

**Medical Sciences
Specialist Advisory Group**

**The use of Forensic Anthropology, Forensic
Entomology and Forensic Odontology Evidence in
Court**

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[v1.0]

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INTRODUCTION

While the subject of bias was raised in the late 1980s as an issue for forensic document examiners to consider (Miller 1984), it was not until over 20 years later that the potential for contextual information to render forensic experts vulnerable to erroneous identifications was more fully explored (e.g. Dror *et al.* 2005; 2006). The potential for error due to cognitive factors is now recognised by a number of forensic disciplines, including odontology (Page *et al.* 2012), fingerprint examination (Edmond *et al.* 2013), anthropology (Nakhaeizadeh *et al.* 2014; Nakhaeizadeh and Morgan 2015; Nakhaeizadeh *et al.* 2018), entomology (Archer and Wallman 2016), toolmark and firearm analysis (Kerstholt *et al.* 2010), and forensic pathology (Kukucka *et al.* 2017; Oliver 2017). Further, The National Academy of Sciences (NAS 2009) and The President's Council of Advisors on Science and Technology (PCAST 2016) have issued reports challenging forensic scientists. These publications highlight the shortcomings of pattern and experience-based forensic evidence, and the potential for cognitive bias to influence analysis and conclusions. The findings in these reports and prior discussions about the actual and potential role of forensic science in contributing to false convictions (e.g. Saks and Koehler, 2005; Garrett and Neufeld, 2009; Etter, 2013; Murray, 2015) resulted in re-evaluation of current procedures by practitioners from fingerprint examinations, questioned documents, toolmark analysis, firearm analysis, hair analysis, and odontology (Edmond *et al.* 2013; Saks and Koehler 2005).

The NAS and PCAST reports also suggest that lawyers and judges often have insufficient training and background in scientific methodology (NAS 2009; PCAST 2016; see also Edmond 2015). Consequently, there is the possibility that legal practitioners in particular cases may fail to fully comprehend some of the approaches employed by different forensic science disciplines, and the reliability of forensic science evidence that is offered in court (NAS 2009: 27; see also Caddy 2010). The courts may therefore risk failure in their role as gatekeepers with the power to dismiss low quality and invalid expert evidence. This limited understanding by legal personnel potentially also applies to the supplementary forensic science disciplines most closely associated with medicolegal work, including forensic anthropology, odontology and entomology.

Cases of wrongful conviction, although rare, have increased recognition by forensic pathologists, clinical forensic medical practitioners and forensic psychiatrists in Victoria (Australia) of the need to improve uniformity of approach among practitioners, and to assist the legal community in comprehending their evidence (e.g. Cordner 2012; 2015; Maxwell 2014). In light of this, the Medical Sciences Specialist Advisory group (MS SAG) facilitated by the Australia New Zealand Policing Advisory Agency National Institute of Forensic Science (ANZPAA NIFS), tasked its Technical Advisory Groups (TAGs)¹ to engage in a similar process of consideration.

This paper will be a living document that provides a series of questions developed by the TAGs of the MS SAG in the disciplines of forensic anthropology, forensic entomology and forensic odontology. It is hoped that this publication provides the outline of fundamental aspects for anthropology, entomology and odontology practitioners to consider when developing their conclusions, as well as indicate where the level of minimum standards may lie. In addition, it is hoped the document will be an aid for the legal community (prosecutors, defence lawyers and judges) to more fully scrutinise expert forensic anthropology, entomology and odontology evidence.

¹ TAGS were previously known as Scientific Working Groups (SWGs) and form the MS SAG, which was established in 2006 following endorsement from NIFS (Donlon 2016).

FORENSIC ANTHROPOLOGY

PRELIMINARIES

1. What qualifications and experience do you have to practise as a forensic anthropologist?
2. Who contacted you about this case (person and/or agency) and requested that you undertake an assessment of the evidence? When was this contact made?
3. What circumstantial and technical information did you receive about the case, and when did you receive it? Does the sequence of events described in your answer introduce the potential for cognitive bias?

THE SCENE

4. Did you attend the scene where remains were found and view the remains *in situ*? If not, did the inability to attend the scene impact on the conclusions you drew from your analysis?
5. Did you assist with, or advise remotely on, the recovery of the human remains and associated evidence in this case? How was the recovery of the human remains and associated evidence recorded?
6. Have you described in detail the physical context where the human remains were located?
7. Did the process of recovering the human remains impact on the conclusions you drew from your analysis?

EXAMINATION

8. Did you form any part of your opinion based on photographs? If yes, what are the limitations of drawing conclusions from photographic evidence and do these limitations apply to your conclusions?

IF THE ISSUE RELATES TO TIME SINCE DEATH (POST-MORTEM INTERVAL)

9. Have you provided a detailed description of the preservation and completeness of the remains? If not, please explain why.
10. What methods (e.g. radiocarbon dating) have you considered or used to estimate the post-mortem interval and why? What is the evidence base for this/these methods?

IF THE ISSUE RELATES TO THE INTERPRETATION OF SKELETAL TRAUMA

11. Have you described in detail all of the skeletal defects present? Have you described the procedures used in the examination? What conclusions can you draw from the analysis of the defects?
12. Is your opinion about any of the skeletal defects based on information beyond your actual examination of the remains? If so, who and/or what else has been relied upon?
13. Is it possible to comment on the timing of the trauma? Was the trauma sustained ante-, peri- or post-mortem? What evidence did you use to conclude the timing of the described trauma?
14. Is it possible to comment on the degree of force required to create the skeletal trauma? If yes, then comment; if not, please explain why not?
15. Did you receive input from a relevant consultant specialist? If so, who was this, why was the input sought, and what was the contribution? If not, why was no other specialist consulted?
16. Describe the peer review process your case report has been subject to. If your report has not been peer reviewed, please explain why not.

FORENSIC ENTOMOLOGY

PRELIMINARIES

1. What qualifications and experience do you have to practise as a forensic entomologist?
2. Who contacted you about this case (person and/or agency) and requested that you undertake an assessment of the evidence? When was this contact made?
3. What circumstantial and technical information did you receive about the case, and when did you receive it? Does the sequence of events described in your answer introduce the potential for cognitive bias?

EVIDENCE COLLECTION AND STORAGE

4. Where and when was the evidence collected?
5. If not you, then which individual or agency collected the evidence?
6. Were you contacted by the individual or agency prior to them collecting the evidence?
7. If yes to the above, did the individual or agency seek advice from you in their collection procedures?
8. Did the collector have either experience or training in the collection of forensic entomology evidence?
9. Where and how was the evidence stored and transported between collection and delivery to you?
10. Have evidence collection procedures been followed according to your standards, or to the standards set out by Amendt *et al.* 2007?
11. If yes to the above, were the procedures that were used those agreed previously between you and the agency (including use of an entomology 'kit')?
12. Do your evidence procedures address the risks of potential contamination in the mortuary, and at the site of body discovery?
13. What procedures do you have in place for chain of evidential custody, and for storage of evidence and case notes?
14. Were there any significant delays between body discovery and evidence collection that are likely to have affected your conclusions?

CONCLUSIONS

15. Have any of your conclusions been drawn from photographic evidence, and if so, are you aware of the limitations of such evidence when used by entomologists (Porter 2012)?
16. To the best of our current biological knowledge about invertebrate distributions, are the invertebrates collected from the body expected to be found in the region in which it was located?
17. Are there any factors specific to this case that you believe have limited the scope or accuracy of your opinion?
18. Were you unable to identify any of the specimens collected to the taxonomic level required to form an opinion? If so, and if the specimens were at least recognisable as blowflies or flesh flies, did you consider a molecular approach? If not, why not?

19. Is a weather station vs. scene temperature correlation necessary in this case? If so, was it performed using a validated method (e.g. Archer 2004)?
20. If you are stating a post-mortem interval, rather than a minimum post-mortem interval, how do you justify your calculation of the pre-appearance interval² (George *et al.* 2013)?
21. What method did you use to calculate the minimum post-mortem interval? What are the potential limitations of the method, and the reference data used?
22. Are you aware of the toxicology findings, and have you considered the effect that any detected drugs and toxins may have had on insect growth rates and/or succession patterns?
23. Describe the peer review process your case report has been subject to. If your report has not been peer reviewed, please explain why not.

² A “pre-appearance interval” used in this sense will equate to the time between death of a person and first appearance on the dead body of carrion insects (usually blowfly maggots).

FORENSIC ODONTOLOGY

PRELIMINARIES

1. What qualifications and experience do you have to practise as a forensic odontologist?
2. Who contacted you about this case (person and/or agency) and requested that you undertake an assessment of the evidence? When was this contact made?
3. What circumstantial and technical information did you receive about the case, and when did you receive it? Does the sequence of events described in your answer introduce the potential for cognitive bias?
4. What types of data were utilised (written; radiographs (digital or film); photography (digital or film); casts (digital or stone); dental appliances (actual or digital representation)?
5. What method or methods were used in your examination?
6. What assumptions did you make in forming your conclusions?
7. Describe the peer review process your case report has been subject to. If your report has not been peer reviewed, please explain why not.

SPECIFIC TO HUMAN IDENTIFICATION VIA DENTAL COMPARISON

1. What discrepancies were noted between ante-mortem (AM) and post-mortem (PM) datasets?
2. How were discrepancies reconciled?
3. Do the conclusions accord with Interpol guidelines?
4. Was the time difference between AM and PM datasets of significance to the decision making? (Are the features relied upon for decision making likely affected by the time span between AM and PM?)

SPECIFIC TO AGE ESTIMATION BASED ON DENTAL DEVELOPMENT

1. Is there an appropriate population dataset available and was this used? Are there any weaknesses associated with using this population dataset?

SPECIFIC TO PATTERNED INJURY EXAMINATION

POTENTIAL SOURCES OF BIAS

1. What information about the circumstances of the case was provided to you, by whom, and when?
2. Did you perform examination of the victim(s)?
3. Did you perform examination and/or take impressions of suspect(s) dentition?
4. Were you given a number of de-identified dental casts to compare to the injury – or just that of the suspect(s)?
5. Was a comparison of the relationship between the injury and the dentition performed by the same person who examined the alleged victim and/or the suspect(s)?

QUALITY OF THE INJURY

6. What are the class characteristics of a human bite mark (Forrest and Soon 2016: 230)?
7. To what extent does this injury display the class characteristics of a human bite mark (Forrest and Soon 2016: 230; Gold et al. 1989, Grey 1989, Goodbody et al. 1976)?
8. What individual characteristics of a human bite can be transferred to an injury (Forrest and Soon 2016: 230-231)?
9. To what extent do individual characteristics appear to have been represented in this specific injury (e.g. gaps representing missing teeth, severe crowding of teeth) that would be expected to be reflected in a causative dentition (Forrest and Soon 2016: 230-231; Miller et al. 2009, Bush et al. 2009)?

CASE SELECTION

10. Is this injury as presented adequate and suitable for potential comparison with suspect dentitions (Forrest and Soon 2016: 250)?

QUALITY OF THE EVIDENCE

11. What deficiencies do you note in the quality of the evidence provided to you in respect of this injury? (e.g. presence of recognisable or measurable distortion in images, problems with colour balance without a 50% grey patch for colour correction if appropriate, presence or absence of a locating image or images, presence of images without a forensic scale to demonstrate the extent of the injury, presence of a forensic scale in some of the images to permit adequate scaling) (Forrest and Soon 2016)
12. In regard to 6-10 above, how would you describe the evidentiary quality of the injury itself as presented in terms of: the ability to discern detail within the injury (class characteristics, individual characteristics); age of the injury; and potential distortions?
13. Were any special methods used to record the injury – alternative light sources, if appropriate (Forrest and Soon 2016: 245), physical or scanned impressions of the injury, DNA swabs (AuSFO 2013: 2; Forrest and Soon 2016: 280-281)? What are the advantages and disadvantages of these methods for this particular injury?

EXAMINATION OF SUSPECT DENTITIONS

14. If the injury displayed individuating features, was the suspect/s dentition(s) examined (Forrest and Soon 2016: 251-253; Bush *et al.* 2011)?

COMPARISON PROCEDURE

15. How did you compare the suspect dentition(s) to the mark? What are the advantages and disadvantages of this method?
16. What features are present in both the injury itself and the suspect dentition(s) that lead you to your conclusion?
17. Are there any discordant features that you cannot reconcile in this comparison?
18. What is the strength of the relationship between the form and pattern of the suspect's dentition and that of the injury?

CONCLUSION

19. Does your conclusion accord with one of the possible outcomes generally recommended by both the Australian Society of Forensic Odontology and the American Board of Forensic Odontology (AuSFO 2013; ABFO 2016)? In summary:

- > Can exclude the suspect
- > Cannot exclude the suspect
- > Cannot reach a conclusion because of insufficient detail to perform a valid comparison.

EVIDENCE BASE

20. Are you familiar with the evidence base for comparison of dentitions with injuries?

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