



UNIVERSITY OF
LEICESTER

Advanced Forensic Genetics - UK

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NAS Workshop 14th March 2024



Outline

England and Wales (NI) Some echoes in EU/ other nations (perhaps with exception of New Zealand/ Scotland?).

- What is happening (can we know?)
- Legal parameters (court?) – permitting or prohibiting?
- Regulation/ oversight
- Maximising utility AND maintaining ‘Integrity’?



Prelim notes re: FSP in UK*

- Entirely private 'marketplace'. Police contract usu. with one of 'Big 3' Forensic Science Providers (FSPs).
 - Cellmark Eurofins Key Forensics
- Contracts dictate what is provided, but is a complex picture – commercial interests means not 'transparent'.
- FSPs need to 'sell' the tech and R & D focus skewed by police demands?
- 2018 Govt 'Biometric Strategy': paucity of detail, no underlying principles, and lack of 'strategy', giving justifiable rise to concerns about the content, and intent behind the HOB Programme.



Standard processing

A standard DNA test is defined as a DNA-17 test that is used for the majority of forensic DNA Applications in the UK ↵

- **NDNAD:** Almost 7m subject profiles (just under 6m individuals). 2021/22: 22,477 routine subject to crime scene matches, (644 homicides & 550 rapes). Approx. 65% hit rate upon loading scene profile. (£2m p.a.)
- 16 labs upload standard profiles + 14 RapidHit Units.
- **Familial searching:** Due to cost and resource, used only for the most serious of crimes. Need approval of FIND Strategy Board chair. 27 familial searches carried out in 2021/22.
- **Prüm:** 2021/22: UK connected to 15 EU Member States. Since 2019, UK has received >13,000 initial 'hits', incl. >2,000 relating to particularly serious crimes. (47k 'inbound' hits).

Strategic DNA

- This project, to be delivered in 2019, will provide a secure, accredited and legislatively compliant profile storage, search and matching facility to replace the existing database. It will maintain current capabilities and the functionality available to the user today.
- The solution will also deliver full, end-to-end automation for routine transactions, ensuring a more responsive service and delivering business efficiency.
- The Strategic DNA project will also improve resilience of the platform and, in addition to future-proofing the solution, will provide a flexibility that supports customer process change, with a data model and components that are customisable.
- The new system is unlikely to move onto the strategic biometric platform in the lifetime of the programme.

- LOTS of issues with infrastructure/ IT.
- Home Office Biometrics Programme (HOB) - upgrade of NDNAD completed end 2020 (still upgrading elimination database).
- Y-STR reference database: 10k volunteer samples are currently being collected to “enhance the UK’s capability in the investigation of sexual offences as well as other serious/major criminal offences, where often the male DNA profile is masked due to a mixed DNA profile.”
- Strategic plan for development of DNA capabilities – with Forensic Capability Network (FCN). ‘DNA Futures’ programme.

Supporting the delivery of the DNA futures programme through the sharing of knowledge and research.



Key topics of interest (assimilated from FSR/Futures/ academic/practitioner research ideas)

- Transference and Persistence challenges and interpretation requires consistency a model is required for the research community to use
- Location of human touch DNA
- Opportunities to improve effectiveness and efficiency of searching)
- Progression of YSTR use and databases
- Combined examinations DNA/Fingerprints – sample determination, integrity of mark (FSR1:409)
- BPA research limited, studies linked to force, stamping cases
- Deconvolving complex DNA mixtures
- Broader benefits of Next Generation Sequencing
- Surname prediction, geographic mapping, ancestry
- Impact of storage time and temperature on quality and quantity of DNA extracted from forensic samples
- Identification of optimal recovery methods for DNA as a national study
- Aging of blood
- National review of DNA success rates
- Human factors and decision making in the recovery of DNA
- Evaluation of the real-life risks of scene to scene contamination – increased anti contamination measures have been introduced but what is the reality? In the absence of quantitative data.
- Use of genetic genealogy databases in operational setting
- Near or at scene DNA amplification devices and real time database connectivity
- Body fluid identification
- Evaluation of the implementation of DNA 17 and impact on criminal justice processes
- Communication and presentation of evidence within the court room environment (meaning, interpretation & evaluation of scientific evidence in understandable ways for the non – scientist) utilising current and emerging technologies
- Focus on the power of forensic intelligence to support investigations
- Exploration of Omics and nanotechnology in detection of both chemical and biological material
- Understanding of how human interaction (human factors impact on decision and risk taking at all levels of an investigation from crime scene to court, including the impact of bias beyond confirmation and contextual.



Non-routine DNA – is it being used?

(responses of users/providers/police – paraphrased quotes.)



- Probabilistic genotyping used routinely by all FSPs (mixtures)
- Phenotyping and biogeographical ancestry used in certain cases for intelligence.
- Police are asking to use IGG and some are finding ways... Met pilot.
- Some 'familial search' lists are coming back with race/IGG 'tags' added.
- Cases of body ID each "one offs"
- Investigation using biogeographic ancestry leading to 'race' based investigation.



- We don't have the legislation in place to use anything other than STRs for almost all investigations.
- IGG not currently used but... once evaluated will probably be used in very limited number of cases particularly for body ID (after familial searching)
- IGG is NOT supported – brakes are on.
- Some of these techniques are hugely problematic.
- GDPR prohibits IGG in Europe

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Law	Section(s)	Relevance	Permitting/Prohibiting
Police Criminal Evidence Act 1984	s.63T 'Use of retained material'	(1) Any material must not be used other than— (a)in the interests of national security, (b)for the purposes of a terrorist investigation, (c) for purposes related to the prevention or detection of crime, the investigation of an offence or the conduct of a prosecution, or (d)for purposes related to the identification of a deceased person or of the person to whom the material relates.	<div> ✖ ✔ "Must NOT be used other <u>than..</u>" but then very broad parameters. </div> <p>Does not say what <i>can</i> be done, nor what <i>cannot</i> be done – interpreted either way.</p>
Protection of Freedoms Act 2012	Chapter 1: Regulation of Biometric Data	Created Biometrics Commissioner Role (s.20) & National DNA Strategy Board (s.24) (FINDS)	Permitted long-term retention of DNA but merely amended PACE on purposes – this issue for Commissioner/ FINDS.
Terrorism Act/ Counter-Terrorism and Border Security Act 2019	s.43: Destruction and retention of fingerprints and samples etc	Outlines 'relevant searches' of databases for DNA taken from suspected terrorists (different requirements).	PACE applies.
Forensic Regulator Act 2021		Publish CoP for 'Forensic Science Activities' (not all). Must investigate if FSAs are carried out in a way that creates a substantial risk of— (a) adversely affecting any investigation, or (b) impeding or prejudicing the course of justice in any proceedings.	Current CoP only includes standard 'DNA' processing and kinship analysis. Requires ISO17025.
Data Protection Act (GDPR)	Part 3: s.31 'LE purposes' s.35 DP principles s.64 DPIAs for 'high risk'	Purposes: the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security. Processing sensitive data by LE must be strictly necessary (if no consent) for the purpose and must have appropriate policy document.	<div> ✖ ✔ Sensitive data cannot be used (w/o consent) except for LE purposes – broad purposes. DPIAs? </div>
Data Protection and Digital Information Bill NOT YET LAW	s.130 – 132 Part 5	(retention) Oversight of Biometrics Databases	Removal of Biometrics Commissioner, transfer to Investigatory Powers Commissioner.
Criminal Procedure Rules 2020/Practice Directions 2023	Part 19 / Part 7.	What 'science' is admissible at trial/ who is an expert etc.	Any non-routine DNA testing <i>should</i> pass 'sufficient reliability' test to be admissible. Must also be transparent about data/ methods etc. and accepted in community/ peer reviewed etc.

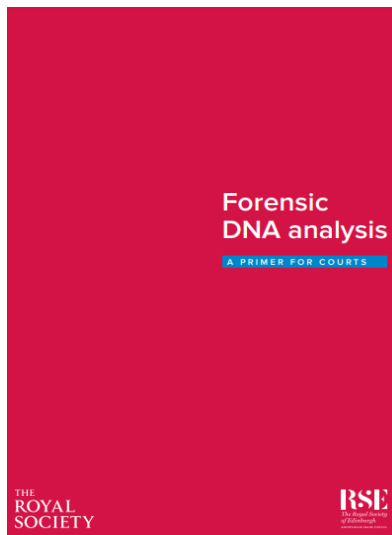


Outdated guidance for prosecutors and courts.

The aim of this primer is to present:

1. A scientific understanding of current practice for DNA analysis used in human identification within a forensic science context
2. Guidance to the Judiciary in relation to the limitations of current interpretation and evaluations that can be made, so that they can be informed when making decisions relating to DNA evidence.
3. The primer has been laid out in sections providing the basic information relating to DNA analysis used in forensic science.

Section 1 provides an introduction to DNA and its use as a forensic science tool as well as the nature of the questions that can be addressed with the most commonly used DNA analysis methods.



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- (1) Any material to which section 63D, 63R or 63S applies must not be used other than—
 - (a) in the interests of national security,
 - (b) for the purposes of a terrorist investigation
 - (c) for purposes related to the prevention or detection of crime, the investigation of an offence or the conduct of a prosecution, or
 - (d) for purposes related to the identification of a deceased person or of the person to whom the material relates.
- (2) Material which is required by section 63D, 63R or 63S to be destroyed must not at any time after it is required to be destroyed be used—
 - (a) in evidence against the person to whom the material relates, or
 - (b) for the purposes of the investigation of any offence.
- (3) In this section—
 - (a) the reference to using material includes a reference to allowing any check to be made against it and to disclosing it to any person,
 - (b) the reference to crime includes a reference to any conduct which—
 - (i) constitutes one or more criminal offences (whether under the law of England and Wales or of any country or territory outside England and Wales), or
 - (ii) is, or corresponds to, any conduct which, if it all took place in England and Wales, would constitute one or more criminal offences, and
 - (c) the references to an investigation and to a prosecution include references, respectively, to any investigation outside England and Wales of any crime or suspected crime and to a prosecution brought in respect of any crime in a country or territory outside England and Wales.]

Police and Criminal Evidence Act 1984

We have limits on what can be **RETAINED (PoFA)** - so we have to maximise the utility of what we **DO** have.

- Must **NOT** be used... but broad parameters.
- Who decides what can be done with retained DNA?

POLICY

GUIDELINES

PRACTICES

STANDARDS

RULES

REGULATIONS

COMPLIANCE

Annex IV - FIND Strategy Board Regulation/Oversight model

DNA					
Activity	Database processor/ Authority	Strategy Board	Biometrics Commissioner	Information Commissioner	Forensic Science Regulator
PACE Arrestees/ Crime stain records	Home Office/LEA	✓	✓	✓	Analysis – ISO 17025 & FSR Codes Databasing - ISO9001, ISO/IEC 20000, ISO/IEC 27000 series (as provided through the TickITplus scheme)
TACT subjects and crime stain records	MPS/ LEA where sample taken	✓	✓	✓	Analysis – ISO 17025
Detainees – TACT Schedule 7	MPS/LEA where sample taken	✓	✓	✓	Analysis – ISO 17025
Missing Persons	Home Office/Missing Persons Unit	✓	✓	✓	Analysis – ISO 17025 & FSR Codes Databasing - ISO9001, ISO/IEC 20000, ISO/IEC 27000 series (as provided through the TickITplus scheme)
Vulnerable Persons	Home Office/LEA	✓	✓	✓	Analysis – ISO 17025 & FSR Codes Databasing - ISO9001, ISO/IEC 20000, ISO/IEC 27000 series (as provided through the TickITplus scheme)
Volunteers	Home Office/LEA	✓	✓	✓	Analysis – ISO 17025 & FSR Codes Should not be loaded, unless due to kinship comparison for MPDD
Contamination Elimination Databases	Home Office/LEA	✓	✓	✓	Analysis – ISO 17025 & FSR Codes Databasing - ISO9001, ISO/IEC 20000, ISO/IEC 27000 series (as provided through the TickITplus scheme)

- Forensic Information Databases Service **Strategy Board** (FINDs) oversee PACE powers – ‘operate’ the NDNAD and routine processing
- Determine access/ familial searching.
- Home Office: Strategic direction shaped by wider policing strategies and Govt policy. But meant to ensure policy: *takes account of developments in science and technology (S&T) and delivers improvements in efficiency and effectiveness*
- Also ‘sending’ DNA overseas:

Outbound Samples

DNA samples should only be exported from the UK as a 'last resort' action. Once a DNA sample has left the UK, the UK has no further physical control over the way in which that sample is used. Any request for a DNA sample to be exported must be challenged and the requestor must be required to demonstrate that the export of a DNA sample is strictly necessary and that no other course which allows the DNA sample to remain in the UK (such as the export of a DNA profile) would suffice. It should be noted that it may, for example, be required for the sample to be subjected to a non-standard DNA test [\[footnote 24\]](#) in the UK. Advice should be sought from Forensic Service Providers in the UK as to what can be achieved for non-standard DNA tests in the UK.

The export of any DNA sample from the UK must be authorised by the Chair (or nominee) of the FIND Strategy Board.

Unidentified Body or Crime Stain DNA Samples from unknown individuals

Unidentified DNA samples (NB: this does not include samples taken from known individuals that are anonymised) can in some circumstances be exported for the purposes of progressing investigations. Such circumstances would include the processing of the DNA sample with an alternative forensic DNA test (that cannot be carried out in the UK) for the resulting DNA profile to be more compatible with a DNA profile from another country.

Any application to the Chair (or nominee) of the FIND Strategy Board for authorisation to export an 'unidentified' DNA sample must detail all the factors and reasons that are said to make it appropriate for such authorisation to be granted and all the 'control measures' that are proposed.

Some (non?) routine testing done outside the UK.

EU law? Same confusion - GDPR:

you cannot use 'genetic' data



yes you can if consent/ law enforcement....





Biometrics and Forensics Ethics Group (BFEG)

- Independent expert advice on ethical issues relating to biometrics, forensic science, & large data sets.
- Broad ethical spectrum that embraces moral, legal, and societal considerations, recognising that policy needs must be reconciled with ethical concerns. Observing these principles should enhance trustworthiness in the use and governance of biometric and forensic services...
- IGG: At time of writing, the whole process is unregulated, and ethical, legal, and safeguarding issues must be considered. (expensive, needs testing, prob. inefficient)

Biometrics and Forensics Ethics Group Principles

The Biometrics and Forensics Ethics Group (BFEG)



Biometrics & Forensic
Ethics Group

March 2023

Should we be making use of
genetic genealogy to assist in
solving crime?

A report on the feasibility of
such methods in the UK

September 2020

The Biometrics and Forensics Ethics Group



Other oversight?

- **Forensic Regulator?** Only 'standard processing' & kinship analysis.
- **Biometrics Commissioner?** Used to oversee retention (PoFA), but often took wider look. Being abolished (because of this? Scotland kept)
- **Investigatory Powers Commissioner?** Taking over (some) Biometrics Commissioner role – limited to RETENTION issues. Highly doubtful will take wider view.
- **Information Commissioner?** Oversees Data Protection, but DP not seen to be relevant to advanced DNA, so no involvement (might change?)





Regulatory capture or escape?

- [MPS – Cellmark](#) Have gained accreditation to use MPS.
- Commercial incentive. Are ‘selling’ to police (and using...?)

UKAS Accredited Next Generation Forensic DNA Analysis

Building on a long history of innovation in forensic DNA profiling, Cellmark has launched an ISO17025 accredited Massively Parallel Sequencing (MPS) service. This next generation of forensic DNA profiling has been introduced working in partnership with Verogen, the world’s leading forensic MPS technology provider.

Cellmark became the first UK forensic laboratory to receive UKAS ISO17025 accreditation for sequence-based forensic DNA profiling in September 2021. MPS (also known as NGS – Next Generation Sequencing) is a huge leap forward in forensic DNA technology and delivers far more detailed DNA information than has previously been possible. The combination of sequence information together with such a large number of markers has the potential to help resolve some of the more challenging forensic DNA samples and complex relationship cases, as well as providing advanced phenotypic intelligence.



Considerations?



- **Law:** What law? What legislative vehicle? (Criminal justice?) Existing law? Primary/secondary legislation? (powerful; slow/broad - vague) Dept. in charge? Oversight (powers/resources)
- **Code of Practice:** Author(s), audience and stakeholders? Flexible? (broad/ needs updating); Oversight and enforcement (voluntary/ penalties)? Generalisability? (overlaps/gaps)
- Both options complex/problematic. CoP risks – what is ‘best practice’? Can give appearance of something being ‘regulated’ when CoP ignored/ worsen problems. User requirements loophole!

Figure 2: Home Office considerations before introducing a new biometric technology or a new application of an existing biometric technology

What framework applies to the organisation using the biometric?

What are the ethical implications?

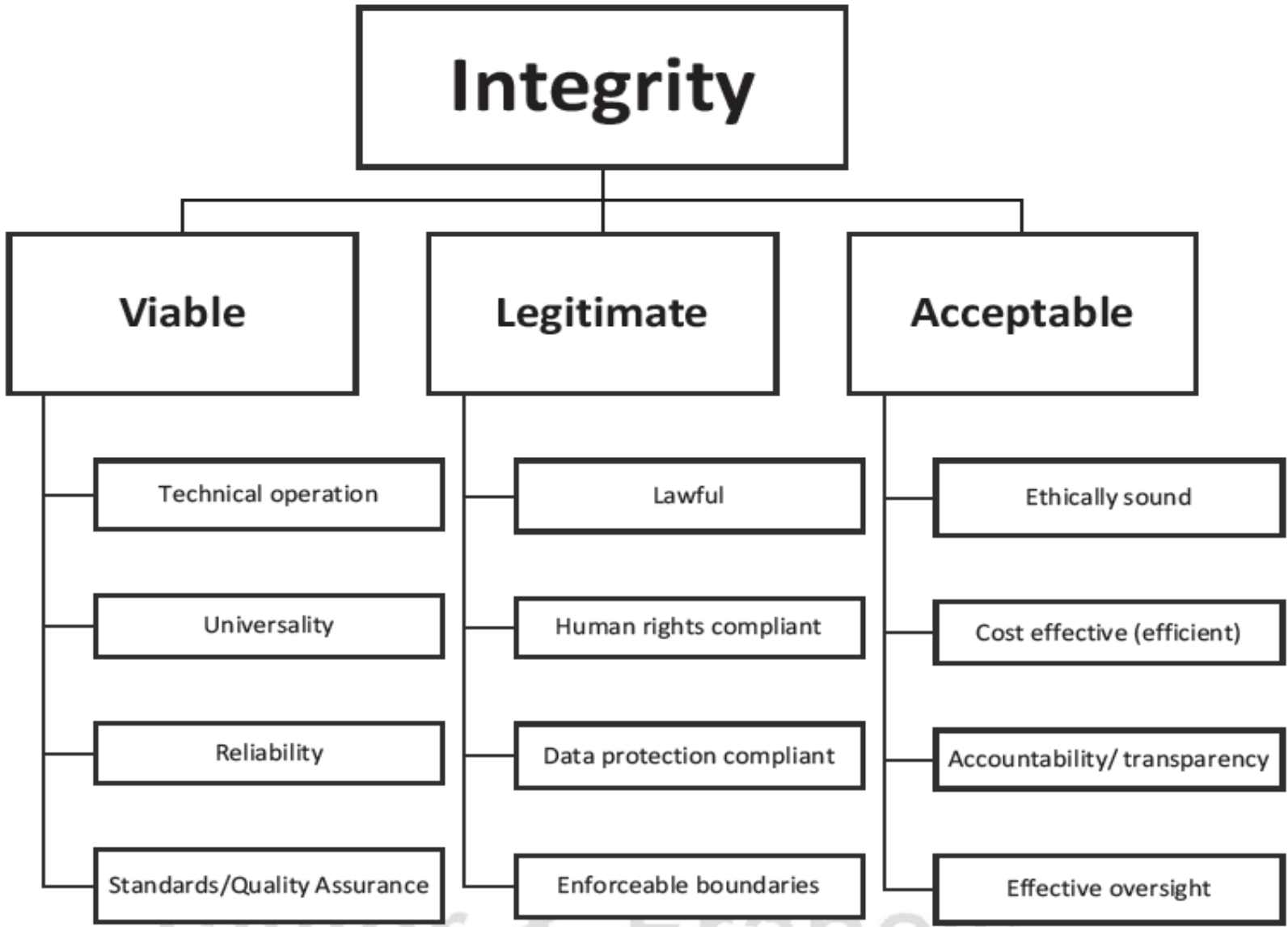
What is the purpose and the legal basis?

Is it necessary and proportionate?

What public engagement has taken place?

How robust is the technique?

How are the risks being mitigated?



Forensic DNA should be reliable, cost-effective and benefits demonstrable. Utility must be maximised at the same time as minimising risks and potential harmful effects.

Technological development has outpaced regulation, and considerations of legitimacy and acceptability; effectiveness ought not be the sole/ primary measure of success.

FIGURE 11.2 The integrity matrix



How to govern?

- Over-reliance upon 'policies', 'guidance' & Codes of Practice. Often not publicly available nor publicly debated. CoP effectiveness? Hurdles and dangerous if leading to complacency/ inaction. (resourcing...?)
- Confusion: "Must NOT be used"... but broad parameters. Unclear safeguards/ over-reaching provisions. Poor oversight.
- Is there 'best practice'? If there is, it is transitory, contentious, and legally and culturally specific.
- Need to '(im)prove' value of DBs pushing developments. Limits on what can be **RETAINED** so have to maximise the utility of what is retained.
- Commercial incentives, but are police/ public becoming more demanding?



Conclusions

- “*Actual deployment of new biometric technologies may lead to more legal challenges unless parliament provides a clear, specific legal framework for the police use of new biometrics...*” Biometrics Commissioner (2018)
- State use of biometrics must have integrity - raises questions of viability, legitimacy and acceptability.
- While scientific and technological advances attract the eye of ethicists and sociologists, the governance and legal regimes of databases garner far less critical attention.
- Science marching on while law and regulation still dragging heels (again...)

Many thanks....



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Background Reading

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