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When DNA Won't Work

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WHEN DNA WON'T WORK

RICK VISSER* AND DR. GREG HAMPIKIAN**

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Within the criminal justice system, DNA (deoxyribonucleic acid) evidence has often been heralded as the gold standard of forensic science. In a 2009 U.S. Supreme Court decision, Chief Justice Roberts wrote that "DNA testing has an unparalleled ability both to exonerate the wrongly convicted and to identify the guilty. It has the potential to significantly improve both the criminal justice system and police investigative practices."[1] The phrases "unparalleled ability" and "significantly improve" reflect the high standard that DNA has attained in both forensic science and the entire criminal justice system.

Forensic DNA technology has a major advantage over other forensic science fields because of its reliance on statistics and its historical development from medical science, which relies on double-blind testing, error analysis, and rigorous peer review.[2] These factors distinguish DNA

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1. Dist. Attorney's Office for Third Judicial Dist. v. Osborne, 557 U.S. 52 (2009).

2. NATIONAL RESEARCH COUNCIL, EVALUATION OF FORENSIC DNA EVIDENCE 47 (National Academy Press, 1996).

analysis from other forms of forensic analysis such as fingerprinting, ballistics, trace evidence, forensic anthropology (bones), handwriting analysis, and others.[3] But every analytical field has its limits, and can be misappropriated. This article summarizes some of the key areas where the use of forensic DNA can be improved and includes proposed remedies.

I. AN OVERVIEW OF DNA

DNA is organized in the cell as a long, two-strand, twisted fiber that, along with proteins, forms chromosomes.[4] The basic hereditary instructions are spelled out in DNA, which is organized in functional groups called genes.[5] These genes are inherited from one's mother and father in the egg and sperm.[6] Thus, for most of a person's genes, there are two forms of alleles, one from the mother and one from the father.[7] The specific chromosomal location of a gene is a locus (loci, plural).[8] At a particular locus, every person has a pair of alleles, located on two chromosomes, one of which is from the mother, and the other from the father.[9] In general, a specific gene codes for a single protein or physical trait.[10] Hence, DNA is a code that contains genetic information essential for all cellular functions. There is also a lot of DNA for which there seems to be no direct function.[11] This DNA was once referred to as "junk DNA," and since it can be changed without any apparent health consequences, evolution has tolerated a great variety of sequences and sizes (length of repeating sequences) in these areas.[12] It is from these areas of variation that forensic scientists can most easily determine identity.[13]

Every human cell, except for mature red blood cells, contains a person's complete DNA.[14] These hereditary molecules become visible as twenty-three pairs of chromosomes during cell division and are chemi-

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3. Mark A. Jobling & Peter Gill, *Encoded Evidence: DNA in Forensic Analysis*, 5 NAT. REV. GENET. 739 (2004).

4. *What is DNA?*, GENETICS HOME REFERENCE, http://ghr.nlm.nih.gov/handbook/basics/dna (last visited Aug 31, 2012). *See also Deoxyribonucleic Acid (DNA)*, NAT'L HUMAN GENOME RES. INST., www.genome.gov/25520880 (last visited Sept. 17, 2012).

5. *What is a Gene?*, GENETICS HOME REFERENCE, http://ghr.nlm.nih.gov/handbook/basics/gene (last visited Sept. 17, 2012).

6. *Id.*

7. *Id.*

8. *Id.*

9. *See id.*

10. *Protein*, NAT'L HUMAN GENOME RES. INST., www.genome.gov/Glossary/index.cfm?id=169 (last visited Oct. 5, 2012); *see also What is a Genome?*, GENETICS HOME REFERENCE, www.ncbi.nlm.nih.gov/About/primer/genetics_gen ome.html (last visited Oct. 5, 2012).

11. *DNA Forensics*, HUMAN GENOME PROJECT INFORMATION, http://www.ornl.gov/sci/techresources/Human_Genome/elsi/forensics.shtml#1 (last visited Sept. 17, 2012).

12. *Id.*

13. *Id.*

14. *Frequently Asked Questions*, HUMAN GENOME PROJECT INFORMATION, http://www.ornl.gov/sci/techresources/Human_Genome/faq/faqs1.shtml (last visited Sept. 17, 2012).

cally constructed of just four very similar nucleotide bases (A, G, C, T).[15] Many of our three billion bases of DNA are similar, and over 95% are identical, but there are millions of differences, which can be exploited for profiling procedures.[16] Forensic science presently concerns itself with a very limited subset of these islands of sequence variations (also referred to as alleles).[17] Presently, the FBI requires the length measurement of the alleles found at just thirteen loci to identify an individual in the national criminal DNA database.[18] So by measuring the length of alleles from the mother and the father at thirteen loci (up to twenty-six different alleles), it is thought that a unique DNA profile can be determined, except in the case of identical siblings (twins, triplets, etc.).[19]

DNA can be extracted from all organs, tissues and body products, including bone, hair, saliva, skin, sperm, sweat, urine, blood, and feces. Although saliva, urine, and feces do not have DNA as a constituent, there are usually enough cells included in these samples to allow DNA profiling.[20]

DNA collected from a crime scene can either match a suspect (with a given match probability), exclude a suspect, or be inconclusive.[21] In the United States, the search for a match is usually done through CODIS (Combined DNA Index System).[22] CODIS is technically the FBI's software for processing and analyzing DNA, but the term CODIS is used generally to refer to the national criminal and forensic DNA system as a whole.[23] A national database of offender profiles, arrestee profiles, and forensic crime scene profiles is maintained by the FBI and called the National DNA Index System (NDIS).[24] It contains all DNA profiles contributed by participating federal, state, and local forensic laboratories.[25] CODIS is designed to compare a target DNA record against the DNA records contained in the database.[26] Once a match is identified by the CODIS software, the laboratories involved in the match exchange information to verify the match.[27] This match can establish the probable

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15. *Id.*

16. *Id.*

17. *See* Karen Norrgard, *Forensics, DNA Fingerprinting, and CODIS*, NATURE EDUCATION (2008), http://www.nature.com/scitable/topicpage/forensics-dna-fingerprinting-and-codis-736 (last visited Oct. 5, 2012); *see also What is DNA?*, *supra*, note 4.

18. Norrgard, *supra* note 17.

19. *Id.*

20. *Id.*

21. *Interpreting Results of DNA Analysis*, OFFICE OF JUSTICE PROGRAMS, www.ojp.usdoj.gov/ovc/publications/bulletins/dna_4_2001/dna8_4_01.html (last visited Oct. 5, 2012).

22. For a thorough discussion of CODIS, *see Combined DNA Index System (CODIS)*, FBI, http://www.fbi.gov/about-us/lab/codis (last visited Aug. 31, 2012).

23. *What is CODIS?*, DNA INITIATIVE, www.dna.gov/solving-crimes/cold-case/howdatabasesaid/codis (last visited Oct. 5, 2012).

24. *Interpreting Results of DNA Analysis*, *supra* note 21.

25. *Id.*

26. *The FBI and DNA,* FBI, http://www.fbi.gov/news/stories/2011/november/dna_112311 (last visited Sept. 17, 2012).

27. *Id.*

cause necessary to obtain an evidentiary DNA sample from the suspect.[28] The laboratory in the jurisdiction of the crime can then perform a DNA analysis on the suspect's sample, and this analysis can be presented as evidence in court.[29] There is also a separate national missing persons database which uses the CODIS system.[30] In 2010, more than 100,000 crimes were matched to convicted felons' and missing persons' DNA in the CODIS system.[31]

The speed and efficiency of CODIS can be very impressive. In a 2012 rape case in Texas, the Houston Police Department crime lab got a match to a DNA profile it submitted to CODIS in two hours.[32] However, the software is not the limiting factor in the speed of response, and therein lies one of the major problems in the system. The number of DNA samples and corresponding backlogs can plague law enforcement and slow down response time.[33]

With the expansion to arrestee testing in many states, there have been many questions raised about an arrestee's civil rights.[34] The FBI has developed a consistent policy of safeguarding personal information, which includes assigning a specimen number to each DNA sample—a number for which only the state crime lab has the matching information.[35] Hence, one's name and personal information are not included in CODIS.[36] In 2012, the Ninth Circuit upheld California's DNA Data Bank Act, which includes the collection of DNA samples from all adults arrested for felonies.[37]

The FBI has strict standards and regulations that control the submission of DNA profiles to CODIS.[38] However, a U.S. district court recently held that the FBI was required to run a CODIS comparative search, even if the DNA sample is not submitted by a CODIS state administrator, and even if it is not developed by an accredited DNA labor-

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28. *Id.*

29. *See id.*

30. *Kidnapping & Missing Persons,* FBI*,* http://www.fbi.gov/wanted/kidnap (last visited Sept. 17, 2012).

31. Ryan Naquin, *Serial Rapist Cold Case Uses Federal DNA Database*, CAROLINA LIVE.COM (June 27, 2012, 9:55 PM), http://www.carolinalive.com/news/story.aspx?id=770518#.T-zUmd1mR8E.

32. Sally MacDonald, *Man Suspected of Multiple Sex Assaults*, MY FOX HOUSTON (July 7, 2012, 11:55 AM), http://www.myfoxhouston.com/story/18826417/man-suspected-of-multiple-sex-assaults.

33. *Using DNA to Solve Crimes*, U.S. DEP'T OF JUSTICE, http://www.justice.gov/ag/dnapolicybook_solve_crimes.htm (last visited Nov. 4, 2012) (discussing how the crime labs' backlogs can harm investigations).

34. *See DNA Collection Upon Arrest*, THE AM. CIV. LIBERTIES UNION OF WASH. ST., http://www.aclu-wa.org/legislative-agenda/dna-collection-upon-arrest (last visited Oct. 5, 2012).

35. *CODIS and NDIS Fact Sheet,* FBI*,* http://www.fbi.gov/about-us/lab/codis/codis-and-ndis-fact-sheet/ (last visited Sept. 17, 2012).

36. *See* United States v. Kincade, 379 F.3d 813, 818 (9th Cir. 2004).The *Kincade* decision includes a detailed analysis of the constitutionality of taking DNA samples.

37. Haskell v. Harris, 669 F.3d 1049, 1050 (9th Cir. 2012).

38. *Combined DNA Index System (CODIS)*, FBI, http://www.fbi.gov/about-us/lab/codis (last visited Sept. 17, 2012).

atory.[39] In that case, the court recognized the importance of the DNA Identification Act, quality assurance standards, and FBI operational standards. It also placed more weight on U.S. Supreme Court precedents, and on advancing the interests of justice.[40] However, the defendant's exoneration still required patience. In 2011, a unanimous Illinois Appellate Court reversed Juan Rivera's conviction and barred a retrial.[41] On January 6, 2012, Mr. Rivera walked out of prison a free man.[42]

II. THE FIRST SUCCESSFUL USE OF DNA IN A CRIMINAL CASE

In 1983, a teenage girl was raped and murdered in England.[43] Although semen was recovered from the victim that yielded a blood type and an enzyme type, no arrests were made.[44] In 1986, a similar rape and murder occurred.[45] Semen from the second case revealed the same blood type as found in the previous crime.[46] In the 1986 case, a suspect, Richard Buckland, confessed to the crime, but he denied involvement in the earlier murder and rape.[47] Alec Jeffries, a genetics professor and the father of DNA profiling, was consulted.[48] Dr. Jefferies compared the DNA from the two crime scenes against the reference DNA from Buckland and found both a match and an exclusion.[49] The semen from the first crime matched the semen from the second.[50] Hence, the same person committed both crimes, but it was not Buckland.[51]

Local law enforcement then sought blood samples from male volunteers in the vicinity.[52] More than 5,000 samples were examined; still, no match was found.[53] The break in the case came when a man told other men in a pub that he had been paid to give a DNA sample for a friend named Colin Pitchfork.[54] Pitchfork was arrested and gave a blood sample for DNA testing.[55] His DNA profile matched that of the rapist and murderer.[56] Pitchfork later pled guilty to both crimes and was sentenced

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39. Rivera v. Mueller, 596 F.Supp.2d 1163, 1170–73 (N.D.Ill 2009).
40. *Id.* at 1170–72.
41. *See generally* People v. Rivera, 962 N.E.2d 53 (Ill. App. Ct. 2011).
42. *Juan Rivera, Center on Wrongful Convictions*, NW. L., http://www.law.northwestern.edu/cwc/exonerations/ilRiveraSummary.html (last visited Sept. 17, 2012).
43. Tim Lambert, *The Case of Colin Pitchfork,* LOC. HISTS., www.localhistories.org/pitchfork.html (last visited Sept. 17, 2012); *see also* JOSEPH WAMBAUGH, THE BLOODING (1989).
44. *Id.*
45. *Id.*
46. *Id.*
47. *Id.*
48. *Id.*
49. *Id.*
50. *Id.*
51. *Id.*
52. *Id.*
53. *Id.*
54. *Id.*
55. *Id.*
56. *Id.*

to life imprisonment.[57] This early case laid the foundation for the dual potential of DNA—a forensic tool that could both exclude and identify suspects. Richard Buckland was, ironically, both the first subject of a DNA investigation, and the first person to obtain freedom through DNA.[58]

III. THE O.J. SIMPSON CASE AND THE CSI PHENOMENON

In 1994, the O.J. Simpson (OJ) case brought forensic DNA to households around the world.[59] The live televised trial lasted nine months, the longest criminal trial ever held in the State of California.[60] Simpson's "Dream Team" included eleven attorneys, who succeeded in attacking the credibility of many of the State's witnesses.[61]

DNA extracted from forty-five bloodstains was used as evidence.[62] Two Los Angeles Police Department criminalists introduced the evidence and were on the witness stand for three weeks.[63] Their testimony and that of the DNA experts was so complicated that it confounded at least some of the jurors, many observers, and even some legal experts.[64]

The legal term used at trial was "not excluded."[65] To summarize, experts testified that OJ could not be excluded from the crime scene based on seven blood samples.[66] The glove found on OJ's property had at least ten different blood stains tested; four of the ten samples were of sufficient quality to perform RFLP tests.[67] The results indicated that OJ, Nicole Brown Simpson, or Ron Goldman could not be excluded.[68] OJ's socks had at least six blood stains, of which three could not exclude Nicole, and the other three could not exclude OJ.[69]

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57. *Id.*

58. *Id.*

59. Doug Linder, *The Trial of Orenthal James Simpson*, UMKC SCH. OF L., http://law2 .umkc.edu/faculty/projects/ftrials/Simpson/Simpsonaccount.htm (last visited Oct. 5, 2012).

60. *Id.*

61. *Id.*

62.. *Simpson Trial: the DNA Evidence,* UMKC SCH. OF L., http://law2.umkc.edu /faculty/projects/ftrials/Simpson/Dna.htm (last visited Sept. 24, 2012) [hereinafter *Simpson Trial*].

63. Linder, *supra* note 59.

64. *Id.*

65. *See id.*

66. *Id.*

67. *See Simpson Trial*, *supra* note 62. RFLP stands for "restriction fragment length polymorphism;" these are segments of DNA analyzed for identifying biological samples. It was developed in the 1980s for forensic DNA use. *See 1980's – DNA Testing Using RFLP Technique*, DNA DIAGNOSTICS CENTER, http://www.dnacenter.com/science-technology/dna-history-1980.html (last visited Sept. 24, 2012).

68. *Id.*

69. *Id.*

One juror later said that it was difficult to keep track of all the scientific evidence,[70] and defense attorney Alan Dershowitz commented that "[m]uch of the expert testimony was incomprehensible to *me*—and I have been teaching law and science for a quarter of a century."[71] The lesson here is that if DNA evidence is too difficult to understand, it will not work in trials.

As incomprehensible as the evidence might have been, however, the OJ trial marked a turning point in the public's attitude toward DNA and other scientific evidence. Through non-stop television coverage of the trial, DNA and its use in criminal justice were shown to millions of Americans for the first time.[72]

Those Americans, of course, included thousands of inmates, some of whom subsequently used DNA in their legal proceedings.[73] It should be noted that prior to the Simpson trial, there had been fourteen exonerations in which DNA evidence had proved that the individuals had been wrongfully convicted.[74] Since the OJ trial, the number of DNA exonerees has increased to 297.[75] The television industry in particular was acutely aware of the public's fascination with DNA, and newsmagazine programs began producing a steady stream of shows in which DNA was highlighted.[76] *48 Hours*, *20/20*, *Dateline*, *Frontline*, and other programs gained popularity in part because of their DNA-based stories. Then, in 2000, *CSI: Crime Scene Investigation* debuted on CBS. For the next nine seasons, *CSI* was ranked in the top ten every year, including two seasons as the number one show and two seasons as the number two show. The original *CSI* has risen to international status, and spawned several spinoff series. In June of 2010, it was declared the most watched show in the world.[77] The popularity of the *CSI* shows spawned a new phenomenon dubbed the CSI effect.[78] Its essence is the claim by some

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70. Thomas L. Jones, *The Murder Trial of O.J. Simpson*, TRUTV, http://www.trutv.com/library/crime/notorious_murders/famous/simpson/blood_12.html (last visited Oct. 5, 2012).

71. *Id.*

72. *Id.*

73. *See Know the Cases*, INNOCENCE PROJECT, http://www.innocenceproject.org/know/Browse-Profiles.php (last visited Oct. 5, 2012).

74. *Id.*

75. *See id.*

76. *See* Paul R. Brewer & Barbara L. Ley, *Media Use and Public Perceptions of DNA Evidence*, 32 SCI. COMM. 93, 95 (2010).

77. Bill Gorman, *CSI: Crime Scene Investigation Is The Most Watched Show in the World!*, TV BY THE NUMBERS (June 11, 2010), http://tvbythenumbers.com/2010/06/11/csi-crime-scene-investigation-is-the-most-watched-show-in-the-world/53833.

78. Tom R. Tyler, *Viewing CSI and the Threshold of Guilt: Managing Truth and Justice in Reality and Fiction*, 115 YALE L.J. 1050, 1050 (2006).

> The CSI effect is a term that legal authorities and the mass media have coined to describe a supposed influence that watching the television show CSI: Crime Scene Investigation has on juror behavior. Some have claimed that jurors who see the high-quality forensic evidence presented on CSI raise their standards in real trials, in which actual evidence is typically more flawed and uncertain.
>
> *Id.*

prosecutors that all jurors now expect DNA evidence in every trial.[79] To the extent that this is true, it presents a problem, since DNA evidence is either not probative or not available in many cases. Most Internet crimes, for example, do not involve DNA; the same is true in rape cases where the defense is consent. Two changes would help alleviate this problem. First, juries should be instructed that DNA evidence will be included or not included in the trial for specific reasons. Second, prosecutors and defense attorneys should be prepared to clearly and skillfully explain to a jury why there is no DNA evidence in a given trial.

How prevalent is the CSI effect? More than 1,000 potential jurors in Michigan were surveyed. The survey asked questions about seven types of cases:

- Every criminal case
- Murder or attempted murder
- Physical assault of any kind
- Rape or other criminal sexual conduct
- Breaking and entering
- Any theft case
- Any crime involving a gun

With respect to each of these categories, the jurors were asked what types of evidence they expected to see:

- Eyewitness testimony from the alleged victim
- Eyewitness testimony from at least one other witness
- Circumstantial evidence
- Scientific evidence of some kind
- DNA evidence
- Fingerprint evidence
- Ballistics or other firearms laboratory evidence[80]

The results are interesting:

- Forty-six percent expected to see some kind of scientific evidence in *every* criminal case.
- Twenty-two percent expected to see DNA evidence in *every* criminal case.
- Thirty-six percent expected to see fingerprint evidence in *every* criminal case.
- Thirty-two percent expected to see ballistic or other firearms laboratory evidence in *every* criminal case.[81]

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79. *E.g.*, Shayna Jacobs, *The CSI Effect: Lack of DNA Evidence Spared Cops Accused of Rape*, DNA INFO.COM (May 27, 2011, 9:15 AM), http://www.dnainfo.com/new-york/20110527/lower-east-side-east-village/csi-effect-spared-cops-accused-of-rape-legal-experts-say.

80. Hon. Donald Shelton, *The CSI Effect: Does it Really Exist?*, NAT'L INST. OF JUST. J. (Mar. 2008), https://www.ncjrs.gov/pdffiles1/nij/221500.pdf.

Of the four types of evidence, DNA actually turned out to be the *least* expected kind of evidence in a criminal trial. So it appears that many potential jurors understand that DNA evidence is not available or needed in every trial. On the other hand, the fact that almost half of the potential jurors expected to see some kind of scientific evidence in every case suggests that the proliferation of high-tech crime shows has had a major impact.

Let us now consider some circumstances in which DNA could be potentially valuable and probative evidence, but for some reason is not.

IV. WHEN DNA WON'T WORK

A. DNA won't work when a DNA database's collection is limited.

A "database" is defined as a large collection of data organized especially for rapid search and retrieval (as by a computer).[82] One significant key to the success of CODIS searches is the scope of its database. We will see, however, that the DNA database is neither as large nor as current as it could be because inclusion varies from state to state. An important role delegated to the states is to determine what the qualifying offenses for arrestees or offenders are and also which DNA evidence goes into the state database and from there into CODIS. However, not all state database entries may qualify for NDIS. In fact, the main source of variation in state submissions is that the inclusion of DNA from offenders and arrestees depends on the laws of *each* state.[83] All fifty states have DNA database laws.[84] Colorado was the first to enact such a law in 1988.[85] Idaho enacted its DNA Database Act of 1996 in 1997.[86] Currently, Idaho is the only state in the country[87] that does not take, at a minimum, DNA samples from all convicted felons.[88]

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81. *Id.*

82. *Database Definition,* MERRIAM-WEBSTER.COM, http://www.merriam-webster.com/dictionary/database (last visited Sept. 17, 2012).

83. *See* Lauren Arihood, *Do You Know What Is Happening with Your Lab's CODIS Hits?* PROMEGA, https://www.promega.com/~/media/files/resources/conference%20proceedings/ishi %2020/poster%20abstracts/poster69.pdf?la=en (last visited Nov. 5, 2012).

84. *DNA Forensics*, *supra* note 11.

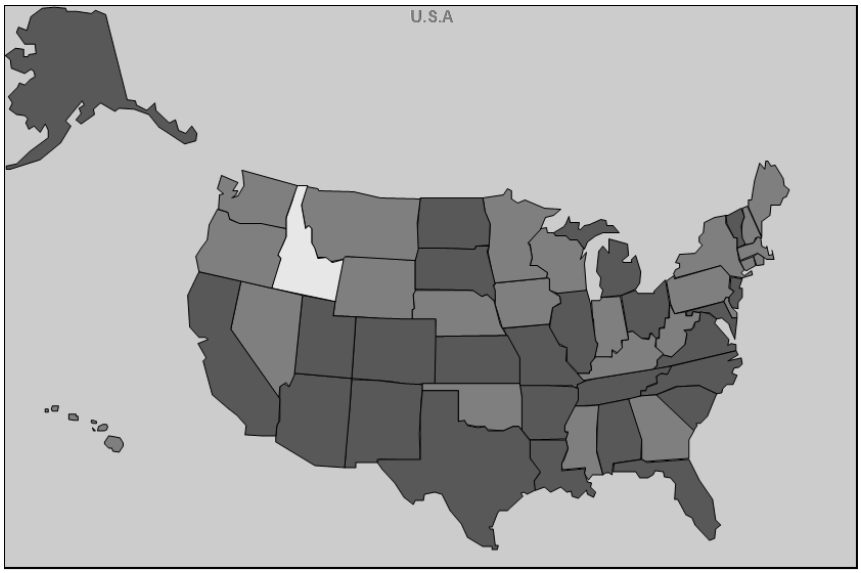
85. COLO. REV. STAT. § 17-2-201(g)(I), (II) (2012).

86. DNA Database Act of 1996, ch. 120, 1997 Idaho Sess. Laws 343.

87. See *infra* Figure 1 and Table 1.

88. Idaho's status will change on July 1, 2013 when an amendment takes effect. It will include all felony offenses. *See* DNA Database Act of 1996 ch. 211, 2011 Idaho Sess. Laws 594.

Figure 1. DNA Database Laws[89]



Legend:
Medium shade = states that take DNA samples from all convicted felony offenders
Dark shade = states that take DNA samples from all convicted felony offenders and from some arrestees
White = state that takes DNA samples from some convicted felony offenders

From whom does the Idaho State Police process DNA samples? Idaho Code section 19-5506 lists sixty-one crimes and fifty-one attempted crimes as qualifying offenses for its DNA Database Act. Below are some examples of qualifying crimes in Idaho that require a person to give a DNA sample.

1. Arson[90]
2. Propelling bodily fluid or waste[91]
3. Burglary (although some burglaries are exempt)[92]
4. False reports of explosives[93]
5. Forest sabotage[94]
6. Mayhem[95]

89. *Requiring DNA Testing upon Felony Arrest*, NAT'L FED'N OF REPUBLICAN WOMEN, http://www.nfrw.org/programs/issues/katieslaw.htm (last visited Sept. 1, 2012).
90. IDAHO CODE ANN. § 19-5505(1) (2012).
91. *Id.* at (9).
92. *Id.* at (11).
93. *Id.* at (21).
94. *Id.* at (32).
95. *Id.* at (33).

7. Rape[96]
8. Racketeering[97]
9. Injuring dams, canals or other structures[98]
10. Setting fire to underground workings of mines[99]
11. Removal of electrical lines[100]

Felony gang activity and felony DUIs are missing from the list; so is possession of a controlled substance unless the person in possession is currently an inmate.[101]

Idaho's law is as interesting for what it excludes as it is for what it includes. For example, many law enforcement professionals would agree that drug dealers and gang members are more likely than the average person to commit violent crimes such as rape or murder.[102] Yet convicted drug dealers and gang members are not required to provide a DNA sample.[103] It is possible then, that the perpetrator of an unsolved rape or murder case could be in prison, but if his conviction and incarceration were for another crime, such as the possession of a controlled substance, a sample of his DNA would not have been taken. The increased ability to solve cold cases is a compelling reason to expand Idaho's database to at least include DNA samples from all convicted felons.

Why has Idaho's DNA Database Act not been expanded sooner? During the 2010 Idaho Legislative session, Representative Jim Patrick, R-Twin Falls, told a reporter that "I know we will not be able to allocate enough money to go further this year, since the next step with the [DNA] database is very expensive."[104] However, prices for taking DNA samples and processing them are quite low. DNA collection swabs that ensure a high yield uptake can be purchased in lots of 500 for $595.00.[105] Prices for processing DNA samples have also dropped significantly in recent years.[106] For example, one well-established private DNA lab can perform DNA profile testing for $500.00 per sample.[107]

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96. *Id.* at (38).
97. *Id.* at (54).
98. *Id.* at (48).
99. *Id.* at (49).
100. *Id.* at (46).
101. *See* §§ 19-5506(20) & 18-2511 (repealed, Mar. 20, 2012).
102. *See generally* David R. Truman, *The Jets and Sharks Are Dead: State Statutory Responses to Criminal Street Gangs*, 73 WASH. U. L. Q. 683, 683 (1995) (stating that gang members "accounted for a record 430 of Los Angeles's 1,100 murders in 1992").
103. § 19-5506.
104. *Lawmaker Says Budget Woes Will Doom DNA Bill*, THE COLUMBIAN (Feb. 1, 2010), http://www.columbian.com/news/2010/feb/01/lawmaker-says-budget-woes-will-doom-dna-bill/.
105. *Buccal Swabs/DNA Extraction*, BOCA SCI., http://www.bocascientific.com/buccal-swabsdna-extraction-c-124.html (last visited Sept. 17, 2012).
106. Randall Parker, *On The Declining Costs Of DNA Sequencing*, FUTUREPUNDIT (Nov. 19, 2003, 12:12 PM), http://www.futurepundit.com/archives/001802.html.
107. *Forensic Services Price List*, BODE TECH. (Dec. 1, 2012), http://www.bodetech.com/wp-content/uploads/2011/12/DNA-Services-Pricing-2011.pdf.

Changing Idaho's DNA Database Act to include all felony convictions is a first step, even though the delay seems unwarranted. The next step could be the inclusion of felony arrestees. In 2000, Alaska was one of the first of twenty-six states to add certain felony arrests to its DNA database.[108] New Mexico has had success with such a system. "Since January 1, 2007, New Mexico (with a population of a little over one million people) has had thirty-three matches from arrestees to unsolved crimes, including three homicides, four rapes, and one kidnapping."[109] Arrestee DNA databases can and do work, but significant civil rights issues need to be addressed, including the question of how profiles are removed upon acquittal.

DNA samples from arrestees in states that take such samples have even had an impact in Idaho. In 2010, a seven-year-old unsolved Idaho rape case that had crime scene DNA profiles (from the two rapists' semen) in CODIS got a match to a newly submitted DNA profile.[110] The profile came from a man *arrested* in Florida for a drug crime.[111] Florida includes DNA samples from felony arrestees in its DNA Database.[112] Detectives interviewed the suspect, and he admitted to the kidnapping and rape.[113] He also named his father as his accomplice.[114] The case is on its way to closure.[115] Florida is a glowing example of how DNA can be used to quickly and effectively solve crimes. Florida's state DNA database has over 700,000 samples, and it receives an average of 7,000 new samples every month.[116] Florida's DNA offender and arrestee backlog is less than thirty days.[117]

The most important reason to take DNA samples from arrestees, however, is to prevent future crimes.[118] Indeed, case studies reveal that some jurisdictions that do not include arrestee DNA in their databases have had tragic results.[119] In Illinois, for example, if DNA samples had

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108. *2000 Forensic* DNA *Expansion Legislation*, DNARESOURCE.COM, http://www.dnaresource.com/documents/2000DNAExpansionLegislation.pdf (last visited Sept. 17, 2012).

109. JEFFREY D. KLEIN, "DNA COLLECTION UPON ARREST" EXPANSION OF THE NEW YORK STATE DNA DATABASE 17 (2009), *available at* http://www.nysenate.gov/files/pdfs/DNA%20upon%20arrest%20%202-09.pdf.

110. *Father, Son Arrested in 2003 Rape, Kidnapping*, CRESTVIEW NEWS BULLETIN (Apr. 9, 2010), http://webcache.googleusercontent.com/search?q=cache:vr9NHnZGwuMJ:www.crestviewbulletin.com/articles/span-9430-idahostyle.html+&cd=1&hl=en&ct=clnk&gl=us&client=firefox-a.

111. *Id.*

112. FLA. STAT. ANN. § 943.325(3)(a) (LexisNexis 2012).

113. *Father, Son Arrested in 2003 Rape, Kidnapping*, *supra* note 110.

114. *Id.*

115. *Id.*

116. *DNA Puts More Criminals Behind Bars in Nov, Says FDLE*, WEST ORLANDO NEWS ONLINE (Dec. 13, 2010), http://westorlandonews.com/2010/12/13/dna-puts-more-criminals-behind-bars-in-nov-says-fdle/.

117. *See infra* Section IV. B (discussing DNA backlogs); *see also* Beth Burger, *FBI says Backlog of DNA Database is now Cleared*, BRADENTON HERALD, (Dec. 15, 2010), http://www.bradenton.com/2010/12/15/2813341/fbi-says-backlog-of-dna-database.html.

118. *The Chicago Study,* DNA SAVES, www.dnasaves.org/dna_law.php (last visited Sept. 17, 2012).

119. *See id.*

been collected from eight serial killers and rapists upon their arrest, there would have been additional charges brought based on existing unsolved crimes.[120] Assuming that those charges had led to convictions based on the DNA evidence, more than fifty subsequent violent crimes, including twenty-two murders and thirty rapes, would not have occurred.[121]

In Washington, Anthony Dias was arrested on July 31, 2005 for a felony hit-and-run.[122] Washington does not take DNA samples from felony arrestees.[123] Dias was released, and before he went to trial he committed at least six rapes.[124] All of his victims were repeatedly raped during his hours-long assaults.[125] Five of those rapes could have been prevented had a DNA sample been required following Dias' July 2005 arrest.[126] A CODIS match would have surfaced that matched Dias' arrest DNA sample to the crime scene DNA evidence from the first rape.

A California case, in which an early DNA sample could have prevented further crimes, is probably the most tragic. On January 26, 1987, Chester Dewayne Turner was arrested for assault with a firearm.[127] There was not enough evidence to convict him, and he was set free.[128] His DNA was not taken.[129] He was arrested twenty more times before he was finally convicted of rape in 2002, and his DNA was taken.[130] It matched the DNA evidence found on twelve rape and murder victims.[131] The first was murdered in March of 1987, less than two months after his first arrest.[132] In 2004, California amended its DNA database law and added DNA collection from any adult person arrested for a felony crime.[133] The law also requires that the sample be taken immediately following arrest and prior to release.[134] Had Chester Turner's DNA been taken when he was arrested on January 26, 1987, it is probable that eleven of his victims would still be alive.[135]

A further expansion of the DNA database is also gaining momentum. Twenty-three states now take DNA samples from anyone convicted

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120. *Id.*
121. *Id.*
122. Nicole Brodeur, *One Chilling Reason to Pass DNA Law*, THE SEATTLE TIMES (Feb. 9, 2012 8:29 PM), http://seattletimes.com/html/nicolebrodeur/2017470143_nicole10m.html.
123. *Id.*
124. *Id.*
125. *Id.*
126. *Id.*
127. Ernest Hewett, *Arrestee DNA Saves Lives,* THE LEGISLATOR, 11, 12 (Mar. 2012), http://www.housedems.ct.gov/hewett/pubs/NBCSL_Legislator_Mar2012_Page11-13.pdf.
128. *Id.*
129. *Id.*
130. *Id.*
131. *Id.*
132. *Id.*
133. CAL. PENAL CODE § 296(a)(2)(c)(West 2012).
134. *Id.*
135. *See* Hewett, *supra* note 127.

of a sex crime misdemeanor.[136] There is proof that taking DNA from those convicted of certain misdemeanors helps solve and prevent crimes. In New York state, DNA samples collected from people convicted of petty larceny have been linked to roughly forty-eight murders and 220 sexual assaults.[137] But New York does not take DNA samples from all misdemeanor convictions, which has led to tragic results.[138] For example, Curtis Tucker had been convicted multiple times in New York courts for misdemeanor offenses that did not require providing a DNA sample.[139] Had he been required to provide such a sample after his first misdemeanor conviction, an unsolved 2004 attempted rape case would have been solved earlier and a brutal 2010 assault prevented.[140]

DNA has the unquestioned ability to identify the guilty and can both solve cold cases and prevent future crimes. There is indeed a clear public safety interest in taking DNA samples from anyone arrested for a felony, but civil rights issues regarding potential racial and socioeconomic disparities in database representation need debate and careful consideration. Proper provisions must also be in place to remove DNA profiles of all those who are acquitted or against whom charges have been dropped. By ignoring these basic human rights considerations, the UK has recently been subjected to sanctions from the European Union for not overseeing its DNA database, and it now must remove millions of profiles from its national database.[141] Universal DNA registration, driver's license DNA, or an opt-in system with additional benefits should all be considered.

B. DNA won't work when there is a backlog[142] of offender/arrestee DNA samples.

The federal government says that "[o]ne of the biggest problems facing the criminal justice system today is the substantial backlog of unanalyzed DNA samples."[143] While all fifty states have DNA collection

136. *State DNA Database Laws – Qualifying Offenses,* DNARESOURCES.COM, www.dnaresource.com/documents/statequalifyingoffenses2010.pdf (last visited Sept. 1, 2012).

137. Cyrus R. Vance, Jr., *Taking DNA from All Criminals Should Be Standard Procedure*, N.Y. TIMES (Jan. 23, 2012), http://www.nytimes.com/2012/01/24/opinion/collect-dna-samples-even-when-its-just-a-misdemeanor.html?_r=1.

138. *Id.*

139. *Id.*

140. *Id.*

141. Andrew D. Thibedeau, *National Forensic DNA Databases,* COUNCIL FOR RESPONSIBLE GENETICS 1, 17 (2011), http://www.councilforresponsiblegenetics.org/dnadata/fullreport.pdf.

142. The National Institute of Justice defines a backlogged case as one that has not been tested within thirty days after it was submitted to the laboratory. *Backlogs of Forensic DNA Evidence,* NAT'L INST. OF JUSTICE, http://www.nij.gov/topics/forensics/lab-operations/evidence-backlogs/welcome.htm (last visited Sept. 17, 2012).

143. *Using DNA to Solve Crimes*, *supra* note 33.

laws, there is a significant number of DNA offender and arrestee samples that have not yet been processed.[144]

In 2008, there were more than 455,000 DNA samples from state felony offenders and felony arrestees that had not yet been processed by state crime labs.[145] In 2010, there were over 6,000 DNA felony offender samples in Idaho's backlog.[146] Some of the samples on hold date back to 2006.[147] Even during a recession, there are things that can be done to reduce this backlog. In 2011, the U.S. Department of Justice's National Institute for Justice (NIJ) combined two existing DNA grant programs into one program to better assist in the reduction of DNA backlogs.[148] The new program is called the DNA Backlog Reduction Program.[149] From 2004 to 2010, NIJ's former Forensic DNA Backlog Reduction Program awarded almost $400 million to all fifty states.[150] In some states, the program has been a huge success. Michigan, for example, had a ten-year backlog of more than 70,000 convicted felony offender DNA samples.[151] In 2003, the Michigan State Police (MSP) was awarded an NIJ grant.[152] MSP's proposal was to outsource all 70,000 samples to a private DNA testing lab.[153] Bode Technology was the lab selected, and it processed the 70,000 samples along with an additional 10,640 samples within one year.[154] How helpful was it? "The elimination of the DNA backlog is good news for Michigan because it means law enforcement has a greater chance of connecting criminals to previously unsolved crimes or linking previously unrelated crimes to a single suspect," said Colonel Tadarial J. Sturdivant, director of the Michigan State Police.[155] "The more samples in the State's database, the more likely investigators

144. The year-end backlog of offender samples was 952,393 in 2009. *DNA Evidence Backlogs: Convicted Offender and Arrestee Samples*, NAT'L INST. OF JUSTICE, http://www.nij.gov/nij/topics/forensics/lab-operations/evidence-backlogs/convicted-offender-arrestee-samples.htm (last visited Oct. 5, 2012) [hereinafter *DNA Evidence Backlogs: Samples*].

145. *DNA Evidence Backlogs: Convicted Offender and Arrestee Data, 2007–2009,* NAT'L INST. OF JUST., http://nij.gov/topics/forensics/lab-operations/evidence-backlogs/convicted-offender-data.htm (last visited Sept. 17, 2012) [hereinafter *DNA Evidence Backlogs: Data*].

146. Joelyn Hansen, *Thousands of State DNA Samples Await Processing*, POST REGISTER (Oct. 9, 2010), http://www.postregister.com/story.php?accnum=1001-10092010&today=2010-10-09&keywords=thousands+of+state+DNA+samples+await+processing.

147. *Id.*

148. *DNA Evidence Backlogs: Samples*, *supra* note 144.

149. *DNA Backlog Reduction Program*, NAT'L INST. OF JUST., http://nij.gov/topics/forensics/lab-operations/evidence-backlogs/backlog-reduction-program.htm (last visited Sept. 17, 2012).

150. *Backlog Reduction Funding Awards, 2004-2010,* NAT'L INST. OF JUST., http://nij.gov/nij/topics/forensics/lab-operations/evidence-backlogs/backlog-reduction-funding.htm (last visited Sept. 17, 2012).

151. *10-Year DNA Backlog Eliminated in 12 Months*, MICHIGAN.GOV (Aug. 31, 2004), http://www.michigan.gov/msp/0,4643,7-123-1586_1710-99859--,00.html.

152. *Id.*

153. *Id.*

154. *Id.*

155. *Id.*

will make a match and either remove a dangerous criminal from the streets or keep one behind bars."[156] In 2006, the FBI had a backlog of over 295,000 federal prisoners' DNA its database.[157] By 2010, that backlog had been cleared.[158] The FBI's goal is to have all qualifying federal inmates give a DNA sample prior to their release.[159] The Idaho State Police (ISP) crime lab received $1,172,894[160] for forensic DNA backlog reduction, and it has made progress with its forensic DNA backlog. But for DNA to work more effectively in Idaho, its *offender* backlog needs to be reduced or eliminated. Colonel Sturdivant is correct in recognizing the value in increasing the number of DNA samples in a state's DNA database. Idaho, however, never received any convicted offender DNA backlog funding, because it had not applied.[161]

One mechanism that many states are using to quickly and cost-effectively eliminate offender backlogs is outsourcing.[162] This requires that the lab fulfill the requirement of the FBI's Quality Assurance Standard 17.[163] Standard 17 addresses the outsourcing of offender/arrestee or casework samples.[164] Under Standard 17, law enforcement agencies seeking to outsource offender and/or casework samples must have the technical specifications of the outsourcing agreement approved in advance by the technical leader of the NDIS participating laboratory that will be entering the DNA data into CODIS.[165] *At a minimum, the outsourced laboratory must follow the FBI's Quality Assurance Standards and be accredited.*[166] Standard 17 of the Quality Assurance Standards also requires the completion of an on-site visit to the vendor laboratory and a technical review of the outsourced DNA records by the NDIS participating laboratory.[167] The ISP crime lab (the NDIS laboratory for Idaho) has not pursued the FBI's Quality Assurance Standard 17 requirements for testing agreements with private laboratories.[168] In Idaho, only the ISP crime lab can upload profiles to the national FBI database of forensic and offender samples.[169] In order for an NDIS lab like ISP's to upload samples processed at another lab, the outsourced lab(s) must

156. *Id.*
157. Burger, *supra* note 117.
158. *Id.*
159. *Id.*
160. *Backlog Reduction Funding Awards, 2004-2010*, *supra* note 150.
161. *Convicted Offender and/or Arrestee Backlog Reduction Funding Awards, 2005-2010,* NAT'L INST. OF JUST., http://nij.gov/nij/topics/forensics/lab-operations/evidence-backlogs/convicted-offender-funding.htm (last visited Oct. 8, 2012).
162. *Quality Assurance Standards for Forensic DNA Testing Laboratories,* FBI http://www.fbi.gov/about-us/lab/codis/qas_testlabs/ (last visited Oct. 8, 2012).
163. *Id.*
164. *Id.*
165. *Id.*
166. *Id.*
167. *Id.*
168. Interview with Cyndi Cunnington, CODIS Administrator, Idaho State Police, in Boise, Idaho.
169. *Id.*

adhere to Quality Assurance Standard 17. The ISP lab would have to do what many other state labs do, specifically:

1. Determine that the outsourced laboratory follows the FBI's Quality Assurance Standards and is accredited.
2. Receive approval by the ISP lab's technical leader.
3. Complete an on-site visit to the vendor lab (usually for one day) by a representative of the ISP lab.
4. Perform a technical review of the outsourced DNA records, similar to the review done for all samples.[170]

By not having any Standard 17 procedures in place, some crime labs are unintentionally placing citizens at an increased risk because backlogs are not in the best interest of public safety and because DNA profiles determined outside the scope of Standard 17 cannot be loaded into CODIS. In Idaho, law enforcement agencies and prosecutors already send DNA to be processed in other labs, especially when they want testing done that is not available at the ISP lab, such as Mitochondrial DNA, Y-STR, Mini-STR, or Identifiler.[171] However, even if the non-ISP lab gets a full STR DNA profile, it cannot be loaded into CODIS.[172] Since Standard 17 must be in place *before* any testing is done, any profiles produced for Idaho agencies by private labs cannot be loaded into CODIS.[173]

If the ISP crime lab reached Standard 17 agreements with private laboratories and qualified for a DNA backlog reduction grant, ISP's DNA offender backlog could affordably and quickly be eliminated. Bode Technology and other DNA labs have proven track records of handling states' DNA backlogs.[174] Based on Bode's rate of twenty-five dollars per DNA sample,[175] Idaho's 6,000-sample backlog could be eliminated for $150,000. In 2010, the average convicted offender backlog grant award was $217,500.[176] Over the seven-year existence of the program, the State of Texas has received almost $6 million in funding.[177] Since Bode has a testing rate of one to two thousand samples per month,[178] Idaho's offender DNA backlog could be eliminated in three to six months.

The DNA backlog is also a major obstacle when using DNA evidence to help solve property crimes. There were more than nine million

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170. *Quality Assurance Standards for Forensic DNA Testing Laboratories*, *supra* note 162.

171. Cunnington, *supra* note 168.

172. *Id.*

173. *Id.*

174. *About Bode, Company Overview*, BODE TECH., http://www.bodetech.com /about-bode (last visited Sept. 25, 2012).

175. *Idaho Struggles with DNA Backlog*, ASQ.ORG, http://asq.org/qualitynews/qnt/execute/displaySetup?newsID=9762 (last visited Oct. 8, 2012).

176. *See Backlog Reduction Funding Awards, 2004–2010*, *supra* note 150.

177. *Id.*

178. E-mail from Bode Tech. to author (Oct. 6, 2012) (on file with author).

reported property crimes in the United States in 2009.[179] The rate of property crime was estimated at 3,036 incidents per 100,000 inhabitants, and property crimes in 2009 resulted in losses estimated at $15.2 billion.[180] Only 12% of reported property crimes are solved.[181] An NIJ study, the "DNA Field Experiment," examined the impact of using DNA evidence in property crimes.[182] The study found that collecting DNA in property crimes is affordable and dramatically increased the number of burglary suspects identified.[183] Suspects were identified in 31% of the cases in which DNA evidence was collected and tested.[184] By comparison, only 12% of the non-DNA property crimes were solved.[185] The Denver Police Department and the Denver District Attorney's Office have a Burglary DNA Project in place.[186] The results are dramatic—the burglary rates have dropped 26%, and annual savings to Denver citizens is estimated to be more than $29 million.[187]

C. DNA won't work when CODIS matches are not reported.

A study in Louisiana revealed that a majority of Louisiana's CODIS hits were not investigated by criminal justice agencies.[188] Two explanations were given for this inaction: "1) the statute of limitations ha[d] run . . . or 2) the victim no longer [desired to press] charges."[189] A 2006 article in *USA Today* reported that several DNA matches were either ignored or overlooked.[190] In addition to the two reasons mentioned above, it was found that if there was a match after a case was closed via a conviction or plea, the match was also ignored.[191]

The tragedy here is that the wrong person may have been convicted, and he or she is unaware of potentially exonerating evidence. The FBI is aware of this problem and takes the position that the FBI is not

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179. FBI, U.S. DEP'T OF JUSTICE, UNIFORM CRIME REPORT: *Crime in the United States,* 2009, PROPERTY CRIME 1 (2009), *available at* http://www2.fbi.gov/ucr/cius2009/documents/propertycrimemain.pdf.

180. *Id.*

181. *Id.*

182. John K. Roman et al., *The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes*, NAT'L INST. OF JUST. 143 (2008) *available at* https://www.ncjrs.gov/pdffiles1/nij/grants/222318.pdf.

183. *Id.*

184. *Id.*

185. *Id.*

186. *Denver DNA Burglary Project*, DENVERDA, http://www.denverda.org/dna/Denver_DNA_Burglary_Project.htm (last visited Oct. 8, 2012).

187. *Id.*

188. Arihood, *supra* note 83.

189. *Id.*

190. Richard Willing, *Many DNA Matches Aren't Acted on*, USA TODAY, http://www.usatoday.com/news/nation/2006-11-20-dna-matches_x.htm (last updated Nov. 21, 2006 8:52am).

191. *See* Melissa Harris, *Unreported DNA Stirs Doubt over Conviction,* THE BALTIMORE SUN (Nov. 26, 2008), http://articles.baltimoresun.com/2008-11-16/news/0811160023_1_dna-crime-lab-stefanski.

to blame because CODIS matches are reported to state crime labs.[192] In 2008, it was discovered that a Baltimore city crime lab technician failed to report to any law enforcement agency that DNA recovered from under the fingernails of a murder victim did not match the person convicted of first degree murder.[193] William C. Thompson, chair of the Department of Criminology at UC Irvine, stated, "The detective may deem the DNA hit irrelevant because they think they know who did it—that's what we call tunnel vision."[194] Thompson further stated that "it may be extremely relevant for a defense attorney trying to construct an alternative theory of the case. The best thing is to err on the side of disclosure and openness. Otherwise, things look terrible later."[195] In an email to the *Baltimore Sun*, a Baltimore police spokesman admitted that DNA hits in ten cases were not followed up on.[196] Unreported DNA matches may open the door for successful *Brady* challenges to serious convictions. In *Brady v. Maryland*, the U.S. Supreme Court ruled that suppression by the prosecution of evidence favorable to a defendant who has requested it violates due process if the evidence is relevant to guilt or punishment.[197] Following the *Brady* decision, prosecutors are required to disclose exculpatory or favorable evidence to the defendant.[198] Withholding this evidence may result in a reversal, a retrial, or even a dismissal.[199]

At a 2006 DNA symposium, Frederick Bieber presented a paper on improving the effectiveness of forensic DNA databases.[200] Through his research, he discovered that "hundreds of DNA database matches . . . languish without any follow-up by law enforcement or prosecutors."[201] Idaho Code section 19-5514 requires that DNA information be released only to law enforcement agencies.[202] A strong argument can be made that any DNA match should also be reported to incarcerated inmates linked to the crime.

D. DNA won't work when the DNA evidence has not been preserved.

DNA can be extracted from a drop of blood too small to see, cells left on food, latent prints, and even soap.[203] However, this will only work

192. *See* Burger, *supra* note 117.
193. *See Denver DNA Burglary Project*, *supra* note 186.
194. *Id.*
195. *Id.*
196. *Id.*
197. *See generally* Brady v. Maryland, 373 U.S. 83, 87 (1963).
198. *Id.*
199. *Successful* Brady/Napue *Cases*, CAPDEFNET.ORG (Sept. 27, 2009), http://www.capdefnet.org/hat/contents/constitutional_issues/exculpatory_evi/SUCCESSFUL%20BRADY%20AND%20NAPUE%20CASES.pdf.
200. Frederick R. Bieber, *Turning Base Hits into Earned Runs: Improving the Effectiveness of Forensic DNA Data Bank Programs*, 34 J.L. MED & ETHICS 222, 222 (2006).
201. *Id.*
202. IDAHO CODE ANN. § 19-5514(4) (2004).
203. *Genetics Lecture 1: There's a lot of it about!*, UCLAC.UK, http://www.ucl.ac.uk/~ucbhjow/bmsi/bmsi_1.html (last visited Oct. 8, 2012).

if the biological evidence has been properly collected and preserved; the importance of preserving biological evidence should be self-evident.[204] As of 2010, thirty-two states have biological evidence preservation laws.[205] Currently, Idaho and Utah are the only western states that do not have such laws or administrative rules.[206]

In Idaho, there are evidence policies in place around the state, but they are inconsistent. In some smaller jurisdictions, there is a lack of formal documentation beyond the state police lab's recommendations. In 2009, the Idaho Innocence Project e-mailed a preservation of biological evidence survey to every Idaho Chief of Police Association police department and to every Idaho Sheriff's Association sheriff's office. Fifty-six of the fifty-eight Idaho Chief of Police Association departments replied, as did forty-one of the forty-four Idaho Sheriff's Association offices. The survey revealed that there are eleven different retention periods for biological evidence in rape cases, seven different retention periods for murder cases, and ten different retention periods for unsolved cases. If a crime involved two or more jurisdictions, such differing retention periods can be problematic. Both the police departments and sheriffs' offices are aware of this problem and a vast majority of them desire action. Ninety-one percent of the Idaho Chief of Police Association respondents and 97% of the Idaho Sheriff's Association respondents agreed with the statement, "I would be in favor of a standardized biological evidence preservation process for Idaho." The survey was followed up with extensive conversations with respondents. Idaho Innocence Project staff members were impressed by both Idaho's local law enforcement agencies' cooperation with the research requests and with their eagerness to adopt best practices in evidence collection and retention. The results have been shared with all participants.[207]

Even in states with preservation statutes, impediments to post-conviction testing can exist that thwart an innocent person's fight for freedom. The biological evidence can be inadvertently destroyed, lost, or degraded. Sadly, on occasion, it can also be intentionally thrown out in violation of the law. That is what happened in the case of Robin Lovitt in Virginia.[208] Lovitt, who was convicted of the capital murder and robbery of a pool hall employee in Arlington, Virginia, was sentenced to death in early 2000.[209] When Lovitt sought to appeal the decision, it

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204. Jessie McQuillan, *Preservation of Crime Scene Biological Evidence – the National Picture,* MONT. INNOCENCE PROJECT, L. & JUST. INTERIM COMM., (2010), http://leg.mt.gov/content/Committees/Interim/2009_2010/Law_and_Justice/Meeting_Documents/Feb2010/McQuillanStateDNAlaws.pdf.

205. *See id.*

206. *DNA Evidence Preservation Laws for the United States and the District of Columbia* 3, 10, NEW ENGLAND INNOCENCE PROJECT, http://www.newenglandinnocence.org/wp-content/uploads/2012/03/DNA_Preservation_Statute_List_3_14_12_doc.pdf (last visited Oct. 8, 2012).

207. This paragraph reflects the Idaho Innocence Project's first-hand findings. Documentation is on file with the authors.

208. Lovitt v. True, 330 F. Supp. 2d 603, 629 (E.D. Va. 2004).

209. *Id.* at 606.

came to light that the evidence associated with his case had been destroyed.[210] A court clerk had discarded the murder weapon, a blood-stained pair of scissors.[211] The DNA testing available at the time of the trial could only conclusively tie the blood on the weapon to the victim and not to anyone else.[212] More sophisticated DNA testing is now available, but the evidence—which could have proven guilt or innocence—is not.[213]

Failure to preserve other types of biological evidence can also have unfortunate consequences. In an Idaho case, Charles Fain was convicted in 1983 of the kidnapping, rape, and murder of a young girl.[214] Although semen and pubic hairs from the perpetrator were found on the victim, forensic DNA analysis did not exist at the time of the investigation.[215] An FBI expert determined that the crime scene hairs were similar to Fain's hair and that Fain could not be excluded as their contributor.[216] He was convicted and sentenced to death.[217] In 2001, mitochondrial DNA (mitoDNA) testing was performed on the pubic hairs, and Fain was positively excluded.[218] Fain was exonerated and released, but DNA could not be used to find the real perpetrator.[219] Mitochondrial DNA has far less statistical power, and it cannot be used to search convicted offender or forensic databases in CODIS for matches.[220] The semen evidence, which would be a rich source of nuclear DNA,[221] had been thrown away even before Fain's trial, and an opportunity to get a CODIS match was lost forever.[222] The murder remains unsolved.[223]

A biological evidence preservation bill was introduced during the 2012 Idaho legislative session; however, it died in committee.[224] It set a retention period for unsolved felony crimes in which identity is at issue.[225] Reintroduction is planned for the 2013 session.[226]

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210. *Id.* at 610.

211. *Id.* at 629.

212. *See id.* at 628.

213. *Preservation of Evidence*, THE INNOCENCE PROJECT, http://www.innocenceproject.org/Content/Preservation_Of_Evidence.php (last visited Oct. 8, 2012).

214. State v. Fain, 774 P.2d 252, 116 Idaho 82 (1989).

215. G. Hampikian, E. West & O. Akselrod, *The Genetics of Innocence: Analysis of 194 U.S. DNA Exonerations*, 12 ANNUAL REV. OF GENOMICS AND HUMAN GENETICS 97, 97–120 (2011), *available at* http://www.annualreviews.org/doi/pdf/10.1146/annurev-genom-082509-141715.

216. *Fain*, 774 P.2d at 255, 116 Idaho at 85.

217. State v. Fain, 809 P.2d 1149, 119 Idaho 670 (1991).

218. Raymond Bonner, *Death Row Inmate is Freed After DNA Test Clears Him*, NYTIMES.COM, http://www.nytimes.com/2001/08/24/us/death-row-inmate-is-freed-after-dna-test-clears-him.html?pagewanted=all&src=pm (last visited Oct. 8, 2012).

219. *Id.*

220. *CODIS Brochure*, FBI.GOV, http://www.fbi.gov/about-us/lab/codis/codis_brochure (last visited Sept. 17, 2012).

221. *Id.*

222. State v. Fain, 774 P.2d 252, 253, 116 Idaho 82, 84 (1989).

223. Bonner, *supra* note 218.

224. H.B. 620, 61st Leg., 2d Reg. Sess. (Idaho, 2012).

225. *Id.*

Even before questions of preservation time arise, proper preservation must begin with proper collection. Much biological evidence is in a liquid state, like saliva, semen, blood, sweat, and urine. Once such evidence is carefully collected, drying it becomes critical to avoid degradation. Moisture can lead to the formation of mold, and mold consumes proteins and DNA.[227] Properly collected, dried, and stored DNA evidence can last a long time, as evidenced by the fact that DNA analysis was performed on the blood stain from the pillow of the dying President Lincoln.[228] This blood stain is over 145 years old.[229] Indeed, a sizeable number of people have been freed by DNA evidence that was more than twenty years old,[230] and the authors have worked on several cases where evidence stored without refrigeration produced DNA profiles more than thirty years after their collection.[231] Properly collected, dried, stored, and retained DNA evidence has the power to free innocent people and to find and convict the true perpetrators. The real lesson from historical DNA cases is that, while we cannot predict the evolution of forensic science, we can anticipate that the future will commend us for preserving evidence that we are not presently capable of processing.

E. DNA won't work when the DNA statistics are confusing or misleading.

Numbers don't lie. Or do they? The proper use of statistics is critical in addressing DNA evidence in criminal cases. But what is the best way to achieve these ends? In a 2010 Florida rape case, an expert testified at trial that the odds were one in 320 quadrillion that someone other than the defendant left DNA evidence (sperm) at the scene.[232] Are such odds truly helpful, or can they confuse a judge and a jury? A quadrillion is a thousand trillion, and a trillion is a thousand billion. Allwords.com defines a quadrillion as "[a]ny very large number, exceeding normal description."[233] A quadrillion is literally ten to the fifteenth pow-

226. *House Education Committee Minutes on H.B. 620*, 2012 61st Leg., 2d Reg. Sess. (Idaho), 1-184,118 (statement by Representative Hart on proposed rescheduled legislation for RS 21290C1).

227. *What Every Law Enforcement Officer Should Know About DNA Evidence*, NAT'L INST. OF JUST., https://www.ncjrs.gov/pdffiles1/nij/bc000614.pdf (last visited Sept. 17, 2012).

228. *DNA Tests Could Show if Lincoln was Terminally Ill*, LIVESCIENCE (May 7, 2009, 12:22 PM), http://www.livescience.com/3563-dna-tests-show-lincoln-terminally-ill.html.

229. Jennifer Pifer Bixler, *DNA Test Could Shed Light on Lincoln's Last Days, Doctor ays*, CNN.COM (MAY 5, 2009), http://edition.cnn.com/2009/HEALTH/05/05/lincoln.cancer .pillow/ index.html.

230. Hampikian, West & Akselrod, *supra* note 215, at 98.

231. *See, e.g.*, Tim Chitwood, *Stocking Strangler Case: DNA Results from 1977 Rape Exclude Carlton Gary*, THE TELEGRAPH (Mar. 7, 2012), http://www.macon.com/2012/03/07/ 1935051/dna-results-from-1977-rape-exclude.html.

232. Alexandria Zayas, *Morris Rape Case: 1 in 320 Quadrillion Chance It's Someone Else's DNA, Too, Expert Says*, TAMPA BAY TIMES (Sept. 2, 2010), http://www.tampabay .com/news/courts/criminal/article1118899.ece.

233. *Quadrillion*, ALLWORDS.COM, http://www.allwords.com/word-quadrillion.html (last visited Oct. 25, 2012).

er. To illustrate the magnitude of such a number, consider the following: One million seconds add up to approximately twelve days. One billion seconds would be thirty-three years. One trillion seconds comes to more than 32,000 years. One quadrillion seconds totals over thirty-two million years, and 320 quadrillion seconds totals over 9 billion years. How does one second compare to 9 billion years? It is incomprehensible.

The first published empirical study of potential DNA bias in DNA mixture interpretation was published by one of the authors of this article, along with Itiel Dror, in 2011.[234] In that study, semen DNA data from a gang rape was given to seventeen analysts in another state.[235] Without potentially biasing contextual data, the analysts were asked to determine if a particular reference sample was "excluded," "could not be excluded," or "inconclusive."[236] The original crime laboratory had said that the person who provided the profile "could not be excluded" as a contributor; however, only one of the seventeen analysts in the second laboratory gave the same conclusion as the original lab analysts.[237] The sixteen other examiners reached different and conflicting conclusions.[238] Therefore, the extraneous context appears to have influenced the interpretation of the DNA mixture, and even analysts trained and working in the same laboratory came to three different conclusions using the same DNA data.[239]

John Butler of the National Institute of Standards and Technology (NIST) is the author of several forensic DNA typing publications and has conducted extensive studies of DNA mixture analysis over several years. For many of his studies, Dr. Butler supplies a large number of volunteer laboratories the same DNA mixture and asks for each lab's analysis.[240] The results of these excellent studies have been presented at conferences and are available at the NIST webpages but have never been published in a peer-reviewed journal.[241] Butler's research shows that even when laboratories agree on who is included in a DNA mixture, the statistics cited can vary over 10 billion-fold.[242] While the difficulties in mixture interpretation are well known to the field, disclaimers or acknowledgement of these difficulties are often not added to the lab reports that issue conclusions about DNA mixtures. In summary, although the use of statistics in DNA analysis is paramount, the issues of

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234. Itiel E. Dror & G. Hampikian, *Subjectivity and Bias in Forensic DNA Mixture Interpretation*, 51 SCI. JUST. 4, 204–08 (Sept. 5, 2011).

235. *Id.* at 205.

236. *Id.*

237. *Id.*

238. *Id.*

239. *Id.* at 204.

240. *See, e.g.*, John M. Butler, *Can the Validation Process in Forensic DNA Typing Be Standardized?* (2004) http://www.cstl.nist.gov/strbase/pub_pres/PromegaPaperOct2004.pdf.

241. *Id.*

242. John M. Butler et al., *Report on ISPG SNP Panel Discussion*, FORENSIC SCIENCE INTERNATIONAL: GENETICS SUPPLEMENT SERIES 1, 471 (2008), *available at* http://www.cstl .nist.gov/biotech/strbase/pub_pres/SNP-panel-ISFG2007.pdf.

subjectivity, potential bias, and extreme variance in statistical reporting have yet to be resolved.

As the most influential national body in the forensic DNA community, the Scientific Working Group on DNA Analysis Methods (SWGDAM) advises the FBI on DNA analysis and interpretation.[243] Its recommendations are often cited by laboratories in their Standard Operating Procedures.[244] The 2010 SWGDAM guidelines state that "the laboratory must perform statistical analysis in support of any inclusion that is determined to be relevant in the context of a case, irrespective of the number of alleles detected and the quantitative value of the statistical analysis."[245] However, some laboratories in North America still report qualitative results, such as "cannot exclude," without any quantitative measure.[246] The SWGDAM guidelines are not binding and are not required for the American Society of Crime Laboratory Directors Laboratory Accreditation Board accreditation.[247] Outside of North America, the International Society for Forensic Genetics DNA Commission's recommendations on the interpretation of mixtures strongly supports the use of another statistical method, likelihood ratios.[248] A likelihood ratio compares two probabilities to find out which one is the most likely.[249] More recently, expert systems such as TrueAllele (CyberGenetics, Pittsburgh) are being used to reexamine data and provide genotypes from data that was originally considered inconclusive.[250] The software also provides statistical measures of likelihood, addressing the possibility that a particular suspect contributed to a complex mixture.[251] Thus, data that is properly preserved can be reanalyzed years after the original analysis, even if the actual evidence has been lost.

V. CONCLUSION

DNA evidence is the gold standard of forensic science. It has the ability to free the innocent and blindly identify criminals from a data-

243. *SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories*, FBI, http://www.fbi.gov/about-us/lab/codis/swgdam-interpretation-guidelines (last visited Oct. 8, 2012).

244. *Id.*

245. *Id.*

246. *See id.*

247. Karen Cormier et al., *Evolution of the Quality Assurance Documents for DNA Laboratories*, FORENSIC MAGAZINE, 1 (2005), http://www3.appliedbiosystems.com/cms/groups/applied_markets_marketing/documents/generaldocuments/cms_042065.pdf.

248. P. Gill et al., *DNA Commission of the International Society of Forensic Genetics: Recommendations of the Interpretation of Mixtures*, FORENSIC SCI. INT'L 90 (2006), available at http://www.sciencedirect.com/science/article/pii/S0379073806002659#.

249. *Formation of the Likelihood Ratio*, INT'L SOC'Y OF FORENSIC GENETICS (2008) http://www.isfg.org/files/ISFG2007_Statistics_Gill_LR.pdf (slide 6).

250. Jack Ballantyne, Erin K. Hanson & Mark W. Perlin, *DNA Mixture Genotyping by Probabilistic Computer Interpretation of Binomially-Sampled Laser Captured Cell Populations: Combining Quantitative Data for Greater Identification Information*, SCI. & JUST. (2012), http://www.sciencedirect.com/science/article/pii/S1355030612000603.

251. *Id.*

base of human profiles. However, DNA evidence can also be misused, misunderstood, or under-utilized. Unfortunately, Idaho currently ranks last in the country in "Investigations Aided by CODIS."[252]

The situation in Idaho can result in tragic consequences: the continued confinement of the innocent, the reduced ability to solve cold cases, and most tragic of all, the failure to prevent future crimes. Fortunately, Idaho's use of DNA evidence can be greatly enhanced with only a few relatively simple steps and a small amount of money.

The first step is to amend Idaho's DNA collection law to move up the date for the inclusion of all felony offenders. Adding felony arrests and some misdemeanor convictions would also advance public safety. At the private lab cost of $25.00 to process a DNA sample,[253] this is an affordable step to protect Idaho citizens.

The second step is for the ISP crime lab to establish the FBI's Quality Assurance Standard 17 with one or more private laboratories which do testing not available in the ISP crime lab. This would allow DNA profiles developed from powerful new technologies, such as "Minifiler DNA," to be uploaded to the state and national DNA databases. Without these agreements in place, law enforcement agencies that go outside of the state laboratory for DNA analysis cannot have these profiles loaded onto the databases. A second advantage of establishing Standard 17 relationships with private laboratories is that the state can apply for backlog reduction grants from the U.S. Department of Justice. Private labs can quickly eliminate Idaho's DNA backlog of convicted offender profiles without using state funds. By both helping to prevent future crimes and solving active and cold criminal cases, this change would protect the public by reducing the chances of wrongful convictions.

The third step is for Idaho or the federal government to amend laws and regulations so that every DNA match that a crime lab makes or receives from CODIS is reported to both law enforcement entities and inmates connected to the crime. As CODIS regulations stand presently, there is no duty to report even exonerating DNA profiles to innocent people who have been wrongly convicted.

Finally, Idaho should adopt a uniform biological evidence preservation process to replace the current set of widely varying practices around the state. This would prevent situations like that of Charles Fain, where an innocent man was eventually exonerated, but the true perpetrator could not be found because the DNA evidence had been discarded.[254]

These progressive and relatively simple steps would help protect the public and maximize the use of an invaluable forensic tool. DNA can work better in Idaho.

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252. *See infra* Table 2.
253. *Idaho Struggles with DNA Backlog*, *supra* note 175.
254. *See supra* Part IV.D.

Appendix

Table 1. State DNA Database Laws[255]

	Qualifying offenses for collection of DNA		
State	**Some felony convictions**	**All felony convictions**	**Murder and Rape Arrests**
Alabama		x	x
Alaska		x	x
Arizona		x	x
Arkansas		x	x
California		x	x
Colorado		x	x
Connecticut		x	
Delaware		x	
Florida		x	x
Georgia		x	
Hawaii		x	
Idaho	x		
Illinois		x	x
Indiana		x	
Iowa		x	
Kansas		x	x
Kentucky		x	
Louisiana		x	x
Maine		x	
Maryland		x	x
Massachusetts		x	
Michigan		x	x
Minnesota		x	

255. *State DNA Database Laws – Qualifying Offenses*, DNA RESOURCE.COM (Sept. 2011) www.dnaresource.com/documents/statequalifyingoffenses2011.pdf.

	Qualifying offenses for collection of DNA		
State	**Some felony convictions**	**All felony convictions**	**Murder and Rape Arrests**
Mississippi		x	
Missouri		x	x
Montana		x	
Nebraska		x	
Nevada		x	
New Hampshire		x	
New Jersey		x	x
New Mexico		x	x
New York		x	
North Carolina		x	x
North Dakota		x	x
Ohio		x	x
Oklahoma		x	
Oregon		x	
Pennsylvania		x	
Rhode Island		x	
South Carolina		x	x
South Dakota		x	x
Tennessee		x	x
Texas		x	x
Utah		x	x
Vermont		x	x
Virginia		x	x
Washington		x	
West Virginia		x	
Wisconsin		x	
Wyoming		x	
Totals	1	49	25

Table 2. Investigations aided by CODIS[256]

Alphabetical Order	
State	**#**
Alabama	4,669
Alaska	406
Arizona	5,360
Arkansas	2,128
California	22,605
Colorado	2,881
Connecticut	907
Delaware	36
Florida	19,547
Georgia	3,913
Hawaii	304
Idaho	23
Illinois	14,653
Indiana	2,633
Iowa	996
Kansas	1,629
Kentucky	851
Louisiana	3,440
Maine	73
Maryland	2,541
Massachusetts	2,357
Michigan	5,892
Minnesota	3,025
Mississippi	225
Missouri	6,785
Montana	99
Nebraska	125
Nevada	1,965
New Hampshire	113

Numerical Order	
State	**#**
California	22,605
Florida	19,547
Illinois	14,653
New York	14,281
Texas	10,895
Virginia	7,562
Ohio	7,103
Missouri	6,785
Michigan	5,892
New Jersey	5,668
Arizona	5,360
Alabama	4,669
Pennsylvania	4,432
South Carolina	4,039
Georgia	3,913
Oregon	3,827
Wisconsin	3,698
Louisiana	3,440
Minnesota	3,025
Colorado	2,881
Indiana	2,633
Maryland	2,541
Massachusetts	2,357
Arkansas	2,128
Nevada	1,965
North Carolina	1,924
Washington	1,705
Kansas	1,629
New Mexico	1,550

256. *CODIS—NDIS Statistics*, FBI (July 2012), http://www.fbi.gov/about-us/lab/codis/ndis-statistics.

Alphabetical Order			**Numerical Order**	
State	**#**		**State**	**#**
New Jersey	5,668		Oklahoma	1,010
New Mexico	1,550		Iowa	996
New York	14,281		Connecticut	907
North Carolina	1,924		Kentucky	851
North Dakota	227		Tennessee	587
Ohio	7,103		Alaska	406
Oklahoma	1,010		Hawaii	304
Oregon	3,827		North Dakota	227
Pennsylvania	4,432		Mississippi	225
Rhode Island	92		South Dakota	158
South Carolina	4,039		Vermont	141
South Dakota	158		Nebraska	125
Tennessee	587		West Virginia	113
Texas	10,895		New Hampshire	112
Utah	58		Montana	99
Vermont	143		Rhode Island	92
Virginia	7,562		Maine	73
Washington	1,705		Utah	58
West Virginia	112		Wyoming	47
Wisconsin	3,698		Delaware	36
Wyoming	47		Idaho	23
Total	179,299		Total	179,299