

The National Academies

Committee on Identifying the Needs of the Forensic Science Community

Forensic Odontology Bite Marks

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Questions from the Committee

1. What is the state of the art?
2. Where is research conducted?
3. Where is it published?
4. What is the scientific basis that informs the interpretation of the evidence?
5. What are the major problems in the scientific foundation, methods, and practice?
6. What research questions do you think need to be answered?



What is the state of the art?



What is the state of the art?

Definition: Bite mark analysis is the investigation of marks made by teeth on human skin or other objects. The analysis is accomplished by combining the science and art of dentistry and a forensic discipline that encompasses aspects of anatomy, pathology, oral medicine, physiology, histology, chemistry, and physics (especially mechanics) and tooth mark pattern analysis.



What is the state of the art?

- Forensic Odontologists understand the anatomy and function of teeth and the dynamic mechanics of biting.
- A competent, skilled Odontologist can produce biter profiles from bite patterns that exhibit sufficient information to have evidentiary value.



What is the state of the art?

- Competent Forensic Odontologists will conform to the American Board of Forensic Odontology Bitemark Methodology Guidelines for:
 - Bitemark Evidence Collection
 - Bitemark Evidence Comparison
 - Bitemark Forensic Report Writing
 - Ethics



State of the Art

The State of the Art is Defined by Forensic Odontologists who:

- Are capable of using all known evidence collection and comparison modalities
- Select those modalities appropriate for the case in question
- And..



State of the Art

- Employ blinding techniques to inhibit bias (observer effects)
 - Evidence collection
 - Evidence analysis
 - Dental lineups
- Seek 2nd opinions from independent, blinded, competent forensic odontologists.
- And...



State of the Art

- Engage in continuing study and research to improve themselves and Forensic Odontology
- Recognize and abide by the Code of Ethics and Conduct



State of the Art

- Understand the scientific method
- Use the scientific method in tests and procedures to the greatest extent possible



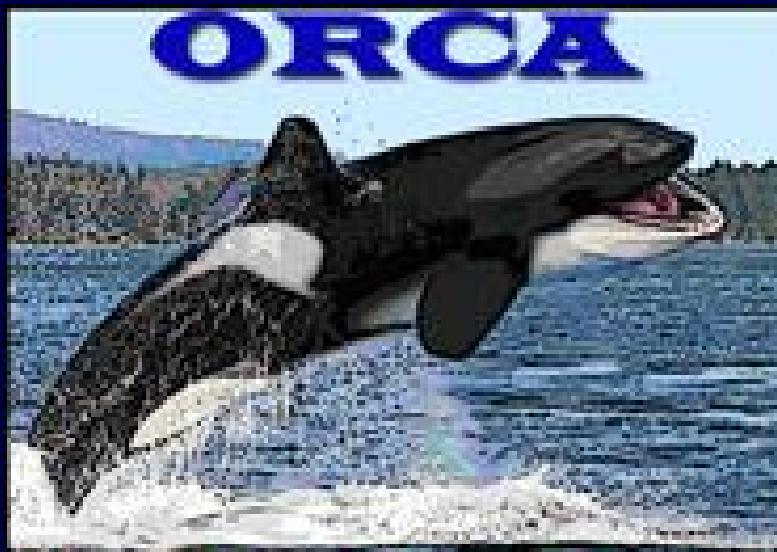
Where is research conducted?



Where is research conducted?

Odontology Research Consortium
Associates

www.orca-forensic.org



ORCA Mission Statement

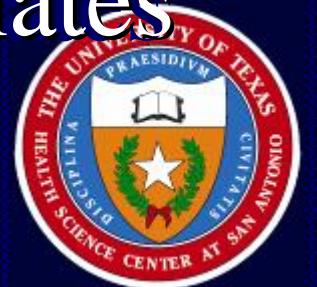
It is our goal to stimulate mutual research co-operation and to enhance the scientific credibility of the discipline by encouraging and supporting scientific rigor in forensic odontology research.



Where is research conducted?

Forensic Odontology research
is conducted by individual
Odontologists and by Odontologists
at Institutions and Universities
Worldwide

Go to www.orca-forensic.org for
complete listing of ORCA associates



Where is research conducted?

Institutions and Universities

University of Alabama, School of
Dentistry, Birmingham, Alabama,
USA

University of British Columbia,
Vancouver, BC, Canada



15 Institutions Worldwide

University at Buffalo, The State
University of New York, Buffalo,
NY, USA

Catholic University at Leuven,
School of Dentistry, Leuven,
Belgium



15 Institutions Worldwide

Columbia University School of
Dental Medicine, New York, NY,
USA

Louisiana State University School of
Dentistry, New Orleans, LA, USA



15 Institutions Worldwide

University of Manchester, Dental
School, Manchester, England, UK

Marquette University, Milwaukee,
WI, USA



15 Institutions Worldwide

McGill University, Montreal,
Quebec, Canada

University of Melbourne, School of
Dental Science, Melbourne,
Australia



15 Institutions Worldwide

University of Nevada Las Vegas,
School of Dental Medicine, Las
Vegas, NV, USA

University of Oslo, Faculty of
Dentistry, Oslo, Norway



15 Institutions Worldwide

National Board of Forensic
Medicine, Stockholm, Sweden

University of Texas Dental Branch
at Houston, USA



15 Institutions Worldwide

University of Texas Health Science
Center at San Antonio, Dental School
USA



Where is it published?

- The Journal of Forensic Sciences
- Forensic Science International
- American Journal of Forensic Medicine and Pathology
(list attached)



What is the scientific basis that informs the interpretation of the evidence?



What is the scientific basis that informs the interpretation of the evidence?

Although forensic odontologists have significantly improved the scientific basis for collecting and analyzing evidence (digital analysis, improved exemplars, light microscopy, SEM, improved metric analysis, etc)...



What is the scientific basis that informs the interpretation of the evidence?

...there has been no significant improvement in the scientific basis for interpreting the evidence to reach a truly objective conclusion.



What is the scientific basis that informs the interpretation of the evidence?

- Forensic Odontology, like other forensic identification modalities, relies on the education, ability, and experience of the practitioners
- Interpretation of bite mark evidence must be tempered with a recognition of the limitations of the discipline.



What is the scientific basis that informs the interpretation of the evidence?

- Forensic Odontology provides important information that can assist judges and juries to understand situations involving bite marks.
- But...



What are the major problems in
the scientific foundation, methods,
and practice?



Major problems

- The uniqueness of the human dentition has not been scientifically established.



Major problems

- The ability of the dentition, *if unique*, to transfer a unique pattern to human skin and maintain that uniqueness has not been scientifically established.



Major problems

- A clear statement of the type, quality, and number of class and individual characteristics or other features required to indicate that a bite mark has reached a threshold of evidentiary value has not been established.



Major problems

- Forensic Odontology certifying organizations have not created or administered bite mark analysis proficiency tests for their board certified members.



Major problems

- The ability to analyze and interpret the scope or extent of distortion of bite mark patterns on human skin has not been demonstrated.



Major problems

- The effect of that distortion on comparison modalities is not fully understood and has not been quantified



What research questions do
you think need to be
answered?



Research Questions

- Is the dentition of each human unique?
- Do teeth transfer their distinctive characteristics to human skin and maintain and express the uniqueness?



Research Questions

- Are the currently recommended analysis and comparison methods sufficient?



Research Questions

- What new analysis methods are most likely to lead to significant improvement in the comparison procedures?



Research Questions

- What are the features of a bite mark that distinguish one with evidentiary value from one without?
- Can those features be listed and quantified?



Research Questions

- Can new and potentially better methods of comparing bite patterns and the teeth that may have created them be developed?



Research Questions

- What are the most promising of these potential new methods?



Big Research Question

- What are the potential sources for funding for this research?



Conclusions

- Bite Mark Analysis is too important and valuable to the investigation and adjudication of certain crimes to be discounted or overlooked.
- The use of bite mark analysis to exclude suspects is powerful and important.



Conclusions

- The scientific basis for associating unknown biters to tooth marks or bite marks must be established.
- Currently, the association of one individual in an open population to a bite pattern on human skin to a reasonable dental, medical, or scientific certainty based on pattern analysis alone cannot be scientifically supported.



Conclusions

- In closed or limited population cases it may be possible to associate a biter and the bite mark(s) with reasonable dental, medical, or scientific certainty *for that limited population.*
- Forensic Odontology certifying bodies should properly test and periodically re-test their certified members for proficiency in bite mark analysis



Thank You

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The opinions expressed are solely those of the author and do not necessarily represent the positions or viewpoints of the University of Texas Health Science Center at San Antonio or the American Board of Forensic Odontology

