Tactical Crisis Management: The Challenge of the 80's** 73778
By W. Ronald Olin, Assistant Chief of Police, Police Department, Lawrence, Kans.
- The Legal Digest** 26 **Probable Cause to Search: The Use of Inferences** 73779
By Robert L. McGuiness, Special Agent, Legal Counsel Division, Federal Bureau of Investigation, Washington, D.C.
- 32 **Wanted by the FBI**



The Cover: The Newberg, Oreg., Police Department sends a 6'4" sergeant to kindergarten to explain that being a policeman is a big job. Photograph by Bob Ellis, "Oregonian," Portland, Oreg.

Federal Bureau of Investigation
United States Department of Justice
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William H. Webster, Director

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Forensic Science

OBTAINING SALIVA SAMPLES FROM BITEMARK EVIDENCE

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EDITOR'S NOTE: This article should be of interest to all police personnel; however, only medical examiners or trained forensic technicians should attempt to obtain this type of evidence.

Reference is made to a brand name applicator (Swube). This type of applicator is recommended because it has a friction cap and its design and availability lends itself to this procedure. While brand names may be mentioned in articles published in the Bulletin, this is solely for information and assistance to law enforcement personnel. It should not, under any circumstance, be construed as an endorsement or approval by the FBI.

Bitemarks are most frequently found in violent crimes, especially those that are sex related. To aid in the possible determination of the assailant's blood type, the assailant's secretor status, and the presence or absence of salivary amylase and other proteins, saliva samples should be obtained in all suspected bitemark cases. The importance of bitemark evidence has become prominent as a result of recent trials in Florida, such as the Theodore Bundy¹ and Dorothy Haizlip² cases.

In the latter case, Dorothy Haizlip was found beaten and strangled in her Miami home. Bitemarks were found on her thigh and right breast. The area within the bitemark rings was swabbed and the evidence preserved. Testing of the swabbings revealed alpha amylase and the presence of the A and H antigens. The victim's serotype was blood group O. Subsequent blood and saliva standards obtained from the defendant confirmed that he was a type A secretor.

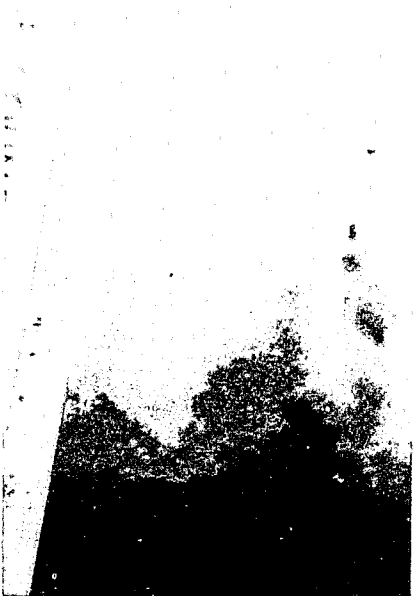
The basis for all data relative to a bitemark is the preawareness or discovery of the bitemark, followed by photography and saliva collection. Bitemarks may take many different forms, the most common being the bite "ring" made by the anterior (incisor) teeth of each arch. (See fig. 1.) Other

Figure 1



Bite ring made by anterior (incisor) teeth of each arch.

Figure 2



Half-ring bitemark (Haizlip case).

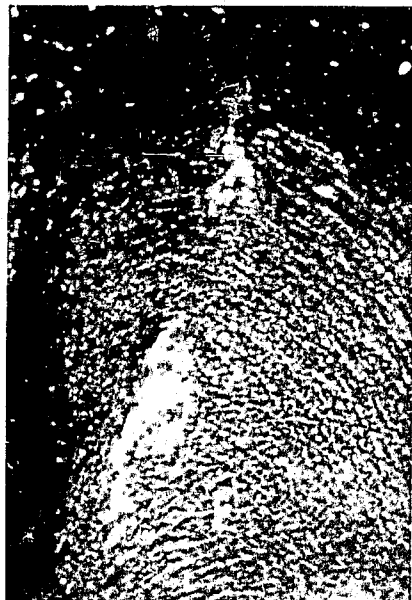
bites may be a half ring in which only incisor teeth of the arch are present, as in the Haizlip case. (See fig. 2.) In addition, bitemarks may only be two or three teeth of an arch, not forming a bite "ring" but making more of a "tooth mark." (See fig. 3.)

In homicide cases, the bitemark-related samples should be collected from the victim at the crime scene; however, if the bitemark area is handled with care during transit, the evidence may be collected in the morgue. One should avoid contaminating the bitemark and should position the body so as to avoid touching the surface of the bitemark with absorbant material, such as blood, water, clothing, or paper. The preferred method is to construct a cardboard tent and secure it over and around the bitemark area with scotch tape.

A bitemark saliva collection kit should include the following equipment. (See fig. 4.)

- 1) Two tubes containing specially treated cotton threads (one tube labeled "control" and the other tube labeled "sample"). (See fig. 5.) The cotton threads are specially treated by thoroughly washing and rinsing a portion of 100-percent cotton sheeting. It cannot be over-emphasized that the sheeting should be thoroughly rinsed following a detergent wash because residual detergent on fabric sizing can interfere with subsequent body fluid typings, and in particular, with the salivary amylase testing. After thoroughly drying the cloth, separate (tease) eight threads approximately 12 to 15 mm long from the piece of sheeting and place them in a 1 dram shell vial. This shell vial should have a 2 to 3 mm hole melted into the plastic stopper. This hole allows the threads to air dry once they have been moistened during the swabbing process.

Figure 3



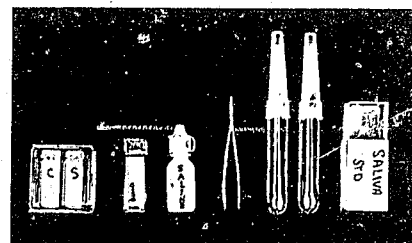
Bite mark made by a few teeth (tooth marks).

- 2) Filter paper (3 mm Whatman).
- 3) Labeled container for blood specimen. The container must be free of preservatives or other chemicals and must be large enough to contain at least 5 cc of blood.
- 4) Labeled container (squeeze bottle) for physiological saline solution.
- 5) One pair of clean forceps.
- 6) Two double Swube disposable applicators. Each double Swube disposable applicator consists of two cotton-tipped swabs in a clear plastic tube. Two labels should be included in the kit for attachment to the appropriate tube.
- 7) Cardboard box containing specially treated cotton cloth cut in a square, measuring approximately 3 cm². The cotton cloth is obtained from 100-percent cotton sheeting and is treated identically to the cotton threads previously described.
- 8) Instructions.

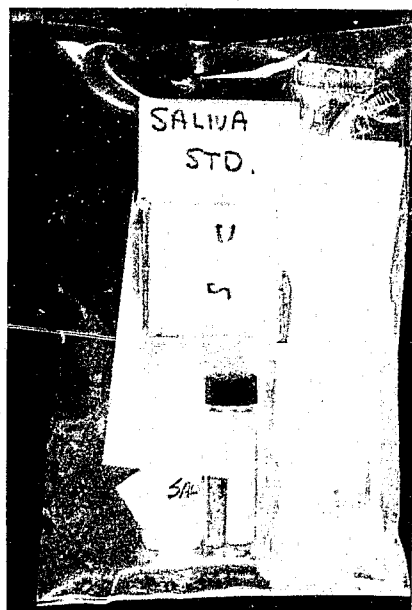
The saliva sample should be collected as follows:

- 1) Using clean forceps, grasp the clump of threads from the tube labeled control. Saturate the threads with saline, shaking off the excess solution. Obtain a control sample by swabbing an area approximately 1 by 1 inch, adjacent to the bite mark but not part of it. Avoid swabbing areas contaminated by blood. Place the threads back into the control tube. The control area is sampled first so as not to contaminate the forceps with secretor material from the bite mark. The threads from the second vial are used to obtain a sample within the bite mark "ring." The sample is collected and placed in the appropriately labeled container. Care should be taken when swabbing so as not to contaminate the swabbing material with blood or inflict any extraneous wounds with the forceps. The threads must not be touched by the examiner's hands since this could result in contamination by sweat. The specimens will be used to aid in the determination of assailant blood

Figure 4



Components of saliva kit from left to right: Plastic box with filter paper and tubes containing cotton threads, blood tube, squeeze bottle with physiological saline solutions, tweezers, Swubes, and saliva standard cardboard box with cotton cloth. (The items not pictured here are labels for the swabs and instructions.)



Bite mark saliva collection kit.

Figure 5



Specially treated cotton threads.

type and secretor status in accordance with the usual forensic practices (i.e., the absorption-elution test).

- 2) Two cotton-tipped applicators from one of the Swube applicators should be used to reswab the area within the bite mark ring previously swabbed with threads. This is done to secure more material on a media adequate for blood typing and amylase testing. Salivary amylase (alpha amylase, AMY-1, Ec. 3.2.1.1) is commonly tested for by the starch-iodine method,³ dyed starch substrate,⁴ or electrophoretic technique.⁵ Swabbing should be done by saturating the swabs with saline, draining off the excess water by gently touching it against the filter paper, rubbing thoroughly the area within the bite mark "ring," and placing the swabs into the plastic container. Remember that control swabbings must also be made of the adjacent area, using another Swube container. The samples obtained are also used to determine the assailant's blood type and secretor status by use of the absorption-inhibition tests.

- 3) In order to be able to interpret the results of the blood grouping tests, whole blood and saliva standards need to be collected from the victim. The cotton cloth from the box provided in the kit should be used to collect the saliva standard from the victim's mouth. The sample is obtained from the buccal mucosa, directly opposite the molar teeth on one side. If the cloth cannot be directly placed in the appropriate area, cotton swabs (Swube) may be used and pressed and rubbed against the cloth in order to transfer the control sample. The cloth is then stored in the cardboard box. Clean rubber gloves must be worn by the examiner for the collection of the saliva control. Five cm³ of whole blood should be collected from the victim by an appropriate technique and placed in a sterile container that is free of preservatives and other chemicals.

The specimens should be transported to the testing laboratories (usually crime laboratories) as soon as possible after collection. If prolonged storage is anticipated, they should be placed in a cool environment (4° C). Important information can be obtained from the saliva sample which may connect a suspect to a crime. The findings can be of the utmost importance to those persons involved in prosecuting or defending these types of criminal cases.

It is important to remember that contamination of the bite mark will alter or invalidate the blood grouping and serologic studies. In addition, the bite may be made through clothing which will prevent any saliva from being deposited onto the skin, thereby giving a false negative.

The method described here is simple, convenient, and inexpensive. A complete bite mark workup could also be the key that connects a particular crime to a particular suspect. **FBI**

Footnotes

¹ State of Florida v. Theodore Robert Bundy, Leon County, Fla., Circuit Court, Case No. 78 CF-670.

² State of Florida v. Roy Allen Stewart, Case No. 70-6621, Circuit Court of the 11th Judicial Circuit in and for Dade County, Fla.

³ W. Roberts, "On the Estimation of the Amygdaloid and Proteolytic Activity of Pancreatic Extracts," *Proc. R. Soc., London* 32: (1881), pp. 145-161; L. C. Nukollis, *The Scientific Investigation of Crimes* (London: Butterworth & Co., Ltd., 1956), p. 200; and D. F. Nelson and P. L. Kirk, "The Identification of Saliva," *Journal of Forensic Medicine* 10 (1963): pp. 14-21.

⁴ G. M. Willott, "An Improved Test for the Detection of Salivary Amylase in Stains," *Journal of Forensic Sciences Society*, 14 (1974): pp. 341-344.

⁵ J. C. Ward, A. D. Merritt and D. Bixler, "Human Salivary Amylase: Genetics of Electrophoretic Variants," *American Journal of Human Genetics*, 23 (1971): p. 403; A. D. Merritt, M. L. Rivas, D. Bixler and R. Newell, "Salivary and Pancreatic Amylase: Electrophoretic Characterizations and Genetic Studies," *American Journal of Human Genetics*, 25 (1973): p. 510.

END