

Report

Report into the circumstances of a complaint received from the Greater Manchester Police on 7 March 2012 regarding DNA evidence provided by LGC Forensics.

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1. Summary

- 1.1 On 23 October 2011 Mr Adam Scott was charged with an offence of rape by Greater Manchester Police and held in custody. The sole evidence was a partial DNA profile developed by LGC Forensics (LGC) at its Teddington laboratory and believed, at the time, to be from one sample taken from the victim of the rape. Following my investigation I am satisfied that it was his profile though not from the samples taken from the rape victim, but introduced through the incorrect re-use of disposable plastic trays between 8 and 10 October 2011 during the automated DNA extraction process at LGC. Scott's saliva from an unconnected earlier processed sample had been present in one cell of a tray that was re-used, with sufficient DNA present to contaminate the later rape sample.
- 1.2 The batch containing the rape sample showed DNA present in the negative control (a blank sample put through to test for contamination). This was not sufficiently dealt with and resulted in an incorrect conclusion; it was a missed opportunity to identify the true extent of the problem.
- 1.3 The misuse of the plastic trays during another batch was spotted by LGC staff on 11 October 2011 and procedures changed to prevent the error happening again. However, the incident report was not sufficiently escalated and an opportunity was missed to check back and identify the same issue a few days earlier. The re-use of the trays was the result of human error by an unidentified laboratory technician failing to follow the LGC operating procedures. LGC internal investigations identified and acknowledged the errors and failures in the issues set out above, procedures and training have since been improved, assessed and cleared as part of a wider annual assessment of LGC by the United Kingdom Accreditation Service.

2. The Role of the Forensic Science Regulator

2.1 The non-statutory post of Forensic Science Regulator was created by the Secretary of State for the Home Department and set out in a Written Ministerial Statement in July 2007 ¹:

“...we have put in hand to establish the post of forensic science regulator, whose role will be to advise the Government and the criminal justice system on quality standards in the provision of forensic science. This will involve identifying the requirement for new or improved quality standards, leading on the development of new standards where necessary; providing advice and guidance so that providers will be able to demonstrate compliance with common standards, in procurement and in courts, for example; ensuring that satisfactory arrangements exist to provide assurance and monitoring of the standards; and reporting on quality standards generally.”

2.2 I took up the role as a public appointee in February 2008 on a three year term (which was renewed in February 2011) and established a process to manage complaints or referrals about quality standards. I have a team of 3 scientists and 1 support staff member with additional support provided from within the Home Office.

3. Introduction

3.1 On 7 March 2012 I was informed by Greater Manchester Police (GMP) of the case of Mr Adam Scott who had been arrested and charged in Manchester with an offence of rape based on the evidence of a DNA profile that was the result of contamination at the Teddington laboratory of LGC Forensics (LGC). The case against Mr Scott was withdrawn by the Crown Prosecution Service (CPS) on 7 March. The managing director of LGC telephoned me on 7 March informing me of the incident.

3.2 On 8 March I recorded the matter as a complaint and set the following objectives:

- a. To investigate fully the complaint from GMP in order to see what lessons can be learned.

¹ Hansard - Written Ministerial Statements 12 July 2007: Column 67WS.

- b. To assess the LGC corrective actions.
- c. To assess the quality standards, technical standards and compliance mechanisms applied at the time to the profiling of DNA samples to establish any possible deficiencies.
- d. To liaise with the Chair of the National DNA Database Strategy Board and the Crown Prosecution Service to coordinate activities and undertake joint risk assessments.
- e. To brief and advise Ministers on issues arising from the GMP complaint.

3.3 This report covers my investigation into the complaint and assessment of the immediate work undertaken to correct any identified issues. There is further work being done within my ongoing programme of work concerning the quality, technical standards and compliance mechanisms that should apply to DNA profiling and forensic science more broadly, including the validation of methods. I have liaised throughout with the Chair of the National DNA Database Strategy Board and the CPS lead on forensic science policy and have briefed the Parliamentary Under Secretary for Crime and Security, Mr James Brokenshire MP.

4. **Quality Standards**

4.1 Standards that apply to laboratories undertaking DNA profiling for loading of DNA profiles onto the National DNA Database[®] (NDNAD) are set by rules agreed by the NDNAD Strategy Board and reinforced in the commercial sector through police contract requirements with the commercial forensic service providers. I attend the meetings of the board as an advisor.

4.2 Management of these standards is delivered through the National DNA Database Delivery Unit (NDU). The basis of the standards is accreditation against BS/EN ISO 17025 (General requirements for the competence of testing and calibration laboratories).

4.3 Accreditation against the standard is undertaken by the United Kingdom Accreditation Service (UKAS). UKAS and the NDU work collaboratively through

an agreement published by UKAS - LAB32 Edition 2 (August 2011): Accreditation for Suppliers to the UK National DNA Database.²

4.4 LGC is accredited for a broad range of methods across its forensic science laboratories, including “documented in-house methods meeting the requirements for suppliers to the Custodian of the National DNA Database”.³

4.5 BS/EN ISO 17025 is used globally as the standard applicable to forensic science laboratories and is interpreted for the forensic science context through guidance published by the International Laboratory Accreditation Cooperation (ILAC) - Guidelines for Forensic Science Laboratories (ILAC G19).⁴ The process and benefits of accreditation are set out on the UKAS web site⁵ and for my purposes it provides an independent and robust compliance mechanism against a suitable standard. Accreditation against the standard involves on-site assessments by technically competent assessors across a range of areas at the heart of which are assessments of an organisations’ quality management systems, the training and on-going competence of the individual practitioners employed in an organisation, evidence of the validation and correct use of tests and methods, and evidence that the work is impartial and free from external pressure. Accreditation is managed on a 4 year cycle with on-site visits undertaken at least annually by UKAS.

4.6 I have in place a programme or work that adopts but broadens the NDNAD standards to develop further the use of accreditation and have published Codes of Practice and Conduct for Providers and Practitioners of Forensic Science Services in the Criminal Justice System which builds on BS/EN ISO 17025 by adding necessary additions and guidance for the UK context.⁶

4.7 The NDU issued “Technical Standards for Processing Samples for Inclusion on the National DNA Database[®]”, to ensure that all forensic service providers

² <http://www.ukas.com/library/Technical-Information/Pubs-Technical-Articles/Pubs-List/Lab32.pdf>

³ <http://www.ukas.org/testing/schedules/actual/0003Testing%20Multiple.pdf>

⁴ http://www.ilac.org/documents/g19_2002.pdf

⁵ http://www.ukas.com/about-accreditation/What_is_Accreditation/What_is_Accreditation.asp

⁶ <http://www.homeoffice.gov.uk/agencies-public-bodies/fsr/codes-practice/>

supplying profiles to the NDNAD are aware of and adhere to the technical standards for processing samples for inclusion on the NDNAD. These are currently under review.

5. Background

- 5.1 LGC is one of the forensic service providers contracted to provide a DNA analytical service to police forces. It operates two sites providing DNA analysis: at its laboratory in Teddington where it processes the samples submitted by its laboratories and police forces for offences under police investigation (case samples) and at Runcorn where samples taken by the police from people (subject samples) are processed.
- 5.2 On 1 March 2011 the Teddington site introduced new robotics (two identical Qiagen® QIASymphony® SP instruments using the QIASymphony DNA Investigator kits) to automate and improve the efficiency of the early part of the DNA analytical process in which DNA is extracted from case samples. The automation of DNA processes is good practice in high volume laboratories providing that the processes are validated and subject to the appropriate quality management systems (which equally applies to manual systems).
- 5.3 Prior to this, in August 2010, LGC applied to UKAS for an extension of its accredited scope of methods in order to include the use of the automated DNA extraction methods using the new robotics. In parallel it applied to the NDU for permission to introduce the new methods. Ahead of this LGC had conducted a validation exercise. Both UKAS and the NDU assessed the reported validation of the new methods and concluded that suitable validation studies had been done, and further that the new robotics based methods would provide improved results (DNA yield and success rates) over the previous extraction methods. The validation studies by LGC tested the robotics with 24 samples (23 test samples and one control negative) per batch while the instrument is capable of managing up to 96 samples per batch.
- 5.4 At the end of November 2010 the NDU concluded that permission could be given for LGC to load profiles developed using the new methods subject to

confirmation that the UKAS extension to scope was granted. UKAS wrote to LGC on 20 December 2010 granting the extension of scope. UKAS recommended that processing be done in batches of no more than 24; this was supported by the NDU in order to ensure high quality results for all samples processed.

- 5.5 Neither UKAS nor the NDU visited LGC at Teddington prior to granting the extension to scope or permission but were content to work with validation reports and through correspondence. However, this was done with the knowledge that UKAS would be on site in May 2011 as part of its annual surveillance visit.
- 5.6 In May 2011 LGC was subject to an annual surveillance visit by UKAS assessors in which the use of the automated DNA extraction methods were checked and found to be satisfactory.
- 5.7 The robotic instruments manage each of the loaded samples through a DNA extraction process to deliver a tray of extracts that is moved to the next stage of the analytical process. Within the extraction process each sample is robotically pipetted into a cell of a plastic tray made up of 2 x 4 cells where it is mixed with reagents, heated and later pipetted out for analysis. The plastic trays are collected from within the instrument from a stack of fresh, DNA free trays pre-loaded into a plastic box that in turn is loaded into a drawer in the instrument by a technician. Once empty each plastic box is transferred by a technician into the adjacent waste drawer to receive the used plastic trays deposited by the machine. Prior to 12 October 2011 there was nothing to distinguish an empty plastic box as being for waste only. Once full, each stack of waste trays should be removed by a technician and immediately disposed of as clinical waste.
- 5.8 The new extraction method commenced operational use at Teddington on 1 March 2011. Between then and 12 October 2011 approximately 26,000 samples were processed with no indication of any problems until 11 October when it was discovered that a stack of plastic trays removed as waste from one of the robotic units was incorrectly re-used (reported internally as a quality incident). As a result of this a number of samples were re-processed and

procedures changed so that the empty plastic boxes removed from the supply drawer were marked as 'waste' before being loaded into the waste drawer.

5.9 It is clear that the report that followed this breach of the operating procedures was not sufficiently escalated leading to insufficient back checks for previous re-use of tray stacks.

6. Police Case Samples

6.1 Between 6 and 8 October 2011 a saliva case sample submitted by the British Transport Police, following a spitting incident in Exeter was processed through the LGC Teddington laboratory. Extraction of the DNA from the saliva was done as one sample in a batch of 24 (including a control blank) on 6 October using the automated method. Included in the same batch was an unrelated case sample from a Wiltshire Police investigation.

6.2 On 2 October 2010 a woman was attacked and raped in Manchester. The rape was investigated by GMP and included a forensic medical examination of the victim by a doctor. The victim's clothing and samples taken from her during her examination were submitted, on 7 October, to the LGC laboratory at Risley.

6.3 The case was processed at Risley on 7 October and assessed by a reporting officer who gave instructions regarding the processing of the exhibits, which were followed that day by a forensic examiner following set procedures. Included in the exhibits were six swabs from the examination of the victim: (two vulval – labelled GE2A and 2B, two low vaginal – GE3A and 3B, two high vaginal – GE 4A and 4B). Semen was detected on each of the swabs and separated from other cellular material, each fraction was analysed for DNA profiles at LGC Teddington between 8 and 10 October.

6.4 The low, high vaginal and one vulval swab (GE2A) produced DNA profiles from the seminal fraction identified as those of the victim's boyfriend. The other of the two vulval swabs (GE2B) produced a mixed profile from the seminal component containing the victim's boyfriend and another unknown male with 17 alleles present.

- 6.5 On 12 October the reporting officer at Risley was informed, by email, that the negative (blank) control run with the extraction batch containing the GMP rape samples had shown a 'strong profile'. She was informed that the most likely cause was a 'consumable contamination affecting a single tube or pipette etc'.
- 6.6 On 17 October the reporting officer concluded that there were two male profiles present in the vulval swab (GE2B), one of which was the victim's boyfriend. The profile of the unknown male (17/20 alleles at this stage) was loaded onto the NDNAD and reported onwards that day to GMP in a NDNAD match report which identified Mr Adam Scott as the second male.
- 6.7 The NDNAD match report information indicated that the profile match was partial with 17 out of 20 alleles matched, and listed the exhibit number as GE2A and 2B. This is a consequence of the two swabs being treated from the outset as subsets of one exhibit, and recorded through the system as such. The match report therefore failed to identify that the match did not apply to GE2A but to GE2B only. However, details were passed to GMP by emails directly from LGC, as a result of which GMP was aware that only one of the original swabs contained the partial (17 out of 20) profile.
- 6.8 On 22 October LGC issued a forensic report stating that Adam Scott's DNA profile had been found among a mixed DNA profile from semen on the swab GE2B. The report stated:
- 'It is estimated that the chance of obtaining matching DNA components if the DNA came from someone else unrelated to Adam Scott is approximately one in one billion (one billion is one thousand million). In my opinion the DNA matching that of Adam Scott has most likely originated from semen'.
- 6.9 The LGC reporting officer later produced a witness statement dated 23 November 2011, in which she stated:
- 'Interpretation and conclusions**
- The DNA detected in the sample recovered from (victim's name) vulval swab (GE2b) can be accounted for by a mixture of DNA from (victim's boyfriend) and Adam Scott. In my opinion these findings are what I would expect if Adam Scott had some form of sexual activity with (victim's name).

In order to assess the overall findings in this case I have therefore considered the following propositions:

- Adam Scott had vaginal intercourse with (victim's name)
- Adam Scott has never been to Manchester and does not know (victim's name)

In my opinion, the scientific findings in relation to (victim's name) vulval swab provide strong scientific support for the view that Adam Scott had sexual intercourse with (victim's name) rather than he did not. However, given the position of the semen matching Adam Scott and an absence of semen on (victim's name) internal swabs, the findings do not specifically support vaginal penetration with ejaculation inside the vagina. They may also support vaginal-penile contact with external ejaculation or vaginal intercourse with no internal ejaculation.

I have assessed the scientific findings based on the following scale of scientific support: no, weak, moderate, strong, very strong and extremely strong.

Should any of this information change I may need to re-evaluate my findings. This is best done in advance of the trial'.

- 6.10 Mr Adam Scott was arrested on suspicion of rape and taken to Manchester where on 22 and 23 October he was interviewed and denied being in Manchester or any involvement in the rape. On 23 October, following advice and permission to charge him from the CPS, he was charged with the rape and held in custody. The sole evidence against him was the partial DNA profile. The CPS gave instructions to the police to research further evidence such as bank records and mobile telephone cell site analysis in order to establish any corroborative evidence of his presence in Manchester.
- 6.11 On 12 December GMP established from cell site analysis of the telephone used by Mr Scott that the telephone was in Plymouth a few hours after the reported rape. The GMP detective constable leading the investigation had concerns about the reliability of the DNA result and in the presence of contradictory, rather than the hoped for supporting evidence; she pressed her forensic science department for further analysis. On 12 December 2011 she sent an email to the GMP forensics department expressing her concerns. This generated a reconsideration of the case and eventually agreement on 31 January 2012 by GMP to pay for additional tests. In the meantime, on 17 January the CPS wrote to GMP authorising release of the swabs (GE2A and GE2B) to a defence expert

for re-analysis. However, release was delayed pending the further tests authorised by GMP.

6.12 The further profiling was completed on 27 February. This was conducted on the original DNA extract that contained the contaminated DNA and worked only to confirm the presence of Mr Scott's DNA.

6.13 On 28 February the LGC reporting officer sought advice from colleagues and the possibility of contamination was raised. This instigated a complete re-testing of the GMP samples from the swabs. On 3 March this produced fresh results that showed Mr Scott's DNA was not present and an internal investigation commenced by LGC into the possibility of contamination. GMP was notified on 5 March that there may be a problem with the case; details were confirmed on 6 March when the local CPS was also notified.

7. Root Cause Analysis

7.1 BS/EN ISO 17025 deals with non-conforming tests and demands that work is undertaken to identify the root cause of any non-conformity, which in this case was the generation of a wrong DNA profile. This was promptly done by LGC which was able to refer back to the non-conformity identified on 11 October 2010 when it was noticed that waste plastic trays had been re-used. Further more detailed analysis of the records maintained by the robotics instrument of the recorded positions of the cells used in each tray to first extract Mr Scott's DNA from the BTP saliva sample and secondly the GMP sample from the vulval swab (GE2B) showed conclusively that the cell position in each run matched. This provided clear evidence for the possibility that a re-used tray transferred residual DNA from the first batch into the second. This was confirmed by identical analysis of the previous Wiltshire case and the control blank in the batch containing the GMP sample (GE2B) that showed traces of the Wiltshire sample.

7.2 I have checked the work undertaken by LGC to identify the root cause. Having considered all the circumstances: the paths of the exhibits in the various cases, the detailed examination of the robotics records and the knowledge that plastic

trays had been re-used on another occasion, I am satisfied that the root cause analysis is correct. Mr Adam Scott's DNA contaminated the GMP sample (GE2B) through the incorrect re-use of disposable plastic trays used as part of the automated DNA extraction process.

- 7.3 There were inadequate records kept by the laboratory technicians so it has not been possible to identify who failed to properly dispose of the used trays and who then reloaded them, such records were not required at that time. Further, the used trays were not marked in any way to identify that they had been used. Also, with the benefit of hindsight it now seems possible that the validation work undertaken for the robotics and related operating procedures could have identified the risks surrounding the plastic trays.

8. Audit of DNA Extraction Processes

- 8.1 Confirmation of the cause of the contamination raised the obvious question regarding any other possible contamination incidents during the extraction process. Records identified every sample that had been processed through the robotics extraction process since the instruments were taken into use on 1 March 2011 until procedures were changed on 12 October 2011. This amounted to some 26,000 samples which were checked against each other for repeated (i.e. contaminant) profiles.
- 8.2 LGC checks found no other incidents of contamination. I have audited these checks, as have the NDU and UKAS. I am satisfied that there are no further cases of contamination during the automated DNA extraction process in use since March to 12 October 2011.

9. The Decision to Charge Mr Scott

- 9.1 The decision to charge Mr Scott with the offence of rape was taken by a CPS lawyer who was informed of the evidence against him. The lawyer applied the CPS Threshold Test⁷ and gave instructions regarding further work to be done.

⁷ http://www.cps.gov.uk/publications/code_for_crown_prosecutors/threshold.html

10. LGC Response

- 10.1 Once LGC confirmed the contamination it notified the police, CPS and myself and conducted an internal investigation in which it correctly identified and acknowledged its errors. It put in place appropriate changes and improvements. UKAS has since conducted detailed assessments at each of the LGC sites using experts in the relevant fields.
- 10.2 LGC has been open and frank with me and agreed to all my requests for information and access to staff. From the outset it has acknowledged its errors and failings and has undertaken to do everything necessary to put matters right. I have had one meeting with the chair and managing director of the LGC group and several meetings with the managing director of LGC Forensics. I will be meeting with them again to demand further and final assurances of their commitment to quality standards.

11. Conclusions

- 11.1 Mr Adam Scott was the innocent victim of avoidable contamination from an unrelated case that did contain his DNA.
- 11.2 The contamination was the result of human error by a technician who failed to follow basic procedures for the disposal of plastic trays used as part of a validated DNA extraction process. The procedures themselves were not adequate leading to no records maintained by the technicians and nothing done to mark used trays as such.
- 11.3 Contamination was identified in the control negative processed in the same batch as the GMP rape sample. This presented an opportunity to investigate fully and establish a wider problem than that concluded at the time.
- 11.4 The re-use of plastic trays was identified on 11 October 2011 and should have triggered a more comprehensive response than that undertaken.
- 11.5 These errors were compounded by the failure at LGC to consider the possibility of contamination despite concerns expressed by the investigating officer about the reliability of the DNA profile.

- 11.6 It is unlikely that the case against Mr Scott would ever have proceeded to trial and in the absence of any further evidence the case would probably have been discontinued. However, this is of little comfort to Mr Scott who was charged on 23 October 2011 and remanded in custody on this case until it was withdrawn on 7 March 2012.
- 11.7 The error that led to the contamination has occurred on at least two occasions, one identified on 12 October 2011 and again in this case. However, checks against approximately 26,000 samples and the results of their DNA profiling results have identified no further cases of contamination across or between unrelated cases processed from 1 March to 12 October 2011.
- 11.8 Once the contamination was identified LGC took immediate steps to identify the root cause of the problem and put in place suitable corrective actions, including better record keeping and a process to mark the box receiving the used plastic trays so that it cannot be confused with boxes of new trays. Processes to dispose of trays have also been improved. LGC have also undertaken a programme of 'failure and mode effect analysis' to help identify risks of failures across all its operating procedures.

12. UKAS Surveillance Visit

- 12.1 On 23 March 2012, aware that UKAS were soon due to conduct its annual assessment of LGC, I wrote to UKAS regarding the issues in this report and raised my concerns regarding human errors and failings in procedures at LGC. I asked UKAS to assess the LGC response to the incidents and to address my wider concern at the human errors the incidents exposed within the organisation.
- 12.2 UKAS have concluded a series of visits to LGC laboratories between 27 March and 20 April 2012 using a team of over 20 assessors exploring a wide range of relevant issues.
- 12.3 UKAS wrote to me on 14 May confirming that it had raised with LGC a number of mandatory improvement actions which have been met. In light of the UKAS

findings and the LGC response to the UKAS action plan, UKAS have recommended that LGC retain its BS/EN ISO 17025 accreditation.