Wrongful Convictions and Forensic Science

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in collaboration with
Jane Goodman-Delahunty
Overview of presentation

- Adversarial vs inquisitorial criminal procedures
- Forensic science: Fingerprint identification and DNA profiling
- How wrongful convictions occur
- Investigative and evidentiary errors, unconscious biases
- Strengthening forensic science, guidelines for reporting a match
- What legal professionals need to know
- Safeguards to avoid wrongful convictions
Adversarial vs Inquisitorial

**Adversarial**

- Passive judge
- Evidence exclusions to avoid prejudice
- Party-centred
- Advantages party with most resources
- Partisan experts, hired guns
- Rebuttal experts “let the best expert win”
- Trial by ambush

**Inquisitorial**

- Judge active search for truth
- All case decisions reviewed
- Court-centred
- No independent investigation by defence
- Single court-appointed expert, not so independent
- Minor role for defence
- Trial by dossier, more confirmatory review
Forensic science

• **19th century: fingerprint**
  - Compare latent mark lifted from crime scene to 10-prints of (un)known suspects.
  - Evidence at court is number of points of similarity between mark and print.

• **21st century: DNA profiling**
  - Compare crime scene sample to (un)known suspect sample; kit analysis, amplify, interpret.
  - Evidence is likelihood of random match in population.

• Although forensic evidence is valuable in solving crimes and prosecuting criminals, errors occur.
<table>
<thead>
<tr>
<th>FEATURES</th>
<th>FINGERPRINTS</th>
<th>DNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forensic uses</td>
<td>since 1900</td>
<td>since 1990</td>
</tr>
<tr>
<td>Uniqueness</td>
<td>presumed; twins differ</td>
<td>twins same, family similar</td>
</tr>
<tr>
<td>Scientific foundation</td>
<td>none</td>
<td>unchallenged</td>
</tr>
<tr>
<td>Expert training</td>
<td>years of specialist training</td>
<td>technicians use analysis kits, scientists testify in court</td>
</tr>
<tr>
<td>Training content</td>
<td>the biology of fingerprints; use of tools; human judgment and skills</td>
<td>kits, technology, chemistry</td>
</tr>
<tr>
<td>Test basis</td>
<td>pattern matching</td>
<td>pattern matching</td>
</tr>
<tr>
<td>Criteria for match</td>
<td>arbitrary</td>
<td>empirically validated</td>
</tr>
<tr>
<td>Points of similarity tested</td>
<td>not all have <em>a priori</em> set of points</td>
<td>9 -15 loci</td>
</tr>
<tr>
<td>Test outcomes</td>
<td>match, mismatch, insufficient, inconclusive</td>
<td>match, mismatch, inconclusive</td>
</tr>
<tr>
<td>Verification/checking</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Expression of similarity</td>
<td>most certain; some probabilistic</td>
<td>probabilistic</td>
</tr>
<tr>
<td>Expression of certainty</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Challenge match in court</td>
<td>rare</td>
<td>yes, but rare</td>
</tr>
<tr>
<td>Factfinder assess match</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>
Investigative and evidentiary errors in forensic evidence

**Investigative**
- Careless gathering of samples
- Inappropriate testing
- Incorrect interpretation
- Expectancy bias
- Confirmation bias
- Contextual bias
- Frame of referral question
- Overconfidence in science

**Evidentiary**
- Expert not competent
- Exclude background (how samples obtained)
- Exclude error rates, contamination rates
- Erroneous jury directions
- Improper weight to evidence
- Little challenge to evidence
HM Advocate v McKie (1999), Scotland

- McKie and Asbury’s prints found at murder scene.
- Asbury convicted and sentenced to life.
- McKie, a policewoman investigating crime denied being at the scene, and was tried for perjury.
- McKie was acquitted after defence experts discredited prosecution fingerprint identification evidence.
- Asbury’s conviction was then overturned.
**R v Jama (2009), Victoria, Australia**

- Female had GHB symptoms at club, and 4 swabs to test for sexual assault.
- Cold hit match to Jama, whose alibi was being at home with ailing father. RMP 1 in 45 billion “rock solid.” Sample 800 billion times more likely from Jama than random.
- Convicted, six year sentence for lack for remorse.
- DNA sample provided by Jama’s sexual partner in same hospital room 28 hours before M. Standard of cleaning inadequate to remove DNA traces on medical trolley, contaminated samples.

*Farah Jama and lawyer who appealed his conviction*
Investigative errors in *McKie* and *Jama*

<table>
<thead>
<tr>
<th>Features</th>
<th>McKie</th>
<th>Jama</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambiguous samples</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Contaminated samples</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Cold hit in database</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tests link to accused</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Single theory of culpability</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flawed theory overlooked</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Exonerating facts ignored</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Negative stereotype of accused</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Unskilled expert</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Error rates (false +ve) ignored</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
# Evidentiary errors in McKie and Jama

<table>
<thead>
<tr>
<th>Features</th>
<th>McKie</th>
<th>Jama</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumstantial evidence only</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No pre-trial disclosure by prosecution</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>No independent tests by defence</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Poor communication</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Facts about origin of samples excluded</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No report on error/contamination rates</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Expert competence untested</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Presumption of reliable science</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Test results overstated</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Factfinder questions unanswered</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Unconscious bias in *McKie* and *Jama*

<table>
<thead>
<tr>
<th>Cognitive biases</th>
<th>McKie</th>
<th>Jama</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectancy bias</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Confirmation bias</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Contextual bias</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Commitment bias</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Overconfidence</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Strengthening forensic science

Procedures to minimize scientific errors (Thompson, 2011)

• CSI model vs Blind service lab shield from information that suspect is perpetrator and source of sample

• Case management model sequential unmasked testing (Krane et al., 2008)

• Signal detection to assess false –ve and false +ve rates; $d'$: how well matches distinguished from nonmatches; beta: threshold for a match decision (NSF Workshop, 2010)

• International standards and regulations
Advice to scientists expressing a match
(Koehler & Meixner Report to NSF 2011)

- Never say there is/is not a match.
- Likelihood of results if defendant is source/is not the source.
- Strength of evidence independent of other case facts – avoid “double-counting”
- Confidence estimate of match strength.
- No ultimate opinion as to which hypothesis is true; no comments about source samples.
What legal professionals need to know

- DNA knowledge, CSI effects, prosecution bias.
- Lawyers and judges make scientific errors.
- All scientific evidence can be challenged.
- *Daubert* tests inadequate.
- Gatekeeper effects and single experts.
- Cross-examination exposes weaknesses.
- Status of “DNA-only” cases.
- Scientific education for lawyers.
Traditional legal safeguards on reliability of scientific evidence

**Adversarial legal systems**
- Prosecution discloses exculpatory evidence
- Parties exchange expert information before trial
- Rules of evidence on experts (FRE 702)
- Judicial gate-keeping
- Cross-examination
- Concurrent experts
- Judicial directions
- Deliberation

**Inquisitorial legal systems**:
- Neutrality of prosecutor and judge
- Judge receives complete dossier of all case decisions
- Comprehensive review
- Judge actively questions witnesses
- Independent expert
Primacy of fact-finding in law

• 90% of cases resolved based on facts
• Relevance, reliability and fairness
• “Task of fact finding for courts is to identify the truth, subject to the principles of a fair trial and to specific rules of law and discretions designed to protect other public values which, on occasions, are entitled to recognition in a way which constrains the fact finding process”
• The public will never accept that justice can be attained by a “forensic game” (Spigelman, 2011)
Truth and justice in adversary proceedings

Relationship between truth and adversarial system:

• The adversarial system is not concerned with truth, but with “procedural truth” or “legal truth”, not substantive fact.

• The adversarial system is the most effective mechanism for the discovery of truth using the Socratic dialogue.

• The adversarial system seeks truth, but that search is qualified when the pursuit of truth conflicts with other values

(Spigelman, 2011)
Which system produces fewer wrongful convictions?

• Data on this unavailable, difficult to obtain
• Few experimental studies, e.g., discrediting information outcomes vary by accessibility:
  - by one party: inquisitorial more likely to expose information and more accurate
  - by both parties: adversarial more accurate
• Evidence more thoroughly tested by cross-examination, dossier reviews confirm not test
• Independent fact finders more accurate
New safeguards: Towards a hybrid inquisitorial and adversarial model
(Findley, 2011)

- Prosecution and defence counsel work for single office
- Individual criminal lawyers rotate duties: sometime prosecution, sometimes defence
- Lawyers have equal power to seek scientific information on behalf of clients
- Scientists independent of police
- Scientists report to all legal counsel
- Scientists are “blind” to clients (state/accused)
- Cross-examination of forensic scientist
- Independent, actively engaged fact finder
- Deliberation by community promotes legitimacy