THE JUDICIAL VIEW OF BITEMARKS WITHIN THE UNITED STATES CRIMINAL JUSTICE SYSTEM

I.A. Pretty,[1] D.J. Sweet[2]

1. Department of Restorative Dentistry, The University of Manchester, Dental School and Hospital, Manchester, England
2. Bureau of Legal Dentistry, Vancouver, British Columbia, Canada

ABSTRACT

When examining most traditional sciences a thorough review of the relevant primary literature is usually sufficient to provide the investigator with a sound insight into the discipline. Forensic science differs in this regard, as it is presented in two main arenas: the peer-reviewed forensic journals and the Courts of Law where testimony is proffered. Because of this duality of scientific assessment the following legal review is presented. The review analysed Appellate Court rulings from the United States and identified trends of objections to bitemark testimony.

Nine major trends were identified within the cases assessed: bitemark evidence not sufficiently reliable or accepted, arguments regarding the uniqueness of the human dentition, constitutional arguments, inflammatory photographs, inaccuracy of techniques and errors in protocol, use of historical bitemarks and previous biting behavior, funds for defence witnesses and objections pertaining to witness credibility.

(J Forensic Odontostomatol 2006;24:1-11)

Keywords: Bitemark, bite, legal, law, review, forensic science, standards

INTRODUCTION

A recent study showed that 42% of bitemark cases handled by forensic dentists resulted in a Court appearance.[1] The acceptance of bitemark evidence into the Court system and the qualification of forensic dentists as experts are essential to the continued development of the discipline. It is also essential that forensic dentists ensure that their testimony in Court strengthens the discipline rather than sets negative precedents.

In 1978 Hale wrote a paper entitled "The Admissibility of Bite Mark Evidence", which was published in the Southern Californian Law Review.[2] This extensively cited article concluded that the admissibility of bitemark evidence should be barred until forensic odontologists produced policies for the analysis of bitemarks. This work was partly responsible for the creation of the American Board of Forensic Odontology (ABFO) working committees on bitemark standards, initiated to satisfy the recommendations of Hale and others.[3] This review analyses the U.S. Appellate literature to see if such a conclusion should still be reached today. Areas of investigation centre on the admissibility of bitemark evidence and the acceptance of forensic odontologists as expert witnesses.

METHOD

Using the Lexis® database* American Appellate law was used to review the legal position. Appellate cases chosen as lower Court proceedings are rarely published unless new law is being established. The Freestyle™ search engine on the Lexis/Nexis database* using the "Mega" library of US Appeals identified cases. The search terms used were "Bite", "Mark", and "Odontologist". Following examination of the cases, it was found that the admission of bitemark evidence within the U.S. legal system is commonplace. Cases were identified where bitemark evidence was proven unreliable or unfairly prejudicial to the defendant.

THE ADMISSION OF BITEMARK EVIDENCE IN THE U.S. COURTS

Bitemark identification, as it is most commonly referred to in legal terms, has been virtually unanimously admitted by the Courts. Indeed, most U.S. jurisdictions have allowed such testimony. Table 1 provides a state-by-state summary of the number of bitemark cases used in this review.

---

* Reed Elsevier Inc, New York, USA

Table 1: *Distribution of the Appellate bitemark cases examined by U.S. State*

STATE	NUMBER OF CASES	STATE	NUMBER OF CASES
Alabama	2	Nevada	3
Arizona	2	New Jersey	1
Arkansas	3	New York	5
California	5	North Carolina	4
Connecticut	2	Ohio	3
Florida	5	Oklahoma	4
Georgia	2	Oregon	3
Illinois	13	Pennsylvania	2
Indiana	2	Rhode Island	1
Kansas	2	South Carolina	1
Louisiana	2	Tennessee	1
Massachusetts	1	Texas	7
Michigan	1	Vermont	1
Military Cases	2	Virginia	2
Minnesota	1	Washington	4
Mississippi	7	West Virginia	1
Missouri	5	Wisconsin	1

The Historical Basis for the Admissibility of Bitemark Evidence

While *Doyle* v. *State*[4] represented the first bitemark case in modern U.S. legal history, it did not examine the scientific basis for the admissibility of the evidence. A critical review of the bitemark literature found that the scientific issues surrounding bitemark evidence can be summarised as the uniqueness of the human dentition, its rendition on the bitten substrate, the use of statistical evidence and the lack of a consistent method of analysis.[5] *People* v. *Marx*[6] is generally regarded as the landmark case for bitemark evidence. However, it is interesting to note that more contemporary cases have cited *Doyle* as the basis for rejecting arguments for unproven reliability and acceptance.[7]

The *Marx* case involved the murder of an elderly woman who sustained a bitemark on her nose that, following exhumation of the body, was examined by four forensic odontologists, three of which presented for the prosecution. The case is well described in the Journal of Forensic Sciences.[8] All three witnesses for the prosecution testified that the defendant caused the bite and an attempt was made to demonstrate the significance of Marx's highly unusual dentition. At appeal, the defence stated that the techniques and skills utilised were not generally accepted and therefore should have failed the *Frye*[9] test. The appeals Court stated that they considered the use of bitemarks as novel, although the techniques employed were not i.e., photographs, models, and radiographs. The Court went further by stating that unlike some other forensic disciplines, "… the Court did not have to sacrifice its independence and common sense in evaluating it".[6]

This implied that the jury could perform their own analyses by examining the methods that the forensic dentists had used, and they did not require the expert to explain the nuances of the techniques to them. The evidence was, in essence, self-explanatory. The Court did not state that experience in bitemark analysis, nor the knowledge of the gross, class and unique characteristics of teeth were required by the jury in order to properly assess the *value* of the evidence. They justified this statement by comparing bitemark analysis, which employs (for the main part physical exemplars) with that of polygraph evidence stating that the trier-of-fact (usually the jury) had to rely entirely on the testimony of the polygrapher with only "marks on paper" to verify the claims being made.[8] The result of this reliance on the expert would lead to the jury sacrificing its independence in deference to the expert. One can argue that the provision of scaled photographs and overlays to a jury is problematic and the temptation for members to conduct their own analysis is high; yet this would be undertaken without the scientific understanding to permit the results to be properly interpreted.

It is interesting to note that an expert is called precisely for their knowledge and to aid the jury.[10] Indeed many forensic dentists may be unsettled with the thought that once the physical exemplars are collected, no further expertise is required.[6] This case initiated the premise that bitemarks should be admitted although the weight of such evidence should be carefully examined by the trier-of-fact. The *Marx* Court also commented on the experts' enthusiasm to develop or extend forensic dentistry into the area of bitemark identification. It is useful to note that the *Marx* holding stated that ".. the theory of bitemark indentification is…based on an assessment of the probability that two or more people could leave the same bitemark" The term *probability* is one steeped in statistical nuance and there are no published scientific studies that have presented evidence for the calculation of probabilities in relation to bitemark suspects.[6] Before *Marx* forensic odontological work had largely been limited to the identification of found remains by dental records.

An Indiana Court also compared bitemark identification with polygraph techniques finding that bitemark comparison was simply the examination of items of physical evidence to see if they were reciprocal.[11] The methods of achieving this comparison, while complex, were determined to be accurate. As a concise statement of the current status of bitemark admissibility the following, written in 1981, serves well:

> "The reliability of bite mark evidence as a means of identification is sufficiently established in the scientific community to make such evidence admissible in a criminal case, without separately establishing scientific reliability in each case, but subject to the establishment by foundation evidence of the authenticity of the materials used and propriety of the procedure followed in the particular case and to cross-examination intended to test the reliability of the conclusion reached in that case".[12]

It should be noted that this case employed the *Frye*[9] rule which has now been superceded by *Daubert;* [13] however, the general acceptance of bitemark evidence persists and there is still a continuing acceptance of the scientific credibility of bitemark evidence. A number of high profile US cases featuring bitemarks are currently under review due to the post-trial testing of DNA samples that have demonstrated that the convicted individual may not have been responsible for the crime. The outcomes of these appeals may well challenge this general acceptance.

APPELATE CASE ASSESSMENT OF BITEMARK EVIDENCE ADMISSIBILITY

Following an examination of the admission issues for bitemarks it is possible to isolate several important trends pertaining to bitemark admissibility from the 103 cases examined. These are: bitemark evidence not sufficiently reliable or accepted, arguments regarding the uniqueness of the human dentition, constitutional arguments, inflammatory photographs, inaccuracy of techniques and errors in protocol, use of historical bitemarks and previous biting behaviour, funds for defence witnesses and objections pertaining to witness credibility. Each of the areas is discussed, with accompanying examples, below. Further case law examples illustrating each of the trends are provided in Table 2, with a full citation list provided in Table 3.

Bitemark evidence not sufficiently reliable or accepted

This argument is frequently used by defence teams attempting to bar the admission of incriminating bitemark evidence and, despite many years of uninterrupted bitemark admission, was used as recently as 1997.[14] One of the pervasive reasons for refusing appeals on this basis is that once a scientific method has been accepted as reliable under one *Frye*[9] hearing then general acceptance has been established. Judge Cox[15] stated that bitemarks have been so overwhelmingly accepted by the Courts that a proponent need not establish the principle of general acceptance on each occasion.

The case of *State* v. *Hodgson*[16] is significant as it was the first appeal case to examine bitemark evidence in the light of the *Daubert* ruling. Convicted of two counts of first-degree murder, Hodgson appealed the admissibility of the odontological evidence linking a bitemark on his arm to one of the decedents. Arguing that bitemark evidence was not generally accepted he claimed that the science did not meet the requirements of *Frye*. The Court disagreed with Hodgson stating that *Daubert* and FRE 702 [17] had superseded *Frye*[9] and that they were satisfied that bitemark evidence by an accepted expert was neither novel nor an emerging science and thus was admitted correctly. Following *Marx* and *Hodgson* no bitemark evidence has been refused admission due to arguments regarding *Frye,* FRE, or *Daubert.* It should be noted that the Kumho Tire case[18] further influenced the application of *Daubert* by stating that the gatekeeper role of the judge was not limited to *novel* scientific testimony; leaving the possibility that the scientific credibility of bitemark analyses could be revisited. In essence *Kumho* provides trial judges a broad discretion to apply any and all useful factors in determining the reliability of proffered evidence. Table 2 provides a reference list for bitemark cases that feature this objection.

Table 2: *Index to illustrative cases, grouped by issue of admissibility*

ISSUE OF ADMISSIBILITY	ILLUSTRATIVE CASES FROM TABLE 3
Bitemark evidence not sufficiently reliable or established. Abuse of Court discretion in admitting testimony and evidence	4, 5, 6, 8, 10, 11, 14, 15, 17, 18, 23, 25, 26, 29, 31, 32, 40, 44, 45, 46, 50, 53, 57, 58, 61, 64, 67, 68, 70, 75, 80, 82, 87, 88, 95, 98
Arguments regarding the uniqueness of the human dentition	3, 9, 15, 20
Constitutional argument (5th Amendment) improper seizure of exemplars	1, 4, 17, 27, 48, 51, 56, 60, 94, 98
Photographs of bitemark eviodence inflammatory	7, 10, 18, 33, 52, 86, 88
Ubaccyract if tecgbuqyes Errors in bitemark protocol	2, 9, 13, 19, 80, 97
Use of previous bitemarks or evidence of previous biting behaviour	22, 30, 54, 86, 88, 89, 103
Defence requesting prosecution's testimony or funds for own witness	28, 34, 41, 43, 73, 74, 85, 92
Witness prejudiced or other witness related objections	32, 33, 34, 58, 61, 62, 91, 97, 102

Arguments regarding the uniqueness of the human dentition

Several appellants have raised the issue of the uniqueness of the human dentition (or lack thereof) as an argument against the admission of bitemark evidence. In *State* v. *Garrison*[19], the appellant argued that the testimony of the forensic dentist, who stated that the probability of the bitemarks not being made by Garrison was 8 in 1,000,000, was unreliable and flawed. When questioned regarding the validity of the stated probability the witness testified that the figure had been arrived at following consultation of several leading textbooks and journal articles. It is likely that the figure was obtained from the work of McFarlane *et al* who, in an example, stated that the probability of another individual having the same dentition as their volunteer was 1 in 800,000.[20, 21]

The majority opinion in this case stated that experts quoting from books or articles fell under the hearsay exception for learned treatises, and thus the point of appeal was overturned. It is interesting, however, to examine the dissenting opinion in this appeal. Justices Gordon and Cameron noted that the witness had neither performed any of his own mathematical calculations nor was he aware of any of the formulae used to derive the quoted figures. The expert's ignorance of the statistical weighting that should be given to each variable used in the equation and his inability to replicate the findings in Court were serious shortcomings of his testimony.

The Justices carried out a literature search and were unable to locate the articles or formulae to which the witness alluded. The dissenting opinion continued by describing the inherent difficulties of determining the uniqueness of the human dentition and in particular the hazards of applying the product rule. Gordon and Cameron concluded that witnesses who offered statements representing direct quotes from books or similar materials should only be permitted to do so if the referenced sources were available to the Court and opposing council. Within the published literature there is considerable evidence that the human dentition is unique.[22] However, little of this research has assessed or described the unique features of the anterior teeth, i.e. those involved in the biting process. Even if one concedes that the anterior dentition is unique the greater question is the degree to which these unique features are recorded on the bitten substrate; for example human skin.[22] Table 2 provides a reference list for bitemark cases that feature this objection.

Constitutional arguments. Improper seizure of exemplars

The Fifth Amendment, that forms the basis of most constitutional appeals against bitemark evidence, states that no person shall be compelled to be a witness against himself. A case example of the Fifth Amendment in a bitemark appeal can be found in *State* v. *Sapsford*[23], an appeal against a conviction of three counts of rape and one count each of attempted aggravated murder and felonious sexual penetration. Sapsford claimed that he was compelled to submit to dental impressions that resulted in the production of exemplars making him the source of incriminating evidence. Using this argument, he claimed that such compulsion was in violation of his Fifth Amendment privilege against self-incrimination. Examining this point the Court overturned his claim by stating that the Fifth Amendment privilege extended only to communicative or testimonial acts and not to the taking of dental exemplars. In this manner, dental impressions did not differ from the taking of fingerprints, photographs, or blood.[23]

In an attempt to use the protective shield of self-incrimination to overturn the admission of bitemark evidence, Asherman[24] stated that the Connecticut State Constitution offered further protection than the Fifth Amendment . Claiming that the use of the word "evidence" rather than "witness" in the State Constitution extended the protection to non-testimonial evidence, Asherman appealed his conviction. The Judges disagreed and found the nature, spirit, and principle of the two statements were the same. They noted that some jurisdictions had widened the meaning of such clauses by finding that evidence that required the defendant to perform an affirmative act should be excluded.[24] This wider interpretation would allow dental impressions and fingerprint samples but would not allow handwriting or speech samples. Table 2 provides a reference list for bitemark cases that feature this objection.

Photographs of bitemark evidence inflammatory

Photographs play a crucial role in both the analysis and subsequent Court presentation of bitemark injuries. It is usually essential to the expert witnesses' testimony that such photographs are available for demonstration to the jury. Defendants frequently object to the display of such images in Court. *State* v. *Kendrick*[25] offers a typical example of such an appeal.

During the original trial against Kendrick, the dental expert presented testimony regarding a bitemark that

Table 3: *U.S. Appeal Cases examined with citation*

CASE No, NAME and CITATION	CASE No, NAME and CITATION
[L1] Doyle v. State, 159 Texas, C.R.310, 263 S.W.2d 779 (Jan. 20, 1954) [L2] People v. Johnson, 8 Ill. App.3d 457, 289 N.E.2d 772 (Nov. 16, 1972) [L3] People v. Marx, 54 Cal. App.3d 100, 126 Cal. Rptr. 350 (Dec. 29, 1975) [L4] People v. Milone, 43 Ill. App.3d 385, 356 N.E.2d 531 (Apr.7 1976) [L5] State v. Routh, 30 Or. App.3d 901, 568 P.2d 704 (Sep. 12, 1977) [L6] Niehaus v. State, 265 Ind. 655, 359 N.E.2d 513 (Jan 25, 1977) [L7] People v. Watson, 75 Cal. App.3d 384, 142 Cal. Rptr. 134 (Nov. 28, 1977) [L8] People v. Slone, 76 Cal. App.3d 611, 143 Cal. Rptr 61 (Jan. 6 1978) [L9] State v. Garrison, 120 Ariz. 255, 585 P.2d 563 (Sept. 20 1978) [L10] State v. Howe, 136 Vt. 53, 386 A.2d 1125 (Mar 15, 1978) [L11] State v. Jones, 273 S.C. 723, 259 S.E. 2d 120 (Oct. 11 1979) [L12] Deutscher v. State, 95 Nov. 669, 601 P.2d 407 (Oct. 18 1979) [L13] State v. Peoples, 227 Kan. 127, 60S P.2d 135 (Jan. 19, 1980) [L14] State v. Kleypas, 602 S.W.2d 863 (Mo. App.) (July. 10, 1980) [L15] State v. Sager, 600 S.W.2d 541 (Mo. App.) (May 5, 1980) [L16] People v. Geer, 624, S.W.2d 143; (Mo. App.) (Sep. 22, 1981) [L17] People v. Middleton, 54 N.Y.2d 42, 429 N.E.2d 100 (Oct. 27, 1981) [L18] State v. Temple, 302 NC.I., 273 S.E.2d 273 (Jan. 6, 1981) [L19] State v. Green, 305 N.C. 463, 290 S.E.2d 625 (May 4, 1982) [L20] Bludsworth v. State, 98 Nev. 289, 646 P.2d 558 (June 18, 1982) [L21] State v. Turner, 633 S.W.2d 421 (Mo. App) (Mar. 2 1982) [L22] United States v. Martin, 13 M.J. 66 (CMA 1982) (Apr. 19, 1982) [L23] Kennedy v. State, 640 P.2d 971 (Oklahoma) (Feb. 3, 1982) [L24] People v. Queen, 108 Ill. App.3d 1088, 440 N.E.2d 126 (July 13, 1982) [L25] Aguilar v. State, 98 Nev. 18, 639 P.2d 533 (Jan. 28, 1982)	[L50] Jackson v. State, 511 So.2d 1047 (Fla. App.) (Aug. 7, 1987) [L51] People v. Dace, 153 Ill. App. 3d 891, 506 N.E.2d 280 (Apr. 3 1987) [L52] State v. Kendrick, 47 Wash. App. 620, 736 P.2d 1079 (May 11, 1987) [L53] Handley v. State, 515 So.2d 121, Court of Appeal of Alabama (June 30, 1987) [L54] People v. Wachal, 156 Ill. App. 3d 331, 509 N.E.2d 648 (May 29, 1987) [L55] State v. Vital, 505 So.2d 1006 (La. App.) (Apr. 9, 1987) [L56] Marquez v. State, 725 S.W.2d 217 (Tex. Cr. App.) (Jan. 14, 1987) [L57] Harward v. Commonwealth, 5 Va. App. 468, 364 S.E.2d 5Il (Jan. 19, 1988) [L58] Mitchell v. State, 527, So.2d 179 (Fla. Sup. Ct) (May 19, 1988) [L59] State v. Pierce, Slip opinion not designated for publication, Supreme Court [L60] DuBoise v. State, 520 So.2d 260 (Fla. Sup. Ct) (Feb 4, 1988) [L61] State v. Armstrong, 369 S.E.2d 870 (W.Va.) [L62] Bromley v. State, 380 S.E.2d 694 (Ga. 1989) (June 30, 1989) [L63] United States v. Sergeant Rickey J. Covington. ACM 27337 [L64] People v. Marsh, 441 N.W.2d 33 (Mich. App. 1989) (May 15, 1989) [L65] Chaney v. State, 775 S.W.2d 722 (Texas App. Dallas) (July 5, 1989) [L66] State v. Richards, 166 Ariz. 576, 804 P.2d 109 (Aug. 7, 1990) [L67] People v. Calabro, 555 N.Y.S2d 321, 161 A.D.2d 375 (May 15, 1990) [L68] Spence v. State, 795 S.W.2d 743 (Tex. Crim. App.) (June 13, 1990) [L69] Litaker v. State, 784 S.W.2d 739 (Tex. App.) (Feb. 21, 1990) [L70] Commonwealth v. Henry, 524 Pa, 135, 569 A.2d9 929 (Feb. 8, 1990) [L71] State v. Moen, 110 Ore. App. 372; 822 P.2d 762 (Dec. 18, 1991) [L72] Salazar v. State, Slip opinion (Tex. App. Houston) (Jan, 16, 1991) [L73] Wilhoit v. State, 809 P.2d 1322 (Ct. of Crim. App. Of Okla) (April 16, 1991) [L74] Washington v. State, 863 P.2d 673; 1992 Okla. Crim. App. [L75] State v. Burgos, 53 Ill. 2d 218; 606 N.E.2d 1201 (Nov 19, 1992) [L76] Harris v. State, Slip opinion (Arkansas App.) (Nov 18, 1992)

[L26]Commonwealth v. Graves, 310 Pa. Super 184; 456 A.2d 561 (Feb. 4, 1983)
[L27]State v. Sapsford, 22 Ohio App.3d 1 (Nov. 9, 1983)
[L28]State v. Stokes, 433 So.2d, 29 (La. 1983) (May 23, 1983)
[L29]People v. Bethune, 484 N.Y.S. 2d 577. 105 A.D.2d 262 (Dec. 31, 1984)
[L30]People v. Smith, 63 N.Y.2d 41, 468 N.E.2d 879 (July 2, 1984)
[L31]Bradford v. State, 460 So.2d 926 (Fla. App. 2d Dist. 1984) (Nov. 30, 1984)
[L32]Bundy v. State, 455 So.2d 330 (Florida Sup. Ct.) (June 21, 1984)
[L33]State v. Asherman, 193 Conn. 695, 478 A.2d 227 (July 17, 1984)
[L34]State v. Adams, A.2d 218 (R.I. 1981) (Aug. 21, 1984)
[L35]People v. Williams, 128 Ill. App.3d 384, 470 N.E.2d 1140 (Oct. 22, 1984)
[L36]Smith v. State, 253 Ga. 536, 322 S.E.2d 492 (Nov. 16, 1984)
[L37]State v. Carter, 74 N.C.App 437, 328 S.E.2d 607 (May 7, 1985)
[L38]State v. Dickson, 691 S.W.2d 334 (Mo. App. 1985) (April 2, 1985)
[L39]Tuggle v. Commonwealth, 230 Va. 99, 334 S.E.2d 838 (Sept. 6, 1985)
[L40]State v. Ortiz, 198 Conn. 220, 502 A.2d 40Q (Dec. 31, 1985)
[L41]Standridge v. State, 701 P.2d 761 (Okl. Cr. 1985) (June 6. 1985)
[L42]State v. Johnson, 317 N.C. 343, 346 S.E.2d 596 (Aug. 12, 1986)
[L43]McCrory v. State, 505 So.2d 1272 (Ala. Cr. App) (Dec. 9, 1986)
[L44]State v. Stinson, 134 Wis. 2d 224, 397 N.W.2d 136 (Oct. 28, 1986)
[L45]People v. Pante, 147 Ill. App.3d 1039, 498 N.E.2d 889 (Oct. 3. 1986)
[L46]Commonwealth v. Cifizzari, 397 Mass. 560, 492 N.E.2d 357 (May 14, 1986)
[L47]State v. Bingham, 105 Wash. 2d 820, 719 P.2d 109 (Wash.1986) (May 15 1986)
[L48]Wade v. State, 490 N.E.2d 1097 (Ind. 1986) (April 3, 1986)
[L49]People v. Walkey, 177 Cal. App. 3d 268, 223 Cal. Rptr. 132 (Cal. App., 4th Dist) (Jan. 23, 1986)
[L77]State v. Lyons,124 Ore. App. 598; 863 P.2d 1303; 1993 Ore. App.
[L78]Davis v. State, 611 So. 2d 906 (Miss. Sup. Ct.) (Dec. 17, 1992)
[L79]Williams v. State, 829 S.W.2d 216, (Tex. Crim. App. En Blanc) (April 1992)
[L80]People v. Holmes. 234 Ill. App. 3d 931, 601 N.E. 2d 985 (Sept. 8, 1992)
[L81]State v. Hill, 64 Ohio St. 3d 313 (Dec, 11, 1992)
[L82]Verdict v. State, 315 Ark. 436, 868 S.W.2d 443 (Dec. 20, 1992)
[L83]State v. Welburn, Slip opinion (Ohio App.) (Nov. 17, 1993)
[L84]People v. Gallo, 260 Ill. App. 3d 1032, 632 N.E.2d 99 (Mar. 18, 1994)
[L85]Harrison v. State, 635 So.2d 894 (Miss. Sup. Ct.) (Apr. 14, 1994)
[L86]Kinney v. State, 315 Ark.481, 868 S.W.2d 463 (Jan. 10, 1994)
[L87]State v. Hodgson, 512 N.W.2d 95 (Minn. Sup. Ct.) (Feb. 11, 1994)
[L88]State v. Cazes, 875 S.W.2d 253;Tenn (Feb. 14, 1994)
[L89]State v. Noguera, 512 U.S. 1253; 114 S.Ct. 2780; (Feb. 20, 1994)
[L90]People v. Brown, 162 Misc. 2d 555, 618 N.Y.S.2d 188 (N.Y. Co. Ct.) (1994)
[L91]State v. Warness, 77 Wash. App. 636, 893 P.2d 665 (May 1, 1995)
[L92]State v. Krone, 182 Ariz. 319, 897 P.2d 621 (Ariz. Sup. Ct) (June 22, 1995)
[L93]Naples v. State, 666 So. 2d 763 (1995)
[L94]State v. Payne, 282 Ill. App. 3d 307; 667 N.E.2d 643; 199 Ill. App.
[L95]State v. Shaw, 278 Ill. App. 3d 939; 664 N.E.2d 97; 199 Ill. App.
[L96]Rios v. State, Unpublished opinion. 04-96-00375-CR
[L97]Banks v. State, 725 So. 2d 711; (1997)
[L98]Howard v. State, 697 So. 2d 415; (1997)
[L99]State v. Kiser, 87 Wash. App. 126; 940 P.2d 308; (1997)
[L100]Walters v. State, 720 So.2d 856; (1998)
[L101]State v. Steward, 179 Ill. 2d 611; 705 N.E.2d 447; (1998)
[L102]Brewer v. State, 725 So.2d 106; (19978)
[L103]State v. Fortin, 318 N.J. Super. 577; 724 A.2d 818; (1999)

involved over 180 exhibits, including numerous photographs. Kendrick argued that several of the photographs, including those of his mouth, should not have been admitted, as they were unnecessarily gruesome. The Court examined the photographs of the victims (including shots depicting the bitemarks) and found that they were indeed gruesome, but not overly so. They accurately depicted the horrific nature of the two victims' last moments and so were determined to be probative. The Court stated that violent crimes could not be explained to the jury in a "lily-white" manner.[26] Kendrick particularly objected to the photographs of his mouth that were taken using cheek retractors on the grounds that it made him look "vampirish". The Court stated that the photographs were essential aids to the often complex testimony of the forensic odontologists. The reasons for the use of the cheek retractors were carefully explained and thus the Judges concluded that the photographs were correctly admitted in the original trial. Table 2 provides a reference list for bitemark cases that feature this objection.

Inaccuracy of techniques and errors in bitemark protocol

Defendants in Court can question the accuracy of the techniques involved in the analysis of bitemark injuries. A representative case is that of *State* v. *Peoples*[27] in which Peoples, on appeal, challenged the accuracy of the exhibits and models used by the forensic dentist in arriving at his conclusions. Peoples' concerns were centred on the enlargement of a series of photographs and the production of plaster models of his teeth. The Court carefully assessed the exhibits and the techniques used to produce them and found no error in the original trial to admit them into evidence. The Court stated that any doubts regarding the accuracy of the exhibits should be applied to the weight of the evidence and not dictate its admissibility. It should be noted that forensic dentists must be prepared to defend the accuracy of their exhibits and be able to describe how they check and validate such materials.

A case example of a technique being questioned by a defendant can be found in *People* v. *Holmes.*[28] The expert used a plaster cast of Holmes' teeth to make an imprint in a sheet of Styrofoam from which hand-traced overlays were produced. The accuracy of this technique was questioned in light of the availability of more precise methods. The odontologist was asked to repeat the analysis using a radiographic technique and the original verdict was affirmed. There are many techniques and methods employed by those who examine bitemarks and such experts should expect to have their protocols questioned by opposing counsel. The use of controversial or novel systems is likely to make such inquiries more probable.

Banks v. *State*[29] where the single item of physical evidence linking Banks to the crime scene was a bitemark in a sandwich, highlights a more serious example of protocol error. Following his analysis of the bitemark, the prosecution's dental expert threw the sandwich away believing that it would become susceptible to mould and hence be useless. The destruction of this evidence denied Banks the opportunity to obtain his own expert who could examine the bitemark and rebut the prosecution's expert. The Court agreed that this error had caused an unfair disadvantage to the defence and that the bitemark evidence should not have been admitted. Due to the pivotal nature of the evidence, the verdict was reversed. Table 2 provides a reference list for bitemark cases that feature this objection.

The use of previous bitemarks or evidence of previous biting behaviour

Examples exist of historical bitemarks being used to compare to contemporary injuries allegedly caused by the same defendant. An example of this can be found in *State* v. *Smith.*[30] The prosecution in this case used two techniques to identify the biter. The first used a plaster cast of the suspect's teeth to compare to a scaled photograph of the injury. The second, contested method, used a photograph-to-photograph comparison. The prosecution presented a black-and-white photograph of a bite injury allegedly made by Smith in 1977 on the nose of a murder victim. Smith had confessed to this crime and thus the prosecution argued that it was reasonable to assume that Smith was responsible for the bitemark. The expert then compared the historical bite with the bitemark from the contemporary crime and found them similar. The defence strongly objected to this technique stating that the method was not well accepted. The Court, however, disagreed and the original verdict was affirmed.

The premise that if an individual has bitten before then they will be likely to bite again has been offered into evidence by State prosecutors and tenaciously objected to by defence teams. *United States* v. *Martin*[31] represents an example of such a prosecutorial technique. The prosecution offered testimony that at times of stress the defendant bit or chewed items, such as toothbrushes or pencils. A bitemark was found on the neck of Martin's murdered

wife and the prosecution stated that because of the aforementioned biting behaviour the injury was likely to have been caused by Martin. Upon appeal, Martin claimed that this evidence was wrongly admitted; the linking of biting objects to biting his wife was nonsense. The Court found that the evidence had been admitted in error. Had the expert established a link between the biting of objects and a propensity to bite humans it may have been marginally admissible. However, despite agreeing with Martin's point of appeal the Court determined that the evidence did not have a substantial prejudicial effect on the outcome of the trial and the original verdict was upheld.

Defence requesting prosecution's testimony or funds for own witness

Courts take the issue of the State withholding evidence from the defence seriously and timely, accurate disclosure is well grounded in the doctrine of the U.S. legal system. The disclosure rules insist that a defendant be entitled to all results or reports of physical or mental examinations and of scientific tests or experiments conducted concerning a particular case. The rules also state that, subject to an appropriate protection order, all tangible objects that were used in the execution of such tests should also be released to the accused.[32]

State v. *Adams*[26] demonstrates an example of disclosure issues within the context of a bitemark case. Adams claimed that the Court had erred in failing to dismiss the case when it became apparent that the State had not disclosed the existence of a scientific report concerning an alleged bitemark of the victim or the existence of a cast impression of the injury. The prosecution was instructed to disclose fully the materials, but when this was done the cast of the impression was not included. The Appellate Court stated that there had been a deliberate misinterpretation of the disclosure rules and this had resulted in gross error in favour of the State. This non-compliance was compounded by the ultimate failure of complete disclosure despite specific instructions from the Court to do so. The implications of the lack of disclosure were significant, as Adams was unable to secure an independent forensic dentist who could have offered an alternative opinion to that of the state. Following several other points of appeal the original verdict was overturned, which was a very serious consequence of the State's actions.[26]

The issue of Courts providing funding for accused individuals to secure expert witnesses is heavily debated. *Washington* v. *State*[33] provides an example of this issue in relation to a forensic dental expert. Washington's appeal against the death sentence was based upon many grounds but in particular he claimed that the Court erred when it denied him funds to obtain a forensic dentist to refute the prosecution's witness. In examining the original trial, the Appeals Court found that the bitemark evidence had a "high impact" upon the trial and the Court's refusal to grant funds for a defence expert was an irreversible error. The verdict was overturned and the case was remanded for a new trial. This example is often contradicted by other jurisdictions that believe that it is not the State's responsibility to provide the defendant with numerous experts to testify on their behalf.

WITNESS RELATED OBJECTIONS

This section examines the objection to bitemark testimony based on expert witness issues. The cases represent instances where the witness has been accepted as an expert and offered an opinion during the trial. It is a recognised defence strategy to suggest to the jury that the witness is less credible, and thus reduce the weight afforded to their testimony. Before examining some of the case-related issues, it is worthwhile to examine some aspects of what it is to be an expert witness.

A legal definition of an expert witness is "one who possesses extraordinary knowledge concerning a subject which was obtained from experience or by careful study".[34] A more general view is that experts are persons with special knowledge, skill, experience, training, and/or education that goes beyond the normal experience of ordinary members of the public. Some Courts have stated that experts can be qualified if they are, without other qualification, merely "helpful" to the jury.

It is argued that nearly anyone could provide expert testimony in some form or another. If the brakes fail on your new vehicle, a brake specialist from a local automotive shop would be able to inform the Court of the processes behind the failure. In this field, they would be providing expert testimony. If you receive dental treatment that is of poor quality, a general practitioner with many years experience would be an excellent witness to choose. When examining bitemark evidence, however, the selection of a *forensic* dentist can be problematic.

Dentists in all jurisdictions have an obligation to pursue continuing education throughout their

professional careers. This can result in a plethora of diplomas, additional degrees, and memberships in organisations. Lawyers, and others, who employ dental expert witnesses, need to be able to interpret what may appear to be an extensive *curriculum vitae* and extract the salient features. With regard to bitemark evidence an expert will either have to have a) been board certified by the ABFO, b) completed a research degree followed by extensive casework experience, or c) extensive documented experience in the discipline. The selection of Court specialists should be limited to those individuals represented by these groups. The use of non-dental personnel to testify concerning bitemarks is fraught with danger. This was shown by the Appeal case *State* v. *Adams,*[35] where the use of a physician's testimony concerning a bite injury was ruled inadmissible.

What is a Bitemark Expert Witness?

Dental experts testifying regarding bitemarks use their knowledge of: a) dental materials, b) associated instruments, c) the morphology of the human dentition in terms of gross, class and unique characteristics, d) the effects of use, misuse and abuse of the dentition leading to the production of unqiue characteristics, e) a knowledge of the masticatory system and f) the dynamic interaction between teeth and objects to assist the Court.[36] An effective odontologist's testimony is the culmination of extensive research and preparation. This will frequently involve the use of pattern analysis, often using some form of transparent overlay and a careful metric assessment of both the injury and the suspect's(s') dentition. The results of such preparation, combined with direct observations or examinations represents the foundation of all expert testimony and is estolled within the guidelines of the major forensic dental organisations such as the American Board of Forensic Odontology.[37,38]

One of the most serious allegations that can be brought against a witness is that of perjury. In *Bromley* v. *State*[39] the defence alleged at appeal that the State's witness had lied during cross-examination. At Bromley's original trial, the dentist was asked if he had consulted with any other expert during his analysis of the evidence and the formulation of his conclusions. He responded that he had not. It was later proved that he had infact consulted with the defence witness in the case. The Court found that the testimony given by the expert, although false, was harmless to the appellant, and did not warrant an assignment of error.

Another example where the integrity of the witness was questioned is *Brewer* v. *State,*[40] a capital case in which the appellant had been convicted of the rape and murder of a three-year-old child. In this case, the appellant claimed that the forensic dentist's testimony should not have been permitted, as previous testimony by the witness in another trial had been deemed inadmissible. *Brewer* also stated that the witness had been less than forthright concerning his qualifications in previous testimony.[41] The Court examined the issues and found that one of the previous trials did not involve dental testimony and the second was about membership of a professional organisation that the witness had properly explained. The Court stated:

> "...the record evidence shows that Dr ..... possessed the knowledge, skill, experience, training, and education necessary to qualify as an expert in forensic odontology. The problems in *Maxwell* and *Keko* went to the weight and credibility to be assigned to his testimony by the jury - not his qualifications."

The appeal Court found no assignments of error and affirmed the trial Court ruling. Other cases[24-42] examined the issues of prejudice of experts and prosecution witnesses working in teams, none of which was found to have any merit. See Table 2 for further citations. However, the cases do illustrate that the behaviours and actions of forensic odontologists are open to negative interpretation. Therefore, care should be taken to demonstrate no impropriety, lest it be brought in front of a public Court. Forensic odontologists must subscribe to rigorous and comprehensive standards of practice to ensure fair and equitable treatment for all parties concerned.[43] It should be noted that the *Brewer* case has been re-examined in light of DNA evidence that has demonstrated that two individuals' DNA were responsible for the rape of the child and neither were Kennedy Brewer. The odontology testimony and its application may therefore well be questioned again, but it should be clear that the original appeal was based on the expert's qualifications not the methods of analysis employed.

SUMMARY AND CONCLUSION

It can be stated in summary that historically bitemark evidence has been generally accepted within the forensic field, and the admission of such evidence on this principle is correct within the definitions provided by *Frye* [9] and the Federal Rules of Evidence (FRE, Rule 702).[17] Indeed within the U.S. evidence

of positive identification of bitemark suspects has been admitted in all States with the single exception of Oklahoma;[44] where the odontologists conclusion level was limited to "probable bitemark". Unfortunately the case literature does not described how this conclusion was reached in light of the state's newly adopted *Daubert* standard. The impact of *Daubert*[13] and its clarification under *Kumho* have not yet been fully assessed. *Daubert* requires published evidence of reliability of forensic procedures and these are limited with regard to bitemark evidence.[45,46] *Daubert* states that purported scientific testimony should be based on scientific procedure or method and comprise of more than subjective belief or unsupported speculation.[13] Further requirements include that evidence is supported by appropriate validation, again the bitemark literature is sparse in this regard.[22] It is important to note that the degree of acceptance of bitemark evidence does vary widely in the field with many odontologists sceptical about the conclusions that can be drawn from such analyses.[47] The trends analysed previously describe some of the attempts by defence lawyers to highlight the weaknesses inherent in bitemark analysis. It is important for testifying odontologists to be aware of such issues and strategies, and be prepared to address them if required. The surest means by which odontologists can avoid complications in Court is by following guidelines issued by their regulatory or advisory bodies, restricting bitemark analysis to those injuries demonstrating the highest level of forensic significance and ensuring that the conclusions drawn can be supported not only by the evidence at hand, but by the scientific base for the procedure employed in reaching that conclusion. There is a clear need for further bitemark research to ensure that a robust and effective answer can be provided under a *Daubert* challenge and in particular studies that assess the validity and reliability of both metric and pattern analysis are required.[13]

REFERENCES

1. Atkinson SA. A qualitative and quantitative survey of forensic odontologists in England and Wales, 1994. Med Sci Law 1998;38(1):34-41.

2. Hale A. The admissibility of bitemark evidence. Southern Californian Law Review 1978;51(3):309-34.

3. American Board of Forensic Odontology. Guidelines for bitemark analysis. JADA 1986;112:383-6.

4. Doyle v. State, 159 Texas, C.R.310, 263 S.W.2d 779 (Jan. 20, 1954).

5. Pretty IA, Sweet D. The scientific basis for human bitemark analyses - a critical review. Sci Justice 2001;41(2):85-92.

6. People v. Marx, 54 Cal. App.3d 100, 126 Cal. 350. In.

7. Zarkowski P. Bite mark evidence: its worth in the eyes of the expert. J Law Ethics Dent 1988;1(1):47-57.

8. Vale GL, Sognnaes RF, Felando GN, Noguchi TT. Unusual three-dimensional bite mark evidence in a homicide case. J Forensic Sci 1976;21(3):642-52.

9. Frye v. United States 293 F. 1013 (DC Cir. 1923).

10. Faigman DL, Kale DH, Saks MJ, Sanders J. Modern Scientific Evidence: The Law and Science of Expert Testimony. The legal standard for the admissibility of scientific evidence. St. Paul, Minn: West Publishing Co., 1997.

11. Niehaus v. State, 265 Ind. 655, 359 N.E.2d 513 (Jan 25, 1977).

12. People v. Middleton, 54 N.Y.2d., 429 N.E.2d 581.

13. Daubert v. Merrell Dow Pharmaceuticals, 509 U.S. 579 (1993).

14. Howard v. State, 697 So. 2d 415.

15. U.S. v. Gibson, 24 M.J. 246 CMA.

16. State v. Hodgson, 512 N.W.2d 95.

17. Mueller CB, Kirkpatrick LC. Federal Rules of Evidence: With Advisory Committee Notes and Legislative History. New York: Aspen Law & Business, 2005.

18. Kumho Tire Co. v. Carmichael is 526 US 137 (1999).

19. State v. Garrison, 120 Ariz. 255, 585 P.2d 563.

20. MacFarlane TW, MacDonald DG, Sutherland DA. Statistical problems in dental identification. J Forensic Sci Soc 1974;14(3):247-52.

21. MacDonald DG, MacFarlane TW. Forensic odontology. Report of a case involving bite marks. Glasg Dent J 1972;3(1):16-9.

22. Pretty IA. The barriers to achieving an evidence base for bitemark analysis. Forensic Sci Int 2006.

23. State v. Sapsford, 22 Ohio App.3d 1.

24. State v. Asherman, 193 Conn. 695, 478 A.2d 227 (July 17, 1984).

25. State v. Kendrick, 47 Wash. App. 620; 736 P.2d.

26. State v. Maurice Adams, 481 A.2d 718.

27. State v. Peoples, 227 Kan. 127, 60S P.2d 135.

28. State v. Holmes, 234 Ill. App. 3d 931, 601 N.E. 2d 985.

29. Banks v. State, 725 So. 2d 711.

30. State v. Smith, 63 N.Y.2d 41, 468 N.E.2d 879.

31. United States v. Martin, 13 M.J. 66 (CMA).

32. State v. Krone, 182 Ariz. 319, 897 P.2d 621 (Ariz. Sup. Ct) (June 22, 1995).

33. Washington v. State, 836 P.2d 673; Okla. Crim. App.

34. Woolridge ED. Glossary of legal terminology. Dent Clin North Am 1977;21(1):181-93.

35. State v. Adams, 76 Wn.2d 650, 656, 458 P.2d 558.

36. Sweet D, Shutler GG. Analysis of salivary DNA evidence from a bite mark on a body submerged in water. J Forensic Sci 1999;44(5):1069-72.

37. Kittleson JM, Kieser JA, Buckingham DM, Herbison GP. Weighing evidence: Quantitative measures of the importance of bitemark evidence. J Forensic Odontostomatol 2002; 20(2):31-7.

38. Bowers CM, Johansen RJ. Bitemark Evidence. In: Saks MJ, editor. Modern Scientific Evidence. New York, West Publishing Co., 2002.

39. Bromley v. State, 380 S.E.2d 694.

40. Brewer v. State, 725 So.2d 106.

41. Hansen M. Out of the blue. Am Bar Assoc J 1996;80:50-5.

42. Mitchell v. State, 527, So.2d 179 (Fla. Sup. Ct) (May 19, 1988).

43. Sweet D, Pretty IA. A look at forensic dentistry - Part 2: teeth as weapons of violence - identification of bitemark perpetrators. Br Dent J 2001;190(8):415-8.

44. Crider v. State, F-1999-1422 (October 11, 2001).

45. Arheart KL, Pretty IA. Results of the 4th ABFO Bitemark Workshop - 1999. Forensic Sci Int 2001;124(2-3):104-11.

46. Pretty IA, Sweet D. Digital bite mark overlays - an analysis of effectiveness. J Forensic Sci 2001;46(6):1385-91.

47. Pretty IA. A web-based survey of odontologist's opinions concerning bitemark analyses. J Forensic Sci 2003;48(5):1117-20.

Address for correspondence:
Iain A Pretty
Dental Health Unit
3A Skelton House, Lloyd Street North
Manchester Science Park
Manchester, England
M15 6SH

Tel: +44 (0) 161 226 1211
Fax: +44 (0) 161 232 4700
Email: iain.pretty@manchester.ac.uk

The Criminal Justice System (CJS) is one of the major public services in the country, with over 400,000 staff across six agencies which work together to deliver criminal justice.Â Some services and initiatives within the CJS are run by a number of voluntary groups such as Victim Support and the National Association for the Care and Resettlement of Offenders (NACRO).Â One goal of the criminal justice system is to reduce crime. Reducing crime can be achieved through â€˜reactive meansâ€™, such as responding to a call for service, making an arrest, obtaining a criminal conviction, and carrying out the punishment imposed by the court, or through â€˜proactive meansâ€™, such as eliminating the conditions that produce criminality.