

Forensic DNA Technology: A Powerful Tool for Judicial Reform

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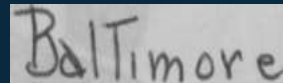


Outline of the Presentation:

- Introduction
- DNA research for forensics
 - Polymorphisms and databases
 - Optimization and fast-tracking reactions
 - New developments
- Conclusion
 - How can one say that the use of DNA for forensics has indeed reformed the Philippine justice system?

Forensics

is the application of a broad spectrum of sciences **to answer questions of interest to the legal system.** This may be in relation to a crime or to a civil action.



American Academy of
Forensic Sciences

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FORENSIC APPLICATIONS

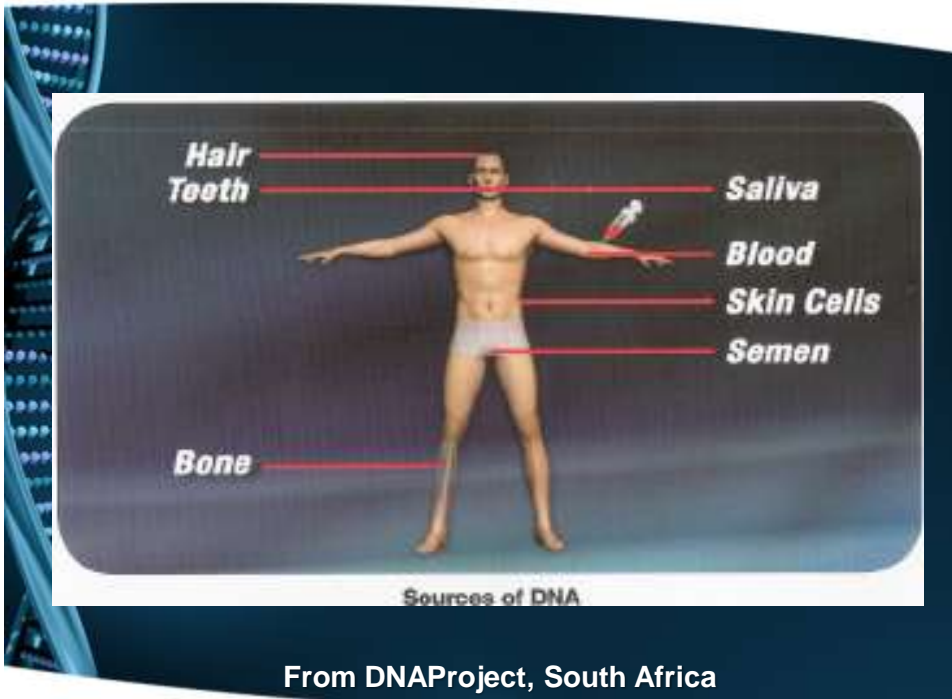
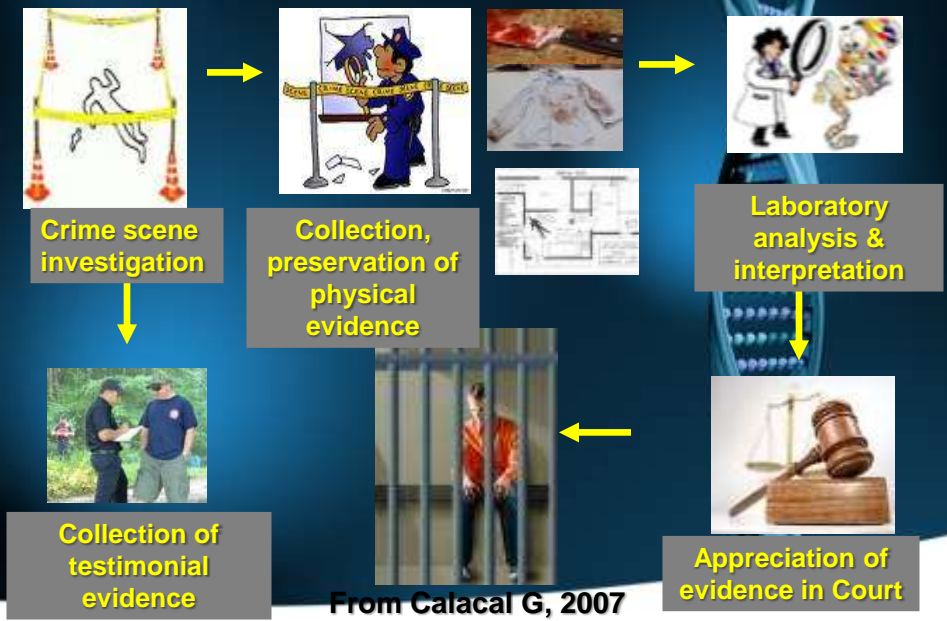


- Investigations : Civil/ criminal
- Disputed parentage cases
- Mass disasters

IDENTIFICATION!

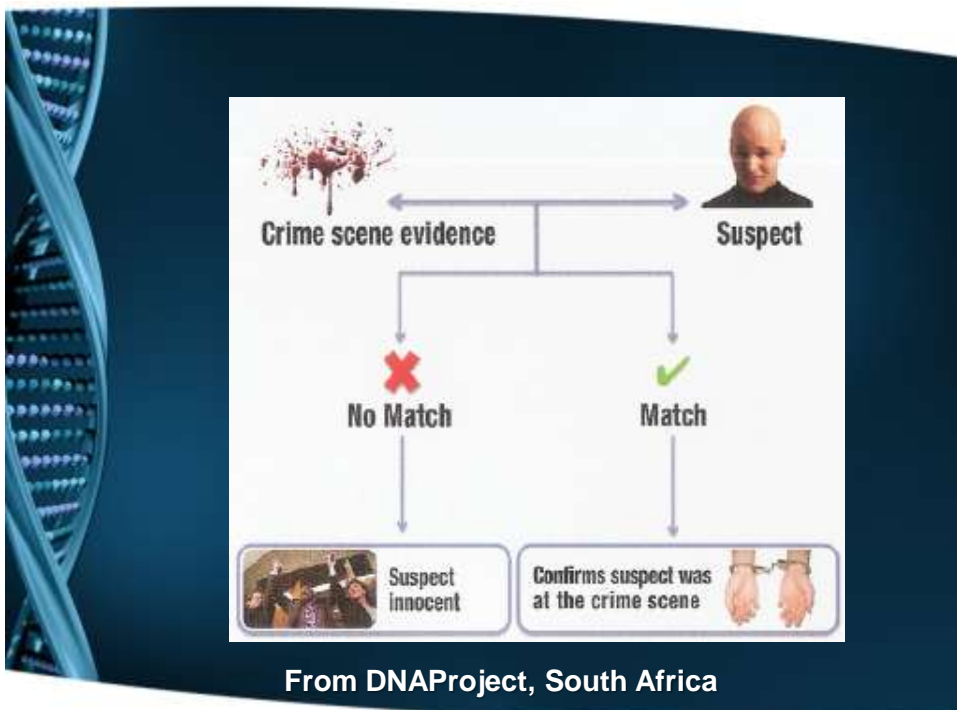
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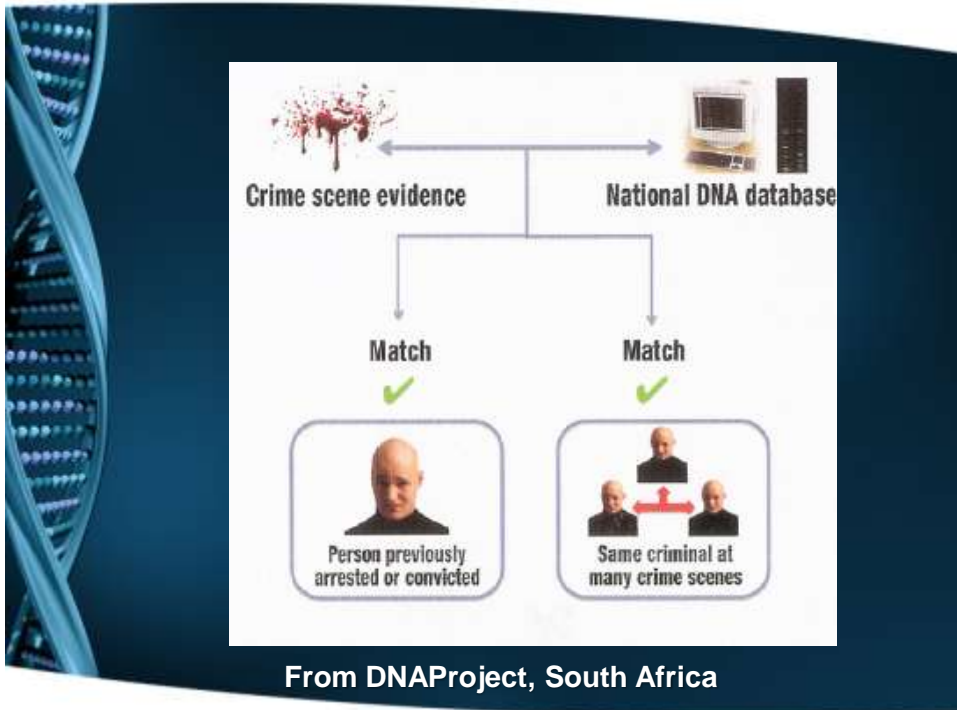
FORENSIC INVESTIGATION



How is DNA typing done?

1. Briefing and signing of documents
2. Sample collection or submission of sample
3. DNA extraction
4. Polymerase Chain Reaction (PCR)
5. Automated DNA fragment analysis
6. Statistical analysis if needed and report writing
7. Release of Report





1- DNA markers for Profiling

- Search for **highly polymorphic** markers in a given population;
- Suitability for **multiplex reactions** to enhance genetic information/ amount of biological sample; and
- Establishment of **reference databases** for the evaluation of statistical weight of evidence



Evaluating DNA tests of motherless cases using a Philippine genetic database

M.C.A. De Ungria, A.M. Frani, M.M.F. Magno, K.A. Tabbada, G.C. Calacal, F.C. Delfin, and S.C. Halos

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ELSEVIER

Forensic Science International

Forensic Science International 152 (2005) 281–284

Announcement of population data

Allele frequencies of 19 STR loci in a Philippine population generated using AmpFISTR multiplex and ALF singleplex systems

Maria Corazon A. De Ungria^{a,*}, Rhonda K. Roby^{b,c}, Kristina A. Tabbada^a, Sulekha Rao-Coticono^d, Michelle Music M. Tan^a, Karen N. Hernandez^a

Philippine Journal of Science 140 (1): 1–6, June 2011
ISSN 0031 - 7683

Research Note

Expansion of the Philippine Autosomal Short Tandem Repeat Population Database for DNA-based Paternity Testing

J Forensic Sci. 2008 Jan;53(1):256-8.

Population data of 10 Y-chromosomal STR Loci in Cebu province, Central Visayas (Philippines).

Salvador JM, Tabbada KA, De Ungria MC.

DNA Analysis Laboratory, Natural Sciences Research Institute, University of the Philippines, Diliman, Quezon City 1101, Philippines.

13. [Asian online Y-STR Haplotype Reference Database.](#)

Lessig R, Willuweit S, Krawczak M, Wu FC, Pu CE, Kim W, Henke L, Henke J, Miranda J, Hidding M, Benecke M, Schmitt C, Magno M, Calacal G, Delfin FC, de Ungria MC, Elias S, Augustin C, Tun Z, Honda K, Kayser M, Gusmao L, Amorim A, Alves C, Hou Y, Keyser C, Ludes B, Klitsch M, Immel UD, Reichenpfader B, Zaharova B, Roewer L.

Leg Med (Tokyo). 2003 Mar;5 Suppl 1:S160-3.

ARTICLE

The Y-chromosome landscape of the Philippines: extensive heterogeneity and varying genetic affinities of Negrito and non-Negrito groups

Frederick Delfin^{1,2}, Jazelyn M Salvador¹, Gayvelline C Calacal¹, Henry B Perdigon¹, Kristina A Tabbada¹, Lilian P Villamor¹, Saturrnina C Halos¹, Ellen Gunnarsdóttir², Sean Myles^{1,6}, David A Hughes², Shuhua Xu³, Li Jin³, Oscar Lao⁴, Manfred Kayser⁴, Matthew E Hurles⁵, Mark Stoneking² and Maria Corazon A De Ungria¹

2- Chemical reactions for optimization

- Handling '**difficult**' samples, e.g. archived or highly challenged;
- Reduction in time for DNA analysis using **more robust reaction buffers** and **direct amplification strategies**



Am J Forensic Med Pathol. 2005 Sep;26(3):285-91.

Identification of exhumed remains of fire tragedy victims using conventional methods and autosomal/Y-chromosomal short tandem repeat DNA profiling.

Calacal GC, Delfin FC, Tan MM, Roewer L, Magtanong DL, Lara MC, Fortun R, De Ungria MC.





Int J Legal Med
DOI 10.1007/s00414-010-0535-4

ORIGINAL ARTICLE

Y-STR DNA analysis of 154 female child sexual assault cases in the Philippines

Sheena Marie B. Maigulla · Jazelyn M. Salvador · Gayvelline C. Calacal · Minerva S. Sagum · Miriam Ruth M. Dalet · Frederick C. Delfin · Kristina A. Tabbada · Shiela Ann Edith L. Franco · Henry B. Perdigon · Bernadette J. Madrid · Merle P. Tan · Maria Corazon A. De Ungria



ELSEVIER *Forensic Science International: Genetics 2 (2008) 329–332* 


www.elsevier.com/bs


Forensic DNA evidence and the death penalty in the Philippines

M.C.A. De Ungria^{a,*}, M.S. Sagum^a, G.C. Calacal^a, F.C. Delfin^a, K.A. Tabbada^a, M.R.M. Dalet^a, T.O. Te^{b,c}, J.L. Diokno^b, M.S.L. Diokno^b, C.A. Asplen^d

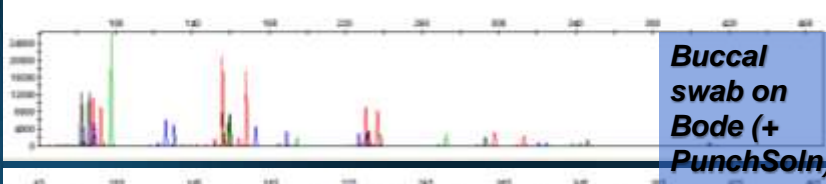
Children Detention Center in Metro Manila - August 2007

PowerPlex® 21 Validation: Sensitivity (Direct Amplification)

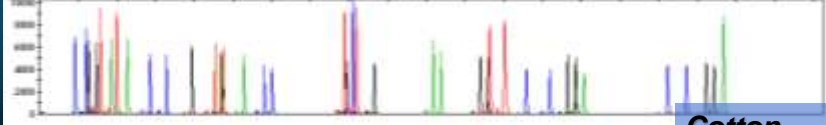




Blood on FTA card



Buccal swab on Bode (+ PunchSoln)

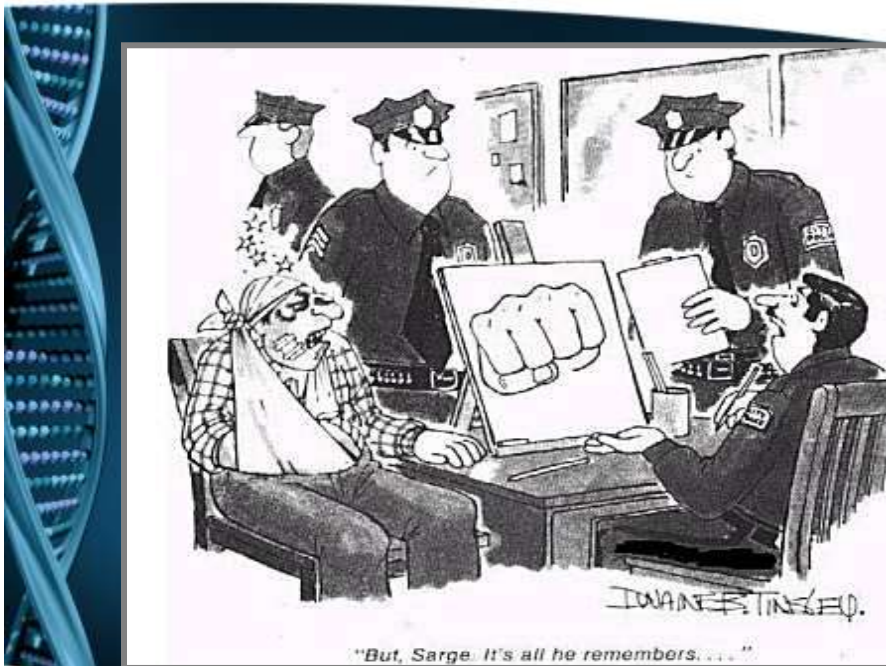


Cotton swab (+ SwabSoln)

Salvador et al 2012 AFSN

3- CSI in real-time and automating laboratory analysis

- Handheld devices and **portable systems** for fast DNA profiling 'real time' at the crime scene;
- Use of **robotics** for generating a DNA profile and **expert systems** for analysis; and
- **Criminal Database** access via **cloud computing**



Genetic Suspects
Global Governance of Forensic DNA Profiling and Databasing
EDITED BY Richard Hindmarsh and Barbara Peismark

MARIA CORAZON DE UNGRIA AND JOSE M. JOSE

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Forensic DNA profiling and databasing: the Philippine experience

THURSDAY, OCTOBER 4, 2012 The Philippine STAR *Science & Technology* B-7

The use of forensic DNA evidence in effective governance of the local community

Among the forensic sciences, the most recently introduced and among the most powerful means of identification is DNA technology. By taking advantage of one's genetic code, it has become easier to link suspects to a crime based on biological samples found to come from, by taking advantage of the hereditary nature of DNA, it has also become possible to resolve issues of child support, paternity, in matters pertaining to child support or claims of inheritance. However, in order to successfully implement justice to claim their inheritance, attributing their conviction largely to false testimonies.

For some of these people, there may still be hope. The DNA Analysis Laboratory, Natural Science Research Institute of UP has been trying to address the issue of wrongful convictions. We have been involved in over 10 appellate cases in trial courts because DNA evidence negated witness testimonies, including those of victims. These acquittals notwithstanding, our belief of the need to increase the



STAR SCIENCE

By MARIA CORAZON A. DE UNGRIA, Ph.D.



DNA as a tool for Judicial Reform





Republic of the Philippines
Supreme Court
Manila

A.M. No. 06-11-5-SC

RULE ON DNA EVIDENCE

EFFECTIVE OCTOBER 15, 2007

SEC. 8. Reliability of DNA Testing Methodology.— Whether the DNA testing methodology is reliable, and whether the DNA testing results are reliable, shall be determined by the court.

SEC. 9. Evaluation of DNA Testing Results.— In evaluating the results of DNA testing, the court shall consider the following:

and that

(c) DNA results that exclude the putative parent from paternity shall be conclusive proof of non-paternity. If the value of the Probability of Paternity is less than 99.9%, the results of the DNA testing shall be considered as corroborative evidence. If the value of the Probability of Paternity is 99.9% or higher, there shall be a disputable presumption of paternity.

SEC. 10. Post-conviction DNA Testing. Remedy if the Results are Favorable to the Convict.— The convict or the prosecution may file a petition for a writ of *habeas corpus* in the court of origin if the



UP-NSRI DNA Analysis Lab:

- **Senior Scientists:**
 - Gayvelline Calacal
 - Frederick Delfin
 - Jazelyn Salvador
- **Senior REPS:**
 - Miriam Dalet
 - Minerva Sagum
- **Junior Researchers:**
 - Angel Honrado
 - Paul Ryan Sales
- **Consultants:**
 - Dr Saturnina Halos
 - Atty Jose Jose



We would also like to acknowledge the support of NSRI personnel and staff especially the Directors who have shown full support for our work through the years.

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