Forensic Science Regulator
Overseeing Quality

DNA Analysis Specialist Group (DNASG)

Minutes of the 24th meeting held on 28 November 2016, at 5, St Philip's Place, Colmore Row, Birmingham

1. Welcome and apologies

1.1 The Chair welcomed all to the meeting. A full list of attendees is available at Annex A. Apologies had been received from Andy Ward, UK Accreditation Services and Maggie Boyce, Acting Chair of the Body Fluid Forum.

1.2 The Chair welcomed visitors Kevin Sullivan and Ian Evett from Principal Forensic Services (PFS) and Sue Woodroffe from Orchid Cellmark.

2. Standards

DNA mixture interpretation software validation standard and guidance

2.1 Members of the DNASG had been provided with an updated version of the DNA mixture interpretation software validation standard and guidance which had been developed by PFS for the Forensic Science Regulator (FSR) and collated feedback from a consultation on the document. Members reviewed the feedback from the consultation and provided the following comments:

- In consideration as to whether the document should be a Regulator's standard or be a guidance document, the group heard that advice would be sought from the Regulator's Forensic Science Advisory Council (FSAC) and the Quality Standards Specialist group (QSSG). The group considered whether the document could be split into two parts with a section for end user validation and another section for development of a mixture interpretation tool, these areas were already separate sections which might be adequate.

- It had been suggested that 'Markov Chain Monte Carlo' be deleted from the Terms and Definitions as this is just one of a number of statistical techniques. It was agreed to retain MCMC but only in addition to listing other statistical techniques.

Action 1: Roberto Puch-Solis to send a list of other mathematical models used to model peak height data to Kevin Sullivan, which can be included in terms and definitions of the document.

- Discussions were held about the section 'Demonstrating that the calculations made by the software emulating the model are correct when the "true" state is not known' and whether the solution should be to write the software programs in two differing programme languages, using these separate programmes working independently of each other. It had been suggested in feedback from the consultation that this was overly burdensome for end users to do, however the group thought that as a quality assurance check for the manufacturers who developed the coding, this was necessary and then only one programme would need to be used on live cases.

- In the section 'Demonstrating the performance of the models in cases where the true state is known' it was agreed that Roberto Puch-Solis would provide wording on ground-truth databases which takes into account of the possibility of getting a likelihood ratio of less than 1 if the prosecution hypothesis were true.

Action 2: Roberto Puch-Solis to provide Kevin Sullivan with wording on ground-truth data which takes into account the possibility of getting a likelihood ratio of less than 1 if the prosecution hypothesis were true.

- Consideration was given to the list of 'Expected Performance Parameters' for the DNA mixture interpretation software standards. Concerns had been raised that the current list of requirements were set too high. It was clarified that all these requirements did not need to be provided by one software package however there was a requirement to avoid differences in mixture interpretation capabilities across providers with outcomes for the CJS being dependent upon which provider analysed the samples and the amount of money the police were willing to pay. It was suggested that two lists should be created; one which specified the minimum capabilities that all FSPs were expected to achieve and a further list of longer term aspirations. The Regulator and June Guiness agreed to review the list of requirements and would specify the minimum capabilities.

Action 3: June Guiness and Gill Tully to consider the list of 'Expected Performance Parameters' for DNA mixture interpretation software standards and determine which elements are essential and should constitute the minimum capabilities and which are currently aspirational.

- The group considered whether the defence should have access to the validation of the software in order to be able to appropriately challenge or not as part of the judicial process. The group agreed that the validation of the software should be published so that the defence can access it.

- It was suggested that Turing's theorem should be deleted from the list of possible tests to validate the operation of the model. However if it were deleted from the list consideration should be given to whether it

ought to be added to the list of further reading. Consideration would be given in light of the earlier discussion on MCMC.

Action 4: Roberto Puch-Solis to discuss with Kevin Sullivan the possibility of deleting Turing's theorem from the list of possible tests to validate the operation of the model and, if so, whether it should be added to the further reading list.

Action 5: The members of the DNASG were invited to provide further feedback on the DNA mixture interpretation software validation standard and guidance by 12 December 2016.

DNA mixture interpretation guidelines

2.2 Members of the DNASG had been provided with an updated version of the DNA mixture interpretation guidelines which had been developed by PFS for the Regulator and collated feedback from a consultation on the document. Members reviewed the feedback from the consultation and provided the following comments:

- It had been suggested elsewhere that the 'Likelihood Ratio' was not the best mechanism for inferring evidential weight of evidence. However, it was decided that logically, likelihood ratio was the only way of inferring evidential weight.

- It was agreed that the hypotheses needed to be mutually exclusive but may not need to be exhaustive and this would be made clear in the documents.

- The draft guidelines referenced a DNA mixture collaborative study commissioned by the Regulator which showed a high degree of inter-laboratory and some intra-laboratory variation in the evaluation and reporting of results. It had been suggested in the consultation that the reasons for these variations should be provided. Instead the group agreed that the reference to the DNA mixture collaborative study should be removed as it had not been published.

- The draft guidance document stated that scientists should always consider propositions that include individuals who are related to the person of interest in mixture interpretations. Members of the group queried the practicality for this, raising the issue of the additional resources required and suggested that it should be undertaken when there was an indication that a relative of the person of interest was a contributor to the mixture.

- Consideration was given to the section in the guidance document on cases where a mixed profile could be clearly separated into major and minor components. The guidance supported the designation of the major profile, only where a clear unambiguous single strong profile was

present at every locus. A respondent to the consultation queried why the major profile had to be complete for it to be designated and suggested that some partiality of the major profile might be acceptable. The group were advised that the National DNA Database Delivery Unit (NDU) would be undertaking a study to look at partial major profile mixtures and it was acknowledged that any guidance document could not to provide a complete guide as to the interpretation of all possible combinations of mixtures.

- Discussions were held about the section on 'Calibration of expert opinion against software' and one FSP was offering a service whereby a scientist would offer an evaluation of a mixture without carrying out a software calculation. The FSP consultation response document stated that a panel of scientists had been selected whose qualitative assessment of these types of mixed profiles had been shown to be conservative compared with calculated assessments. It was queried whether conservative assessments were a good measure and perhaps a better wording would be 'reporters who are good at obtaining a close match with the calculated assessments'.

- The group considered guideline 10: The practice of including prosecution aligned statements on possibility in statements should be discouraged. It was suggested that statements such as 'X cannot be excluded from the mixture' were unbalanced unless you also said that 'X cannot be included in the mixture'. It was thought that the wording 'X could be excluded from the mixture but no further evaluation was possible' was acceptable. It was also suggested that if it cannot be determined whether an individual is a contributor to a mixture, there is a strong argument that the mixture should not be presented to the jury at all. It was queried whether it was acceptable to say that a person of interest could not be excluded from a mixture when that person of interest had already accepted that it was their DNA. The group were unsure whether in situations where the DNA evidence was undisputed, whether it was necessary to frame propositions and the framing of propositions in that situation was tangential to the DNA mixture interpretation guidelines.

- The group considered whether the document should include a guideline which stated that it is unacceptable to provide qualitative evaluations for mixtures for investigative purposes, when it had not been possible to undertake a calibrated assessment of that mixture. This would provide clarity to the police and the courts that FSPs cannot be asked to provide qualitative assessments for court purposes. However, there were concerns about including a guideline which was discordant with how evidence had been presented in the past.

Action 6: Gill Tully and June Guiness agreed to consider further the issues around the use of qualitative evaluations of scientific evidence for court purposes which could not be sufficiently backed up by calibrated software, how they would be addressed in the DNA mixture

interpretation guidelines and agreed to raise the issues with the senior judiciary.

- An issue was raised that scientists had been asked to attend court to present evidence when a full statement for court purposes had not been requested or issued. The Regulator noted the duty of expert witnesses to make the court aware if any parties within the criminal process were not complying with the rules. The Regulator encourage all to read the latest version of the legal obligations for expert witnesses guidelines and asked the representative from the CPS to raise this issue within the CPS.

Action 7: The CPS representative to raise the issue within the CPS of forensic scientists being asked to attend court and give evidence when they had not been asked to write a full statement for court purposes.

- Guideline 14 was discussed which stated: 'In a case where a statistical analysis is beyond the capabilities of the software currently available to an FSP, consideration should be given to consultation with a specialist who has proven knowledge of the statistics of DNA mixtures interpretation'. Discussions were held about whether this guideline, covered bespoke statistical analysis, should be included and what should be the qualifications of the individual. It was thought that an individual who had a qualification in statistics or experience in the field would be suitable and that it was necessary to retain this recommendation.

Action 8: The members of the DNASG were invited to provide further feedback on the DNA mixture interpretation guidelines by 12 December 2016.

3 Minutes of the last meeting

3.1 The minutes of the last meeting were agreed as an accurate reflection of the discussions held and were approved for publication on the Regulator's website.

4 Actions and matters arising

4.1 There were no outstanding actions from previous meetings.

5 EA5 Database proportions

5.1 A FSP had reported that for the commonest full SGMPlus profile using allele frequencies from the DNA17 data collected for the population Ethnic Appearance Code 5 (EA5) (which includes individuals from East and South East Asia) and a 3% Fst, a match probability was more than 1 in a billion (i.e. 1 in 550 million) was obtained. This may affect a small number of samples

where the alternative person of interest is another EA5 person and the profile contained results at only the SGM+ loci. The number of samples meeting both these requirements was considered to be extremely small. The group also heard that this should not affect older results, as the commonest full profile for the FSS population databases for the EA5 and EA6 groups had given a LR larger than 1 billion. These databases were rarely used, because there was no information on the recent ancestry of the samples used for these EA5 and EA6 datasets, so there was no way of checking whether relatives had been included in the dataset, which would in turn skew the allele frequencies. These databases had consequently not been added to the SGMPlus calculation software for routine use. The advice which had been given to forensic scientists in the FSS, if it was considered possible that another individual from an EA5 population could have been the person of interest, was to ask Ian Evett for advice.

5.2 It was queried whether undertaking deeper investigations into the EA5 population structure would be disproportionate given the small number of cases it might affect and the amount of work required to investigate past cases. One possible approach to mitigate risks, was that all new evidential SGMPlus matches to an EA5 person of interest, have the actual match probability calculated to confirm the match probability is at least 1 in a billion. If the threshold was not reached then an upgrade to DNA17 should be considered for the crime stain or a new PACE sample should be obtained. It was suggested that the NDU should undertake investigations to determine what the scale of the problem might be and what might be a proportionate response. It was agreed that the Regulator's Codes of Practice and Conduct – Allele frequency databases and reporting guidance for DNA (Short Tandem Repeat) profiling – FSR-G-213 should be updated to reflect this finding.

Action 9: The NDU to undertake investigations to determine the scale of the problem in relation to the discovery that the commonest EA5 profile has a match probability of less than 1 in a billion and to determine a proportionate response.

Action 10: June Guiness to update the Regulator's Code of Practice and Conduct – Allele frequency databases and reporting guidance for DNA (Short Tandem Repeat) profiling – FSR-G-213, to make it clear that when a person of interest is EA5, the FSP need to calculate the match probability rather than use the figure 1 in a billion.

6 Workplan

6.1 Members of the DNASG had been provided with an updated workplan for the group and were invited to feedback by email any items which had been missed off the plan.

Action 11: DNASG members to feedback any items which had been missed off the workplan for the group.

7 HOB Programme

7.1 An update was provided on the DNA section of the Home Office's Biometrics programme. Stage 1 of the programme would focus on delivering a reliable and resilient infrastructure and automating the processes in operation within the NDU. It would also ensure the establishment of proactive contamination and elimination databases rather than reactive ones. Stage 2 would address the requirements for international DNA data exchange under Prüm. Stage 3 would improve the functionality of the NDNAD to get the most out of the data held on the database including the application of allele frequencies to determine whether profiles could be loaded to the database rather than allele counts. It would also address improved management of mixtures and find a solution to putting Y-STRs on the database. The group was invited to read the papers they had been provided and feedback any comments to the NDU.

Action 12: DNASG members to read the papers on the Home Office Biometrics Programme and feedback any comment to the NDU.

8 DNA Data Assurance Strategy

8.1 The group had been provided with the NDU Data Assurance Strategy which aimed to achieve assurance that the data held on the NDNAD was accurate, robust and maintains its integrity. Members of the group were asked to feedback any comments via email to the NDU.

Action 13: DNASG members to read the NDU Data Assurance Strategy and feedback any comments to the NDU.

9 Emerging technologies

Y-STRs

9.1 It was noted that a number of different groups were working on Y-STRs and that coordination of the work was necessary especially if work was to be presented to the NDNAD Strategy Board. Therefore, the action from the Y-STR meeting for 'Andrew McDonald to liaise with a number of police forces in order to develop a policy for Y-STR profiling which could be submitted to the NDNAD Strategy Board' should be undertaken in conjunction with the Met Police who were developing a piece of work on Y-STRs for presentation to the Strategy Board.

Action 14: Secretariat to contact Andrew McDonald and ask him to liaise with the Met Police when developing a policy for Y-STR profiling which could be submitted to the NDNAD Strategy Board.

Rapid DNA

9.2 A draft report from the Rapid DNA project delivery board had been provided to members.

10 Professional and Scientific Updates

Association of Forensic Science Providers (AFSP) DNA working group

10.1 An update was provided by the AFSP DNA working group. The AFSP DNA working group had contributed to the development of the programme for the annual conference for the chartered society of forensic science. The conference had been ambitious with six parallel work streams but positive feedback had been received. The AFSP DNA working group were also coordinating a large project to increase the number of UK Y-STR profiles on the European based Y-STR Haplotype Reference Database (YHRD). The work was being delivered by King's College London and 3000 UK haplotypes would be added to the YHRD. The AFSP DNA working group was still collating publications on transfer and persistence and tertiary transfer, with a particular focus on the more sensitive DNA17 kits. A reference list would be produced and also possibly a review of the literature.

EuroForGen

10.2 The funding for EuroForGen ends at the end of the 2016 and the work would be finished with a series of lectures and short presentations which would be made available on the website. The charity Sense About Science had also been commissioned to produce a document for the public about forensic genetics.

ENFSI

10.3 The committee were developing a mixtures interpretation guidance document which would have a key focus on definitions and would be presented at the next ENFSI meeting. The ENFSI website would be hosted by Europol and become a more publically accessible website.

11 AOB

11.1 The DNASG were informed about work which was being undertaken on behalf of the Strategy Board in attempt to determine whether there was a safe zone whereby SGMPlus profiles could be reported with a match probability of 1 in a billion.

11.2 The date of the next meeting was confirmed as 4 May 2017 from 12pm to 4pm.

POST MEETING NOTE: The date of the next meeting was put back to the 15 May 2017.

Annex A: Attendance at the DNASG meeting

Members:

Sue Pope (Chair)	Principal Forensic Services
Lesley Ann Beck	Forensic Service of Northern Ireland
Mark Bishop	Crown Prosecution Service
Kirsty Faulkner	National DNA Database Delivery Unit
Susan Hales	Metropolitan Police
Des Van Hinsbergh	Key Forensic Services
Fiona McMahon	Scottish Police Authority
Roberto Puch-Solis	Royal Statistical Society
Dorothy Ramsbottom	Forensic Science Ireland
Sara Short	Chartered Society of Forensic Sciences
Denise Syndercombe-Court	International Society for Forensic Genetics
Andrew Thomson	National DNA Database Delivery Unit
Jim Thomson	LGC Forensics
Huw Turk	Orchid Cellmark

In attendance:

Gill Tully	Forensic Science Regulator
Emma Burton-Graham	Home Office, Science Secretariat
Ian Evett	Principal Forensic Services
June Guiness	Forensic Science Regulation Unit
Kevin Sullivan	Principal Forensic Services
Sue Woodroffe	Orchid Cellmark

Apologies:

Maggie Boyce	Acting-chair, Body Fluid Forum
Andy Ward	UK Accreditation Service

Annex B: Minutes from the Y-STR Working Group

Minutes of the meeting held on 22 September 2016
Room 5C, 5 St.Philip's Place, Colmore Row, Birmingham, B3 2PW

1.0 Welcome, Introduction and Apologies

1.1 June Guiness welcomed all to the meeting. A full list of attendees is attached at Annex A. Apologies had been received from Maggie Boyce from Key Forensic Services and Tim Clayton from LGC.

1.2 The minutes of the previous meeting were approved as an accurate reflection of the discussions held.

2.0 Actions & Matters Arising

2.1 The group heard that the Forensic Science Regulator had requested that a standard for Y-STRs be developed and was seeking advice from the Y-STR working group as to the format and content of that document and the issues that the document needed to address. Two different approaches to a standard were discussed. The first approach would be a separate stand-alone guidance document with the level of detail being equivalent to a technical standard. An alternative approach would be to inset Y-STR specific details into the DNA appendix. It was noted that a stand-alone document would be more straightforward to update and the document would need to be re-visited in the near future after Y-STR work within FSPs had progressed.

2.2 It was highlighted that in general FSR standard documents are not restrictive nor constrained and principles outlined in the DNA appendix can be applied across difference DNA technologies. The exception to this rule being the DNA17 guidance document[1] which does contain detailed knowledge specifically in relation to the DNA 17 technology. It was agreed that the approach taken with the DNA 17 guidance document could be used for the Y-STR guidance document and that a mechanism for reviewing these documents should be established. It was agreed that the DNA 17 and Y-STR guidance documents should be reviewed annually by the DNA specialist group.

Action 1: June Guiness to feedback to the Regulator the Y-STR sub-group recommendation that the approach taken with the DNA 17 guidance document should also be used for the Y-STR guidance.

Action 2: June Guiness to include an annual review of the DNA17 and Y-STR guidance documents within the programme of work for the DNA Specialist Group.

[1] Codes of Practice and Conduct: Guidance: Allele frequency databases and reporting guidance for the DNA (Short Tandem Repeat) profiling.

3.0 Clarification of Protection of Freedom Act 2012 legislation

3.1 An action had arisen at the previous Y-STR meeting for clarification to be sought as to the interpretation of the Protection of Freedom Act (2012) (PoFA) legislation and specifically whether legally, a Y-STR profile may be obtained from a buccal swab, after an autosomal profile had been obtained. June Guiness had discussed the issues with the previous Biometrics Commission who had a legal background. He had provided the view that the information provided in the minutes of the previous Y-STR meeting was the correct interpretation that a DNA sample taken from an arrested person, needed to be destroyed as soon as a DNA profile had been derived from it and in any event within six months of the date it was taken. The legislation did not provide clarification if this was an autosomal or Y-STR profile. It was suggested that the Forensic Science Providers (FSPs) should seek legal guidance to ensure that their processes met with legislative requirements.

3.2 It was highlighted that the burden should belong with the police, and police forces should not request FSPs to undertake Y-STR profiling if the legislation did not permit such profiling. However, it was noted that the FSPs still had a responsibility to be cognisant of the legal requirements. It was suggested that if a FSP were uncertain about the legality of undertaking a Y-STR profile on a sample, they should query it with the police force. Members expressed frustration that the issue could not be resolved at a higher level by the Home Office, given that it had developed the legislation.

3.3 As the legislation did not specify which technology should be used to generate a DNA profile, one possible solution would be for police forces and FSPs to adopt a policy for sexual assault cases that recommends Y-STR profiling be undertaken on buccal swabs of offenders, prior to autosomal profiling. The Y-STR profile could be stored on the case file until required. An alternative approach, would be for the police officers to take a subsequent DNA sample, if Y-STR profiling was required. Andrew McDonald agreed to liaise with a number of police forces in order to develop a policy for Y-STR profiling which could be submitted to the strategy board.

Action 3: Andrew McDonald to liaise with a number of police forces in order to develop a policy for Y-STR profiling which could be submitted to the National DNA Database strategy board.

4.0 Quality Assurance section of the standard

4.1 The group discussed a draft document which had been provided on ‘Quality Assurance and the Use of Elimination Databases in Y-STR Profiling’. The draft document stated that where possible, extraction positive controls should be processed alongside Y-STR samples. It was queried whether this were necessary and FSPs acknowledged that it was not their current standard practice to always have extraction positives on all batches. The group agreed that a PCR positive control should always be co-processed with a Y-STR batch but not an extraction positive control. It was agreed that the wording

should be amended to read that PCR positive and negative controls should be co-processed alongside Y-STR samples.

4.2 The draft document stated that Y-STR haplotypes from male visitors should be held in a local elimination database. The necessity for this policy was queried, given Y-STR profiling would likely to be a service with a relatively low demand. It was clarified that only those male individuals who entered the laboratories would need to have their Y-STR haplotype stored on an elimination database.

4.3 It was agreed that FSPs would need to prove through validation the comparable sensitivities of their autosomal and Y-STR processes. Only once the validation had shown it, could FSPs make the assumption that because no STR profile were obtained from an extraction negative control sample the same could be assumed for a Y-STR profile.

4.4 Paragraph 8 of the document recognised that not all samples generated from crime stains and associated reference samples (including PACE samples) would be automatically profiled using Y-STR analysis. Therefore it is possible that an unknown Y-STR profile obtained could be the result of a contamination event however this contamination event could go undetected if the sample from which the contaminant derived had not been Y-STR profiled. It was acknowledge that it was not possible to profile all samples using Y-STR analysis and therefore this risk must be acknowledge up-front in cases involving Y-STR analysis.

4.5 Paragraphs 15 to 18 covered the creation of Y-STR elimination databases. It was agreed that the paragraphs should highlight that Y-STR elimination databases would need to be tightly controlled and an explanation of the reasons should be provided. Discussions were held whether the document should draw to FSPs attention that male staff members should only be entered onto Y-STR population databases once as multiple entries by a single individual could distort the frequencies for reporting a match. The group thought the risk of this happening would be relatively low as uploading of profiles to Y-STR population databases would occur very infrequently.

4.6 The Y-STR profiling of transgender members of staff was discussed. The Home Office National DNA Database Ethics Group had recommended that new recruits to forensic laboratories should be made aware in their pre-employment terms and conditions that individuals with a Y chromosome would need to be profiled using Y-STR analysis. It was suggested the phrase ‘sex allocation’ should be used rather than ‘gender’.

4.7 Discussions were held about the necessity to keep the contents of Y-STR elimination databases secure and access restricted. A number of FSPs acknowledged that their case workers had access to staff autosomal elimination databases to allow them to check for contamination. It was noted that preventing case workers having access to staff Y-STR elimination databases would be very inefficient. As a compromise, it was suggested that only a limited number of staff members should have access to the staff Y-STR

elimination databases which would restrict access but also minimise inefficiencies in working practices.

4.8 The group discussed the minimum number of alleles which should be used to search the Y-STR elimination databases to prevent adventitious matches and unnecessary investigation. It was suggested that FSPs should determine themselves the number of alleles based on the size of their elimination database. However, the view was held that a relatively large number of alleles would need to be searched including the most discriminatory loci, to prevent a large number of adventitious matches. There would also be a necessity to take into account the commonality of that profile in the local population.

Action 4: Y-STR sub-group to forward any further comments to Stephen Ferguson and Stephen Ferguson to update the Quality Assurance and the Use of Elimination Databases in Y-STR Profiling document.

5.0 Feedback from the International Y-STR conference in Berlin in May

5.1 An overview was provided on the 10th International Y chromosome workshop – Haploid Markers 2016 – Update on DNA variation which was held in Berlin in May[2]. Presentations were heard on population genetics, casework, mutations, technology and statistics. Details of a presentation on 'Routine analysis of sexual assault cases in Brazil, using 23 Y chromosomal markers' by Samuel Ferreira were provided. Since 2013, Brazil had routinely been conducting Y-STR analysis on rape cases and currently next generation sequencing (NGS) technologies were used to simultaneously analyse autosomal and Y-STR markers. The group heard that NGS worked less well than conventional methods when high levels of female DNA and low levels of male DNA were present. A further presentation by a group of Chinese scientists showed that the group had been able to distinguish between 13% of father son pairs using the Y filer™ Plus PCR Amplification kit. Similarly, they had been able to differentiate between 24% of brothers, 29% of uncle/nephew pairs and 36% of cousins. Methods for undertaking statistical evaluations had been discussed including Brenner's Kappa method and Andersen's Discrete Laplace method. A consensus on which method was preferred had not been reached however a view was provided that Andersen's Discrete Laplace method was the preferred method.

5.2 The group heard that a paper was being prepared by David Balding and Bruce Weir which outlines an alternative method, named the Theta method, for evaluating the weight of evidence of Y haplotypes. If possible, the paper would be shared with the group.

5.2 The FSPs present at the meeting indicated that they are currently using the Pseudocount method (N+1/N+1) for evaluating the weight of evidence of Y

[2] Link to the conference programme: https://yhrd.org/pages/HM2016#programme

haplotypes. No views were provided on which method FSPs should be using and it was noted that FSPs would welcome advice from statisticians as to which method should be adopted.

6.0 User specification for the Y-STR software to allow estimation of costs to be developed

6.1 At the previous sub-group meeting, members had expressed significant risk if UK FSPs continued to rely on the European based Y-STR Haplotype Reference Database (YHRD) for Y-STR statistical calculations. The risks were identified as follows:

- there was currently no independent validation of the tool set implemented on YHRD;
- unilateral updates or other changes to the software instituted by the developers would potentially trigger further validation after the initial validation;
- the current functionality might not support an agreed UK approach;
- the UK would be constrained by the tools provided and could not therefore innovate or progress without the co-operation of the current administrators.

6.2 There had been an agreement at the previous sub-group meeting that a UK Y-STR database would be desirable and a paper had been provided which addressed some of the issues and barriers to a UK Y-STR database. Consideration was required in relation to the governance of UK Y-STR database, including hosting and funding. The possibility of hosting a UK Y-STR database as part of the Home Office Biometrics (HOB) Programme was raised. However, it was thought that the timelines for the HOB programme would not allow for a UK database in the near future. An alternative approach would be for a FSP to hold the UK Y-STR database on behalf of the forensic community. Appropriate governance structures with standards and oversight would be required and also the capability to allow external FSPs to access the database and submit profiles. The database could be transitioned to the HOB programme at a later date.

6.3 Funding for a UK Y-STR database was considered and members were reminded that the DNA Specialist Group had suggested that the Y-STR sub-group define the user specifications for the database in order for an estimate of the costs to be drawn-up. Following this the Forensic Science Regulator would explore the possibility of funding with the National Police Chief's Council Science and Innovation Board and Susan Hale would explore the possibility of funding through the Police Innovation Fund. A further suggestion put forward was to investigate whether individual police forces would be willing to fund the Y-STR database. The first stage would be the production of a specification which sets out the basic requirements for the database, the benefits and basic functionality and then additional functionality such as population data, complex mixture software and the ability to search and hold un-sourced contamination profiles. LGC indicated that they had started the

development of an outline specification which included hardware issues, software functionality and other proposals and would be willing to further develop this document.

Action 5: Tim Clayton to develop a specification document for a UK Y-STR population database to be reviewed at the DNA Specialist Group meeting.

6.4 The necessity of a UK Y-STR database was queried and if the YHRD is not an appropriate dataset for comparison with Y-STR profiles from individuals in the UK, why was it currently being used for such comparisons. It was clarified that the main issue with the YHRD was the lack of control UK FSPs had over the validation of software and that the YHRD would not be compliant with new FSR quality guidelines. It was suggested that an alternative approach would be for the YHRD to relinquish their database in its entirety to different groups. Or alternatively, the European Union could establish a Y-STR database with appropriate validation. It was decided that an options paper should be developed for the DNA Specialist Group meeting.

6.5 An update was provided on the collaborative project between King's College London and the Association of Forensic Providers (AFSP) to increase the number of UK profiles on the YHRD available for frequency determinations. 2,900 complete profiles had been obtained so far with the aim to obtain 3,500 profiles from individuals from Caucasian, African, Nigerian and Somalian descent which could be added to the YHRD database. It was noted that the dataset would be published in full and the anomalies and deletions identified would be followed up. The question was raised whether, once the 3,500 UK Y-STR profile had been obtained, whether this subset could be used for frequency determinations or whether the European population should still be used. However, it was suggested that the mixed UK population was not fully represented within the 3,500 samples, especially individuals from South Asian descent, and ideally a minimum of 5000 samples was required. It was suggested that this requirement to profile extra samples should be included in the specification document for a UK Y-STR database.

6.6 A further piece of work was identified for this group which was to determine the appropriate datasets to be used when undertaking frequency determinations for suspects.

Action 6: Andrew McDonald to develop a Y-STR database options paper for the DNA Specialist Group meeting, with input from Tim Clayton, Jim Thomson and Denise Syndercombe-Court.

Action 7: Y-STR sub-group to identify the appropriate datasets to be used when undertaking frequency determinations for suspects.

7.0 AOB

7.1 The group discussed the Scientific Working Group on DNA Analysis Methods (SWGDAM) Interpretation Guidelines for Y-Chromosome STR Typing. The SWGDAM guidelines included the use of confidence intervals for interpretation and reporting of Y-STR profiles. The group were not in favour of using this method for reporting the weight of evidence of Y haplotypes as it was thought to be difficult to explain to a jury. The SWGDAM guidelines also recommended multiplying the profile probability against an F_{ST}[3] formula to obtain a match probability. The group thought that this approach was overly conservative. The group recommended that FSPs use the Pseudocount method for evaluating the weight of evidence of Y haplotypes until the UK had developed its own statistical tool.

[3] F_{ST} is a coefficient used in forensic applications which measures the average progress of sub-populations towards fixation and can also be interpreted as measuring the relatedness among individuals within subpopulations relative to the total population.

Annex C: Attendance at the Y-STR Subgroup Meeting

Present:

Emma Burton-Graham, Secretariat	Home Office Science Secretariat
Steven Ferguson	Forensic Services, Scottish Police Authority
June Guiness	Home Office, Forensic Science Regulator
John Lowe	Key Forensic Services
Andrew McDonald	Cellmark Forensics
Dave Mallett	Cellmark Forensics
Charlotte Murphy	Forensic Science Ireland
Sue Pope	Principal Forensic Services
Roberto Puch-Solis	RSS
Denise Syndercombe-Court	Kings College London
Jim Thomson	LGC
Jon Wetton	Leicester University

Apologies:

Maggie Boyce	Key Forensic Services
Tim Clayton	LGC