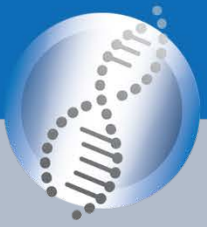


# Expert Evidence Challenging DNA evidence 2020 Public Defenders Conference

Jae Gerhard  
Principal Forensic Scientist  
Independent Forensic Services

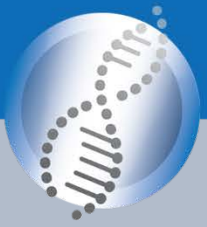




# Current DNA Testing Landscape

- Majority of DNA samples collected by police
- Lab performs minimal sample collection or biological testing of samples collected by police
- Samples processed robotically with minimal human intervention
- PowerPlex™ in use – testing 21 areas of DNA
- STRmix™ used for statistical evaluation

**Still one of the most robust tools for human identification. However....**



# Challenging DNA Evidence

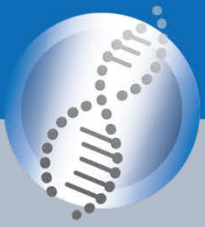
Very rarely are the issues with the science in relation to contamination

During this session we will cover

- Current issues
  - Sometimes the labs just get it wrong
  - Motivational bias – as a result of receiving police instruction
  - Sometimes the big numbers don't actually mean anything

- How can you tell that there might be a problem?

Reports are limited. You will usually require an expert to conduct independent review to identify potential issues



# Sometimes they get it wrong

Case example:

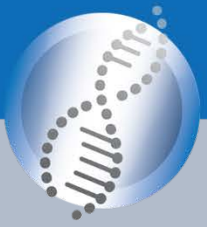
Sexual assault, complainant's clothing DNA tested

- DNA Report

Item No.	Item Description	Results
R1	Swab inner waistband of jeans	The DNA profile recovered has the same DNA profile as John SMITH. It is greater than 100 billion times more likely that this profile originates from John SMITH.....

- Issue

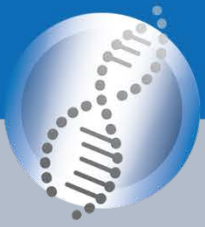
- DNA profile actually matched the complainant – NOT John SMITH



# STRmix™

- A software program developed by Australian and New Zealand scientists
- Already in use in forensic labs in Australia and New Zealand
- Commercially available as of Feb 2014
- Uses biological and mathematical modelling approach to the interpretation and analysis of a DNA profile.

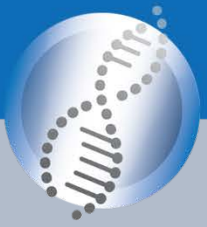




# Sometimes they get it wrong - STRmix™

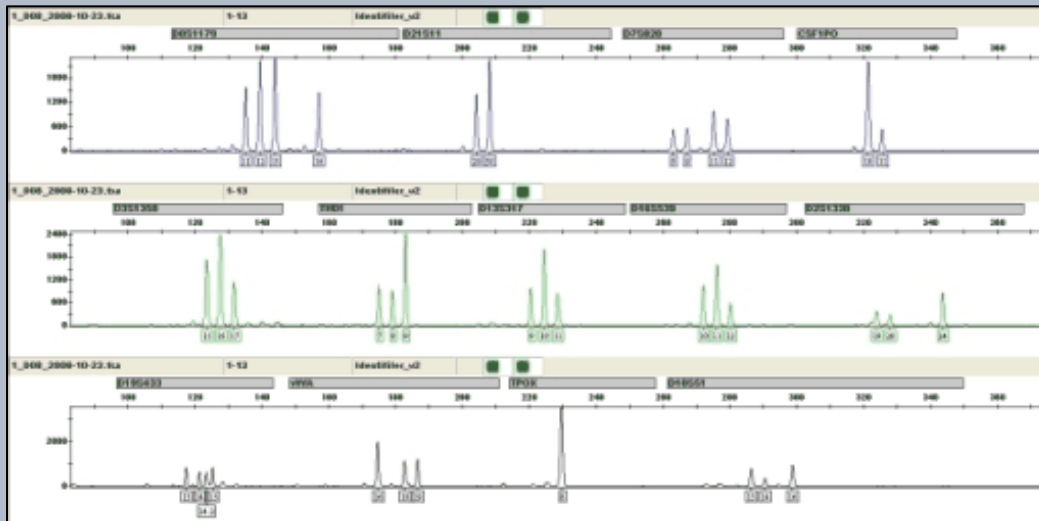
Contributor 1	
Genotype [23,23]	- 100.0
Contributor 2	
Genotype [24,25]	- 20.5%
Genotype [22,25]	- 4.4%
Genotype [20,25]	- 7.7%
Genotype [22,24]	- 3.6%
Genotype [20,24]	- 9.7%
Genotype [20,22]	- 4.5%
Genotype [18,25]	- 8.7%
Genotype [23,25]	- 4.0%
Genotype [25,25]	- 1.7%
Genotype [-1,25]	- 1.7%
Genotype [21,25]	- 2.3%
Genotype [21,24]	- 0.2%
Genotype [18,24]	- 2.4%
Genotype [23,24]	- 0.4%
Genotype [24,24]	- 0.2%
Genotype [-1,24]	- 0.1%
Genotype [18,22]	- 11.8%
Genotype [22,22]	- 0.9%
Genotype [-1,22]	- 0.0%
Genotype [21,22]	- 0.1%
Genotype [22,23]	- 1.1%
Genotype [18,20]	- 5.8%
Genotype [20,20]	- 1.4%
Genotype [-1,20]	- 0.0%
Genotype [20,23]	- 2.2%
Genotype [20,21]	- 0.0%

- Clear sign that there is a problem with the modelling
- Most likely – the number of contributors determined by the DNA laboratory is wrong

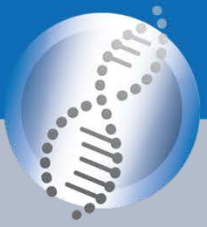


# Motivational bias – case example

- DNA lab instructed to identify suspect DNA on clothing
- Mixed DNA profiles were obtained (at least 3 people)
- Suspect is a contributor – statistical analysis done
- However, the same ‘unknown individual’ appears to be a minor contributor in multiple profiles



**Not identified or disclosed by lab, but this ‘unknown’ contributor could be the true offender**



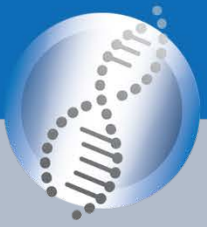
## Motivational bias – case example

- Sexual assault of infant. Nappy submitted for forensic examination
- DNA Report

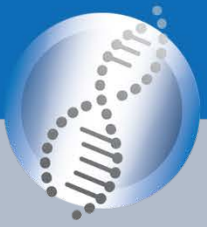
Item No.	Item Description	Results
R1	Sample from nappy	A presumptive test for semen produced a positive result.  A mixed DNA profile. Infant and defendant not excluded.

- Issue
  - Infant faecal material produces positive result to presumptive semen test. Defendant changes infants nappies.





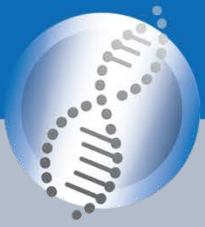
# **DNA is not just a number: Context matters**



# Forensic Biology

- Detection and confirmation of body fluids
- DNA profiling
- Interpretation of DNA profiles
- Gives an **OPINION** on the evidence



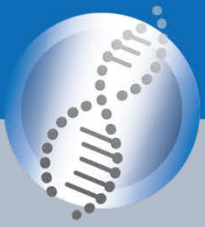


# Sometimes the big numbers don't mean anything

- Case example: Sexual assault mother's boyfriend allegedly assaulted daughter

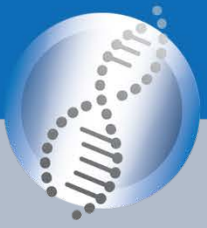
Item No.	Sample Description	Results
R1	Trace DNA tapelift from underwear of Ms Smith	A mixed DNA profile originated from at least two individuals was obtained. This DNA profile is 100 billion times more likely if Ms Smith and Mr Jones are contributors

- Issue
  - Ms Smith and Mr Jones live in the same premises, washing clothing in same machine at same time and generally live in same environment. Trace DNA = transferable



# Challenging DNA evidence – when you should seek advise

- Reporting of stats <100,000
- Complex mixed DNA profiles >3 contributors
- Is trace DNA relevant? (*Fitzgerald; Paulino; Wise*)
- Contextualisation - Can the scientist offer an opinion on the evidence rather than reporting of factual DNA (time since intercourse, BPA etc)
- And if you don't have funding – phone anyway!!
  - We offer 30 minutes consult for free and will help point you in the right direction



## Contact us

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[enquiries@independentforensicservices.com.au](mailto:enquiries@independentforensicservices.com.au)