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COMMENTS

ODONTOLOGY: BITE MARKS AS EVIDENCE IN CRIMINAL TRIALS

Michelle McClure†

INTRODUCTION

On June 21, 1978, in Wood River, Illinois, a beautiful 22-year old woman was brutally murdered in the basement of her new home.¹ Her semi-nude body was found by her boyfriend, her head and shoulders immersed in a large can of water, and her hands tied behind her back with a white extension cord.¹ Two men's socks were tied tightly around her neck, and she wore nothing from the waist down.² "She had a large gash on her forehead, a cut on her nose, and a large gash on her chin."³ The crime scene was secured, fingerprints processed, and photographs taken.

Unfortunately, although the police were able to narrow down a list of suspects, the murder remained unsolved. It wasn't until the summer of 1980 that Alva Busch, a crime scene technician with the Illinois Department of Law Enforcement, investigated the case and felt that two new techniques, unavailable at the time of the murder, might aid in the investigation.⁴ Busch thought that recently developed laser technology, used with respect to finger prints, and image enhancement, to identify instruments that made wounds and to identify bite marks, might help crack the case.⁵

In August of 1980, Dr. Homer Campbell reviewed the photographs and indicated that certain marks on the victim's right collarbone were bite marks.⁶ Prior to that time nobody who had worked on

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1. *People v. Prante*, 498 N.E.2d 889, 891 (Ill. App. 5 Dist. 1986).
2. *Id.*
3. *Id.*
4. *Id.*
5. *Id.* at 892.
6. *Prante*, 498 N.E.2d at 892.

the case, including the pathologist who examined the body, had identified the marks on the right collarbone as bite marks.⁷ On June 1, 1982, the body was exhumed and a second autopsy performed. The doctor performing the autopsy confirmed that the wounds were bite marks and the marks had been inflicted at approximately the time of death, because the microscopic slides "showed fresh hemorrhage in the subcutaneous tissue with no inflammation."⁸ Experts later testified that the pattern of the defendant John Prante's teeth were consistent with the bite marks found on the victim.⁹ John Prante is now serving a sentence of 75 years for the murder of Karla Brown.¹⁰

Bite mark evidence has not only played an important role in convicting people of crimes, but has also played an important role in vindicating the innocent. In at least one instance, it has freed an innocent man from a prison sentence for murder.¹¹ A 64 year old woman was robbed and murdered in her home on February 25, 1974.¹² Shortly thereafter, Alpha Nims was arrested on suspicion of murder.¹³ Nims claimed that, although he drove the getaway car for the robbery, he did not enter the home of the victim, nor did he murder the woman.¹⁴

In October of 1975, Nims, tried and convicted of murder, was sentenced to 25 years to life. A bite mark was found on the murder victim, but was not used as evidence at the trial.¹⁵ The first trial was overturned on a technicality, and the second trial in 1980, ended in a hung jury.¹⁶ The focus of the third trial was the bite mark evidence. Upon careful review it was determined that Nims could not have inflicted the bite mark wound on the murder victim.¹⁷ After seven years in prison and three trials, Alpha Nims was acquitted of murder.¹⁸

The use of bite marks as evidence in criminal trials, however, remains a controversial issue. Since bite mark evidence is currently admissible in most states,¹⁹ the debate centers around the weight bite mark evidence should be accorded. At the forefront of the debate is

7. *Id.*

8. *Id.*

9. *Id.* at 893.

10. *Id.* at 897.

11. *Prante*, 498 N.E.2d at 890.

12. C.P. Karazulas, *The Presentation of Bite Mark Evidence Resulting in the Acquittal of a Man After Serving Seven Years in Prison for Murder*, 29 J. FORENSIC SCI. 355 (1984).

13. *Id.*

14. *Id.*

15. *Id.*

16. *Id.*

17. Karazulas, *supra* note 12, at 356.

18. *Id.* at 357-8.

19. *Id.* at 358.

the question of if, like a fingerprint, each individual person possesses a unique dentition and bite mark. The second question is, if each dentition is indeed unique, whether a bite mark can be successfully matched to the dentition of a suspect. Although there is presently a set of guidelines for analyzing and matching marks,²⁰ those too remain under scrutiny.

This comment will address those controversies regarding the use of bite mark identifications as evidence in criminal trials. Section I will give a general introduction to the field of odontology. In Section II the author will provide a history of odontology, including the development of the American Board of Forensic Odontology and its creation of the bite mark analysis guidelines. The various techniques for analysis of both the bite mark and the dentition of the suspect will be discussed in Section III. This section will also examine current and promising progress in the analysis process. Section IV will address the controversies surrounding the use of bite mark analysis in criminal proceedings. Lastly, Section V considers the recent studies and advancements in the bite mark analysis, wherein the author's conclusion will defend the reliability of bite mark evidence.

I. ODONTOLOGY IN GENERAL

The comparison of bite marks found on a victim to the dental impression of criminal suspects falls in the field of forensic odontology. The theory of bite mark identification relies on the premise that human bite marks are unique. The human dentition, which consists of 32 teeth each possessing a unique size and shape,²¹ has many variables with the potential of uniqueness. In addition to tooth size and shape, factors such as extractions, malalignment, malposition, malformation, spacing, fractured teeth, and dental restorations also contribute to an individual's particular bite mark.²² However, as will be discussed later in the article, the human bite mark also lends itself to relatively simple alterations in the event that an individual wishes to quickly change their bite mark formation.

Bite marks are commonly found in food products or on the skin of a victim or an assailant.²³ Bite marks discovered in food products occur in cases where criminals ate food at the scene of a crime, and

20. American Board of Forensic Odontology, *Guidelines for Bite Mark Analysis*, 122 J. AM. DENTAL ASS'N 383 (1986).

21. *Id.*

22. E.H. Dinkle, Jr., *The Use of Bite Mark Evidence as an Investigative Aid*, 19 J. FORENSIC SCI. 535, 536 (1974).

23. *Id.*

left bite marks behind in the uneaten portions of food. An example is the Connecticut case of the *State v. Ortiz*, involving a situation where a bite mark was left on an apple.²⁴ The usefulness of bite marks in foodstuffs depends upon the consistency of the material, the manner in which the bite was applied, and the amount of deterioration that has taken place since the food was bitten.²⁵ For example, baked goods seldom provide usable evidence, while bites in cheese, fruit, candy, and hard sausage frequently provide excellent marks.²⁶ However, there have been instances where bite marks have been analyzed on the rigid surface of a car hood or an empty beer can.²⁷

Bite marks found on human skin provide a different set of variables. Marks against the victim, occurring most frequently in sexual assault and child abuse cases,²⁸ are typically found on the breast, neck, arm, cheek, thigh, buttock, and stomach.²⁹ Although these marks are commonly inflicted by the assailant, a self-bite occasionally occurs when an assailant forces a victim's hand into her mouth to prevent the victim from screaming.³⁰

On the other hand, the marks found on an assailant are normally located on the neck, arms, face, and possibly the genitalia.³¹ These marks are caused by the anterior teeth of the victim, while biting in self-defense.³² The marks found on assailant's hand are commonly inflicted when the assailant attempts to stifle the scream of the victim.³³

II. THE HISTORY OF ODONTOLOGY

The earliest known use of bite mark evidence used in the conviction of a criminal occurred in 1906 in England.³⁴ The crime which occurred was a burglary, and the prosecution was able to show that the suspect's teeth matched the bite mark left on a piece of cheese found at the crime scene.³⁵ Here in the United States, the earliest bite mark

24. Steven Weigler, *Bite Mark Evidence: Forensic Odontology and the Law*, 2 HEALTH MATRIX 303, 307 (1992).

25. *State v. Ortiz*, 502 A.2d 400 (Conn.1985).

26. Dinkle, *supra* note 22, at 538.

27. *Id.*

28. Weigler, *supra* note 24, at 307.

29. Dinkle, *supra* note 22, at 536.

30. Weigler, *supra* note 24.

31. Dinkle, *supra* note 22, at 537.

32. *Id.*

33. J. Furness, *Forensic Odontology*, INT'L. CRIM. POLICE REV., 258, 226 (1971).

34. Dinkle, *supra* note 22, at 537.

35. J.F. Julius, *Information Concerning Bite Mark Evidence Admissible in Court*, 10 Newsletter handed out at American Academy of Forensic Sciences annual meeting 11(1981), *as*

evidence with available legal citation was the 1954 case of *Doyle v. State of Texas*.³⁶ Once again, the bite mark was discovered on a piece of cheese.³⁷

Although the first formal odontology training in the United States occurred in 1962, the Odontology Section of the American Academy of Forensic Sciences (OSSIFIES) was not established until the early 1970's.³⁸ The OSSIFIES, which consists of roughly 300 members employed in the odontology field,³⁹ is a forum designed to provide communication and an exchange of ideas within the odontology area.⁴⁰ The American Board of Forensic Odontology, Inc. (ABFO) is the certifying board for the odontology field, and established the first standard guidelines for bite mark analysis in 1986.⁴¹ According to the statement of purpose, "careful use of these guidelines in bite mark analysis will enhance the quality of the investigation and conclusions."⁴²

A. ABFO Guidelines

The ABFO set forth the following guidelines for the analysis of bite marks. First, the analysis is broken into four distinct sections: 1) the description of the bite mark; 2) the collection of the evidence from the victim; 3) the collection of evidence from the suspect; and 4) the analysis of the evidence.⁴³

The guidelines then set criteria for each section. For example, when describing the bite mark, the analyst should make note of the name, age, and race of the victim.⁴⁴ The analyst should also comment on the location, shape, and color of the mark, and the type of injury inflicted.⁴⁵ An analyst should consider possible affects of "washing, contamination, lividity, embalming, decomposition, or change of position" when examining the bite mark of a victim.⁴⁶ A photographic

cited in Elizabeth Robinson and James Wentzel, *Toneline Bite Mark Photography*, 37 J. FORENSIC SCI. 195 (1992).

36. Robinson and Wentzel, *supra* note 35.

37. *Doyle v. State*, 263 S.W.2d 779; 159 Tex. Crim. 310 (1954).

38. Robinson and Wentzel, *supra* note 35.

39. Weigler, *supra* note 24, at 304.

40. L. Thomas Johnson, *The Significance of Bite Mark Evidence in Homicide Investigations*, (Sept. 20-21, 1990) (unpublished manuscript on file with author)(presented at the 2nd Annual Forensic Seminar of the Milwaukee County Medical Examiner), as cited in Weigler, *supra* note 24, at 304.

41. Weigler, *supra* note 24, at 305.

42. *Id.*

43. Weigler, *supra* note 24, at 307-08.

44. *Id.* at 308.

45. *Id.*

46. Weigler, *supra* note 24, at 308.

technique should be used to document the mark and salivary swabbing should be applied to determine if there are antigen secretions.⁴⁷ Tissues samples should be obtained, with impressions made of the three dimensional characteristics inherent in the mark.⁴⁸

From the suspect, the analyst should obtain a complete dental history, and front and profile pictures should be taken of the suspect's face. A dental chart, study casts, and two sets of impressions of the suspect's teeth should be obtained when feasible.⁴⁹ It must be noted that necessary court orders, warrants, or legal consent must be obtained before commencing the investigation of the suspect.⁵⁰

Once evidence has been obtained from the suspect, a comparison is done between the bite mark and the biter's teeth. Although there are many comparison techniques, the standard comparison is to use a bite mark template⁵¹ and match it to a photograph or model of the suspect's teeth.⁵²

The Guidelines Committee also established a uniform scoring system where each bite is evaluated according to the overall arch size, shape, and tooth position within the arch.⁵³ The system was developed with the basic premise that there is a high point value given to unusual and unique features.⁵⁴ Ordinary features are not given the same weight, and thus result in lower point values, than distinct features.⁵⁵

In general, three points are scored for a significantly distinctive feature, whereas only one point is given per arch of ordinary features. For example, if the number of teeth in the bite mark match the number of teeth in the suspects mouth, two points are scored, one per arch.⁵⁶ One point per arch is received for consistent arch sizes.⁵⁷ However, for every distinctive curvature of a tooth's incisal edge⁵⁸ matching that

47. *Id.*

48. Weigler, *supra* note 24, at 308.

49. *Id.*

50. Weigler, *supra* note 24, at 308-09.

51. *Id.* at 309.

52. As will be discussed later in this comment, a template is created by pressing the model of the biter's teeth into a medium, such as wax, to create a transparent overlay. GOSTA GUSTAFSON, *FORENSIC ODONTOLOGY* 140 (American Elsevier Pub. 1966).

53. Weigler, *supra* note 24, at 309.

54. Raymond D. Rawson *et. al.*, Reliability of the Scoring System of the American Board of Forensic Odontology for Human Bite Marks, 31 *J. FORENSIC SCI.* 1235, 1236 (1986).

55. *Id.* at 1236.

56. *Id.*

57. Rawson, *supra* note 54, at 1237.

58. *Id.*

of the bite mark, three points are received.⁵⁹ Similarly, for every fractured tooth or unusual anatomy, three points are received.⁶⁰

III. BITE MARK ANALYSIS

Marks on the human skin vary from a slight indentation or minor abrasion, to a laceration and penetration of underlying tissue. Many factors affect the usefulness of bite marks on the skin of humans. Two bite marks from one individual may differ depending on whether the biter used his tongue, lips or cheeks.⁶¹ The movement of the biter's jaw and the angle of the bite are also factors to be considered.⁶² The medium of skin itself should also be considered. Skin is elastic and is stretched during the bite infliction, and the surface itself is almost always curved to some degree.

During the act of biting, the skin is stretched and compressed by the teeth as it is dragged and pushed between the dental arches . . . The skin is literally forced through the labyrinth of tooth surfaces so that the areas of contact between the skin and the teeth give rise to the patterned injury.⁶³

Additionally, it should be considered whether the bite mark is examined on a living or dead subject. Bite marks on a living subject could fade quickly,⁶⁴ or can be altered by an infection, swelling and bruising of the underlying tissue.⁶⁵ When the subject is no longer living, the variables are very different, depending on when the bite marks were inflicted in relation to death. The normal distention or rigidity of a living being lasts for some hours after death occurs.⁶⁶ When this turgor disappears, the bite marks lose their sharpness and definition.⁶⁷ Shrinkage of the skin due to water loss, and putrefaction can also change the shape and appearance of the mark.⁶⁸

59. The "incisal" is the surface of the incisor teeth that is in contact with the opposite jaw. See SPENSER L. ROGERS, *THE TESTIMONY OF TEETH: FORENSIC ASPECTS OF HUMAN DENTITION* 7 (Charles C. Thomas Pub. 1988).

60. Rawson, *supra* note 54, at 1237.

61. *Id.*

62. Weigler, *supra* note 24 at 307.

63. *Id.*

64. Michael H. West et al., *The Use of Human Skin in the Fabrication of a Bite Mark Template: Two Case Reports*, 35 J. FORENSIC SCI. 1477, 1478 (1990).

65. L. Thomas Johnson, *Interview of Chairman of the Certification and Examining Committee, American Board of Forensic Odontology Inc. In Milwaukee, WI.* (1991), as cited in Weigler, *supra* note 24, at 307.

66. Dinkle, *supra* note 22, at 538.

67. *Id.*

68. *Id.*

There are primarily three steps in the comparison of bite marks. The first is the analysis of the bite mark, the second is obtaining a model of the suspected biter's teeth, and the third is the comparison of the bite with the model of the suspect's dentition.

There are several techniques for analysis of bite marks, and the common point of any analysis is photography. Photographs of the bite mark are always used.⁶⁹ The photographs, both black and white and color, are enlarged to the size of the actual bite mark to make accurate comparisons.⁷⁰ Either a reference scale, ruler, or ABFO reference scale is usually included in the photograph to show proportion and size.⁷¹

Radiographic interpretation has been used in the past as a complement to the standard photographic techniques. This process penetrates the tissues and can therefore reveal damage not readily observed in the standard photographic procedures.⁷² The bite mark, usually removed from the body by surgical procedures, is covered with a 60% iodine solution.⁷³ Standard radiographic procedures for soft tissue are then utilized.⁷⁴ The process creates a contrast enhanced image of the mark, useful in the analysis process.

However, radiographic interpretation may be replaced by a recent and promising development in the use of photography in the analysis of bite marks. This development is the use of ultraviolet (UV) technology. UV light, although invisible to the naked eye, provides greater detail and contrast to the photograph than does the use of standard lighting procedures.⁷⁵

There are two techniques that utilize ultraviolet light in photography. In ultraviolet imaging, the bite mark is flooded with ultraviolet light.⁷⁶ Here an ultraviolet filter is used on the camera to block out all light to which the film is exposed, with the exception of the UV rays.⁷⁷ This creates an ultraviolet image of the wound.⁷⁸

The second technique is called fluorescent ultraviolet imaging, and it too is accomplished by flooding the bite mark with ultraviolet

69. *Id.*

70. Robinson and Wentzel, *supra* note 35, at 196.

71. *Id.*

72. *Id.*

73. Raymond D. Rawson et. al., *Radiographic Interpretation of Contrast-Media-Enhanced Bite Marks*, 24 J. FORENSIC SCI. 898, 901 (1979).

74. *Id.* at 898.

75. *Id.* at 899.

76. National District Attorney's Asso., NDAABULLETIN, July/Aug., 1992, at 8.

77. *Id.*

78. *Id.*

light.⁷⁹ In ultraviolet imaging, though, an opposite approach is used. Performed only in the dark, ultraviolet imaging utilizes a different filter which blocks all UV light, and allows only visible rays to hit the film.⁸⁰ This method has proved the most useful of the two techniques, even revealing wounds not readily seen by the human eye.⁸¹

This ability to reveal wounds not seen by the naked eye presented new problems. Initial evaluations at the crime scene were overlooking these hidden injuries and, therefore, not requesting ultraviolet photography. An initial process was needed to scan victims for any hidden injuries.

In response to this need, a video camera, sensitive to light waves was developed.⁸² This camera, with the capability of intensifying an ultraviolet image over 70,000 times, enables investigators to immediately become aware of unseen injuries without waiting for film development.⁸³ This procedure even extends as far as to allow an investigator to link the camera to a graphics computer to reveal previously undetected injury patterns.⁸⁴

As a less expensive alternative, odontologists have been utilizing an process called toneline photography to produce a transparent overlay with a photographic outline of the mark.⁸⁵ Toneline, otherwise referred to as "line print," utilizes common and readily available film products and darkroom equipment to produce a thin, black outline of the bite mark. However, it is admitted that there may be loss of detail, and the procedure does not always work.⁸⁶ These drawbacks must be weighed against the relative expense of the procedure.

To aid in determining the existence of three dimensional characteristics not imperceptible to the human eye, forensic scientists have been using the scanning electron microscope (SEM).⁸⁷ Evidence such as a rough edge of a tooth can be determined by using this technique; however, problems with availability and expense hinder common use of the procedure.⁸⁸

Scanning photomacrography serves a purpose similar to SEM, in that it detects characteristics not apparent without the help of technol-

79. *Id.*

80. NDAA BULLETIN, *supra* note 76, at 8.

81. *Id.*

82. *Id.*

83. *Id.*

84. *Id.*

85. NDAA BULLETIN, *supra* note 76, at 9.

86. Robinson and Wentzel, *supra* note 35, at 206.

87. *Id.*

88. Thomas J. David, *Adjunctive Use of Scanning Electron Microscopy in Bite Mark Analysis: A Three Dimensional Study*, 31 J. FORENSIC SCI. 1126, 1130 (1986).

ogy.⁸⁹ "This method uses a series of illuminator-lamps that are able to project a thin, adjustable light beam on the object to be photographed."⁹⁰

In addition to the above described techniques, investigators frequently employ a procedure known as dusting and lifting. Much like fingerprinting, dusting and lifting enables investigators to lift tooth prints off the surface of both alive and deceased victims.⁹¹ The procedure begins with the investigator lightly brushing the bite mark with a standard black fingerprint powder and a camelhair brush.⁹² Clear fingerprint tape is used to lift the print from the bite mark, which is then placed on a glossy fingerprint card.⁹³ The procedure boasts excellent clarity and detail, as well as ease, speed and accuracy. In addition, it allows odontologist as well as medical examiners and investigators to utilize the simple procedure.⁹⁴ No expertise is required to successfully lift a bite print.⁹⁵

To preserve the bite mark and allow for prolonged study, scientists have developed a procedure for removing the bitten tissue from the body of a deceased victim. This is accomplished by the use of the Acrylonitrile-Butadiene-Styrene plastic ring (ABS ring).⁹⁶ Information can be obtained on deceased persons by carefully removing the tissue inflicted with the bite mark. However, it is extremely difficult to maintain the anatomical configurations of the skin and body contours.⁹⁷ The ABS ring supports the configurations and contours before and after removal from the body.⁹⁸ The technique is explained as convenient, easy, and adaptable to most surface areas, such as the breast, scalp and abdomen.⁹⁹

A. Retrieval of Suspect Dentation and Template Utilization

Equally as important as the analysis of the bite mark, is acquiring models of any suspected biter's teeth. Obtaining these models requires immediate attention to prevent suspects from altering their bite

89. Weigler, *supra* note 24, at 310.

90. *Id.*

91. *Id.*

92. Valerie J. Rao and Richard R. Souviron, *Dusting and Lifting the Bite Print: A New Technique*, 19 J. FORENSIC SCI. 326 (1984).

93. *Id.* It is necessary to shave any hair from the skin to produce a smooth surface. *Id.*

94. *Id.*

95. *Id.* at 327.

96. Rao, *supra* note 92, at 330.

97. Daniel J. Sweet *et. al.*, *Use of an Acrylonitrile-Butadiene-Styrene (ABS) Plastic Ring as a Matrix in the Recovery of Bite Mark as Evidence*, 36 J. FORENSIC SCI. 1565 (1991).

98. *Id.*

99. *Id.*

mark. Altering is possible by filing down teeth to change their shape, or even extracting teeth completely.

At the outset, a court order must be secured, or a consent form signed by the suspect, in order to legally perform the examination. Permission from the court is granted by obtaining a search warrant. Then, as established in the ABFO Guidelines, the analyst should first acquire a complete dental history of the suspect, and front and profile pictures should be taken of the suspect's face. The molds of the suspect's teeth should then be obtained.

After impressions are taken and models created, a written description is made of the details of the suspect's teeth. Among the details noted in a description are the relation between the upper and lower jaws, the form of the arches, missing teeth, spaces between teeth, displacement of teeth, width of teeth. Special features which are noted include fractures, ridges and tooth edges.¹⁰⁰

The actual comparison of the bite mark and the suspect's teeth is performed by using templates. Templates are created by pressing the model of the biter's teeth into a medium, such as wax, to create a transparent overlay.¹⁰¹ The template is then compared to the bite mark. The standard comparison matches a photograph or model to the template of the suspect's dentation using an overlay technique.¹⁰² Points are then awarded to matches as per the ABFO scoring guide described above. However, this method can produce errors because of the differences in the physical properties between the skin and the wax or styrofoam mold.¹⁰³ For example, where skin is elastic and the area of the bite mark usually occurs on a curved surface, wax and styrofoam is non-elastic and usually performed on a flat surface.¹⁰⁴ Studies have shown that, in comparing templates created on wax and styrofoam with those using human skin, the results are often not similar.¹⁰⁵

Therefore, more accurate results may be procured by using the skin of the victim to create the template. When the victim is not available, a volunteer can be substituted; however, the forensic odontologist should try to obtain a volunteer of similar age, sex, anatomic size and shape, muscle tone, body fat, and other similar physical characteristics.¹⁰⁶ If human skin is available, the teeth are "inked", using stan-

100. *Id.*

101. GOSTA GUSTAFSON, FORENSIC ODONTOLOGY 158 (American Elsevier Pub. 1966).

102. *Id.* at 153.

103. Weigler, *supra* note 24, at 309.

104. West, *supra* note 64.

105. West, *supra* note 64, at 1477-78.

106. West, *supra* note 64, at 1478.

dard office ink, and then placed on the skin in the same area and position as the normal bite.¹⁰⁷ Transparencies are then created by tracing the ink print on the skin, hence creating a more accurate comparison and a more reliable finding.¹⁰⁸

Computerized axial tomographic scanning (CAT scans) is a modern procedure used in dentition analysis of a suspect.¹⁰⁹ CAT scans provide specific details of the suspect's incisal edges, not available using the traditional wax overlay technique.¹¹⁰

Bite marks may also prove useful in identification of a perpetrator in a way unrelated to the comparison of the mark to the teeth of the suspect. In some cases, saliva from the biter may be recoverable from the mark. In these instances, saliva may be comparable to the blood group of a possible suspect.

According to recent statistics, approximately 80% of people secrete protein antigenic complexes comparable to their blood type in their saliva.¹¹¹ These secretions are comparable to the individuals blood type of A, B, or O.¹¹² Therefore, such secretions could prove very useful in either implicating or eliminating suspects in a case.

The saliva sample from the bite mark is obtained by swabbing the area with a sterile cotton swab dipped in a saline solution, and should be acquired at the beginning of the bite mark examination. A control swabbing is also suggested in an unbitten area.¹¹³ Unfortunately, this swabbing rarely reveals a secretory substance. This is in part because not all people are secretors, and in part because the current level of technology does not detect the protein antigenic substances.¹¹⁴ However, since there is the possibility of obtaining pertinent information, it is a technique that should always be attempted.

IV. THE CONTROVERSIES

As of March of 1992, there have been one hundred and ninety three reported cases where bite marks evidence has been introduced or noted in appeal.¹¹⁵ Bite mark evidence has been used to convict sus-

107. *Id.*

108. *Id.*

109. *Id.*

110. William L. Ferrell et al., *Computerized Axial Tomography as an Aid in Bite Mark Analysis: A Case Report*, 32 J. FORENSIC SCI. 266, 269-70 (1987).

111. Weigler, *supra* note 24, at 310.

112. HANDBOOK OF DENTAL JURISPRUDENCE AND RISK MANAGEMENT 147 (Burton R. Pollock ed., PGS Publishing 1987).

113. *Id.*

114. *Id.*

115. *Id.*

pects for burglary, homicide, rape, and child abuse.¹¹⁶ In fact, with regards to child abuse cases, studies indicate that the frequency of abusive biting may be reaching epidemic proportions.¹¹⁷ However, although well over 50 percent of the states have accepted bite mark evidence as admissible,¹¹⁸ dispute over its reliability still exists.

Previously, courts have admitted bite mark evidence without applying the *Frye* test.¹¹⁹ The *Frye* test, now superseded by the Federal Rules of Evidence and modern jurisdictional variants on the *Frye* test, required acceptance of a novel technique by the scientific community as a precursor to admissibility. However, courts found that the reliability of bite mark evidence to establish identification to be sufficiently established within the scientific community as to make the evidence admissible without first establishing separate reliability in each case.¹²⁰ "Where bite mark evidence is presented by a qualified expert, a *Frye* hearing is not required."¹²¹

The 1993 United States Supreme Court decision of *Daubert v. Merrell Dow Pharmaceuticals*¹²² shifted the reliance on *Frye's* "general acceptance" test in favor of the Federal Rules of Evidence. State courts have yet to make their own rulings on this decision. However, even if accepted by the states, the *Daubert* decision is likely to have little effect on bite mark admissibility.

Under the Federal Rules of Evidence, especially Rule 702, the trial judge now has the task of ensuring that an expert's testimony is both reliable and relevant.¹²³ Rule 104(a) requires that the testimony assists the trier of fact to understand or determine a fact in issue.¹²⁴ Essentially, according to the Evidence Rules, relevant evidence based on scientifically valid principles will be admissible. In the case of bite mark evidence, previously found to be so sufficiently established within the scientific community as to no longer require a *Frye* test consideration in each separate case, it is unlikely to be found inadmis-

116. Weigler, *supra* note 24, at 307.

117. *Id.*

118. Raymond D. Rawson *et. al.*, *Incidence of Bite Marks in a Selected Juvenile Population: A Preliminary Report*, 29 J. FORENSIC SCI. 254, 259 (1984).

119. Under the *Frye* test, a proponent of the scientific evidence must show the evidence's reliability. The test applied is whether methods applied to producing the evidence are generally accepted and have gained recognition within the scientific community. Evidence meeting this criteria is admissible if presented by a qualified expert. See *Frye v. United States*, 293 F. 1013 (D.C. Cir., 1923).

120. Paul C. Giannelii, *Forensic Science: Dental and Bite Mark Evidence*, 5-6 CRIM. L. BULL. 276, 283.

121. *State v Richards*, 804 P.2d 109,111 (Az.Ct.App., 1990).

122. *Daubert v. Merrell Dow Pharmaceuticals*, 113 S. Ct. 2786 (1993).

123. *Id.* at 2795.

124. *Id.* at 2795.

sible under the now relied upon Federal Rules of Evidence. Although the weight of the bite mark identification evidence may sometimes be questioned, it is doubtful that a judge would find it useless in assisting the trier of fact to understand or determine facts at issue. Furthermore, bite mark evidence has historically been found to be based on scientifically valid principles. This is not likely to change today, especially in light of ever improving technology within the field of odontology.

Since the actual admissibility of bite mark evidence is apt not to be at issue, the nucleus of the debate becomes the weight that the evidence should be accorded. Should bite mark identification be permitted as the sole piece of evidence in determining guilt, or should it merely be used as a helpful addition to all other evidence in convicting a defendant?

The bite mark controversy appears to have been falsely fueled by the dispute over expert testimony at trial. Those in opposition to reliance on bite mark evidence argue that if trial experts within the field can be at odds, then how can the science be reliable? Admittedly, expert witnesses for bite mark evidence usually present conflicting testimony at trial. For example, in the case of *State of Illinois v. Milone*, the experts for the prosecution positively identified the defendant as the inflictor of the bite mark wound.¹²⁵ Experts for the defendant either denied that a positive identification could be made, or denied that the defendant inflicted the wound.¹²⁶ An even more dramatic example of expert discrepancy is *People v. Smith*.¹²⁷ In *Smith*, the prosecution experts positively identified the accused as inflicting the bite marks on the victim.¹²⁸ Yet, the defense experts testified that, not only was the mark not inflicted by the defendant, but it "was not a bite mark at all."¹²⁹

Opponents of bite mark evidence incorrectly emphasize the expert discrepancies as indicative of a lack of scientific reliability. Adversaries argue that lack of scientific data leads to subjective instead of objective determinations.¹³⁰ Although concededly the science of odontology is relatively new, the mere fact that trial experts are in disagreement is not conclusive of unreliability. Trial experts, subject to cross-examination, are hired by a party to support a specific conclusion. Quite obviously, an expert will not be retained if their conclusions will support the opposing party. Expert disagreement is inherent

125. *People v. Milone*, 356 N.E. 2d 1350, 1356 (Ill.App.2d, 1976).

126. *Id.*

127. *People v. Smith*, 63 N.Y.2d 41 (1985).

128. *Id.* at 58.

129. *Id.*

130. Giannelli, *supra* note 120.

in the adversarial system, and should not be used in an effort to show unreliability.

The bite mark debate is more correctly centered around the basic argument of the uniqueness of human dentition, although this too is an unfounded argument made by the opposition. Proponents claim that techniques currently being utilized are at least as valid as fingerprint technology. Yet, the opponents continue to counter-argue that there is little research establishing the unique nature of a human bite mark.¹³¹

Recent studies, however, do indicate that the human bite mark is a unique, individual trait. For example, a 1984 study asked what the probability of two people having exactly a certain number of teeth of matching positions?¹³² Using principles of probability and applying them to the analysis of teeth with a precise method of measurement, the study concluded that there is uniqueness of human dentition beyond a reasonable doubt.¹³³

General controversy also exists concerning the reliability of the scoring system instituted by the American Board of Forensic Odontology. There are some that suggest that the system is so unreliable that bite mark evidence should be excluded from the court room until standards have been scientifically validated.¹³⁴ In response to this criticism, the ABFO conducted a series of investigations to determine the reliability of the scoring system.¹³⁵ The study concluded that the scoring system "has demonstrated a method of evaluation that produced a high degree of reliability among observers. In addition, it demonstrated the ability to discriminate between different degrees of match."¹³⁶ However, the study admitted that the scoring system was only a "beginning of a truly scientific approach."¹³⁷

It may be true that the scoring system is not perfect; however, that does not make the technology behind it unreliable. Furthermore, the more precise the analysis techniques become, the more accurately an analyst can score similarities in relation to the scoring system.

As in discussed in this paper, technology has progressed substantially to reach the point of current analysis techniques. Reducing photographic distortion is just one example of advancement. A 1986 review of trial transcripts revealed that distortion and the interpretation

131. Raymond D. Rawson et. al., *Statistical Evidence for the Individuality of the Human Dentition*, 29 J. FORENSIC SCI. 245 (1984).

132. *Id.*

133. *Id.* at 252.

134. Rawson, *supra* note 54, at 1236.

135. *Id.*

136. Rawson, *supra* note 54, at 1257-59.

137. Rawson, *supra* note 54, at 1259.

of distortion was an area of concern.¹³⁸ Today, however, adaptations have been devised to all but alleviate this distortion. The nature of the skin, the dynamics of the bite, and photographic elements are the primary causes of distortion.¹³⁹ Yet, if the entire bite mark is presented from one viewing angle, the curvature of the body upon which the bite mark was inflicted does not produce a significant photographic distortion.¹⁴⁰ Secondly, it is extremely important to indicate the angle at which the bite mark was photographed, as is difficult to interpret prints photographed from unknown angles.¹⁴¹

To allow for proper evaluation regarding distortion, one study suggested the use of a circular scale in the photograph to allow calculation of the photographic angle, and to enable the evaluator to make corrections on the viewing angle before making comparisons.¹⁴² To minimize distortion, the mark should be photographed at a 90 degree angle or perpendicular to the center of the bite.¹⁴³ Such adaptations and improvements have greatly increased the reliability of bite mark comparison results.

Previously unavailable fluorescent ultraviolet imaging further enhances photographic detail and contrast, and the adapted video camera allows the analyst to view invisible injuries. Three dimensional characteristics of teeth are now perceptible with the aid of the scanning electron microscope. It is with these new technical advances, along with others already discussed, that accurate and reliable bite mark identification is produced. The ABFO Scoring Guidelines are merely an aid in totaling the number of matches between bite and bite mark. Despite any potential imperfections in the scoring system, it should not be considered a hindrance to reliable results.

V. CONCLUSION

Bite mark identification is based on scientifically valid principles, and a single court has yet to find the evidence inadmissible. This is unlikely to change even in light of the recent United States Supreme Court decision which superseded the *Frye* test in the federal arena. Studies show that the human dentition is indeed unique; hence, creating a unique bite mark. That coupled with accurate analysis procedure enables a scientist to reliably discern similarities and differences be-

138. Raymond D. Rawson et al., *Analysis of Photographic Distortion in Bite Marks: A Report of the Bite Mark Guidelines Committee*, 31 J. FORENSIC SCI. 1261, 1262 (1986).

139. *Id.* at 1262.

140. *Id.* at 1267.

141. *Id.*

142. *Id.*

143. *Id.* at 1266.

tween a dentition of a suspect and the bite mark on a victim. Although bite mark comparisons will not always reveal crucial findings, bite mark evidence can potentially be an invaluable tool in both the conviction of the guilty and the vindication of the innocent.

