

BIOSCIENCES FEDERATION

RSC | Advancing the
Chemical Sciences

Forensic Use of Bioinformation

A response from the Biosciences Federation and the Royal Society of Chemistry to the Nuffield Council on Bioethics

January 2007

Background

The Biosciences Federation (BSF) is a single authority representing the UK's biological expertise, providing independent opinion to inform public policy and promoting the advancement of the biosciences. The Federation was established in 2002, and is actively working to influence policy and strategy in biology-based research – including funding and the interface with other disciplines - and in school and university teaching. It is also concerned about the translation of research into benefits for society, and about the impact of legislation and regulations on the ability of those working in teaching and research to deliver effectively. The Federation brings together the strengths of 42 member organisations (plus two associate members), including the Institute of Biology which represents 39 additional affiliated societies (see Appendix). This represents a cumulative membership of over 65,000 individuals, covering the full spectrum of biosciences from physiology and neuroscience, biochemistry and microbiology, to ecology, taxonomy and environmental science. The Biosciences Federation is a registered charity (no. 1103894).

The Royal Society of Chemistry (RSC) is the largest organisation in Europe for advancing the chemical sciences. Supported by a network of 43,000 members worldwide and an internationally acclaimed publishing business, our activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public.

We welcome the opportunity to comment on this timely consultation. We restrict our comments to those of a scientific, rather than ethical, nature.

The interpretation of bioinformation

In your view, is the SGM Plus® system, which uses ten STR markers, sufficiently reliable for use in ascertaining the identity of suspects in criminal investigations and/or criminal trials?
--

1. The BSF and RSC would like the Nuffield Council on Bioethics to note that the probability of a random match between unrelated individuals using SGM Plus® is typically 1 in 10 trillion; the 1 in 1 billion figure is a deliberately conservative overestimate of the true

random match probability¹. It is also important to note that no ethnic group has yet been found in which the random match probability is unusually high due to bottleneck effects. However, chance matches are more likely to arise with partial profiles, and as the size of the NDNAD grows. Additional markers are required to improve the discriminating power of profiles and to allow fuller profiles to be obtained from degraded material.

2. SGM Plus® currently provides only weak information on ethnic/geographic origin. However, there is considerable effort currently under way to identify single nucleotide polymorphisms (SNPs) that show major population differences in allele frequencies. Ethnic inferencing from DNA samples is of obvious forensic utility, but it is important to recognise that witness/police judgements of ethnicity based on appearance may not accurately reflect actual ethnic origin.
3. It is our understanding that the European Network of Forensic Science Institutes hopes to expand typing to a 13-15 STR loci marker system in the next year or two, which will substantially reduce the likelihood of an adventitious match. We would advise an international collaborative approach to the identification of additional markers because of the growing requirement for exchange of profiles between countries. Standardisation of DNA profiling within the European Network of Forensic Science Institutes is desirable but not essential so long as there are sufficient 'core' loci in common. Currently only 7 STR loci are common to all European laboratories, which is insufficient to achieve individual discrimination when seeking a match on an international dimension².
4. It is important that samples within the NDNAD are treated in the same way as additional interrogation of some DNA samples would raise statistical issues with regard to multiple-testing. Currently, a match on NDNAD is confirmed by repeat testing using precisely the same 10 SGM Plus® markers. This is adequate to trap errors but will not trap (rare) instances of true but adventitious matches. The move to a 13-15 marker system will help substantially here.

The management of the NDNAD

“[Concerns over] the revelation of ‘sensitive’ personal or medical information...in particular the risk of revealing possible familial relationships that were previously unknown”

5. The information contained within NDNAD should be limited to that required for identification purposes only. The BSF and RSC believe strongly that medical information should not be retained and the original physical sample should be destroyed.
6. SGM Plus® profiles currently provide no information of an explicitly medical nature, although it has been suggested that one marker may be associated with Type I diabetes³. Other indicators may be discovered as knowledge and understanding of the human genome increases. Combined with the forensic utility of familial searching, the potential to discover ‘sensitive’ information is significant. Current legislation and international conventions and instruments on consent and confidentiality of genetic information specifically differentiate between forensic and medical use⁴. It is essential to legislate on the confidentiality of genetic information contained within the NDNAD. We advise wider consultation on this important issue.

¹ Information provided by Professor Sir Alec J Jeffreys, Department of Genetics, University of Leicester

² Information provided by Professor Peter Gill, Forensic Science Service, Birmingham

³ www.dur.ac.uk/p.j.johnson/Williams_Johnson_Martin_NDNAD_report_2004.pdf

⁴ Information provided by Paul Debenham, LGC Ltd, London

The evidential value of bioinformation

What should be done to ensure that police, legal professionals, witnesses and jury members have sufficient understanding of any forensic bioinformation relevant to their participation in the criminal justice system?

7. We support the House of Commons Science & Technology Committee's recommendation that a Scientific Review Committee should be established within the Criminal Cases Review Commission in order to promote communication between the scientific and legal professions and to provide for ongoing scientific scrutiny of expert evidence⁵.
8. There is significant room for improvement in the way that statistical evidence, including risks and probabilities, is presented to juries. If statistical evaluations of the weight of evidence - such as Bayes Theorem - are too complex for a jury to comprehend, alternatives must be found. The Crown Prosecution Service has continued to shy away from making a decision on this issue. We urge further public consultation and debate.

Should a DNA match ever be sufficient to prove guilt in the absence of other evidence?

9. Given the potential for cross-contamination of evidence with biomaterial, the BSF and RSC believe that a DNA match should never be taken as sufficient to prove guilt in the absence of other substantial evidence. Corroboration of evidence is already a requirement of Scottish law, and is subject to long standing CPS guidance in England and Wales.

Openness

10. The Biosciences Federation and the Royal Society of Chemistry are pleased for this response to be publicly available and will be shortly placing a version on www.bsf.ac.uk and www.rsc.org. Should the Nuffield Council on Bioethics have any queries regarding this response then they should in the first instance address them to Dr Caroline Wallace, Policy Coordinator, Biosciences Federation, PO Box 11319, London, WC1X 8WQ email:cwallace.bsf@physoc.org.

⁵ Forensic Science on Trial, House of Commons Science and Technology Committee, Seventh Report of Session 2004-2005

Appendix

Member Societies of the Biosciences Federation

Association for the Study of Animal Behaviour	Genetics Society
Biochemical Society	Heads of University Biological Sciences
Bioscience Network	Heads of University Centres for Biomedical Science
British Andrology Society	Institute of Animal Technology
British Association for Psychopharmacology	Institute of Biology
British Biophysical Society	Institute of Horticulture
British Ecological Society	Laboratory Animal Science Association
British Lichen Society	Linnean Society
British Mycological Society	Nutrition Society
British Neuroscience Association	Physiological Society
British Pharmacological Society	Royal Microscopical Society
British Phycological Society	Royal Society of Chemistry
British Society of Animal Science	Society for Applied Microbiology
British Society for Developmental Biology	Society for Endocrinology
British Society for Immunology	Society for Experimental Biology
British Society for Matrix Biology	Society for General Microbiology
British Society for Medical Mycology	Society for Reproduction and Fertility
British Society for Neuroendocrinology	Universities Bioscience Managers Association
British Society for Plant Pathology	UK Environmental Mutagen Society
British Society for Proteome Research	Zoological Society of London
British Toxicology Society	
Experimental Psychology Society	

Associate Member Societies

The BioIndustry Association	The Wellcome Trust
-----------------------------	--------------------

Additional Societies represented by the Institute of Biology

Anatomical Society of Great Britain & Ireland	Institute of Trichologists
Association for Radiation Research	International Association for Plant Tissue Culture & Biotechnology
Association of Applied Biologists	International Biodeterioration and Biodegradation Society
Association of Clinical Embryologists	International Biometric Society
Association of Clinical Microbiologists	International Society for Applied Ethology
Association of Veterinary Teachers and Research Workers	Marine Biological Association of the UK
British Association for Cancer Research	Primate Society of Great Britain
British Association for Lung Research	PSI - Statisticians in the Pharmaceutical Industry
British Association for Tissue Banking	Royal Entomological Society
British Crop Production Council	Royal Zoological Society of Scotland
British Inflammation Research Association	Scottish Association for Marine Science
British Marine Life Study Society	Society for Anaerobic Microbiology
British Microcirculation Society	Society for Low Temperature Biology
British Society for Ecological Medicine	Society for the Study of Human Biology
British Society for Parasitology	Society of Academic & Research Surgery
British Society for Research on Ageing	Society of Cosmetic Scientists
British Society of Soil Science	Society of Pharmaceutical Medicine
Fisheries Society of the British Isles	UK Registry of Canine Behaviourists
Freshwater Biological Association	Universities Federation for Animal Welfare
Galton Institute	

Additional Societies represented by the Linnean Society

Botanical Society of the British Isles

Systematics Association