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Human DNA Identity Testing Policy Report

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Acronyms and Abbreviations

AABB	American Association of Blood Banks
ASCLD/LAB	American Society of Crime Laboratory Directors Laboratory Accreditation Board
CDC	Centers for Disease Control and Prevention
CLIA	Clinical Laboratory Improvement Amendments
CMS	Centers for Medicare & Medicaid Services
CODIS	Combined DNA Index System
DNA	Deoxyribonucleic acid
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
ICE	Immigration and Customs Enforcement
ICMP	International Commission on Missing Persons
ISO/IEC	International Standards Organization / International Electrotechnical Commission
MOU	Memorandum of Understanding
NamUs	National Missing and Unidentified Person System
NIST	National Institute of Standards and Technology
NIJ	National Institutes of Justice
NRC	National Research Council
PCR	Polymerase Chain Reaction
POI	Proof of Identity
QA	Quality Assurance
QD	Questioned Database
RD	Reference Database
SRM	Standard Reference Materials
STR	Short Tandem Repeats
SWGDAM	Scientific Working Group on DNA Analysis Methods
TVPA	Trafficking Victims Protection Act
UAE	United Arab Emirates
USCIS	U.S. Citizenship and Immigration Services
USDHHS	U.S. Department of Health and Human Services
USDOD	U.S. Department of Defense
USDOS	U.S. Department of State
USINS	U.S. Immigration and Naturalization Service

Executive Summary

DNA is one of the most powerful crime-solving tools, both for identifying and for prosecuting perpetrators. The compelling reliability of this tool has led to a range of government-use applications of human DNA identity testing beyond crime solving. The U.S. government has instituted policies and regulations for use of DNA in missing persons identification, military, immigration, border security, human trafficking, and intercountry adoption.

Unlike other biometric forms of identification, DNA is useful for establishing biological relationships. This makes DNA ideally suited for resolving questions of relatedness, particularly valuable in migration policies. Migrant applicants may submit DNA specimens as proof of relations with family members already settled in a destination country. As well, governments seeking trafficked individuals may use migrants' DNA specimens to identify reported missing persons.

Recent reports of immigration fraud into the United States have led to efforts to improve documentation of immigration applicants and refugees, including DNA profiling. With such programs options are to collect DNA specimens of noncitizens at the time of application or at the time of entry. Additionally, the profiled DNA may be (a) compared to claimed relatives; (b) compared to a database of crime evidence and wanted persons profiles; or (c) uploaded into a database for future reference.

The use of DNA for government purposes is fraught with concerns over privacy and intended use of provided DNA specimens. The collection and use of DNA of noncriminals can raise questions of Fourth Amendment violations in the United States. The existing policies have not been resolved in courts or legal opinions, although the U.S. Supreme Court is set to hear a case on arrestee collection in February 2013. It is clear, however, that policies involving DNA collection are subject to intense scrutiny and care must be taken to protect the privacy of provided specimens and define the intended uses of specimens and the resulting profiles.

As U.S. authorities consider approaches to incorporating DNA profiling into migration procedures, they must tackle the concerns for (1) retention of specimens; (2) use of stored specimens; (3) security and access to specimens; (4) security and access to DNA profiles; and (5) cross-border searching and exchange of profiles.

Introduction

Nearly 30 years ago, the realization that DNA markers would be useful for determining identity and relationships transformed law enforcement and government processes. Since then, we have been grappling with the ethical considerations and social implications of genetic testing and whether this technology represents a mere paradigm shift or a slippery slope to

violations of the Fourth Amendment. As the technology has developed and applications broadened, so too has a patchwork of policies and regulations to guide appropriate uses of DNA for identification.

This report reviews the key policies relevant to expanded use of DNA testing in U.S. immigration, examining the multiple government-use applications of human DNA identity testing, the scope of the existing policies, and the ethical and social considerations for DNA identity testing for government purposes.

Appendix A outlines key U.S. legislation for DNA collection and **Appendix B** outlines relevant formal DNA collection policies of U.S. federal agencies.

Background

Human DNA Identification

DNA is found in the cell nucleus of all living things. This nuclear DNA is organized into 23 pairs of chromosomes inherited from both of an individual's parents. The mitochondria of a cell also contain DNA, which is inherited from an individual's mother and thus differs from nuclear DNA. Certain regions of DNA are nearly identical from person to person, while others are variable, based on an individual's parents' DNA. Analyses of several of these variable regions comprise a profile that may be unique to an individual.

DNA can be used to establish familial relationships, particularly parent-child relationships. Mitochondrial DNA sequence analysis can show maternal relationships including siblings, maternal cousins, or half-siblings with the same mother. Similarly, because only males possess a Y chromosome, Y chromosome variant analysis will show paternal relationships including siblings, paternal cousins, or half-siblings with the same father.

Patterns of variations in DNA also can be compared among individuals within a population to establish ancestral heredity. Which variations and how many are analyzed greatly affect the statistical likelihoods that an individual comes from a particular ancestry. Nevertheless, such services are available to analyze an individual's DNA to ascertain probable ancestral connections.

Because DNA encodes the blueprint of biological processes, it is commonly used to diagnose inherited medical conditions, such as muscular dystrophy and cystic fibrosis. Increasingly, DNA is used to predict an individual's propensity to develop medical conditions such as Alzheimer's, diabetes, and many forms of cancer.

The discovery in 1985 that each of our genomes contains highly variable repeating segments of DNA (Jeffreys, Wilson, and Thein, 1985a, 1985b) brought tremendous potential to advance the goals of justice, both in apprehending those who had committed crimes and liberating those wrongly convicted. The U.S. law enforcement community quickly made use of

this technology, and in 1988 the Federal Bureau of Investigation (FBI) began incorporating DNA testing into criminal investigations.

DNA has four characteristics that make it an ideal tool for forensic investigators:

1. Individuals have a unique DNA code, with the exception of identical twins.
2. DNA is chemically stable; decades-old crimes have been solved through DNA evidence that was carefully labeled and properly stored.
3. Only trace amounts of DNA are needed to generate a DNA profile.
4. DNA profiles are easily catalogued into computer databases, allowing investigators to efficiently compile and search data (Butler, 2005).

In the United States, forensic scientists have adapted a set of variable segments to profile samples at a crime scene. Because DNA is found in most cells and is technologically detectable in small quantities, it can be isolated from samples such as blood, semen, skin, saliva, or hair follicles.

Although the DNA code from one person to the next is approximately 99.9% identical, scientists have identified regions where the code reliably varies. Within these regions are short tandem repeats (STRs), sections of the DNA code that repeat over and over. The number of repeats varies from person to person. In the United States, law enforcement uses 13 STRs to comprise a DNA profile.

A technique called polymerase chain reaction (PCR) makes billions of DNA copies of the 13 STRs. Using this approach, forensic analysts can examine even extremely small or degraded samples. Because the number of repeats for each of the 13 STRs varies from person to person, the 13 STRs together compose a profile.

Analyzing 13 STRs is a relatively powerful tool to provide a statistically unique profile.[1] However, some DNA variations (alleles) are more common than others, so individuals may have profiles that are similar, or that overlap in certain patterns, even when the individuals are not related. Although unlikely, it is possible that two unrelated individuals would share the same profile, particularly if fewer than 13 STRs are examined. The fewer the STRs analyzed, the more likely it is that the incomplete profile will match more than one reference profile.

DNA Analysis

Developing a DNA profile of an individual begins with the collection of a biological sample, usually in the form of blood, saliva, hair, or a buccal swab (a swabbing of the inside of the cheek) [Step 1]. Throughout analysis, standard protocols must be followed to prevent contamination of the sample with unrelated DNA or chemicals that can interfere with analysis. Often, a portion of the biological sample is transferred to a “staincard” for long-term storage

[1] A “statistically unique profile” is defined herein as a profile comprised of multiple polymorphic loci each with relatively high level of heterozygosity. Adapted from Radtkey et al. (2000).

and easy handling [Step 2]. The DNA is extracted from the sample [Step 3] and tests are performed to ascertain the quality and quantity of the purified DNA [Step 4]. Specific regions of the DNA sample are then amplified, usually using a commercially available PCR kit [Step 5]. The amplified products are run through a machine that separates the amplified products by size [Step 6]. The machine has a laser that detects the varying sized PCR products, which are each labeled with a fluorescent dye. The output of the machine is an "electropherogram" which demonstrates the sizes of the alleles for the 13 STRs. The sizes determined on the electropherogram are analyzed for quality (e.g., peak size, controls) [Step 7] before being finalized as an individual's DNA profile. Different laboratories have different internal processes for handling sample throughput and minimizing error. It is standard quality control to not handle "known" or "identification" DNA samples alongside crime scene samples to prevent contamination or sample switching.

DNA Analysis for Kinship

In addition to exact matches between a sample and reference profile, DNA can be used to determine relationship of two profiles, based on how many markers are shared (Daiger and Chakravarti, 1983; Hammond et al., 1994; Jeffreys et al., 1985c). Private companies and hospital/academic laboratories provide relationship testing for more than 400,000 cases per year, primarily paternity cases (Relationship Testing Program Unit, 2008). Relationship testing usually involves analysis of autosomal STRs and kinship analysis to predict statistical likelihood of relatedness (Debenham, 2006; Ge et al., 2010). In some cases, Y-STRs and mtDNA may be useful in ascertaining relatedness. Relationship testing is used routinely in individual cases of paternity/maternity (e.g., civil custody and estate cases), for identifying unidentified remains, in immigration cases to confirm claimed relationship of a petitioner to an applicant, and in adoptions to confirm the biological relationship of a relinquishing parent to a child.

Rapid DNA Analysis

With standard DNA analysis, the seven steps outlined above can take as few as 24 hours to process if a sample is handled continuously for all processes, or as long as 7 days if samples are batched for processing. Rapid DNA analysis provides a more efficient turnaround time for processing DNA samples into profiles, relying on a compact, portable system to simplify microfluidic DNA analysis and automatic processes for DNA isolation, replication, separation, detection, and data analysis(National Institute of Standards and Technology, 2009). Turnaround time is from minutes to hours, depending on the system and likely to reduce with improved technology. Current platforms can process only a handful of samples at a time in about 90 minutes. Rapid DNA analysis may be used at crime scene sites for sample processing and searches for matches or integrated with kinship software for determining relationships.

DNA Applications

DNA Collection for U.S. Law Enforcement

In 1989 the FBI's Technical Working Group on DNA Analysis Methods conceptualized the Combined DNA Index System (CODIS), a fully integrated law enforcement system of DNA records. The DNA Identification Act of 1994 formally authorized CODIS and directed the FBI to set national standards for forensic DNA testing (Pub Law 103-322, 1994; 42 USC Subchapter IX Part A, 1994). In 1997, the FBI selected the 13 short DNA segments, or STRs, as the standard for DNA profiling, and in 1998 the national CODIS system was launched to assist in cases where no suspect has been identified. CODIS is a software system designed to match DNA profiles compiled by two types of databases: the Forensic Index, which searches DNA profiles generated from crime scene evidence; and the Offender Index, which searches DNA profiles of potential suspects. The system searches tiered databases maintained by local, state, and federal agencies. DNA profiles in CODIS are not linked to demographic information, but are traceable to the profile's contributing laboratory.

Individual state and federal legislation has expanded CODIS to varying degrees and U.S. legislation has allowed for funding of DNA laboratories (Pub Law 106-546, 2000) and interstate exchange of DNA information (Pub Law 105-251, 1998). In 2009, the federal collection of DNA was expanded beyond the original mandate of CODIS collection of convicted offenders to include arrestees and migrant detainees (see discussion below on detainees) (U.S. Department of Justice, 2008). Several states had similar legislation in place to collect from arrestees at that time, and at print, more than half of the states now have legislation for collecting from arrestees. Several challenges to these policies based on the Fourth Amendment have been tested in regional and federal courts. In February 2013, the Supreme Court is to hear one such challenge in *Maryland v. King*. **Appendix C** outlines the cases heard to date.

In 2010, the FBI revisited the standard 13 STR panel composition and has since proposed expansion of the core CODIS markers with additional STRs for up to 24 total markers (Hares, 2011). The additional markers will minimize the likelihood of adventitious matches in the database, improve international compatibility for data sharing, and improve the discriminatory power for missing persons and familial searching.

Several criteria were considered in selecting markers for CODIS: (1) no known associations with medical conditions or defects; (2) low mutation rate; (3) high level of independence; (4) high level of discrimination; (5) use by the international forensic DNA community; (6) number of loci versus discrimination factor; and (7) compliance with quality assurance standards (Ge, Eisenberg, and Budowle, 2012). The statutory authority for CODIS mandates that the markers have no association with biomedically relevant phenotypes (Katsanis, and Wagner, 2012).

DNA Collection for Mass Disaster and Missing Persons Identification

Private, academic, and government laboratories use DNA testing to identify victims of mass disasters (Olaisen, Stenersen, and Mevag, 1997; Biesecker et al., 2005; Dolan et al., 2009), and remains in mass graves (Zupanič, Pogorelc, and Balažic, 2010; Marjanović et al., 2009; Dzijan et al., 2009). Identification of victims and missing persons relies on the generation and comparison of two databases: a Reference Database (RD) containing DNA profiles of relatives of missing persons, and a Questioned Database (QD) comprising DNA profiles from unknown remains (Lorente et al., 2002). A comparisons of the two databases yields statistical likelihoods of relatedness useful for confirming identity (Decorte, 2010).

In the tragic case of mass fatality, correct and efficient victim identification is essential for civil and criminal investigative needs (U.S. Department of Justice, 2005). In response to the September 11, 2001, terrorist attacks, the National Institutes of Justice (NIJ) developed formal procedures to systematize and coordinate DNA collection, protocols for processing and statistical approaches for identification (U.S. National Institute of Justice, 2006).

For mass fatalities and also for individual missing persons cases, the United States maintains a CODIS Missing Persons index separate from the criminal indices. This index contains DNA profiles from missing persons and their family members. CODIS does not include demographic information of uploaded profiles, but for missing persons cases, limited information (e.g., age, sex, race, date and location last seen) may be useful for an investigation. In the United States, the National Missing and Unidentified Person System (NamUs), created by NIJ, comprises two web-based, publicly accessible databases: the Missing Person Database and the Unidentified Person Database. NamUs is used by law enforcement, medical professionals, first responders, social services, families of missing persons, and the public to search for and report information related to specific cases.

Other countries have similar databases for missing persons identification, with varying policies for governance. For instance, Spain instituted a formal national effort to systematize collection of unidentified human remains and family members of missing persons and developed independent databases to search for genetic similarity (Alvarez-Cubero et al., 2012; Lorente et al., 2001).

International DNA Collection

The International Commission on Missing Persons (ICMP), established in 1996, coordinates identification of persons who have gone missing as a result of armed conflict or human rights violations (ICMP, 2008). The ICMP's goals are to use DNA technologies for the identification of the missing and unidentified, develop standard approaches to missing persons identifications, and establish a sustainable infrastructure to continue identifications without direct aid of ICMP personnel. The ICMP's activities include four focus areas: Political Objectives, Forensics Program, Family Association Development, and the DNA Program (Huffine et al., 2001). The ICMP has provided financial support, required supplies and

equipment, forensic expertise, and administrative support for governments and has provided support to families of the missing and unidentified through their family outreach centers.

Outside of the United States, most developed countries have developed DNA database systems, some operated under CODIS software. However, nations rarely share DNA profiles for searching across international borders. In 2002, INTERPOL, an international police organization with 190 member countries, established DNA Gateway, an automated DNA database with DNA profiles from criminal offenders, crime scene evidence, and missing and unidentified persons (INTERPOL, 2009). By the end of 2011, DNA Gateway was actively used by 61 member countries and contained more than 117,000 DNA profiles. With this international database, law enforcement can share information and link crimes across national borders. INTERPOL developed its I-24/7 global communications system to promote international standards and best practices and facilitate international cooperation among member countries' law enforcement (INTERPOL, 2012).

DNA Identification in U.S. Military

To aid identification of military personnel, the United States began collecting DNA to use in cases of unidentified servicemen. In the Gulf War of 1991, the U.S. Department of Defense (USDOD) collected samples as reference specimens (USDOD, 1991). The program began collecting from active duty and reserve military personnel upon their enlistment, reenlistment, or preparation for operational deployment. The Armed Forces DNA Identification Laboratory stores specimens from enlisted persons and processes them for identification purposes. According to a 2001 USDOD directive, the provision of specimens by military members is mandatory (USDOD, 1996, 2001). Although the original intent of the repository was to be only for identification, an Act in 2002 permits the use of these samples for prosecution of felony and sexual offenses (Pub Law 107-5314, 2002), and inclusion of profiles in CODIS is permitted for certain qualifying military offenses (10 USC §1565, 2012). Government authorities or private contractors may collect samples (USDOD, 2005, 2010). Specimens are retained for 50 years or expunged at the request of the donor (USDOD, 2003). USDOD continues to explore potential uses of DNA and opportunities to improve effectiveness of its programs (Institute for Defense Analyses, 2009; MITRE Corporation, 2010).

DNA Identification in Migration

DNA analysis is a powerful biometric identifier for border security and immigration purposes because, in contrast to other biometric identifiers (e.g., fingerprints, iris recognition, voice recognition), DNA profiles can identify biological relationships with high confidence. Biometric identifiers can support efficient identification of potential high-risk travelers or expedite entry and exit procedures for frequent, low-risk travelers. Biometric markers also may identify criminals, terrorists, or known traffickers attempting to travel under false identities (Thomas, 2006). Immigration fraud through document falsification is readily detectable with biometric markers (CRS, 2008).

Immigration and border security authorities use three key attributes to establish proof of identity at international borders: (1) biometric (e.g., fingerprints); (2) attributed (e.g., full name); and (3) biographical (e.g., education history) (Jamieson et al., 2008). Attributed and biographical data on proof of identity (POI) documents can be easily compromised, but biometric data, including fingerprints, face geometry, DNA, or voice patterns, are difficult to falsify.

Several countries are beginning to adopt programs to incorporate DNA collection and relationship testing into the standard immigration procedures. The United States, Australia, Canada, Finland, the Netherlands, Norway, Sweden, and Hong Kong Special Administrative Region of China are each considering relationship testing in border security measures to confirm immigrants' relatedness to individuals who are already settled in the receiving country (Taitz et al., 2002). In such programs, the similarities and differences between petitioners' profiles can be used to determine the probability of familial relatedness.

Documentation of refugees petitioning for immigration has also been under consideration by the UN and the United States (UNHCR, 2008). In 2010, the U.S. Department of State (USDOS) set policies to permit mandatory DNA testing in select cases for international refugees as part of the U.S. Refugee Family Reunification (Priority Three, or P-3) Program (Holland, 2011; USDOS, 2010). Fraud in the refugee program has amplified the need for the United States to use biometric measures and DNA in particular to document biological relationships (Esbenshade, 2010; Jordan, 2008; USDOS, 2008).

Prior to 2000, the U.S. Immigration and Naturalization Service (USINS, now called the U.S. Citizenship and Immigration Services—USCIS) could require blood group or human leukocyte antigen testing to confirm familial relationships. In 2000, USINS established voluntary DNA testing for immigration cases (USDOS, 2000). In 2006, the USCIS Ombudsman recommended that local offices be the authority to require DNA testing for special cases (U.S. Department of Homeland Security, 2006a). This recommendation was partially based on the fact that blood group antigen and human leukocyte antigen testing could be required in certain cases under 8 CFR 204.2(d)(vi) (1998). USCIS responded with measures to systemize DNA testing in immigration cases, including drafting legislation to require DNA testing where fraud is detected (U.S. Department of Homeland Security, 2006b). However, USCIS declined to preclude requiring DNA testing as standard procedure, citing costs of existing technology (Sahli, 2009). The integration of DNA into U.S. immigration and border security procedures continues to be reviewed and scrutinized (U.S. Department of Homeland Security, undated, 2010a, 2010c).

In January 2009, the United States began collecting DNA from federal arrestees and detainees for inclusion in CODIS (Pub Law 109-162, 2006). Non-U.S. citizens detained under the authority of the United States must submit to a buccal swab in addition to fingerprinting. Records of persons detained by Immigration and Customs Enforcement (ICE) and who have submitted DNA profiles are searchable (U.S. Department of Homeland Security, 2010b).

DNA Identification in Human Trafficking

With a number of international law enforcement agencies managing migration and coping with cross-border crime, international collaboration to use DNA as a biometric tool is increasing. International DNA data sharing carries some nontrivial technical and administrative challenges. Cooperation and communication among governments is vital for handling, exchanging, and protecting sensitive genetic information (McCartney, Wilson, and Williams, 2011).

Identification of victims of human trafficking remains a sore challenge in combating modern slavery (U.S. Department of State, 2012c). Comparisons of DNA profiles from missing persons' family members to profiles of suspected victims identified through law enforcement and health and social services may serve to identify some victims, such as detained sex workers and migrant workers. In 2009, China initiated a nationwide DNA database program to facilitate the collection of DNA samples from parents of missing and homeless children with the aim of finding matches between the two indices. Within 2 years, the effort assisted the return of more than 1,400 homeless or abducted children to their families (People's Daily Online, 2011). The United Arab Emirates (UAE) also developed a program to collect DNA from children who may have been trafficked as camel jockeys (Truong and Angeles, 2005). In an effort to identify stolen children, the Guatemalan Congress enacted the Alba-Kenneth Warning System, which requires DNA databanking for cases of missing children (Congreso de la República de Guatemala, 2010).

An initiative in Spain, DNA-PROKIDS, is leading an international effort to promote the use of DNA to combat human trafficking. As of May 2012, DNA-PROKIDS had established memoranda of understanding (MOUs) in 12 countries (Bolivia, El Salvador, Guatemala, Indonesia, Malaysia, Mexico, Nepal, Paraguay, Peru, Philippines, Sri Lanka, and Thailand) to provide DNA collection and testing (Eisenberg and Schade, 2010).

DNA Identification in International Adoptions

Adopting children internationally has increased in the past decades, which has led to crime and fraud in some countries. Adoption fraud, while not technically considered human trafficking under the U.S. Trafficking Victims Protection Act (TVPA) definition (Pub Law 106-386, 2000), frequently involves violent abduction or nonviolent coercion of a guardian to relinquish a child. A child may be adopted from outside the United States if he or she has no parents, or if the both parents relinquish their rights, obligations, and claims to the child. The standard processes for adopting a child from another country into the United States may involve DNA testing, particularly in the case of adopting a sibling of an existing adopted child. In such cases, USCIS may require DNA testing to confirm this relationship (U.S. Department of Homeland Security, 2000). With illicit intercountry adoption fraud, children are either abducted from guardian care or parents are forced to relinquish a child. In cases of a mass disaster or

war, children may become displaced from their biological family and later adopted out of their home country.

Like relationship testing for missing persons investigations, relationship testing to investigate adoption fraud works by verifying or refuting claimed biological relationships. With rapid increases in international adoptions in the 1990s, the United States implemented routine DNA testing as a measure against international adoption fraud of children from Guatemala and Vietnam (U.S. Department of Homeland Security, 2012). Both adoption programs since have been closed because of continuing reports of fraud, despite required DNA testing (Joint Council on International Children's Services and the National Council for Adoption, 2007; Llorca, 2008). In Guatemala, fraudulent DNA collection at the collection sites of Guatemala's medical examiners' offices and "genotype recycling" (see discussion below) was suspected for several cases (International Commission against Impunity in Guatemala, 2010; Siegal, 2011), prompting USDOS and USCIS to alter their collection processes (U.S. Department of Homeland Security, 2007).

Human DNA Identification Standards and Accreditation

In the clinical genetic testing community, multiple branches of the U.S. Department of Health and Human Services (USDHHS) oversee varying aspects of test validity and laboratory accuracy. The Centers for Disease Control and Prevention (CDC) has established guidelines for determining both analytic and clinical validity of genetic tests, the Centers for Medicare & Medicaid Services (CMS), through the Clinical Laboratory Improvement Amendments (CLIA) mandate (CLIA, 1988), regulates the analytic validity of tests through semiannual laboratory inspections, and the Food and Drug Administration (FDA) regulates any devices and certain reagents used in genetic testing.

However, DNA profiling is not considered a medical test, so is not subject to such organized federal oversight (Schneider, 2006). Forensic DNA laboratories receiving federal funding are subject to the FBI Quality Assurance Standards established by the DNA Advisory Board in 1998, which require an audit every other year (DNA Advisory Board, 1998). FBI updated the standards in September 2011 (FBI, 2011a, 2011b, 2011c, 2011d). FBI further restricts access to the federal database, CODIS (Combined DNA Index System), to laboratories with accreditation (FBI, 2000a). The accreditation programs (e.g., American Society of Crime Laboratory Directors Laboratory Accreditation Board—ASCLD/LAB [ASCLD, 2012], International Standards Organization/International Electrotechnical Commission—ISO/IEC [ISO, 2010]) for forensic DNA laboratories in the United States act independent of government jurisdiction, although the ASCLD/LAB DNA auditors are trained by and follow FBI Quality Assurance Standards. A handful of states require accreditation of forensic disciplines, including New York, Oklahoma, and Texas.

Federal legislation authorizing the FBI to establish CODIS also authorized the creation of a Federal DNA Advisory Board. The Federal DNA Advisory Board, responsible for recommending quality assurance standards and revisions as necessary, charged the Scientific Working Group for DNA Analysis Methods (SWGDAM) with the responsibility of maintaining quality standards and updates (FBI, 2000b). Policies of SWGDAM include guidelines for interpreting data (FBI SWGDAM, 2000, 2003a, 2005, 2009a, 2010), training guidelines for DNA analysts (FBI SWGDAM, 2002), safety guidelines (FBI SWGDAM, 2003b), guidelines of partial match reporting (FBI SWGDAM, 2009b), and utility reporting for specialized databases (FBI SWGDAM, 2012).

The U.S. Congress commissioned the National Academy of Sciences to develop a report evaluating the challenges and disparities in forensic science. The 2009 National Research Council (NRC) report concluded that the forensic science disciplines are subject to fragmented oversight (NRC, 2009). NRC drafted 10 recommendations to improve the system, including the following five relevant to this study: (1) establishment of an independent federal entity to establish standards and mandatory accreditation; (2) research into the accuracy, reliability, and validity in forensic science disciplines; (3) research into the extent of human observer bias (examiner bias); (4) mandatory accreditation; and (5) certification of practitioners. Further, the NRC report noted that, “although DNA analysis is considered the most reliable forensic tool available today, laboratories nonetheless can make errors working with either nuclear DNA or mtDNA—errors such as mislabeling samples, losing samples, or misinterpreting the data.”

The National Institute of Standards and Technology (NIST) provides Standard Reference Materials (SRMs) for human identity testing applications. The primary NIST standards for this purpose are the certified allele calls for the 13 core CODIS loci (15 USC §271, 1988). ISO/EIC also provides guidelines for standard exchange of human DNA identification data (ISO, 2012).

Because relationship testing also is neither health-related nor for forensic investigations, it is not subject to mandatory laboratory or test quality standards (e.g., CLIA, FDA, or FBI) unless the tests are to be used for legal purposes (e.g., custody, inheritance). In such cases, courts require that testing be conducted in a laboratory accredited by the American Association of Blood Banks (AABB) (2010a). Similarly, immigration testing must be performed in AABB-accredited laboratories (U.S. Department of State, 2012a; U.S. Department of Homeland Security, 2008). AABB accredits the quality and operational systems of the laboratory, including its collection, processing, testing, distribution, and administration methods (AABB, 2010b).

Ethical, Legal, and Social Considerations With DNA Identification

The collection and use of DNA by law enforcement, courts, or other government authorities for identification raises several justice, civil, social, and ethical questions. Efforts to identify and assess the scientific, legal, ethical, and social issues surrounding the use of DNA

in law enforcement have revealed contentious matters regarding privacy of genetic information, uses of stored DNA profiles, secondary uses of stored DNA samples, and the disparate impact of DNA collection practices on vulnerable populations.

Privacy Protections

The Privacy Act of 1974 (5 USC §552a, 1974) requires that any U.S. government program analyze what information is collected, why information is being collected, the intended use of the information, with whom the information will be shared, how individuals will be consented, and how the information is secured (National Science and Technology Council, 2008).

A code of fair information practices developed in 1973 by the U.S. Department of Health Education and Welfare sets out "an organized set of values and standards about personal information defining the rights of record subjects and the responsibilities of record keepers" (Gellman, 1997). The Code highlights five principles of fair information practices:

1. There must be no secret personal data record-keeping system.
2. There must be a way for individuals to discover what personal information is recorded about them and how it is used.
3. There must be a way for individuals to prevent personal information obtained for one purpose from being used or made available for other purposes without their consent.
4. There must be a way for individuals to correct or amend information about themselves.
5. An organization creating, maintaining, using, or disseminating records of identifiable personal data must ensure the reliability of the data for their intended use and must take reasonable precautions to prevent misuses of the data (Prevost, 1999).

U.S. courts have established that DNA collection is considered a "search" and is protected under the Fourth Amendment. Key questions are (1) whether and when DNA collection is intrusive (i.e., blood collection versus buccal swab) and (2) to what extent DNA collection is considered a "search" (i.e., at the time of collection of the sample, at the time of analysis of the DNA sample, or at the time of database comparison of one profile to another). Recent legal opinions and key court challenges to DNA collection of nonconvicted citizens are summarized in **Appendix C**.

Privacy Concerns

There is widespread agreement that the use of DNA by the government has tremendous potential to promote justice and support our society. However, privacy concerns are raised by the potential governmental intrusion that takes place when a sample is collected, stored, and used to create a unique DNA profile that is stored in a database and searched repeatedly. Collection of DNA by law enforcement pits the "right to be left alone" against public security.

DNA is unlike other biological samples in that it can reveal medical and familial information that a fingerprint or a urine sample does not. As such, the public is cautious about relinquishing DNA samples, whether for medical use or for law enforcement or government identification. Some have questioned the intentions of the USDOD identification database, for example, now that legislation permits the use of provided (and mandatory) samples for law enforcement purposes (Ham, 2003).

The American public is enthusiastic about the use of genetic testing in health care and the implications of biomedicine, including DNA applications in law enforcement. A 2007 study of 1,199 Americans over the age of 18 assessed public acceptance of the use of genetic testing for medical and nonmedical purposes finding that more than 90% of Americans support the use of genetic information for medical research. However, this enthusiasm about genetic testing is tempered by widespread public concern and distrust about discrimination based on use of their genetic test results (Genetics and Public Policy Center, 2007). More than 90% of Americans are concerned and more than 50% are *very* concerned that genetic information could be used in ways that are harmful to them. Moreover, when asked how much they trust various sources with their genetic test results, 54% of respondents had little or no trust in law enforcement. Another survey in 2008 questioned 4,659 Americans on their interest in participating in a large prospective cohort study on genes and environment. In this study, 84% of responders indicated that it would be important to have laws protecting research information from law enforcement (Kaufman et al., 2009).

A program to identify stolen children in Argentina (Pertossi, 2009; Ferguson, 2010) raised questions about genetic privacy, as did a program in Canada to collect DNA from sex workers (Hainsworth, 2010). Ensuring the socially responsible use of genetic information is key in developing model policies to implement DNA testing. The predictive nature of genetic information, its relevance for family members, and its past use to support prejudice, heightens concerns over genetic privacy.

The collection of DNA from non-U.S. citizens by the U.S. government has raised some concerns as well. In response to the notice of intent to collect DNA from detainees (28 CFR §28.12), the Embassy of Canada submitted a formal comment stating their concern for privacy intrusion (Canadian Embassy, 2008). In particular, the comment stated that, “in Canada, the creation of biometric templates for indefinite storage attracts a much higher reasonable expectation of privacy than the initial collection of live photographs and fingerprints given the much greater potential for linking disparate information, tracking and surveillance, especially given advances in computer processing technology which allow for quick matching or linking of data from numerous sources.”

The retention of DNA specimens and the resulting profiles is a lynchpin in the ethical debates around privacy. Critics of USCIS’s plans to introduce rapid DNA testing into immigration processes have noted the potential intent of the program to upload DNA profiles into CODIS (Lynch, 2013).

Genotype Recycling

In some cases, the motivation of an immigrant petitioner or other genetic testing subject to falsify a genetic test is high. Fraudulent testing may occur when an individual attempts to provide DNA samples of related persons in place of unrelated persons. For example, among immigrants from nations where polygamy is permitted, younger wives of a male petitioner may claim they are his daughters or more distant blood relatives of a petitioner may claim closer relationships and attempt to impersonate a parent-child relationship to improve their chances of immigration or accelerate the process (Wenk, 2011). Genotype recycling is a term describing when a person provides a biological sample under different names multiple times, either inadvertently or intentionally (Wenk, 2010).

Private laboratories performing the fraudulent testing may suspect sample substitution when two or more people demonstrate identical DNA profiles. In the United States, some AABB-accredited relationship testing laboratories have internal procedures to detect genotype recycling. For instance, a laboratory might look for discrepancies of sex between the genetic test results and the sex declared on laboratory requisitions, very high parentage indices, or reports containing visibly identical profiles. If the laboratory maintains DNA profiles for past cases, then genotype recycling also can be detected by comparing the DNA profile of each individual tested with all the profiles stored in the laboratory's database. Because a person could intentionally use more than one laboratory for testing purposes, an interlaboratory data profiling system would be optimal for detecting genotype recycling.

To combat this occurrence in immigration cases, the USDOS set requirements for DNA collection to be performed onsite at U.S. Embassies and that samples be collected with U.S. Embassy witnesses (U.S. Department of State, 2012b).

Secondary Uses of Biological Specimens

A biological sample obtained by government officials may be retained in various forms—as blood, saliva, or a buccal swab, as a staincard, or as purified DNA. Different forensic laboratories have different protocols for retaining such biological samples, with many laboratories and private companies retaining purified DNA samples and staincards indefinitely. This sample is a potent source of private information about both the individual and the individual's family members and could potentially be used for analysis beyond the standard profiling markers. The biological sample contains intensely personal information about genetic disorders, familial relationships, and perhaps, in the future, predilection to certain behavioral traits such as a propensity for antisocial behavior. However, the retention of samples by official laboratories makes retesting in the future possible for confirmation or quality control purposes.

As long as the samples are stored, there is a possibility that the state, an individual employee, or another unauthorized third party may analyze and then misuse its genetic information—whether by disclosing it for retributive reasons, by detaining those predisposed to antisocial behavior for crime control purposes, or simply by accidentally releasing the

information. Most states have measures to penalize misuse of identifiable specimens, but some argue that the protections are insufficient.

Conclusions

DNA is a powerful biometric measure for identification of individuals and relatives. The uses of DNA for government purposes need to be carefully constructed to prevent privacy violations, particularly in the collection of DNA from noncriminals. Government programs for DNA collection of immigrants should consider the following:

1. Is DNA collection necessary in the proposed program or are will other biometric measures work sufficiently?
2. How will DNA be collected and by whom? Are there measures in place to ensure the integrity of the collected specimens?
3. How long will the DNA specimens be retained and who has access to these specimens? How will specimens be destroyed?
4. Will the specimens be used for purposes other than the original intended purpose for collection? Will de-identification of the specimens sufficiently protect the providing individuals from misuse of these specimens?
5. How long will the DNA profile be retained and who has access to the database?
6. Will the DNA profile be shared with other entities? Will the DNA profile be uploaded into a database? Will this be a database that can be searched for criminal purposes?
7. Will there be measures in place to permit the expunging of retained DNA profiles or specimens at the request of the provider?
8. How might the proposed program policies be expanded in the future by federal, state, and local laws? Are there policies in place to protect the privacy of the individuals that may be impacted by such expanded programs?

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Appendix A: Key U.S. Legislation

DNA Identification in Migration

1. **Pub. Law 106-386 (2000)**—Victims of Trafficking and Violence Protection Act of 2000. 114 Stat. 1469.

   Act authorizing federal programs to prevent violence against women and to combat trafficking in persons.

DNA Collection for U.S. Law Enforcement

2. **Pub Law 103-322 (September 1994)**—Violent Crime Control and Law Enforcement Act of 1994, Violence Against Women Act of 1994.

   Authorizes admissibility of evidence of similar crimes evidence from other crimes in prosecutions, establishing creation of CODIS. Original law permitting FBI to establish CODIS for criminal offenders and unsolved crime evidence. Law was amended in subsequent years to include military personnel and arrestees. The Attorney General exercised this authority in 42 USC §14132, DNA Identification Act of 1994: Index to facilitate law enforcement exchange of DNA identification information.

3. **42 USC Subchapter IX Part A (1994)**—State and Local Law Enforcement, DNA Identification.

   Establishes CODIS; authorizes appropriations and grant programs, instates collection of DNA from certain federal offenders and District of Columbia offenders; sets privacy protection standards; establishes an advisory board for setting and maintaining DNA QA standards for CODIS and a National Forensic Science Commission; and defines proficiency testing requirements.

4. **Pub Law 105-251 (October 1998)**—Interstate Criminal Justice Improvements.

   Provides funding for States to identify criminals; directs states to share information on crimes. The Attorney General exercised this authority in 112 Stat. 1870 as amended by the rule 42 USC §14601.

5. **Pub Law 106-546 (December 2000)**—DNA Analysis Backlog Elimination Act of 2000.

   Authorizes grants to states to analyze samples for CODIS and to increase capacity of labs. Makes grants available to eligible states or units of local government. Also makes failure to cooperate in mandatory collection a federal crime. The Attorney General exercised this authority in 42 USC §14135, The DNA Analysis Backlog Grant Program.

6. **Pub Law 107-56 (October 2001)**—Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA Patriot Act) Act of 2001.

   Amends the DNA Analysis Backlog Elimination Act of 2000 to expand qualifying federal offenses to include attempt or conspiracy to commit any crime of violence. The Attorney General exercised this authority in 18 USC §1.

7. **Pub Law 108-405 (October 2004)**—Justice for All Act of 2004.

   To protect crime victims' rights, to eliminate the substantial backlog of DNA samples collected from crime scenes and convicted offenders, to improve and expand the DNA testing capacity of federal, state, and local crime laboratories, to increase research and development of new DNA testing technologies, to develop new training programs regarding the collection and use of DNA, and to amend the DNA Identification Act of 1994 to include nonconvicted persons. The Act amends the 42 USC 14135 and 42 USC 14132. The Attorney General exercised this authority in 42 USC §13701, The Debbie Smith Act of 2004.

8. **28 CFR Part 28 (January 2005)**—DNA identification system.

   Establishes the qualifying federal offenses for collection of DNA from individuals in custody of the Bureau of Prisons or under supervision of a probation office.

9. **Pub Law 109-162 (January 2006)**—Violence Against Women Act of 2005. DNA Fingerprint Act of 2005.

   Establishes opt-out procedure to remove samples from the National DNA Index System. Expands CODIS funding. Authorizes DNA collection from persons arrested or detained under Federal authority. The Attorney General exercised this authority in 28 CFR §28.12 as amended by the rule 73 Fed Reg 74932. Law went into effect January 9, 2009.

10. **Pub Law 109-248 (July 2006)**—Adam Walsh Child Protection and Safety Act of 2006.

    Requires collection of DNA from sex offenders. The Attorney General exercised this authority in 42 USC §16901.

11. **Pub Law 110-360 (October 2008)—**The Debbie Smith Reauthorization Act of 2008.

    Reauthorization of 42 USC §13701 extending the availability of grants to eligible states or units of local government.

12. **18 USC §3142(b),(c)(1)(A) (January 2009)**—Release or detention of a defendant pending trial.

    Authorizes pretrial release of a person charged with an offense on condition that the person cooperates in the collection of a DNA sample authorized by the DNA Analysis Backlog Elimination Act of 2000 (42 USC §14135a).

DNA Identification in U.S. Military

13. **Pub Law 107-5314 (December 2002)**—Bob Stump National Defense Authorization Act for Fiscal Year 2003.

    Permits the use of DNA from the military repository for prosecution of a felony or any sexual offense.

14. **8 USC §1440f (June 2008)**—Fingerprints and other biometric information for members of the United States Armed Forces. Pub. L. 112-196.

    Instates collection of DNA from individuals convicted of a qualifying military offense for CODIS.

15. **10 USC §1565 (January 2012)**—DNA identification information: collection from certain offenders.

    Instates collection of DNA from individuals convicted of a qualifying military offense for CODIS.

DNA Identification Standards / Accreditation

16. **15 USC §271 (1988)—**National Institute of Standards and Technology Act. Commerce and Trade: Chapter 7—National Institute of Standards and Technology (NIST).

    Establishes NIST as the agency responsible for enhancing American competitiveness in industry and maintaining its function as a lead national laboratory for measurements, calibrations, and QA techniques.

Privacy of Biometric Data

17. **5 USC §552a (December 1974)**—Privacy Act of 1974. Public Law 93-579, 88 Stat. 1896.

    This Act covers federal databases and is based on the Code of Fair Information practices.

Appendix B: Formal U.S. Policies Regarding DNA Collection

DNA Identification in U.S. Immigration

1. **U.S. Department of State, Immigration and Naturalization Service (July 2000)**—Memorandum from Michael D. Cronin, Acting Executive Associate Commissioner, Office of Programs to All regional directors.

   Guidance on parentage testing for family-based immigrant visa petitions.

   Available at http://www.dhs.gov/xlibrary/assets/CISOmbudsman_RR_26_DNA-04-13-06.pdf.

2. **U.S. Department of Homeland Security (USCIS) (April 2006)**—Memorandum from Prakash Khatri, CIS Ombudsman to Dr. Emilio T. Gonzalez, Director, USCIS.

   Recommends acceptance of DNA test results as secondary evidence of family relationship, to grant authority to directors to require DNA testing and to initiate a DNA testing pilot project to study the impact of requiring DNA testing as evidence of family relationship.

   Available at http://www.dhs.gov/xlibrary/assets/CISOmbudsman_RR_26_DNA-04-13-06.pdf.

3. **U.S. Department of Homeland Security, USCIS (July 2006)**—Memorandum from Dr. Emilio T. Gonzalez, Director, USCIS to Prakash Khatri, CIS Ombudsman.

   Response to recommendation for DNA testing concluding that the benefits of testing would justify the costs.

   Available at http://www.uscis.gov/USCIS/Resources/Ombudsman%20Liaison/cisomb-2009-response.pdf.

4. **U.S. Department of Homeland Security, USCIS (March 2008)**—Memorandum from Michael L. Aytes, Associate Director, Domestic Operations to Field Leadership on genetic relationship testing, suggesting DNA tests revisions to the Adjudicators Field Manual (AFM) Chapter 21 (AFM Update AD07-25).

   Guidance on AABB accreditation and voluntary DNA testing for biological relationship.

   Available at http://www.uscis.gov/files/pressrelease/genetic_testing.pdf.

5. **U.S. Department of Homeland Security, USCIS (March 2010)**—Biometric standards requirements for US-VISIT.

   Standards for future consideration of biometric data, collection, storage, and exchange standards, including potential integration of DNA identification in FBI's Electronic Biometric Transmission Specification (EBTS), DOD's EBTS, and Interpol's Implementation of ANSI/NIST-ITL 1-2007.

   Available at http://www.dhs.gov/xlibrary/assets/usvisit/usvisit_biometric_standards.pdf.

6. **U.S. Department of Homeland Security (May 2010)**—Docket N. DHS-2010-0031. Privacy Act of 1974; Department of Homeland Security United States Immigration and Customs Enforcement—011, Immigration and Enforcement Operational Records System of Records.

   Supports the deployment of the ICE Online Detainee Locator System, which provides a searchable online database to help members of the public locate detainees in ICE custody. Categories for searching include biometric data including date and time of DNA sample collection for FBI processing as required by 28 CFR Part 28.

   Available at http://www.gpo.gov/fdsys/pkg/FR-2010-05-03/html/2010-10286.htm.

7. **U.S. Department of State (September 2010)**—60-day notice of proposed information collection: DS-7656; Affidavit of relationship (AOR); OMB control number 1405.

   Notice of request for public comment on plan to require an affidavit of relationship (AOR) to establish qualification for access to the Priority 3 (P-3) admissions program. The AOR also informs the anchor relative that DNA evidence of all claimed parent-child relationship will be required as a condition of access to P-3 processing and who is responsible for the costs.

   Available at http://www.gpo.gov/fdsys/granule/FR-2011-11-15/2011-29472/content-detail.html.

8. **U.S. Department of Homeland Security, USCIS (September 2010)—**Rapid, low-cost DNA screening and analysis program, a Technology Transition Agreement (TTA) between DHS S&T Human Factors/Behavioral Sciences Division (HFD) and USCIS, version Rev A (7-24-08).

   Nonbinding agreement to develop technology for using DNA to determine kinship or identity in immigration and asylum cases.

   Available at https://www.eff.org/sites/default/files/filenode/2012_USCIS_Rapid_DNA_FOIA_Records-highlighted-1of3.pdf.

9. **U.S. Department of State, Bureau of Consular Affairs (Web page, accessed August 2012)**—DNA Relationship Testing Procedures.

   Web page overview of procedures for petitioners.

   Available at http://travel.state.gov/visa/immigrants/info/info_1337.html

10. **U.S. Department of Homeland Security, USCIS (undated)**—Senior Policy Council—Options Paper: Expanding DNA testing in the immigration process.

    Background and policy options for expansion of DNA collection.

    Available at https://www.eff.org/sites/default/files/filenode/USCIS_DNA_Senior_Policy_Council_Options_Paper.pdf

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DNA Identification in International Adoptions

11. **U.S. Department of Homeland Security, USCIS (November 2000)**—Memorandum from Michael A. Pearson, Executive Associate Commissioner, Office of Field Operations to All Regional Directors, Director, International Affairs, FLETC/GLYNCO on Guidance on processing petitions for adopted alien children less than 18 years of age considered a "child" under the Immigration and Nationality Act through Public Law 1066-139.

    This memorandum provides clarification regarding Public Law 106-139 which amends the age of an alien "adopted child" or "orphan" as defined in the Immigration and Nationality Act (Act) from 16 years old to 18 years old in cases where the child's sibling, who is under 16, is petitioned by the same U.S. citizen(s).

    Available at http://www.uscis.gov/files/pressrelease/adoptchi.pdf.

12. **U.S. Department of Homeland Security, USCIS (August 2007)**—USCIS Update: USCIS highlights change to Guatemalan intercountry adoptions.

    Announcement that the U.S. Embassy in Guatemala requires results of a second DNA test from the biological mother and child before they will issue an immigrant visa for the adopted child.

    Available at http://www.aila.org/content/default.aspx?bc=26284%7C26298%7C23053.

13. **U.S. Department of Homeland Security, USCIS (Web page, accessed August 2012)**—Q and A: USCIS Implements Required DNA Testing for Vietnamese Adoptions.

    Web page overview of procedures for petitioners.

    Available at http://www.uscis.gov/portal/site/uscis/menuitem.5af9bb95919f35e66f614176543f6d1a/?vgnextoid=49f0bfd9dd43a110VgnVCM1000004718190aRCRD&vgnextchannel=68439c7755cb9010VgnVCM10000045f3d6a1RCRD

DNA Collection for U.S. Law Enforcement

14. **U.S. Department of Justice (January 1999)**—Office of the Attorney General, AG Order No. 2196-98. Megan's Law; Final guidelines for the Jacob Wetterling Crimes Against Children and Sexually Violent Offender Registration Act, as amended.

    Establishes minimum standards for collection of information from sex offenders. Final guidelines 64 Fed. Reg. 572. Law went into effect December 17, 1998.

    Available at http://www.gpo.gov/fdsys/granule/FR-1999-01-22/C8-33377/content-detail.html.

15. **U.S. Federal Bureau of Investigation (February 2004)**—Privacy impact assessment National DNA Index System (DNS).

    Freedom of Information/Privacy Act disclosure of the review conducted on September 26, 2003.

    Available at http://www.fbi.gov/foia/privacy-impact-assessments/dns.

16. **U.S. Department of Justice (July 2008)**—Docket No. OAG 121; AG Order No. 2978-2008. Office of the Attorney General; the national guidelines for sex offender registration and notification.

    Summary of comments on the collection of DNA from sex offenders, including concerns regarding DNA collection. Final guidelines 73 Fed. Reg. 38030. Law went into effect July 2, 2008.

    Available at http://www.uscis.gov/ilink/docView/FR/HTML/FR/0-0-0-1/0-0-0-145991/0-0-0-146014/0-0-0-149970.html.

17. **U.S. Department of Justice (December 2008)**—73 Fed. Reg. 74932, DNA-Sample Collection and Biological Evidence Preservation in the Federal Jurisdiction. OAG Docket Nos. 108, 109, 119, AG Order No. 3023-2008.

    Directs federal agencies to collect DNA from individuals who are arrested, facing charges, or convicted, and from non-U.S. persons who are detained under the authority of the United States, subject to certain limitations and exceptions.

    Available at http://www.uscis.gov/ilink/docView/FR/HTML/FR/0-0-0-1/0-0-0-145991/0-0-0-165820.html.

DNA Collection for Missing Persons Identification

18. **U.S. Department of Justice, Office of Justice Programs, National Institute of Justice (June 2005)**—Special NIJ Report: Mass Fatality Incidents: A Guide for Human Forensic Identification.

    Outlines considerations for DNA analysis in the event of a mass fatality or highly fragmented remains to (1) identify the victims, (2) associate fragmented remains, and (3) assist in ongoing medical and legal investigations.

    Available at https://www.ncjrs.gov/pdffiles1/nij/199758.pdf.

19. **U.S. National Institute of Justice (October 2006)**—Lessons learned from 9/11: DNA identification in mass fatality incidents.

    Establishes laboratory policies and procedures including the creation of sample collection documents; assess the magnitude of an identification effort and identify and acquire resources to respond; identify reference and kinship samples; create a comprehensive laboratory management plan including technology management and quality assurance; establish lines of communication between agencies, departments, victims' families, and the press.

    Available at https://www.ncjrs.gov/pdffiles1/nij/214781.pdf.

20. **National Science and Technology Council, Subcommittee on Biometrics and Identity Management (2008)**—Identity Management Task Force Report 2008.

    This report presents an overview of the current state of federal identity management systems and presents a high-level vision of how these systems can be holistically designed to provide services while increasing privacy protection. The purpose of this report is to initiate further discussion on this vision, inform policy decisions, and provide direction on which to base near-term research.

    Available at http://www.biometrics.gov/documents/idmreport_22sep08_final.pdf.

DNA Identification in U.S. Military

21. **U.S. Department of Defense (December 16, 1991)**—Memorandum and Policy Statement: Establishment of a Repository of Specimen Samples to Aid in Remains Identification Using Genetic Deoxyribonucleic Acid (DNA) Analysis.

    Authorizes the Assistant Secretary of Defense for Health Affairs to establish policies and requirements for the use of DNA analysis in identification of remains.

22. **U.S. Department of Defense (October 28, 1996)**—Directive 5154.24, Armed Forces Institute of Pathology.

    Directs Armed Forces Institute of Pathology (AFIP) to maintain the Armed Forces Repository of Specimen Samples for the Identification of Remains and ensure the protection of privacy interests of the specimen samples and resulting DNA analysis. Cancelled and replaced by October 2011 version.

23. **U.S. Department of Defense (October 3, 2001)**—Directive 5154.24, Armed Forces Institute of Pathology.

    Replaces October 1996 version. Directs AFIP to maintain the Armed Forces Repository of Specimen Samples for the Identification of Remains and ensure the protection of privacy interests of the specimen samples and resulting DNA analysis.

    Available at http://www.dtic.mil/whs/directives/corres/pdf/515424p.pdf

24. **U.S. Department of Defense (March 2003)**—Instruction (No. 5154.30): Armed Forces Institute of Pathology.

    Implements policy for management of DNA collection of active duty Armed Forces personnel within the Armed Forces DNA Identification Laboratory (AFDIL), including privacy rules and procedures and retention of specimen for 50 years or expungement at request of the donor.

    Available at http://www.dtic.mil/whs/directives/corres/pdf/515430p.pdf.

25. **U.S. Department of Defense (October 2005)**—Instruction (No. 3020.41): Contractor Personnel Authorized to Accompany the U.S. Armed Forces.

    Establishes acquisition of DNA samples from contingency defense contractor personnel in the Armed Forces for storage in the Armed Forces Repository of Specimen Samples for the Identification of Remains (AFRSSIR). Cancelled and replaced by December 2011 version.

26. **Institute for Defense Analyses (June 2009)**—Assessment of DOD's Central Identification Lab and the Feasibility of Increasing Identification Rates, IDA Paper P-4478.

    Recommendations to improve efficiency and effectiveness of existing Central Identification Lab identification activities.

    Available at http://www.dtic.mil/dpmo/docs/ida_study_11-18-09.pdf.

27. **U.S. Department of Defense (May 2010)**—Instruction (No. 5505.14): Deoxyribonucleic Acid (DNA) Collection Requirements for Criminal Investigations.

    Recognizes DOD and the Coast Guard as agencies for collection of DNA samples under qualifying codes.

    Available at http://www.dtic.mil/whs/directives/corres/pdf/550514p.pdf.

28. **U.S. Department of Defense (December 2011)**—Instruction (No. 3020.41): Contractor Personnel Authorized to Accompany the U.S. Armed Forces.

    Replaces October 2005 version. Establishes acquisition of DNA samples from contingency defense contractor personnel in the Armed Forces for storage in the Armed Forces Repository of Specimen Samples for the Identification of Remains (AFRSSIR).

    Available at http://www.dtic.mil/whs/directives/corres/pdf/302041p.pdf.

DNA Identification Standards / Accreditation

29. **DNA Advisory Board (1998)**—DNA Advisory Board Quality Assurance Standards for Forensic DNA Testing Laboratories.

    Original quality assurance standards for laboratories performing forensic DNA testing or using the Combined DNA Index System (CODIS). Updated standards took effect on July 1, 2009.

    Available at http://www.cstl.nist.gov/strbase/dabqas.htm.

30. **U.S. Federal Bureau of Investigation, FBI Laboratory (January 2000)—**National DNA Index System (NDIS) DNA Data Acceptance Standards. Operational Procedures.

Ongoing standards for operating the national CODIS database including QA standards.

Available at http://www.nlada.org/forensics/for_lib/Documents/1132070952.06/RF_GN_13_NDIS_Data_Standards%252005_31_05.pdf.

31. **U.S. Federal Bureau of Investigation (July 2000)—**Scientific Working Groups.

Establishes operational bylaws for FBI-sponsored Scientific Working Groups.

Available at http://www.swgdam.org/bylaws.html.

32. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (July 2000)—**Short Tandem Repeat (STR) Interpretation Guidelines.

Provides a framework for laboratories to develop STR interpretation guidelines for validation.

Available at http://www.swgdam.org/Interpretation_Guidelines_January_2010.pdf.

33. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (October 2002)—**Training Guidelines.

Defines specific course requirements, in-house laboratory training and assessment and minimal experience for DNA analysts.

Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/oct2001/kzinski.htm.

34. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (April 2003)—**Guidelines for Mitochondrial DNA (mtDNA) Nucleotide Sequence Interpretation.

Provides a framework for laboratories to develop mtDNA interpretation guidelines for validation.

Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2003/swgdammitodna.htm.

35. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (April 2003)—**Guidance Document for Implementing Health and Safety Programs in DNA Laboratories.

Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/april2003/swgdamsafety.htm

36. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (January 2005)**—Summary of the Findings of a Quality Review of the Scientific Working Group on DNA Analysis Methods Mitochondrial DNA Database.

    Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/jan2005/research/2005research.htm

37. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (January 2009)**—Y-Chromosome Short Tandem Repeat (Y-STR) Interpretation Guidelines.

    Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/jan2009/standards/2009_01_standards01.htm

38. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) Ad Hoc Committee on Partial Matches (October 2009)**—SWGDAM Recommendations to the FBI Director on the "Interim Plan for the Release of Information in the Event of a 'Partial Match' at NDIS."

    Available at http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/oct2009/standard_guidlines/swgdam.html

39. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (January 2010)**—STR Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories.

    Available at http://www.swgdam.org/Interpretation_Guidelines_January_2010.pdf

40. **U.S. Federal Bureau of Investigation (updated September 2011)**—The FBI Director's Forensic Quality Assurance Standards for Forensic DNA Testing Laboratories.

    Available at http://www.swgdam.org/FBI%20Director%20Forensic%20Standards%20%20Revisions%20APPROVED%20and%20Final%20effective%209-01-2011.pdf

41. **U.S. Federal Bureau of Investigation (September 2011)**—Forensic Quality Assurance Standards Audit for Forensic DNA Testing Laboratories.

    Available at http://www.swgdam.org/Forensic_QAS_Audit_Document_%20FBI%20APPROVED%20and%20FINAL%20effective%209-1-11.pdf

42. **U.S. Federal Bureau of Investigation (updated September 2011)**—The FBI Director's Quality Assurance Standards for DNA Databasing Laboratories.

    Available at http://www.swgdam.org/FBI%20Director%20Databasing%20Standards%20Revisions%20APPROVED%20and%20final%20effective%209-1-11.pdf

43. **U.S. Federal Bureau of Investigation (September 2011)—**The FBI Quality Assurance Standards Audit for DNA Databasing Laboratories.

Available at http://www.swgdam.org/Database_QAS_Audit_Document_FINAL%20and%20Approved%20effective%209-1-11.pdf

44. **U.S. Federal Bureau of Investigation, Scientific Working Group on DNA Analysis Methods (SWGDAM) (March 2012)—**Letter from Anthony J. Onorato, Chair, SWGDAM to Minh Nguyen, Program Manager, Office of Investigative and Forensic Sciences, National Institute of Justice to regarding the United States Y-STR Database.

Available at http://www.swgdam.org/Ltr_to_NIJ_on_USYSTR_database.pdf

Appendix C: Key Court Challenges to DNA Collection

In anticipation of the upcoming Supreme Court hearing on the Fourth Amendment implications of DNA collection prior to conviction, David H. Kaye reviewed the status of relevant court opinions and legal opinions November 10, 2012. His notes on case law as of that date are summarized below.

The complete analysis is available at http://www.personal.psu.edu/dhk3/blogs/DoubleHelixLaw/2012/11/the-constitutionality-of-dna-collection-before-conviction-an-updated-scorecard-1.html.

Appellate: State Supreme Courts (1.5-1.5)

1. **Mario W. v. Kaipio, Commissioner**, 281 P.3d 476 (Ariz. 2012) (state arrestee law for juveniles constitutional insofar as it allows sampling as a booking procedure, but preconviction analysis of the sample is unconstitutional under a totality-of-the-circumstances standard and an analogy to searching containers)

2. **King v. State**, 42 A.3d 549 (Md. 2012) (state law requiring sampling after arraignment unconstitutional "as applied" under "totality of the circumstances" balancing test), cert. granted sub nom. Maryland v. King, No. 12-207 (U.S. Nov. 9, 2012)

3. **Anderson v. Commonwealth**, 650 S.E.2d 702 (Va. 2007) (state arrestee law upheld under unspecified balancing test and analogy to fingerprinting as a booking procedure)

4. *Related case:* **State v. Franklin**, 76 So.3d 423 (La. 2011) (no search warrant required to take a DNA sample from a murder defendant for use in the murder investigation because he had to submit a sample "as a routine incident of booking" anyway)

Appellate: State Intermediate Courts (opinions not reviewed by higher courts) (0-2)

5. **People v. Buza**, 129 Cal.Rptr.3d 753 (Cal. Ct. App. 2011) (unconstitutional under balancing tests), rev. granted, 262 P.3d 854 (Cal. 2011)

6. **In re Welfare of C.T.L.**, 722 N.W.2d 484 (Minn. Ct. App. 2006) (state arrestee law struck down as per se unreasonable without probable cause and a warrant)

Appellate: Federal Courts (2-0)

7. **United States v. Mitchell**, 652 F.3d 387 (3d Cir. 2011) (en banc) (federal arrestee law upheld under "totality of circumstances" balancing test)

8. **Haskell v. Harris**, 669 F.3d 1049 (9th Cir. 2012) (state arrestee law upheld under "totality of circumstances" balancing test), reh'g en banc granted, 686 F.3d 1121 (9th Cir. 2012)

9. **United States v. Pool**, 621 F.3d 1213 (9th Cir. 2010) (federal arrestee law upheld under "totality of circumstances" balancing test), vacated as moot, 659 F.3d 761 (9th Cir. 2011) (en banc)

10. *Related case*: **Friedman v. Boucher**, 580 F.3d 847 (9th Cir. 2009) (an arrest does not justify DNA sampling without an applicable statute)

Trial Courts: Federal (not reviewed by higher courts) (1-1)

11. **United States v. Thomas**, No. 10-CR-6172 CJS, 2011 WL 1627321 (W.D.N.Y. Apr. 27, 2011) (federal arrestee law upheld under "special needs" balancing test), dismissed, No. 11-1742 (2d Cir. Sept. 20, 2011), ECF No. 43.

12. Amended Order Denying the Government's Motion to Compel DNA Samples, **United States v. Frank**, No. CR-092075-EFS-1(E.D. Wash. Mar. 10, 2010), available at http://www.dnaresource.com/documents/USvFrank.pdf (applying totality balancing to a limited list of interests to find compulsory collection before conviction unreasonable)

13. *Related case:* **United States v. Purdy**, No. 8:05CR204, 2005 WL 3465721 (D. Neb. 2005) (forcibly taking a buccal swab from an arrestee violates Fourth Amendment in the absence of a statute providing for a uniform and limited system of sampling)

Trial Courts: Federal (reviewed by higher courts) (2-1)

14. **United States v. Mitchell**, 681 F.Supp.2d 597 (W.D.Pa. 2009) (federal law held unenforceable), rev'd, 652 F.3d 387 (3d Cir. 2011) (en banc)

15. **United States v. Pool**, 645 F.Supp.2d 903 (E.D.Cal. 2009) (federal arrestee law upheld under "totality of circumstances" balancing test), aff'd, 621 F.3d 1213 (9th Cir. 2010), affirming opinion vacated as moot, 659 F.3d 761 (9th Cir. 2011) (en banc)

16. **Haskell v. Brown**, 677 F.Supp.2d 1187 (N.D. Cal. 2009) (denying a preliminary injunction against the enforcement of California's arrestee sampling law in large part because the balance of interests establishes that the requirement is reasonable), aff'd sub nom. Haskell v. Harris, 669 F.3d 1049 (9th Cir.), reh'g en banc granted, 686 F.3d 1121 (9th Cir. 2012)

Law Review Articles and Notes

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1. D.H. Kaye, The Constitutionality of DNA Sampling on Arrest, 10 Cornell J.L. & Pub. Pol'y 455-508 (2001). A statute with sufficient protections to confine the government to identifying information is constitutional under the special needs exception.

2. Tracey Maclin, Is Obtaining an Arrestee's DNA a Valid Special Needs Search Under the Fourth Amendment? What Should (and Will) the Supreme Court Do?, 34 J.L. Med. & Ethics 165, 178-82 (2006). *Predicting that the Supreme Court will uphold taking DNA from arrestees under a balancing test but stating that it should reject the practice as per se unreasonable*.

3. D. H. Kaye, Who Needs Special Needs? On the Constitutionality of Collecting DNA and Other Biometric Data from Arrestees, 34 J.L. Med. & Ethics 188 (2006). *Proposing a "biometric information exception" to the warrant requirement*.

4. Brian Gallini, Step Out of the Car: License, Registration, and DNA Please, 62 Ark. L. Rev. 475 (2009). *Arkansas law unconstitutional because it does not require a judicial finding of probable cause arrest, contains inadequate safeguards to protect the samples and records, and does not fall within an established exception to the warrant requirement.*

5. Kevin Lapp & Joy Radice, A Better Balancing: Reconsidering Pre-Conviction DNA Extraction from Federal Arrestees, 90 N. Car. L. Rev. Addendum 157 (2012). *Pre-conviction DNA extraction should be permitted only after a neutral third-party finding of probable cause and DNA samples should be destroyed*.

6. David H. Kaye, Drawing Lines: Unrelated Probable Cause as a Prerequisite to Early DNA Collection, 91 N.C. L. Rev. Addendum 1 (2012). *A formal finding of probable cause for an unrelated arrest is not constitutionally required*.

7. David H. Kaye, A Fourth Amendment Theory for Arrestee DNA and Other Biometric Databases, U. 15 Pa. J. Const. L. No. 4, *forthcoming 2013*.

8. *Related article*: Robert Molko, The Perils of Suspicionless DNA Extraction of Arrestees Under California Proposition 69: Liability of the California Prosecutor for Fourth Amendment Violation? The Uncertainty Continues in 2010, 37 W. St. U. L. Rev. 183 (2010)

Student

9. Martha L. Lawson, Note, Personal Does Not Always Equal "Private": The Constitutionality of Requiring DNA Samples from Convicted Felons and Arrestees, 9 Wm. & Mary Bill Rts. J. 645 (2001) *The government's interest in mandatory testing of all those arrested outweighs individuals' privacy interests*.

10. Reneé A. Germaine, Comment, "You Have the Right to Remain Silent… You Have No Right to Your DNA" Louisiana's DNA Detection of Sexual and Violent Offender's Act: An Impermissible Infringement on Fourth Amendment Search and Seizure, 22 J. Marshall J. Computer Info. L. 759 (2004) *Unconstitutional under balancing test other than special needs*.

11. Robert Berlet, Comment, A Step Too Far: Due Process and DNA Collection in California after Proposition 69, 40 U.C. Davis L. Rev. 1481 (2007) *With certain modifications, arrestee DNA sampling as provided for under California law would be constitutional*.

12. John D. Biancamano, Note, Arresting DNA: The Evolving Nature of DNA Collection Statutes and Their Fourth Amendment Justifications, 70 Ohio St. L.J. 619 (2009) *Unconstitutional under special needs and totality of the circumstances tests*.

13. Corey Preston, Note, Faulty Foundations: How the False Analogy to Routine Fingerprinting Undermines the Argument for Arrestee DNA Sampling, 19 Wm. & Mary Bill Rts. J. 475 (2010)

14. Ashley Eiler, Note, Arrested Development: Reforming the Federal All-Arrestee DNA Collection Statute to Comply with the Fourth Amendment, 79 Geo. Wash. L. Rev. 1201, 1220 (2011)

15. Lauren N. Hobson, Note, North Carolina's Arrested Development: Fourth Amendment Problems in the DNA Database Act of 2010, 89 N.C. L. Rev. 1309 (2011) (unconstitutional because no existing exception to the Warrant Clause applies)

16. Kimberly A. Polanco, Note, Constitutional Law-The Fourth Amendment Challenge to DNA Sampling of Arrestees Pursuant to the Justice for All Act of 2004: A Proposed Modification to the Traditional Fourth Amendment Test of Reasonableness, 27 U. Ark. Little Rock L. Rev. 483 (2005) *Constitutional under a balancing test*.

17. Related note: Jacqueline K. S. Lew, Note, The Next Step in DNA Databank Expansion? The Constitutionality of DNA Sampling of Former Arrestees, 57 Hastings L.J. 199 (2005) *Unconstitutional as applied to "former arrestees."*