何秀蘭立法會議員辦事處的信頭
Letterhead of Office of Legislative Councillor Cyd Ho S.L.

立法會 CB(2)803/00-01(01)號文件
LC Paper No. CB(2)803/00-01(01)

傳真（共 24 頁）

香港中區昃臣道 8 號
立法會大樓
立法會秘書處
《2000 年入境（修訂）條例草案》委員會秘書
湯李燕屏女士
（傳真號碼：2877-8024）

湯女士：

《2000 年入境（修訂）條例草案》

在審議上述條例草案的時候，委員曾就政府提出由中港兩地的化驗所分別抽取和測試當地居住的申請人或其父母，然後交換測試結果的做法提出質疑，認爲在科學上是否可行和可靠。上一次會議，我們提交了美國血庫聯會(American Association of Blood Banks)的意見書，現附上一些補充資料，給委員參閱。

我們於 12 月 20 日致函澳洲國家測試機構聯會(National Association of Testing Authorities, Australia)查詢有關政府建議的兩地測試基因是否符合該機構所訂立的指引和標準。該機構於 12 月 22 日以電郵回覆，提供一些專業的意見及該機構就親子關係基因測試發出的指引。

中文大學生化學系主任 Professor Walter Ho Kwok-Keung 及城市大學生物及化學系主任 Professor David Randall 亦分別回應我們的查詢，對政府的建議提供意見。

政府當局在 1 月 15 日回覆條例草案委員會委員於 2000 年 12 月 19 日提出的事項時，回應了李鈞陶先生(Dr. Kenneth Lee)在「信報」發表題爲「一國兩檢」的文章。隨後，李先生亦對政府的函件作出一些回應，並提供美國當局向移民及歸化部前線員工發出有關基因測試以確立親子關係的備忘錄。

現將上述文件一併交予閣下，煩請轉交給條例草案委員會委員、政府當局及公眾人士參閱。

何秀蘭
立法會議員

（黎榮耀　　代行）

連附件

2001 年 2 月 3 日

寄件者：Jennifer Evans <Jennifer.Evans@nata.asn.au>
收件者：addylai@hknet.com <addylai@hknet.com>
主旨：Parentage Testing
日期：2000 年 12 月 22 日 AM 09:03

Dear Lai Wing-Yiu

I am not aware of an arrangement of the type described in your fax ie testing of a child (applicant) and one parent conducted in one laboratory and testing of the other parent conducted in a second laboratory and the results exchanged for collaborative analysis. I assume by 'exchanged for collaborative analysis' you mean:

- the DNA profiles of the child and parent (China) are sent to the Hong Kong laboratory for comparison with the DNA profile of the other parent and, if no exclusions are found, a calculation of the statistical likelihood of parentage; and

- the DNA profile of the parent (Hong Kong) are sent to the Chinese laboratory for comparison with the DNA profiles of the child and parent and, if no exclusions are found, a calculation of the statistical likelihood of parentage.

Some of my concerns about this arrangement are as follows:

- Are the loci used by the Hong Kong and Chinese laboratories the same? If not comparison of DNA profiles will not be possible.

- I know the Government Laboratory in Hong Kong holds ASCLD-LAB accreditation and hence there is a guarantee of the 'quality' of the testing. Issues such as the separation of incompatible processes within the DNA test procedure, quality control measures, proficiency testing, the integrity of databases used for statistical calculations, security of samples, competence of staff performing the tests and interpreting the results, are all addressed by the ASCLD-LAB accreditation process. What guarantees are there on the quality of the service provided by the Chinese laboratory?

- What is the arbitration mechanism for differing conclusions between the Hong Kong and Chinese laboratories?

- Are the following parameters going to be established and agreed by both laboratories:

* limitations on loci used, for example, in Australia tests systems must achieve a combined power of exclusion of 99.5% and the loci used must not have a frequency of mutation of>0.25%.

* criteria as to what results constitute parentage, for example, in Australia, two exclusions must be obtained before parentage is excluded and in cases where no exclusion is obtained, a relative chance of paternity of 99.5% should be reached.

I have listed only a few concerns that come to mind immediately. I feel sure that there are other

issues that would need to be resolved.

In Australia, it would be possible to have the testing performed in two different laboratories but both would have to be NATA accredited for parentage testing. The results could be reported by either accredited laboratory. In practice, however, this does not occur so I have no experience with kind of arrangement.

I have attached a copy of the NATA ISO/IEC 17025 Application Document: Supplementary Requirements for Accreditation in the Field of Forensic Science. Section 3, Part B describes our accreditation criteria for parentage testing laboratories. (Please note that this document must be read in conjunction with ISO/IEC 17025 as all applicable criteria in both documents apply.)

If you have any further queries please do not hesitate to contact me.

Yours sincerely

ISO/IEC 17025 APPLICATION DOCUMENT

SUPPLEMENTARY REQUIREMENTS FOR ACCREDITATION IN THE FIELD OF FORENSIC SCIENCE

2000 Version 1

National Association of Testing Authorities, Australia
ACN 004 379 748

Contents

SECTION 3:

PART B -
SUPPLEMENTARY REQUIREMENTS FOR ACCREDITATION: PARENTAGE TESTING

4.3 DOCUMENT CONTROL

4.3.2.2 Obsolete documents must be retained for as long as case records to which they may pertain.

4.5 SUBCONTRACTING OF TESTS AND CALIBRATIONS

This clause applies in those cases where a laboratory is required to subcontract part of its normal service (eg due to temporary Incapacity, excess workload) or where a laboratory subcontracts due to the need for further expertise and the results of the subcontracted service(s) are incorporated Into the laboratory's test reports (refer also 5.10.6) or used to formulate an opinion which is subsequently incorporated into the laboratory's test reports.

4.5.1 A competent subcontractor is defined as an appropriately accredited NATA laboratory or a laboratory accredited by one of NATA's mutual recognition partners.

4.5.4 The accreditation status of subcontractors should be regularly reviewed to ensure currency.

Information on accreditation status and terms of accreditation may be found at NATA's website or by contacting one of NATA's offices.

4.7 SERVICE TO THE CLIENT

Policies and, where necessary, procedures, must be documented on the access allowed by clients or their representatives to the laboratory, laboratory records (eg case records) and exhibits.

Examples might Include access to relevant areas of the laboratory to witness tests/examinations, access either on-site or off-site to case records or other laboratory records, provision of exhibits or samples for Independent tests/examinations.

4.12 CONTROL OF RECORDS

4.12.1.2 a) i. Retention times must be established and documented for all record types.

ii. Unless otherwise prescribed by Common-wealth and/or State/Territory legislation, retention times will not be less than three years.

b) All records must include the identity of the person Making the record.

Some examples of records required by these accreditation criteria include case records, internal audit records, management review records, complaints, staff training records, quality assurance records (including quality control, proficiency testing, court testimony monitoring, corrective action), equipment maintenance and calibration records.

4.13 INTERNAL AUDITS

4.13.1 The parentage testing laboratory shall, at least once per year, conduct Internal audits of its activities to verify that its operations continue to comply with the requirements of its quality system and accreditation criteria.

All elements of the quality system must be audited at least annually.

4.14 MANAGEMENT REVIEWS

4.14.1 The effectiveness of the quality system shall be reviewed by management at least once per year.

5.2 PERSONNEL

5.2.1 a) Persons who prepare Form 5, Part 1 and/or Form 5 Part II must have a Bachelor degree or equivalent. They must have appropriate DNA laboratory experience, have completed a relevant training program and have demonstrated:

- a sound knowledge of the scientific literature and procedures relevant to DNA testing;
- a thorough knowledge of the relevant theory and practice of DNA typing;
- the necessary skills to evaluate and interpret results of those tests;
- an ability to communicate orally the technical aspects of DNA typing to a lay audience;
- the successful completion of competency test(s) in the relevant area(s).

b) Persons who are competent to prepare Form 5, Part I are called Reporters. They must, in addition, have relevant experience in the interpretation of genetic data.

A laboratory seeking accreditation for parentage testing must nominate the person(s) who will be its Reporter(s). Reporters need not be full-time staff of a laboratory and can act as a consultant to one or more laboratories. In the case of consultant reporters, a formal agreement must exist between the consultant and the laboratory.

Reporters will be evaluated as part of the laboratory's assessment. In the case of an individual who acts as a consultant reporter to more than one laboratory, an interview may not be necessary at each laboratory's assessment. Such individuals will, however, be required to submit to an interview at a frequency not less than the frequency at which laboratory assessments are performed.

NATA will retain records of persons who are Reporters. These will include records of academic and professional Qualifications, relevant work experience and date(s) of assessment interviews.

A laboratory cannot be accredited for parentage testing without the services of a Reporter.

c) Technicians must have completed a relevant training program. Technicians will not have the sole responsibility for the interpretation of results and will not prepare reports.

5.2.2 a) i. The laboratory must have a documented training program.

ii. The training program must include the successful completion of competency test(s) in all applicable areas.

Material from previously analysed/examined and evaluated proficiency tests may serve this purpose.

b) New members of staff, whatever their qualifications or previous experience, must have satisfactorily completed the laboratory's training program before being authorised to work independently.

5.2.5 Training records must be maintained for all personnel. Such records must include details and dates of:

- relevant academic Qualifications;
- participation in the laboratory's training program;
- in-house and external training courses undertaken;
- conferences, seminars, workshops etc attended;
- relevant publications.

Records must be sufficiently detailed to show that staff members have been property trained, that their subsequent ability to perform casework has been formally assessed and that they have been authorised to perform work independently.

Proof of formal staff qualifications and membership of professional societies may be requested as part of the assessment process.

5.3 ACCOMMODATION AND ENVIRONMENTAL CONDITIONS

5.3.1 a) All elements of the laboratory's health and safety program must be clearly documented in a manual which is readily available to all staff.

Examples of procedures which must be included, where appropriate, are:

- procedures for handling chemical spills;
- cleaning and disinfection procedures for biological spills;
- cleaning and decontamination procedures for radioactive spills;
- procedures (including follow-up procedures such as counselling) for dealing with needle-stick injuries;
- evacuation procedures including a plan of the facility showing the location of safety equipment and fire extinguishers;
- policy on the use of protective clothing eg gowns/coats, gloves, goggles etc;
- policy on eating, drinking, applying cosmetics etc in the laboratory;
- waste disposal procedures;
- routine cleaning and disinfection procedures for benches/floors, equipment such as centrifuges, refrigerators etc;
- immunisation policy;
- accident reporting protocols;
- special procedures for handling hazardous sub-stances.

Material safety data sheets must be available in conjunction with the safety manual.

b) An individual must be designated as the health and safety manager (however named).

Ideally, the health and safety manager should have received training in occupational health and safety concepts and in relevant legislative requirements.

c) i. The health and safety program must be monitored regularly and audited at least annually to ensure that its requirements are being met.

ii. Records of safety audits must be maintained.

iii. Where a safety audit identifies departures from the laboratory's health and safety policies and/or procedures, appropriate corrective action procedures must be implemented.

d) Signs must be present to identify safety equipment such as fire extinguishers, safety showers, eyewash facilities, spill kits, etc.

e) i. Proper equipment and material must be available for the handling of carcinogenic, toxic, biological and/or other dangerous material spills.

ii. Spill kits must be available for acids, solvents etc.

iii. Appropriate disinfectants must be available.

It is recommended that 0.05% sodium hy-pochiorite be used for routine disinfection and 0.5% sodium hypochiorite be used for spills of blood and body fluids.

f) i. Where appropriate, the laboratory must have safety showers and eye wash equipment in suitable locations and in good working condition.

ii. The operation of safety showers must be checked regularly.

iii. If commercial eyewash preparations are used, it must be ensured that the solutions are within their expiry dates or, if distilled water is used, the water must be changed at least once per week.

g) Biological safety cabinets must be available for handling samples where protection of staff from biological hazards is necessary.

h) Sufficient first-aid kits must be available and strategically located.

i) An adequate number of personnel must be trained in first-aid procedures.

j) i. Appropriate storage, in accordance with legislative requirements, must be provided for volatile, flammable and explosive and other hazardous materials.

ii. A flammable liquids storage cabinet is required for all but small volumes.

iii. Acids and solvents should not be stored together.

iv. It may be necessary to store some materials in locked cabinets/cupboards.

v. Storage on high shelves is discouraged.

vi. Suitable carriers must be available to carry large bottles.

vii. Gas cylinders must be secured.

k) i. The laboratory must have a fire detection system.

ii. In keeping with any relevant statutory requirements appropriate fire extinguishing devices must be available.

iii. The emergency exits from the laboratory must provide safe exit in an emergency.

iv. Evacuation routes must always be kept clear.

l) Foodstuffs must not be stored in laboratory refrigerators/freezers.

m) Centrifuges used for the centrifugation of biological material must have sealed buckets or a sealed rotor.

This requirement does not need to be met where centrifuges are used only to centrifuge small plastic tubes with lids eg Eppendorf tubes.

n) There must be a documented waste management program which includes procedures for the disposal of:

- biological waste;
- "sharps" and broken glass;
- "uncontaminated" waste, eg paper waste;
- radioactive waste.

o) i. Suitable protective clothing/equipment must be available at all times.

The nature of these items will be dependent on the work being undertaken and might include:

- laboratory coats/gowns
- disposable gloves
- rubber gloves
- heat/cold resistant gloves
- protective eye wear
- face masks
- plastic/rubber aprons

ii. Where radioactive work is performed, detectors must be used regularly to monitor radioactivity levels and the wearing of film badges by staff may be necessary.

p) A register must be maintained of laboratory accidents, injuries and other incidents and the follow-up action taken.

q) Staff must be advised of immunisation and other appropriate precautionary measures.

It is recommended that relevant records be kept.

r) i. Appropriate hand-washing and hand-drying facilities must be available.

ii. A suitable cleaning agent must be available.

Handbasins should not be fitted with domestic taps but with a suitable alternative, eg elbow or foot-activated devices. The use of communal towels is discouraged. Single-use towels or automatic hand-drying devices are preferred.

s) Samples/specimens/exhibits referred to other laboratories must be transported in accordance with Australia Post, IATA or other relevant requirements.

t) Special precautions may be necessary for staff working alone eg in isolated laboratories, out-of hours.

It is recognised that laboratories will be required to comply with Commonwealth and/or State/Territory building and safety legislation. The requirements of such legislation will supersede the requirements of the accreditation criteria.

5.3.3 a) Areas for examination must be separated from the extraction and amplification set-up areas.

b) The area used for sample extraction, concentration and digestion must be physically separate (ie in a separate room) from the amplified DNA work area and be separated from the PCR setup area.

c) The PCR setup work area must be isolated from the extraction area to ensure that the reaction mix cocktails are prepared in a clean environment. This area must be physically separated from the amplified DNA work area.

d) i. The amplified DNA work area must be separated physically in the laboratory for containment of amplified DNA product. This area includes the amplification area with the thermal cycler and space for all procedures utilising the product for typing (eg gel electrophoresis, hybridisation, washing).

ii. Amplified DNA must be stored and disposed of in this area.

iii. All equipment and reagents used in this area must be dedicated and must not be used in either the extraction or PCR setup areas. Dedicated equipment and reagents must be readily identifiable as such.

e) There must be documented procedures for the cleaning and decontamination of facilities and equipment from DNA and PCR product DNA.

5.3.4 a) Policies and procedures on laboratory security must be clearly documented.

b) i. All exterior entrance/exit points to the laboratory facility must be controlled in order to prevent access by unauthorised personnel.

ii. All security doors must have keys or other access devices limited to authorised personnel.

iii. The entire exterior perimeter of the laboratory must inhibit unauthorised access. For example, in the absence of intrusion alarms, suspended ceilings which permit undetected entry to the laboratory are unacceptable.

c) i. Where a laboratory exists within a host agency facility, documented procedures may be required to permit out-of-hours entry for emergencies. Such arrangements are acceptable if they include, for example, the breaking of a storage seal to access a key, code etc and notifying an authorised laboratory person.

ii. Each emergency access to the laboratory must be recorded.

d) i. Access to the operational area of the laboratory must be controllable and limited.

ii. Visitors must not have unrestricted access to the operational areas of the laboratory.

iii. A record must be retained of all visitors to operational areas of the laboratory.

iv. Persons, other than parentage testing laboratory staff, who have a legitimate reason for requiring access to the operational areas of the laboratory eg use of shared equipment, cleaners, may be given authorisation by the laboratory director for access to specific areas of the laboratory without the need to be 'accompanied' by a member of the laboratory's staff.

In general, such persons must meet appropriate security standards and must be made aware of relevant forensic procedures/requirements and of the limitations of their access.

There must be documented procedures for the authorisation of such persons and a record must be maintained of their time spent in the laboratory.

e) Each out-of-hours access to the operational area of the laboratory must be recorded.

f) Internal areas requiring limited/controlled access must have a lock system.

Short-term and long-term evidence storage areas require limited/controlled access.

g) Each access device (keys, magnetic cards etc) must be uniquely identified and recorded in a register.

h) i. The laboratory must be monitored during vacant hours by an intrusion alarm or by security personnel.

ii. The action to be taken in the event that an unauthorised access to the laboratory is suspected, must be documented.

5.4 TEST AND CALIBRATION METHODS AND METHOD VALIDATION

5.4.1 a) Test methods and related procedures must be documented and readily available to the staff.

In addition to a description of the steps involved in the analysis, documentation of methods and procedures must include, where appropriate:

- description of the sample/item to be tested/examined;

- parameters or quantities to be determined;
- equipment/instrumentation required;
- descriptions of sample preparation methods, controls, standards and calibration procedures;
- a discussion of precautions, possible sources of error or limitations of the procedure;
- criteria for the rejection of suspect results;
- data/observations to be recorded and method of analysis and presentation;
- literature references.

AS 2929 provides guidance on the format and content of test methods. In general, the level of detail must be sufficient for a new staff member with basic scientific training in the relevant area to be able to perform the procedure.

b) i. Laboratories must have documented policies for the interpretation of data for each method of DNA analysis.

ii. The basis for concluding that samples are or are not the same type or that the results of the analysis are inconclusive or uninterpretable must be established.

5.4.2 a) The DNA isolation procedure must protect against sample contamination.

b) Where possible, an appropriate procedure must be used for estimating the quality (extent of DNA degradation) and/or quantity of DNA recovered from specimens. This requirement may not apply to liquid blood samples where a further sample can be obtained.

c) i. The loci used must not have a published or observed frequency of mutation of greater than 0.25%.

ii. Test systems used must achieve a combined power of exclusion of 99.5%.

d) i. There must be two independent examples of a mismatch to report an exclusion of parentage.

ii. In cases where only one mismatch is obtained, the implication of a single mismatch must be qualified in the report.

In cases where only one mismatch is obtained, further testing is recommended.

e) Prior to implementing a new DNA analysis procedure or an existing procedure developed by another laboratory that meets the developmental criteria described in 5.4.5.2 (below), the reliability of the procedure must be demonstrated first in-house.

i. The method must be tested using known samples (eg proficiency test samples, samples from an external agency). At least ten such samples must be tested.

ii. Where appropriate, precision (eg measurement of fragment lengths) must be determined by repetitive analysis to establish criteria for matching.

iii. If a subsequent, significant modification is made to an analytical procedure, the modified procedure must be compared to the original using known samples.

iv. Records of performance verification must be maintained for future reference.

f) i. The quality of the standard samples and reagents must be adequate for the procedure used.

ii. Lot/batch numbers of standards and critical reagents must be recorded.

iii. All critical reagents must be routinely tested for their reliability.

In instances where there may be only one at-tempt at typing (eg due to insufficient sample), It must be ensured that the following have been tested prior to use:

- TaQ DNA Polymerase
- Kits

iv. Standards and reagents must be labelled with:

- name of the reagent/standard;
- concentration, where appropriate;
- preparation date;
- identity of the preparer.

Where necessary, the following must also be included on labels:

- expiry date;
- storage conditions;
- hazard warning.

5.4.5.2 a) The DNA primers, probes or oligonuclcotides selected for use in the forensic DNA analysis must be readily available to the scientific community.

b) The following must be included in the validation process:

- Establish Australian population data.
- If appropriate, prepare dried stains using body fluids from donors of known source and analyse to ensure the stain specimens exhibit accurate, interpretable and reproducible DNA types or profiles that match those obtained on liquid specimens.
- Where appropriate, establish the quantity of DNA needed to obtain a result.

c) During the development of a DNA analysis system, basic characteristics of the loci must be determined and documented.

i. The chromosomal location of the polymorphic loci used for parentage testing must have been accepted by a peer reviewed scientific journal.

ii. The molecular basis for detecting the polymorphic loci shall be known. For PCR, this includes the primers and probes.

iii. The type of polymorphism detected shall be known.

d) The validation of PCR-based DNA procedures must include the following:

i. The primers must be of known sequence or source.

ii. Conditions and measures necessary to protect preamplification samples from contamination by post-PCR materials and to detect such contamination must be determined.

iii. The reaction conditions such as thermocycling parameters (including the number of cycles necessary to give specific amplification) and critical reagent concentrations (primers, polymerase and salts) needed to provide the required degree of specificity must be determined.

iv. The potential for differential amplification must be assessed and addressed.

v. A protocol for systems which may result in the loss of an allele must be determined.

vi. Where more than one locus is amplified in one sample mixture, the effects of such amplification on each locus (alleles) must be evaluated.

vii. When a PCR product is characterised directly, the reference standards (eg allelic ladders) necessary to discriminate the alleles shall be established.

viii. When a PCR product is characterised by direct sequencing, the reference standards necessary to determine the sequence shall be established.

ix. When a PCR product is characterised with hybridisation, hybridisation and stringency wash conditions necessary to provide the desired degree of specificity must be determined.

e) The laboratory must determine the specimen types that it will accept for testing.

5.4.6.2 The extent to which uncertainty of measurement is applicable to parentage testing is currently being considered by the Forensic Science Accreditation Advisory Committee and the relevant Specialist Advisory Committee.

5.6 MEASUREMENT TRACEABILITY

5.6.1 Equipment calibration requirements and calibration intervals are detailed in Section 4. For equipment not listed, reference must be made to manufacturers' specifications.

5.6.2 a) Documentation of the calibration/verification program must include:

- the nature of the calibration/verification (eg calibration by NATA accredited laboratory, in-temal check against reference standard, etc);
- the maximum interval between the calibrations/verifications;
- where appropriate, acceptable performance criteria.

b) Where a laboratory performs calibrations in-house by means of comparisons between reference standards and working measuring instruments, the calibration procedure must be documented.

c) The laboratory must have a mechanism that alerts staff when calibrations, verifications and subsidiary checks fall due and which indicates the nature of the work required.

d) Calibration records (eg calibration certificates, calibration data) must be maintained.

5.6.3.2 a) Data bases must be drawn from the Australian population unless the circumstances of a case necessitate the use of a data base from a different population.

b) Population data bases must be checked statistically for genetic dependence. Obvious deviations from expectations must be adequately addressed and taken into account when reporting results.

c) Access to data bases must be limited and documentation must be available detailing who has access and the extent of that access.

Laboratories must be able to demonstrate that data bases, test reports and other test data are protected from unauthorised access and alteration.

5.7 SAMPLING

Laboratories must make agencies collecting specimens aware in writing of their obligations under the Family Law Regulations.

5.8 HANDLING OF TEST AND CALIBRATION ITEMS

5.8.1 a) i. The laboratory must have a documented specimen control system. This must include procedures for the receipt, handling, protection and storage of specimens.

ii. Agencies responsible for the transport of specimens must be made aware of the laboratory's requirements with respect to acceptable transport times, transport conditions, packaging etc.

iii. Policies and procedures for the retention and disposal of specimens following the completion of testing must be documented.

Specimen containers (even if empty) must be retained for a minimum period of six weeks from the date of the test report.

b) i. Specimens must be stored under proper seal.

A container is properly sealed only if its contents cannot readily escape or become contaminated and only if entering the container results in obvious damage/alteration to the container or its seal. Compliance can be achieved in a variety of ways and the adequacy of each laboratory's procedures will need to be determined on a case by case basis.

ii. All seals must be initialled or otherwise marked to record the person sealing the evidence.

Tape used to-seal containers must be initialled or otherwise identified. Heat-sealed packages must have initials or other identification across the seal.

An analyst in the process of testing who needs to store it temporarily in a secure area need not seal the specimen each time it is stored. Containers must be closed for overnight storage to prevent evidence from accidental loss or contamination.

c) A chain of custody record (eg signature, date, time, description of evidence) must be maintained which provides a comprehensive history of each specimen transfer over which the laboratory has control.

A record must be maintained of the control of samples during their presence in the laboratory.

5.8.2 Each specimen must be marked with a unique case designator for identification. Should the item not lend itself to marking, its proximal container must be marked.

Labelling on caps/lids alone is not acceptable because of the risk of wrongly replacing lids during testing of batches of like samples.

5.8.3 Laboratories must have a documented policy for the rejection of specimens which are unsuitable for testing.

5.8.4 a) A secure area for overnight and/or long-term storage of specimens must be available.

Security can be achieved by storing specimens in, for example, locked containers, locked refrigerators, locked laboratories.

If, during the process of testing, an analyst needs to leave for a short time, such as for lunch, it is not necessary to pack up the specimen being examined if it is in a secure area (eg a limited-access laboratory room).

b) Access to all specimen storage areas must be restricted to authorised personnel.

Restricted access is access limited to personnel authorised by the laboratory director.

5.9 ASSURING THE QUALITY OF TEST AND CALIBRATION RESULTS

Quality Control

a) The laboratory's quality control protocols must include specific procedures to assess critical parameters in normal operations which include the following:

- An extraction negative must be included with each set of extractions and must be typed at every locus being tested.
- An amplification blank must be included with each sample set.
- A human DNA of known type must be introduced at or before the amplification step as a positive control and carried through the remainder of the typing.

- To characterise length-based polymorphisms using manual typing systems, markers which approximate the allele size range or ladders containing a majority of the known alleles must be used.

b) Results must be reviewed independently by a second person experienced in the interpretation of DNA typing. Both must agree on the data to be reported.

c) Quality control procedures must be documented.

d) i. A record must be retained to show that appropriate quality control measures have been taken, that the quality control results are acceptable or, if not, that remedial action has been taken.

ii. Where appropriate, quality control data must be recorded in such a way that trends in analysis can be readily evaluated.

Proficiency Testing

e) The laboratory must have a documented program of proficiency testing which measures the capability of its examiners and the reliability of its analytical results.

The documentation of a laboratory's proficiency testing program must include how the test samples are obtained/prepared, who is tested and in what time frame, which laboratory staff member directs the program, how and where the testing information is maintained, what corrective actions are taken if required and who manages them.

f) i. Each laboratory must participate in proficiency testing programs which are provided by external test providers approved by NATA or where these are not available, by interlaboratory comparison.

Such testing must be conducted annually in every subclass in which a laboratory seeks or holds accreditation.

ii. Where laboratories subscribe to proficiency testing programs that issue samples/items for test/examination on more than one occasion through-out the year, results must be submitted on each occasion as required by the program.

g) All staff performing parentage testing must individually perform an external proficiency test (either by interlaboratory comparison or from a recognised proficiency testing provider) at least once per year. Those staff who normally perform only part of the parentage testing process eg. Reporters, must individually undertake an annual proficiency test but may restrict participation to that part of the process normally performed.

h) When participating in proficiency testing programs, the laboratory's routine test procedures must be used.

i) i. Performance in proficiency testing programs must be reviewed by the quality manager and relevant supervisory staff.

ii. Feedback must be provided to all relevant staff.

iii. Where necessary, corrective action must be taken.

j) Proficiency testing records must include:

- full details of the analyses/examinations undertaken and the results and conclusions obtained;
- an indication that performance has been reviewed; and
- details of the corrective action undertaken, where necessary.

5.10 REPORTING THE RESULTS

5.10.1 a) The laboratory's policies and procedures for issuing reports must be documented. These must include:

- prescribed formats for reports;
- issuing of preliminary or interim reports;
- reporting of results by telephone;
- electronic transmission of reports;
- retention of reports;
- report authorisation;
- withdrawal of invalid reports.

b) A copy of the report issued for a parentage test must be retained in conjunction with the case file.

5.10.2 a) Reports must comply with the requirements of the Family Law Regulations.

b) The following must be noted on test reports:

- discrepancies between specimen labelling and the accompanying Forms;
- omissions from the requirements for Forms as detailed in the Family Law Regulations;
- inadequacies in specimen seals.

c) i. Paternity Index should be reported to either a whole number or a maximum of one decimal place.

ii. Relative Chance of Paternity should be reported to one decimal place after the last nine.

d) i. All test results obtained must be recorded on Form 5, Part II.

ii. Form 5, Part II must present actual test results, not an interpretation of test results.

iii. Form 5, Part I must include a statement as to the source of the data base used.

f) i. Preliminary or interim reports must be clearly indicated as such.

ii. Where preliminary or interim reports are issued by telephone, the following must be recorded:

- the date and time of the telephone call;
- the test/examination result(s) given;
- the name of the person to whom the result(s) were given.

iii. The final test document must contain a reference to the preliminary document.

Accredited laboratories are encouraged to apply the NATA endorsement to reports on tests/examinations covered by their accreditation. Additional details relating to the appropriate forms of endorsement and the reproduction of endorsed reports are provided in the relevant schedule of the NATA Rules.

5.10.6 Where the results of tests not performed by the laboratory are included in reports, the source of those results must be clearly and unambiguously identified on the report.

ANNEX 1: REQUIREMENTS FOR PARENTAGE TESTING BY NON-PCR TECHNIQUES

This annex details the additional requirements which must be met by laboratories performing parentage testing by HLA tissue typing, red cell antigen blood grouping, red cell, enzyme blood grouping, serum markers and DNA typing by RFLP.

5.4 TEST AND CALIBRATION METHODS AND METHOD VALIDATION

5.4.2 In the HLA system, the testing of multiple linked loci requires the use of haplotype frequencies in calculating probability.

5.8 HANDLING OF TEST AND CALIBRATION ITEMS

5.8.1 i. The recommended maximum period between collection of blood specimens (except dried blood samples) and receipt by the parentage testing laboratory is three days except for specimens for HLA testing where the maximum period between specimen collection and receipt by the laboratory shall be 36 hours.

ii. If the testing procedure is red cell antigen or red cell enzyme blood grouping and the procedure is not to be carried out within 24 hours of the blood being collected, the specimen must be packed in an insulated package containing an ice pack or other device enabling the blood to be held at a temperature of approximately 5°Celsius throughout transportation to the place of testing.

iii. If the testing procedure is HLA tissue typing or the determination of serum markers the specimen must be packed in an insulated package enabling the blood to be transported to the place of testing at a temperature not in excess of room temperature (approximately 22°Celsius).

5.8.4 i. Red cell antigen blood grouping must be completed within six days of the collection of the specimen.

ii. HLA tissue typing must be completed within three days of the collection of the specimen.

iii. Red cell enzyme blood grouping and testing for serum markers must be completed or a dried sample prepared within six days of the collection of the specimen.

5.9 ASSURING THE QUALITY OF TEST AND CALIBRATION RESULTS

Quality Control

RFLP

The analytical gel used to measure restriction fragments and/or alleles must include the following:

- Size markers which span the band size range and are used to determine the size of unknown bands;
- Human DNA control of known genotype which produces a known profile and serves as a systems check for the following functions:
  - Transfer efficiency
  - Sizing process
  - Probe identity
  - Hybridisation efficiency
  - RFLP specificity and labelling efficiency
  - Image and data processing

In addition, visual markers to determine the end point of electrophoresis may be included.

HLA

Antisera and complement must be tested on large panels to assess specificity. Commercial sera and complement must be tested against a limited number of cells typed in international workshops or in cell exchanges to confirm their stated specificity. (As a guide, 10-15 cells covering in excess of 80% of the known broad antigens should be used.)

Red cell antigen blood grouping

A positive and negative control must be tested for each antiserum. The positive control should show the weakest commonly available expression of the antigen.

Red cell enzymes and serum markers

For red cell enzymes and serum marker systems where only two common alleles are present, controls should consist of the homozygous expression of each allele and the heterozygous expression of both.

For red cell enzymes and serum marker systems where more than two alleles are present, controls should include the alleles in heterozygous expression.

寄件者：Prof. KK Ho <b080707@mailserv.cuhk.edu.hk>
收件者：Lai Wing Yiu <addylai@hknet.com>
主旨：Re: Parentage testing in different laboratories
日期：2001 年 1 月 2 日 PM 06:18

Dear Mr. Lai:

Thank you for your letter. In regard to your two questions, my answers are as follows:

Q.1.: As far as you know, is there any country/government taking and testing DNA samples among different family members in different parentage testing laboratories?

A.: No.

Q.2.: What is your comment on Hong Kong Government's proposal? Is it in conformity with the internationally accepted standards?

A.: As AABB pointed out rightly, testing DNA samples of the same case using different labs can only be done reliably if "laboratories 1) use exactly the same genetic systems, DNA technologies and reagents, 2) cross-train their technologists, and 3) continually exchange specimens for proficiency testing". This essentially requires all the collaborator labs participating the project to take and pass accreditation of international authority on parentage testing such as AABB. As far as I know, the Gov. Lab of HKSAR and none of the testing lab in China have gained such accreditation legally required by other countries such as USA to perform the test. The proposed procedure of testing as now is prone to human error and to legal challenge. If Hong Kong insists to go on such a scheme of testing, I would advise that all labs involved should get accredited by some internationally recognized organization. The whole situation will become very complicated if this involves a number of labs in China.

Professor Walter K.K. Ho
Chairman
Department of Biochemistry
Chinese University of Hong Kong
Shatin, N.T.
Hong Kong

寄件者：David Randall <BHRAND@cityu.edu.hk>
收件者：Lai Wing Yiu <addylai@hknet.com>
副　本　：　bhcheng@cityu.edu.hk <bhcheng@cityu.edu.hk>; bhrkong@cityu.edu.hk <bhrkong@cityu.edu.hk>; bhmyand@cityu.edu.hk <bhmyang@cityu.edu.hk>
主旨：Re: Parentage testing in different laboratories
日期：2000 年 12 月 28 日 AM 09:40

Dear Lai Wing Yiu,

I have discussed your enquiry with Dr Richard Kong, Dr Cheng Shuk Han, and Dr Michael Yang, all of this department and specialists in the field. We all agree that the best solution, although the most costly, is to have all samples tested by laboratories in both Hong Kong and the Mainland. The basic principles of DNA fingerprinting requires matching DNA fragments by sizes. This is usually done by comparing them side by side in a gel, rather than using size markers for conversion. The best way is to perform the same test with all samples in both laboratories. Shipping of samples is not usually a problem. Because the results could have both political and social consequences, it is important to get it right. If the results from both laboratories agree then there can be little doubt.

My very best wishes for the new year.

David Randall.
Chair Professor and Head of Department
Department of Biology and Chemistry
City University of Hong Kong

寄件者：genome@netvigator.com <genome@netvigator.com>
收件者：addylai@hknet.com <addylai@hknet.com>
主旨：Rely: Administration's response to your article
日期：2001 年 1 月 16 日 AM 03:42

Dear Mr. Lai:

Thanks for sending me the respones to my article.

Sure, if the administration intends to use the most recent PCR method for parentage testing, it is faster and simpler. But PCR could be controversial even in forensic testing, as the PCR amplifies any DNA fragemts present in the sample, including DNA contamination. I do not have time to anlyse the possible errors involved with PCR testing. In order to help you & Ms Ho, I have prepare a file containing a memo of INS of USA on the same issue. At the end of the memo, I have attached further reference from ABBA, including some legal reference used by lawyer in courst cases involving DNA testing.

The basic principle I highlighted in my article still correct: comparative studies should be done together in the same lab using the same internal controls. Doing these studies separtely introduces unneccesary errors. Even though these errors may not invalidate the results, it would make the results controversial.

All the best.

Dr. Lee

> Dear Dr. Kenneth Lee,
>
> Thank you for your help last time. In response to your article on 9 December 2000, the Hong
> Kong Government has produced a written reply to answer the questions you raised on performing
> parentage testing at separate laboratories. I would like to seek your further comments on Hong
> Kong Government's reply and the document is enclosed for your reference. Next meeting for the
> committee will be held on 19 Jananry 2001 (Hong Kong time) and if possible, we will be grateful
> if we can have your response before the meeting.
>
> Thank you once more for your assistance.
>
> Sincerely,
>
> Lai Wing Yiu
> Member's Assistant
> Office of Legislative Councillor Cyd Ho

(Available at: http://www.immigrationlinks.com/news/news413.htm)

INS Memorandum on DNA Testing to Establish Family Relationships

July 14, 2000

The Immigration Service has advised field offices of the procedures to follow regarding parentage testing to establish family relationships. The memo notes that there is no authority for requiring DNA tests, but that officers "may have no alternative to suggesting DNA testing." A copy of the memo appears below.

****

U.S. Department of Justice
Immigration and Naturalization Service
425 I Street NW
Washington, DC 20536

HQADN 70/11

JUL14 2000

MEMORANDUM FOR:

ALL REGIONAL DIRECTORS,
ALL DISTRICT DIRECTORS (INCLUDING FOREIGN),
ALL OFFICERS IN CHARGE (INCLUDING FOREIGN),
ALL SERVICE CENTER DIRECTORS,
FLETC,
ARTE A

FROM:

Michael D. Cronin
Acting Executive Associate Commissioner
Office of Programs

SUBJECT: Guidance on Parentage Testing for Family-Based Immigrant Visa Petitions

The purpose of this memorandum is to provide guidance to Immigration and Naturalization Service (INS) field offices on parentage testing to establish a claimed relationship for benefits under the Immigration and Nationality Act. Such testing may be appropriate to establish a parental relationship in support of a petition for a child, son, or daughter (Form I-130). The procedures discussed in this memorandum may also apply to establishing the biological parent of a foreign-born adopted child to support an orphan petition (Form I-600) or to establishing a parental relationship for citizenship cases (Form N-600). In addition, these procedures may be used to establish a parental relationship for refugee and asylum relative petitions (Form I-730). This memorandum has the concurrence of the Office of Policy and Planning and the Office of the General Counsel.

Authority to Require Parentage Testing

A petitioner must establish eligibility for a requested immigration benefit. An application or petition must be filed with any initial evidence required by regulation or by the form instructions. Any evidence submitted is considered part of the relating petition or application and may establish eligibility. 8 CFR 103.2(b)(1).

In the case of a petition for a child, son, or daughter, the petitioner must provide evidence of the claimed relationship. 8 CFR 204.2(d)(2). The initial evidence for a child, son, or daughter includes a birth certificate. When a birth certificate is unavailable, the petitioner must demonstrate that it is not available and submit secondary evidence, such as a baptismal certificate, or church or school records. If the petitioner demonstrates that both initial and secondary evidence is unavailable, two or more affidavits may be substituted. However, the unavailability of a birth certificate creates a presumption of ineligibility for the benefit, and any alternative evidence submitted must be evaluated for its authenticity and credibility. 8 CFR 103.2(b)(2)(i) and 204.2(d)(2)(v).

A director may also require that Blood Group Antigen or Human Leukocyte Antigen (HLA) blood parentage testing be conducted on the child, son, or daughter and putative mother and father to establish eligibility for a benefit. 8 CFR 204.2(d)(2)(vi). Statistical analysis of these tests provides a likelihood of parentage. These test results will often establish or disprove the claimed parental relationship. Since blood parentage testing can be a valuable tool to verify a relationship, it may generally be required when initial and secondary forms of evidence have proven insufficient to prove a claimed relationship. As a result of technological advances, field offices should be aware that Blood Group Antigen and HLA tests are no longer widely available for testing by laboratories, and are not considered to be as reliable as DNA tests.

Although a director may require blood parentage testing, he or she has no statutory or regulatory authority to require DNA testing. However, when initial and secondary forms of evidence have proven inconclusive and blood parentage testing does not clearly establish the claimed parental relationship, field offices may have no alternative to suggesting DNA testing as a means of establishing the relationship. The petitioner has the burden of proof when the evidence submitted has not satisfied his evidentiary threshold and the INS would otherwise deny the petition without more conclusive evidence such as that which DNA testing could provide. In such cases, field offices should inform the petitioner that: 1) DNA testing is absolutely voluntary; 2) the costs of DNA testing and related expenses (such as doctor's fees and the cost of transmitting testing materials and blood samples) must be borne exclusively by the petitioner; and 3) submitting to DNA testing is in no way a guarantee of the approval of the petition.

Field offices should keep in mind that no parentage testing, including DNA testing, is 100 percent conclusive. Therefore, due to the expense, complexity and logistical problems and sensitivity inherent in parentage testing, offices should be extremely cautious when requiring blood testing or suggesting DNA testing as a means of establishing a claimed parental relationship.

While blood testing is not and should not be a routine part of the adjudications process, it can be an extremely valuable tool in cases when it otherwise would be impossible to verify a relationship. Parentage blood tests involve laboratory procedures performed on blood samples or other genetic material obtained from the child and putative parent or parents. The statistical analysis of the blood test provides a likelihood of parentage if the putative parent is not excluded. The likelihood of parentage is greater with increased information. Increasing the number of genetic testing systems tested provides stronger results, while the absence of information diminishes the strength of results. Officers should be aware that

parentage testing is an extremely fact-driven procedure. A laboratory may more accurately determine what tests to run based on specific facts. A more accurate answer will be provided by the laboratory if the Officer provides the laboratory with suspicions of fraud or other pertinent facts.

Minimum Standards

Parties tested: The most accurate results are received when the alleged mother, father and child available for testing. However, testing of only the mother and child or father and child are also acceptable.

Statistical probability: All tests must produce a 99.5% statistical probability for the conclusion of results to establish parentage. Laboratories can continue with a battery of tests until a 99.5% conclusion of parentage is established. After testing the samples from all parties, laboratories will produce a conclusion of parentage which will inform field offices which tests were administered and the conclusion for the results they obtained.

Preferred test: The preferred test is the Polymerase Chain Reaction (PCR) test drawn with a buccal swab or a PCR test based on a blood sample.

Please see below for a more detailed explanation of the parentage testing process and procedures.

Blood Testing

Blood consists of red and white blood cells, platelets and liquid plasma. Each component of the blood contains several antigens or "markers." The blood group antigens are structures on the surface of the blood cells that help to distinguish individuals within a population. The antigens, inherited from the parents, are controlled by genes on a pair of chromosomes. Each parent contributes one of each chromosome pair carrying the genes that determine the detectable properties of an offspring's blood. The presence of a specific antigen indicates a particular genetic composition or marker. Conclusions in parentage blood testing are based upon the principle that the child inherits genetic markers in his or her blood from each of his or her biological parents.

Conventional Blood Tests

There are four basic tests used in conventional blood testing: 1) basic red cell antigens (ABO, MN, CcDEe); 2) extended red cell antigens; 3) white cell antigens (HLA); 4) and red cell enzymes and serum proteins. The laboratory begins by conducting the first test. If parentage cannot be ruled out based on the results of the first test, the laboratory will conduct the second test. The process continues until either the putative parent can be entirely excluded or a good statistical probability is established that the relationship is bona fide.

DNA Testing

DNA (deoxyribonucleic acid) parentage testing provides an alternative to more conventional parentage blood testing methods. DNA testing can be especially useful in countries with limited medical and transportation facilities because, unlike HLA testing, it does not require the use of live human blood cells, which must be tested within just a few days, and are sometimes difficult to obtain. DNA parentage testing can often provide conclusive results even when not all parties are available for testing.

Officers should be aware that parentage testing technology changes rapidly. Whereas HLA blood testing was widely used until 1994, it is now rarely used. Restriction Fragment Length Polymorphism (RFLP)

tests which have been widely used since 1994 are now being phased out by laboratories in the U.S. The DNA test which is most recommended for use in parentage testing is the Polymerase Chain Reaction (PCR) test. Although DNA testing has traditionally been accomplished through blood testing, buccal (mouth or cheek cavity) swabs are an alternative to drawing blood for testing. Cells are drawn from the inside cheek using a long cotton swab. As opposed to blood testing, buccal swab testing does not require the assistance of a physician, and is non-invasive. Nevertheless, it is recommended that only a person specially trained to collect a tissue sampling perform the procedure in order to ensure the quantity is sufficient for testing.

Parentage Testing Procedures

The American Association of Blood Banks (AABB) accredits parentage-testing laboratories for a 2-year period.[1][1] The current list of AABB accredited parentage testing laboratories is attached to this memorandum. Offices may accept parentage-testing results only from laboratories on this list. The current AABB list does not include any laboratories located overseas, however, the AABB does expect to begin accreditation of laboratories located overseas soon. Therefore, foreign offices should not accept test results from local parentage testing laboratories until the local laboratory has received accreditation from the AABB. The burden of proof is on the petitioner to show that the laboratory chosen is accredited by the AABB.

When a field office requires blood testing or suggests DNA testing, it should provide the petitioner with the list of AABB accredited laboratories. Field offices should be aware that the state designations on the list are for laboratory headquarters. Many laboratories have collection sites in many different states and locations. The petitioner must select a laboratory, contact the laboratory directly, and make the necessary arrangements for conducting the tests. To assure the integrity of the test results, all stages of parentage testing must be conducted under appropriate safeguards. These safeguards must include strict controls concerning: 1) protection of the chain of custody of blood or tissue samples; 2) identification of the parties to be tested, generally by photographing individuals being tested; and 3) correct presentation of test results.

Communication should be directly between the laboratory and the civil surgeon or panel physician or the field office. Under no circumstances should a third party, including the individuals being tested, be permitted to carry or transport blood or tissue samples or test results. Since the applicant bears full financial responsibility for testing, the Service has no objection to that person receiving a copy of the test results from the laboratory or panel physician. It is imperative that the same facility test both the alleged child and the alleged parent(s). Where the petitioner is physically present in the U.S., a U.S.-based lab must conduct the tests and relay the results. Instructions usually require the participation of a witness, identification taken from all (adult) parties involved, and photographs taken of all parties.

Analysis of Test Results

In all cases of parentage testing, laboratories should provide the statistical probability for the conclusion for the results they obtain. Offices should use the following interpretations of the plausibility of parentage to analyze test results. In general, AABB standards mandate 99 percent to be the minimum requirement for the proof of parentage. However, this statement does not mean that all test results 99 percent and higher should be accepted as conclusive proof of parentage, or that all test results below 99 percent exclude parentage. The type of parentage test performed, the genetic profile of the local population, and facts specific to the case will all affect the percentage that an office should require to establish a parental

relationship. Field offices should provide laboratories with non-genetic evidence which may affect the lab's assumptions in performing the testing, analysis of the results or the number of genetic markers tested.

Plausibility of Parentage (Percent)	Interpretation
99.80 - 99.90	Practically Proved
99.1 - 99.80	Extremely Likely
95 - 99	Very Likely
90 - 95	Likely
80 - 90	Undecided
Less than 80	Not Useful

Please note that in societies where interfamily marriage is common, close relatives will share many genetic markers and the test results of an aunt, uncle, or grandparent of a beneficiary may appear to establish the claimed parental relationship. The statistics used in paternity testing are designed for evaluating an alleged father as compared to unrelated men. Unlike the random population where persons may share genetic markers by chance, related men will share genetic markers by descent. First degree relatives, such as father, brother or son, will share 50% of their genetic material on average. Therefore, directors should consult with local physicians and parentage testing laboratories, and consider local fraud patterns, to determine the appropriate tests and particular test results to reliably establish the parental relationship in questionable cases. Officers should ask labs to calculate both a father-child and uncle-child or sibling relationship in these cases and should examine reports provided by the laboratory to ensure that sufficient testing was done to distinguish between family members. Officers should feel free to contact the laboratory for clarification if the lab's findings are inconclusive. Labs are able to conduct tests on additional genetic markers if necessary to resolve inconclusive cases.

Questions

Questions regarding the appropriate parentage test to use to establish a claimed relationship or analysis of the test results may be directed to the parentage-testing laboratory selected by the petitioner. Questions regarding this policy should be directed to Anne Gyemant, Residence and Status Branch, Adjudications Division at 202-514-4754.

New Publication: Standards for Parentage Testing

The American Association of Blood Banks (AABB) publishes a wide range of reference and research oriented books on timely topics in blood banking and immunohematology. Just out: the third edition of *Standards for Parentage Testing Laboratories.*

The standards define the criteria by which parentage testing laboratories can become part of the AABB Parentage Testing Accreditation Program.

The publication encompasses necessary and recommended policies and procedures involved in the collection, processing, and interpretation of genetic tests performed to resolve cases of disputed parentage.

The standards cover: general policies; identification, specimen collection, and documentation; serological testing for red blood cell surface antigens; serological testing for HLA antigens; red cell enzyme and serum protein testing; DNA polymorphism testing (RFLP and PCR); immuno-globulin allotyping; and calculations and reports. For information, call the AABB's Sales Desk at (301) 215-6499.

References:

1. Admissibility of Genetic Testing in Paternity Litigation: A Survey of State Statutes (with R. Kanwischer), Family Law Quarterly, Vol. 22, No. 2, Summer 1988, pp. 109-115

2. DNA Paternity Probabilities, Family Law Quarterly, Vol. 24, No. 3 1990, pp. 279-304

3. Presumptions, Probability and Paternity, Jurimetrics: The Journal of Law, Science, and Technology, Vol. 30, Spring 1990, pp. 323-349 The Probability of an Ultimate Issue: The Strange Cases of Paternity Testing, Iowa Law Review, Vol. 75, No. 1, October 1989, pp. 75-109

4. Admissibility of Genetic Testing in Paternity Litigation: A Survey of State Statutes (with R. Kanwischer), Family Law Quarterly, Vol. 22, No. 2, Summer 1988, pp. 109-115

5. Forensic DNA Typing: Selected Legal Issues, A Report to the National Commission on the Future of DNA Evidence, Jan. 2000