
UNDER THE HUMAN SKIN: WILL HUMAN MICROCHIPPING
PROVE TO BE A SURVIVOR IN THE COURTROOM JUST AS
DNA EVIDENCE DID?

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I. INTRODUCTION

On June 10, 2011, the hit television series “CSI: CRIME SCENE INVESTIGATION” was presented with the prestigious “International Television Audience Award for a Drama TV Series” at the 50th Monte Carlo TV Festival making it the third time the series has been awarded this honor in five years.¹ More than 73.8 million viewers across five continents worldwide tuned in to the show,² which follows law enforcement officials as they use highly advanced technological tools to examine evidence and solve crimes.³ Many of the series’ episodes expose viewers to scenes in which investigators gather physical evidence by utilizing cutting edge technology known as DNA testing.⁴ This form of testing, which extracts deoxyribonucleic acid from genetic material such as skin, hair, and other bodily

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¹ See Bill Gorman, *CSI: Crime Scene Investigation Is The Most Watched Show In The World!*, ZAP2IT.COM (June 11, 2010), *archived at* <http://perma.cc/C4ZH-DB8J> (discussing the award criteria and the process for selecting the winner).

² See *id.* (highlighting the number of viewers worldwide and the ratings the show received).

³ See *CSI: Crime Scene Investigation*, TV.COM, *archived at* <http://perma.cc/5ZNB-N9XX> (describing the genre and characteristics of the television series).

⁴ See Randy James, *A Brief History of DNA Testing*, TIME (June 19, 2009), *archived at* <http://perma.cc/F7AZ-W2P4> (inferring that CSI viewers have some familiarization with DNA testing).

fluids, can prove with 99% accuracy whether a suspect is the perpetrator of crime by comparing his or her DNA with the DNA left at the crime scene.⁵

Although the television show CSI is a work of fiction developed for entertainment purposes, DNA testing is a real world scientific breakthrough. Since its inception in 1985, DNA testing has emerged as the most reliable physical evidence at a crime scene and has more recently been declared a “staple” in modern crime scene investigations.⁶ Proponents of DNA admissibility in criminal trials argue that the results of DNA testing can aid in determining which suspects are properly charged and also which defendants should be excluded from the investigation or exonerated.⁷ Critics of DNA testing have often argued that the technique is a violation a citizen’s Fourth Amendment right to Privacy and consequently should not be admissible at trial.⁸ As it stands today, courts in almost every jurisdiction in the United States have established through legislation or precedent that DNA evidence is admissible.⁹

To further utilize the benefits DNA testing provides, all fifty states and the Federal government have passed legislation requiring convicted felons to submit DNA samples to state officials either at

⁵ See *id.* (explaining the procedures for DNA testing and accuracy statistics).

⁶ See *id.* (discussing the reliability of DNA testing on physical evidence); see also Emily Holland, *Moving the Virtual Border to the Cellular Level: Mandatory DNA Testing and the U.S. Refugee Family Reunification Program*, 99 CAL. L. REV. 1635, 1661 (2011) (stating “[s]cientific experts and members of the judiciary consider DNA testing to be the most reliable forensic testing method when appropriate quality-control methods are”).

⁷ See *Dist. Att’y’s Office v. Osborne*, 557 U.S. 55, 55 (2009) (stating “DNA testing has an unparalleled ability both to exonerate the wrongly convicted and to identify the guilty”); see also John P. Cronan, *The Next Frontier of Law Enforcement: A proposal for complete DNA Databanks*, 28 AM. J. CRIM. L. 119, 128 (2000) (explaining how law enforcement officials can use DNA testing as a valuable tool in solving crimes).

⁸ See Solomon Moore, *F.B.I. and States Vastly Expand DNA Databases*, N.Y. TIMES (Apr. 19, 2009), archived at <http://perma.cc/L54A-MYSF> (stating the concerns of criminal experts that collecting DNA presents Fourth Amendment privacy issues).

⁹ See 2 CRIM. PRAC. MANUAL § 73:39 (2015) (declaring that most states have deemed DNA evidence admissible through legislation or litigation); see also *Osborne*, 557 U.S. at 52, 62, 94 (noting that the Federal Government and forty-six states have enacted statutes dealing with access to DNA evidence).

the time of their sentencing or before being released from prison.¹⁰ Additionally, the Federal government has developed its own national DNA database titled CODIS which is monitored by the Federal Bureau of Investigation and can be directly linked to state DNA databases.¹¹ In response the development of DNA databases, opponents have been unsuccessful in challenging the constitutionality of convict-DNA-database statutes in every jurisdiction where they have been brought.¹²

It has been almost thirty years since the discovery of DNA testing and science enthusiasts around the world could be wondering: What's next? What will be the next scientific discovery that impacts the world as DNA testing did? The answer to those questions might be microchipping and, although it is not widely reported, the technology is already being utilized.¹³ The idea of implanting a microchip in a human is not as far-fetched as it sounds and by 2007, two thousand people worldwide had already voluntarily undergone a procedure to have a VeriChip brand Radio-frequency Identification chip implanted in their right upper arm.¹⁴ The diverse group of people who have been microchipped include patients with chronic or debilitating disease, VIP patrons of a Barcelona nightclub, and investigators requiring special access to confidential drug-trafficking case files at the Ministry of Justice in Mexico.¹⁵

Some commentators suggest the benefits of microchipping are endless.¹⁶ Possible uses of microchipping beyond its current use include: implanting chips in soldiers and journalists in war zones; implanting chips in felons released from prison; and even implanting

¹⁰ See *infra* pp. 12-13 and notes 63-65 (explaining the relevant legislation allowing all fifty states and the federal government to collect DNA).

¹¹ See discussion *infra* Part II.A (outlining the Federal government's development of its own national DNA database).

¹² See Nadia Beniquez, *We Have Your DNA, Come Out With Your Hands Up! The Three D'S of DNA: A Fourth Amendment Analysis of a Trilemma*, 13 T.M. COOLEY J. PRAC. & CLINICAL L. 521, 538 (2011) (recognizing that state courts across the country have consistently held DNA databases to be constitutional).

¹³ See Siobhan Morrissey, *Are Microchip Tags Safe?*, TIME (Oct. 18, 2007), archived at <http://perma.cc/Y63G-E9A2> (discussing the current usage of microchips in humans and animals).

¹⁴ See *id.* (stating statistical data of the number of users).

¹⁵ See *id.* (describing the demographics of the patients who had a chip implanted).

¹⁶ See John Brandon, *Is There a Microchip Implant in Your Future?*, FOX NEWS (Aug. 30, 2014), archived at <http://perma.cc/H6UC-E55B> (announcing that microchipping could be a beneficial practice).

chips in children for the unlikely event they are kidnapped.¹⁷ One's imagination could run wild with the endless possibilities of human microchipping but eventually one will find themselves running directly in to this question: Is microchipping ethical?¹⁸ Critics of microchipping suggest their imaginations can run equally wild with the endless problems that microchipping could create.¹⁹ Examples of these problems include: the risk of an individual hacking your infrastructure to steal your identity; the possible privacy rights violations that would be infringed on ex-cons who have managed to stay out of trouble for long periods of time; and the possibility that a microchip might actually put a kidnapped child in a greater danger if the perpetrator becomes aware he is being tracked.²⁰ While we cannot predict with certainty where human microchipping will lead us over the next ten years, this Note attempts to predict if compelled human microchipping will survive constitutional challenges by exposing it to the same constitutional challenges DNA evidence faced.

This Note will predict the legal results of constitution challenges to compelled human microchipping of individuals arrested for or convicted of felonies. First, this note will trace the history and development of DNA testing and its rapid expansion into court room across the country. Second, the Note will examine the various admissibility standards courts apply to DNA evidence and the admissibility issues DNA evidence faced. Third, the Note will explore the class of individuals law enforcement officials are authorized to collect DNA from. Fourth, the Note will analyze DNA's survival of the often used Fourth Amendment Constitutional challenge. Fifth, the Note will introduce a new scientific discovery known as "microchipping." Sixth, the Note will set forth a legal analysis of microchipping under the Fourth Amendment and the admissibility standards used by the courts by comparing it with DNA evidence and databases. Finally, the Note will predict what the legal result would be in the event the government compelled the microchipping of individuals convicted of crimes.

¹⁷ *See id.* (describing possible uses of microchipping).

¹⁸ *See id.* (stating ethical concerns of microchipping).

¹⁹ *See id.* (extrapolating on how all new tech advancements have downsides).

²⁰ *See id.* (setting out the possible negative consequences microchipping could lead to).

II. HISTORY

A. DNA Testing: A Scientific Breakthrough

1. Development of DNA Testing

The discovery that DNA was the master molecule that contains a code responsible for human's genetic makeup and the later development of DNA testing for forensic purposes is widely attributed to three individuals on two different continents at different time periods: Francis H.C. Crick, James D. Watson, and Dr. Alec Jeffreys.²¹ In 1953, American scientists Francis H.C. Crick and James D. Watson discovered that human "genes" were composed of protein and a substance called deoxyribonucleic acid, or DNA.²² Watson recognized that the DNA molecule was made up of long strands of the nitrogen-containing nucleobases adenine, thymine, guanine, and cytosine.²³ He then noticed how two pairs of these bases, adenine-thymine and guanine-cytosine, would form identical shapes if held together by a hydrogen bond.²⁴ This discovery led Crick and Watson to believe that a DNA molecule, made up of long strands of such base pairs in specific and varied sequences, could contain genetic information which could be copied if the nucleobase strands were separated.²⁵ This breakthrough discovery was presented to the world on April 25, 1953, when Watson and Crick announced in a *Nature Mag-*

²¹ See *Genetics and Genomics Timeline 1953*, GENOME NEWS NETWORK, archived at <http://perma.cc/79RQ-V4P7> [hereinafter *Genetics and Genomics Timeline 1953*] (discussing the early history and discovery of deoxyribose nucleic acid (D.N.A)); see also Lisa Calandro et al., *Evolution of DNA Evidence for Crime Solving - A Judicial and Legislative History*, FORENSIC MAGAZINE (Jan. 6, 2005), archived at <http://perma.cc/ELA5-AK5Y> (discussing the history of the first use of DNA forensic evidence to solve a crime).

²² See *Genetics and Genomics Timeline 1953*, *supra* note 21 (explaining the process that led to the discovery of DNA containing genetic codes).

²³ See *Genetics and Genomics Timeline 1953*, *supra* note 21 (describing the makeup of a DNA molecule).

²⁴ See *Genetics and Genomics Timeline 1953*, *supra* note 21 (explaining nucleobases and their relevancy in the discovery of DNA).

²⁵ See *Genetics and Genomics Timeline 1953*, *supra* note 21 (highlighting the discovery made by Crick and Watson).

azine article that “the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.”²⁶

In September 1984, more than thirty years after the discoveries made by Crick and Watson, Dr. Alec Jeffreys discovered that each human being contains a “genetic fingerprint” which is specific to that individual, and this “genetic fingerprint” cannot be the same in any other person on earth except for identical twins.²⁷ Dr. Jeffreys, a geneticist from the University of Leicester in Great Britain, made this discovery while studying hereditary diseases in families.²⁸ Dr. Jeffrey’s procedure included using Restriction Fragment Length Polymorphism (RFLP) to analyze DNA, which led to his discovery that repetitive patterns of DNA, known as Variable Number of Tandem Repeats (VNTRs), were present in all human beings, yet each human being’s VNTR varied in length.²⁹ Dr. Jeffreys coined the technique he used to analyze DNA as “genetic fingerprinting” and concluded that this variation in length of the VNTRs could be used to establish the identity of a person.³⁰

Following his breakthrough discovery, Dr. Jeffreys was soon able to use his “genetic fingerprinting” technique to aid law enforcement officials in tracking down and convicting a murderer.³¹ In 1983, fifteen year old Lynda Mann was raped and murdered in the quiet town of Narborough Village, England.³² In 1986, fifteen year old Dawn Ashworth was raped and murdered in the same town.³³ These two horrific crimes led law enforcement officials to call on Dr.

²⁶ See James D. Watson & Francis H.C. Crick, *Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid*, 171 NATURE 737, 737-38 (1953) (describing the discovery of the DNA double helix structure).

²⁷ See *DNA Fingerprinting*, DNA FORENSICS, archived at <http://perma.cc/NX4-SK2X> [hereinafter *DNA Fingerprinting*] (describing the history and discovery of the DNA “fingerprinting technique”).

²⁸ See *id.* (providing necessary background information which led to the discovery of the “fingerprint technique”).

²⁹ See *id.* (explaining a brief synopsis of the procedure used leading to the discovery).

³⁰ See *id.* (stating the conclusion reached by Dr. Jeffreys after conducting his research).

³¹ See *id.* (highlighting the first time Jeffreys “fingerprinting” technique was used to aid in a criminal investigation).

³² See *id.* (describing the events that led police to utilize Jeffreys’s new “fingerprinting technique”).

³³ See *DNA Fingerprinting*, *supra* note 27 (expanding on the events that led police to call on Dr. Jeffreys).

Jeffreys to provide his expertise and aid in the apprehension of the killer.³⁴ Dr. Jeffreys applied his “fingerprinting technique” and compared suspect Colin Pitchfork’s DNA with the DNA of the semen found on victims Lynda Mann and Dawn Ashworth.³⁵ The DNA was a perfect match, and Colin Pitchfork subsequently pled guilty to both rapes and murders making him the first person in the world to be identified, captured, and successfully prosecuted as a result of DNA evidence.³⁶

One year after the conviction of Colin Pitchfork, the United States followed the lead of Great Britain when prosecutors in a Florida Court successfully used DNA evidence to convict Tommy Lee Andrews of aggravated battery, sexual battery, and armed burglary of a dwelling.³⁷ The evidence introduced by prosecutors included a comparison of DNA from Andrews’ blood with the DNA found in the victim’s vagina.³⁸ By January 1990, approximately two years after the first successful use of DNA in criminal trial, the use of DNA evidence spread rapidly across the United States Justice System, having

³⁴ See *DNA Fingerprinting*, *supra* note 27 (showing how law enforcement officials sought help from Dr. Jeffreys to solve the murders).

³⁵ See *DNA Fingerprinting*, *supra* note 27 (explaining the procedure Dr. Jeffreys used in analyzing the DNA). Originally, seventeen-year-old suspect Richard Buckland confessed to the murder of Dawn Ashworth. Police officials were very reluctant to accept this confession because it was their belief that both crimes were committed by the same suspect. This belief, if proved to be true, would mean that Buckland was only fourteen-years-old when he committed the first murder. Dr. Jeffreys DNA testing revealed that the DNA fingerprint from the semen found on the two murdered victims was not the same as Buckland’s. It also proved that the same suspect was responsible for both crimes. See *DNA Fingerprinting*, *supra* note 27

³⁶ See *DNA Fingerprinting*, *supra* note 27 (announcing that Dr. Jeffreys discovery lead to the first successful conviction by using DNA evidence).

³⁷ See Peter Frick, *Forensic Science in Court: Challenges in the Twenty First Century*, 27 SYRACUSE J. SCI. & TECH. L. REP. 145, 149 (2012) (stating Tommy Lee Andrews was the first person to be successfully convicted using DNA evidence in the U.S.); see also Charity Lynn Clayborn, Note, *Evidence—Criminal Law—Evidence of DNA Fingerprinting Admitted for Identification Purposes in Rape Trial. Andres v. State*, 533 So.2d 841 (Fla. Dist. Ct. App. 1988), 12 U. ARK. LITTLE ROCK L.J. 543, 543-44 (1990) (providing information on the charges filed against the defendant).

³⁸ See Clayborn, *supra* note 37, at 543 (describing the evidence that was introduced by the prosecution). At the trial of Andrews, the prosecution also called a molecular geneticist from the commercial laboratory that performed the test as an expert who witness who testified as to the DNA match. See Clayborn, *supra* note 37, at 543.

been admitted into evidence in at least 185 cases in thirty-eight states.³⁹

2. Development of CODIS and DNA Databanks

In 1990, the FBI launched a pilot software project titled Combined DNA Index System (“CODIS”) to generate intra-agency leads by sharing biological evidence collected from crime scenes with law enforcement official from different jurisdictions.⁴⁰ The program allowed law enforcement officials to upload DNA evidence collected from crime scenes into a database to identify possible suspects or to keep track of multiple crimes committed by the same unknown suspect.⁴¹ Over the next several years, Congress recognized the potential benefits of DNA databanks and passed the DNA Act of 1994, which established the FBI’s authority to maintain a National DNA Index System (NDIS), allowing them to store DNA profiles of convicted offenders from across the nation.⁴²

After the passage of the DNA Act of 1994, the FBI implemented new NDIS system into the already existing CODIS pro-

³⁹ See Paul C. Gianelli, *The DNA Story: An Alternate View*, 88 J. CRIM. L. & CRIMINOLOGY 380, 381 (1997) (noting the rapid expansion of DNA evidence introduced in U.S. Courts).

⁴⁰ See *CODIS Brochure*, FEDERAL BUREAU OF INVESTIGATION, archived at <http://perma.cc/6369-BKZ2> [hereinafter *CODIS Brochure*] (discussing the early history and development of the CODIS pilot program). Originally, the pilot program served only 14 states. *Id.*

⁴¹ See Stephen Mercer & Jessica Gabal, *Shadowdwellers: The Unregulated World of State and Local DNA Databases*, 69 N.Y.U. ANN. SURV. AM. L. 639, 650-51 (2014) (explaining how the CODIS system functions).

⁴² See 42 U.S.C. § 14132 (establishing the FBI’s authority to maintain a DNA Databank); see also Kimberly A. Polanco, *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, 488-89 (2005) (providing information about the 1994 DNA Act). The DNA Act of 1994 allowed the FBI to place DNA samples into four different categories within the CODIS system. *Id.* The categories are: (1) The Convicted Offender Index- contains DNA samples taken from individuals convicted of certain crimes; (2) the Forensic Index- contains DNA profiles generated from biological material discovered at crime scenes; (3) Unidentified Human Remains Index- includes DNA profiles from unidentified human remains; and (4) Missing Persons- contains DNA profiles of missing persons whose DNA has been voluntarily contributed to the system by friends and family. *Id.* at 489. Additionally, the FBI maintains a “Population file,” which catalogues anonymous DNA profiles. *Id.*

gram.⁴³ This new CODIS system, which was fully operational by 1998, streamlined the sharing of DNA profiles by allowing local, state, and federal law enforcement agencies to add, analyze, and share DNA profiles through one system.⁴⁴ The new system utilized a three-tier structure in which DNA from a suspect or missing person could be entered into a local database (LDIS), a statewide database (SDIS), and a national database (NDIS).⁴⁵ The local and statewide databases are fully operated and monitored by state officials, but to receive federal funding to purchase the databank software and train technicians, the states are required to submit all DNA profiles of convicted offenders to the FBI's national database (NDIS).⁴⁶ Currently, all fifty states, the federal government, the U.S. Army Criminal Investigation Laboratory, and Puerto Rico participate in NDIS and CODIS systems.⁴⁷

⁴³ See *Frequently Asked Questions (FAQs) on the CODIS Program and the National DNA Index System*, FEDERAL BUREAU OF INVESTIGATION, archived at <http://perma.cc/HCH2-H75A> [hereinafter *FAQs on the CODIS Program and the National DNA Index System*] (describing the development of the NDIS system).

⁴⁴ See *id.* (outlining the expansion of NDIS and the CODIS system to include state and local agencies).

⁴⁵ See Polanco, *supra* note 42, at 489-90 (examining the three tier structure developed for maintaining DNA samples). The first tier of the structure contains local DNA databanks known as "Local DNA Index System" (LDIS) and is where all DNA profiles originate. To compare profiles with other LDIS systems within the state, the sample is submitted into databanks of the second tier of structure known as "State DNA Index System" (SDIS). Finally, the sample is then submitted into the third tier of the structure known as the National DNA Index System (NDIS), which is directly maintained by the FBI and allows crime laboratories across the country to share and exchange DNA profiles. See Polanco, *supra* note 42, at 489-90.

⁴⁶ See 42 U.S.C. § 14135a (2012) (defining the requirements to receive federal funding for establishing DNA databanks); see also Polanco, *supra* note 42, at 490 (identifying the requirements states must meet to receive federal funding).

⁴⁷ See *FAQs on the CODIS Program and the National DNA Index System*, *supra* note 43 (identifying the jurisdictions and agencies that participate in CODIS); see also Natalie Quan, *Black and White or Red All Over? The Impropriety of Using Crime Scene DNA to Construct Racial Profiles of Suspects*, 84 S. CAL. L. REV. 1403, 1409 (2011) (noting all fifty states participate in CODIS).

3. Admissibility of DNA Evidence in U.S. Jurisdictions

DNA evidence is a form of scientific evidence and therefore must comply with the scientific evidence admissibility standards in all federal and state jurisdictions.⁴⁸ Most courts in United States' jurisdictions apply either the Frye test or the Daubert test when confronted with the issue of whether scientific evidence is admissible.⁴⁹ The Frye test, coined after the seminal 1923 case *Frye v. United States*, declares that expert testimony based on scientific principles or procedures is admissible only after the principle or procedure has gained "general acceptance" by the scientific community.⁵⁰ When considering the admissibility of DNA evidence under the *Frye* test, courts apply the two prong Frye test as follows: (1) Is there a theory, which is generally accepted in the scientific community, which supports the conclusion that DNA forensic testing can produce reliable results?; and (2) are there "generally accepted" techniques or experiments that are capable of producing reliable results in DNA identification?⁵¹ Following the admissibility standards announced in *Frye*, most states adopted the Frye test theory of "general acceptance" until 1993, when the United States Supreme Court held in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* that Federal Rule of Evidence 702 was the new standard for determining the admissibility of scientific

⁴⁸ See Daniel Gaudet, Note, *Waiting for John Doe: The Practical and Constitutional Implications of DNA Indictments*, 18 SUFFOLK J. TRIAL & APP. ADVOC. 106, 108-09 (2013) (stating that all scientific evidence is subject to admissibility standards).

⁴⁹ See Emily L. Baggett, *The Standards Applied to the Admission of Soft Science Experts in State Courts*, 26 AM. J. TRIAL ADVOC. 149, 149-50 (2002) (introducing the two standards of admissibility of scientific evidence).

⁵⁰ See *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923) (holding "the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs"). In *Frye*, the defendant appealed his second degree murder conviction after the lower court refused to allow an expert to testify as to the results of a systolic blood pressure deception test he took before trial. *Id.* Along with the famous holding that became known as the "Frye Test," the court reasoned "[w]e think the systolic blood pressure deception test has not yet gained such standing and scientific recognition among physiological and psychological authorities as would justify the courts in admitting expert testimony deduced from the discovery, development, and experiments thus far made." *Id.*

⁵¹ See *State v. Vandebogart*, 616 A.2d 483, 490 (N.H. 1992) (outlining the two prongs of the *Frye* test to determine the admissibility of DNA evidence).

evidence in federal courts.⁵² According to this new standard, a witness may give expert testimony if: (1) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (2) the testimony is based on sufficient facts or data; (3) the testimony is the product of reliable principles and methods; and (4) the expert has reliably applied the principles and methods to the facts of the cases.⁵³ While the decision in *Daubert* only binds federal courts to apply the new standard, roughly twenty-five states now apply the *Daubert* test, with fifteen states applying the Frye standard and the remaining states applying their own variation of the two tests.⁵⁴

While state courts may apply different standards to determine if DNA is admissible, courts in all fifty states agree that DNA evi-

⁵² See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 589 (1993) (holding federal trial courts now follow Federal Rule of Evidence 702); see also FED. R. EVID. 702 (stating the federal standards of admissibility for scientific evidence); Alice B. Lustre, Annotation, *Post-Daubert Standards for Admissibility of Scientific and Other Expert Evidence in State Courts*, 90 A.L.R.5TH 453 (2001) (explaining the Supreme Court's decision to supersede the Frye test); Baggett, *supra*, note 49, at 150-51 (explaining how the Frye test received much criticism over the years leading to *Daubert*). These criticisms included the standards of the test being too "vague," "overly conservative," and difficulty of ascertaining when a scientific proposition has been generally accepted. See Baggett, *supra*, note 49, at 150.

⁵³ See Adina Rosenfeld, *Admissibility of DNA Evidence: Italy Under Attack*, 40 S.U. L. REV. 197, 212 (2012) (describing the threshold an expert witness must meet to testify under the 702 standard); see also Baggett, *supra* note 49, at 151 (describing the new admissibility standards federal trial courts must follow); *Daubert*, 509 U.S. at 588 (stating "[h]ere there is a specific Rule that speaks to the contested issue. Rule 702, governing expert testimony . . ."). The *Daubert* Court also awarded trial judges with more discretion when determining admissibility by designating them as gatekeepers to ensure that "an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. *Id.* at 589-90. The court also outlined factors that judges might consider in determining reliability pursuant to its new *Daubert* standard. *Id.* at 593. These factors include: (1) whether the scientific theory or technique can and has been tested (2) whether the scientific theory or technique has been subject to peer review and publication, and (3) the rate of error in the particular scientific technique. *Id.* at 593-94.

⁵⁴ See Alvaro Hasani, *Forecasting the End of Climate Change Litigation: Why Expert Testimony Based on Climate Models Should Not Be Admissible*, 32 MISS. C. L. REV. 83, 94 (2013) (exemplifying how inconsistent admissibility standards still persist despite the ruling in *Daubert*).

dence is admissible under either the Daubert or the Frye test.⁵⁵ On the federal level, the circuits that have confronted the issue of DNA admissibility agree with the states that DNA evidence is generally admissible.⁵⁶ The Second Circuit was the first federal court to confront the issue DNA admissibility in the 1990 case *United States v. Jakobetz*.⁵⁷ The case predated the *Daubert* case, which held that Federal Rule of Evidence 702 was the federal standard for determining admissibility of scientific evidence.⁵⁸ At the time, the Second Circuit chose not to use the Frye test and instead employed its own standard of admissibility for scientific evidence.⁵⁹ Notwithstanding the departure from the Frye test, the court still held that the DNA evidence was admissible because the reliability of DNA evidence outweighed the risk of prejudice to the defendant.⁶⁰

⁵⁵ See Gaudet, *supra* note 48, at 109 (stating “[t]oday, courts in all fifty states accept that DNA evidence meets the thresholds for admissibility established in both the Daubert and Frye decisions”).

⁵⁶ See LONNIE E. GRIFFITH, JR. & KARL OAKES, *CYCLOPEDIA OF FEDERAL PROCEDURE*, 11A *CYC. OF FEDERAL PROC.* § 47:65 (3d ed. 2014) (noting that the admissibility of DNA evidence has been permitted in several federal circuits, subject to proper authentication); *see, e.g.*, *United States v. Bonds*, 12 F.3d 540 (6th Cir. 1993) (noting the generally accepted test used to find DNA matches in defendant’s conviction); *United States v. Jakobetz*, 955 F.2d 786 (2d Cir. 1992) (allowing DNA profiling evidence against the defendant); *United States v. Two Bulls*, 918 F.2d 56 (8th Cir. 1990) (holding DNA evidence admissible to prove sexual abuse charges against defendant); *People of Territory of Guam v. Atoigue*, 1992 WL 245628 (D. Guam 1992), *aff’d*, 36 F.3d 1103 (9th Cir. 1994) (finding that although DNA evidence was improperly admitted, its inclusion constituted harmless error); *United States v. Young*, 754 F. Supp. 739 (D. S.D. 1990) (denying defendant’s motion to suppress DNA evidence).

⁵⁷ See *United States v. Jakobetz*, 747 F. Supp. 250, 263 (D. Vt. 1990) (holding that DNA evidence is admissible); *see also* Jeffrey S. Berkman, *Evidence—The Admissibility of Forensic DNA Profiling in the Federal Courts—United States v. Jakobetz*, 747 F.Supp. 250 (D.VT. 1990), 25 *SUFFOLK U. L. REV.* 858, 858 (1991) (describing the first case to decide the admissibility of DNA on the federal level).

⁵⁸ See *Daubert*, 509 U.S. at 588-89 (holding that Rule 702 applies to scientific evidence).

⁵⁹ See *Jakobetz*, 955 F.2d at 794 (announcing the standard of admissibility of scientific evidence used by the second circuit). The court did not use the *Frye* test as the standard of admissibility and this case predates the announcement made in *Daubert*. *Id.* at 796. See *Jakobetz*, 747 F. Supp. at 254 (stating the holding in *Williams*). At the time, the second circuit chose to apply its own standard and concluded “that the appropriate considerations for the admission of novel scientific evidence were the same as those used to determine the admissibility of other evidence.” *Id.*

⁶⁰ See *Jakobetz*, 747 F. Supp. at 263 (denying the defendants motion to dismiss where the defendant claims that DNA evidence is inadmissible because it is unreli-

However, in cases following *Jakobetz*, the Federal Courts used the Daubert test to determine the admissibility of DNA evidence. The Sixth Circuit confronted this issue of first impression in the 1993 case *United States v Bonds* where it announced the proper Daubert test framework which is almost identical to the Rule 702 of the Federal Rules of Evidence.⁶¹ Under the Daubert test and Rule 702, “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.”⁶² In other words, scientific evidence such as DNA is admissible if a judge determines: (1) an expert is testifying to scientific knowledge (reliability prong), and (2) the scientific knowledge will help the jury in resolving a factual dispute (relevance prong).⁶³ The *Bonds* Court further explained that determining if an expert is testifying to scientific knowledge requires a preliminary assessment of the testimony to determine whether the principles, methodology and reasoning underlying the testimony are scientifically valid.⁶⁴ To determine if the principles are scientifically valid, the court considers:

able and unfairly prejudicial). The court further concluded that “[n]onetheless, the government has established that DNA profiling is highly reliable and such reliability outweighs the increased potential for DNA profiling to unfairly prejudice the defendant or mislead or confuse the jury.” *Id.*

⁶¹ See *U.S. v. Bonds*, 12 F.3d 540, 547, 554-56 (6th Cir. 1993) (recognizing the issue as one of first impression on the Sixth Circuit and outlining the Daubert framework). The Defendants make several arguments challenging the admissibility of DNA evidence and testimony based on their contention that the FBI's procedures for making statistical probability estimates are not generally accepted by population geneticists. *Id.* They argued that general acceptance was not established because the FBI's methods were not published in peer-reviewed journals. *Id.* at 564. Their final argument was that the FBI's procedures for declaring DNA matches and estimating probabilities are flawed because the database used by the FBI to make a probability estimate of the DNA pattern found in Bonds's blood failed to take into account ethnic substructure. *Id.* at 563-65.

⁶² See *id.* at 554 (introducing the new standard for admitting scientific evidence); FED. R. EVID. 702 (stating the federal rule for introducing scientific evidence).

⁶³ See *Bonds*, 12 F.3d at 547, 554-56 (clarifying the requirements for admitting scientific evidence).

⁶⁴ See *id.* at 555, 557-58 (describing the requirements in determining whether an expert has scientific knowledge).

(1) whether a theory or technique can be (and has been) tested, (2) whether the theory or technique has been subjected to peer review and publication, (3) the known or potential rate of error in using a particular scientific technique and the existence and maintenance of standards controlling the technique's operation, and (4) whether the theory or technique has been generally accepted in the particular scientific field.⁶⁵

Jakobetz and *Bonds* illustrate how Federal Courts generally address issue of DNA admissibility or testimony. As previously stated, a number of states have adopted the federal standard while others continue to apply the Frye test or develop their own standard.⁶⁶ Irrespective of the admissibility test states chose to apply, no court has found DNA evidence inadmissible due to the invalidity of the underlying theory or a lack of general acceptance.⁶⁷

4. *Who is Required to Submit a DNA Sample?*

All fifty states and the federal government have passed legislation that allow for both the collection and storage of DNA samples in DNA Databanks.⁶⁸ At the federal level, officials are authorized to take a DNA sample from: “(1) individuals in the custody of the Bureau of Prisons who and have been convicted of any Federal felony; (2) individual on probation, parole, or supervised release who have been convicted of any federal felony; and (3) individuals arrested for

⁶⁵ See *id.* (outlining the factors used to consider if testimony is scientifically valid).

⁶⁶ See Hasani, *supra* note 54, at 94-95 (describing the different standards applied across the country).

⁶⁷ See Cronan, *supra* note 7, at 128 (stating that DNA evidence has never been held inadmissible for lack of scientific theory); see also, e.g., *Bonds*, 12 F.3d at 547 (holding DNA admissible under Daubert test); *Vandebogart*, 616 A.2d at 492-494 (concluding that: “the theory underlying DNA profiling is generally accepted in the relevant scientific community.”). Also, “[i]n future cases, a trial court may properly take judicial notice of its general acceptance and thus avoid relitigation on this issue.” *Id.*

⁶⁸ See 42 U.S.C. § 14135a(a)(1)(A) (2012) (proscribing the requirements for collecting DNA samples); see also Jesika S. Wehunt, *Drawing the Line: DNA Databasing at Arrest and Sample Expungement*, 29 GA. ST. U. L. REV. 1063, 1064 (2013) (recognizing that legislation permits all states and the federal government to collect and store DNA samples).

any federal felony.”⁶⁹ At the state level, all fifty states currently have legislation in place to compel DNA collection from anyone convicted of a felony in criminal court.⁷⁰ Additionally, as of February 2015, twenty-nine states have passed laws that allow for the collection of DNA from some or all individuals arrested but not yet convicted.⁷¹ Oddly enough, at both the federal and state level, the burden is on the arrestee or convicted felon to take the appropriate actions to have his DNA removed from DNA databanks in the event he is acquitted, found not guilty, or his conviction is subsequently overturned on appeal.⁷²

⁶⁹ See 42 U.S.C. § 14135a (2012) (outlining the requirements for collecting DNA samples); see also David Rangaviz, Esq. & Eric Morgana, *A Bridge Too Far: The Upcoming Mandatory DNA Sampling Of Arrestees*, 38-WTR VT. B. J. 18, 19 (2013) (reviewing the notable amendments to the statute). Originally, the DNA Act of 2000 only allowed for the collection of DNA samples from individuals convicted of particular enumerated crimes stated in the list of offenses. *Id.* The statute was expanded by the Patriot Act of 2001, which added additional qualifying offenses due to the recent terrorist attacks. *Id.* The statute was again amended in 2004 with the Justice For All Act which now required DNA samples from individuals convicted of “[a]ny felony” at the federal level. *Id.* The 2006 DNA Fingerprint Act again amended the statute by adding language that authorized the Attorney General to collect DNA samples from individuals arrested or detained under federal authority. See Patrick Haines, *Embracing The DNA Fingerprint Act*, 5 J. TELECOMM. & HIGH TECH. L. 629, 645 (2007) (discussing the power of the Attorney General to collect DNA samples or to delegate authority to any agency to collect DNA samples from individuals who are merely arrested for a federal crime). The Attorney General exercised this authority and in January 2009 DNA samples began to be collected from federal felony arrestees. See DOJ DNA Identification System Rule, 28 C.F.R. § 28.12 (2009) (stating “[a]ny agency of the United States that arrests or detains individuals or supervises individuals facing charges shall collect DNA samples from individuals who are arrested, facing charges, or convicted, and from non–United States persons who are detained under the authority of the United States”).

⁷⁰ See *Maryland v. King*, 133 S. Ct. 1958, 1967 (2013) (noting “[a]ll 50 States require the collection of DNA from felony convicts ...”); see also Kevin Lapp, *As Though They Were Not Children: DNA Collection From Juveniles*, 89 TUL. L. REV. 435, 446 (recognizing that all fifty states require DNA samples from anyone convicted of a felony); Greg Brower, *Maryland v. KING: Textualism Meets Reason*, 14 ENGAGE: J. FEDERALIST SOC’Y PRAC. GROUPS 29 n.8 (2013) (stating that all state statutes compel the collection of DNA from convicted felons).

⁷¹ See *28 States Have Passed The Law*, DNA SAVES, archived at <http://perma.cc/FP4H-G7K4> [hereinafter *28 States Have Passed The Law*] (listing the current states that collect DNA samples from arrestees).

⁷² See 42 U.S.C. § 14132 (2012) (listing the appropriate procedure for expunging a DNA profile from a state or federal database); see also *United States v. Mitchell*,

B. Fourth Amendment Challenges to DNA Evidence.

Since the advent of legislation authorizing the collection of DNA samples, constitutional challenges to the practice are brought under the Equal Protection Clause of the Fourteenth Amendment, the Cruel and Unusual Punishment Clause of the Eighth Amendment, the Due Process Clause, the Fourth Amendment's prohibition of unreasonable searches and seizures, and the Fifth Amendment's constitutional right against self-incrimination.⁷³ The most common challenge to the collection of DNA samples is under the Fourth Amendment's prohibition of unreasonable searches and seizures.⁷⁴ When presented with the issue of whether collecting DNA samples violates the Fourth Amendment, a two part test is required as follows: "(1) whether the actions taken are actually a search within the meaning of the fourth amendment; and (2) if it is a search, did the actions violate the Fourth Amendment; i.e was the search unreasonable."⁷⁵ As of April 2015, every circuit court that has considered the issue has held that statutes that authorize the collection of DNA samples from convicted felons are constitutional.⁷⁶ Furthermore, the Supreme Court held that a

652 F.3d. 387, 399 (2011) (noting that DNA can be expunged from the CODIS databank by taking the appropriate actions); Stephanie Beaugh, *How the DNA Act Violates the Fourth Amendment Right to Privacy of Mere Arrestees and Pre-Trial Detainees*, 59 LOY. L. REV. 157, 159, 170 (2013) (providing a scenario depicting the requirements to get DNA removed from a databank).

⁷³ See John D. Biancamano, *Arresting DNA: The Evolving Nature of DNA Collection Statutes and Their Fourth Amendment Justifications*, 70 OHIO ST. L.J. 619, 629-30 (2009) (listing the vehicles used to challenge the collections and storage of DNA); see also Jennifer Graddy, *The Ethical Protocol for Collecting DNA Samples in the Criminal Justice System*, 59 J. MO. B. 226, 228-30 (2003) (highlighting the common constitutional challenges to the collection of DNA samples from persons arrested and convicted).

⁷⁴ See Biancamano, *supra* note 73, at 629-30 (stating the most common challenge to collecting DNA is through the Fourth Amendment).

⁷⁵ See 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, 189 (2010) (identifying the two initial issues of a Fourth Amendment analysis: whether the intrusion qualifies as a search, and if so, whether the search was unreasonable).

⁷⁶ See *Mitchell*, 652 F.3d at 397 (acknowledging that all circuit courts to address the issue have upheld the constitutionality of DNA collection statutes for convicted felons).

Maryland statute authorizing collection of DNA from any person arrested for a felony, but not yet convicted, is constitutional.⁷⁷

I. What Constitutes a “Search” Under the Fourth Amendment?

To determine if the actions taken constitutes a “search” within the meaning of the Fourth Amendment, early jurisprudence focused on whether the law enforcement officials had physically searched a person or had physically trespassed into a constitutionally protected area.⁷⁸ In other words, a “search” was conducted and the Fourth Amendment was implicated if a person was physically searched or if government officials had intruded or trespassed into a person’s house or on their property.⁷⁹

Due to the Court’s early interpretation of the Fourth Amendment, advances in technology generated the argument that that the Court should adjust its approach to account for technological developments and breakthroughs.⁸⁰ In 1967, the Supreme Court finally

⁷⁷ See *King*, 133 S. Ct. at 1980 (holding that taking and analyzing a cheek swab of the arrestee’s DNA is a legitimate police booking procedure that is reasonable under the Fourth Amendment).

⁷⁸ See Russell L. Weaver, *The Fourth Amendment, Privacy and Advancing Technology*, 80 MISS. L.J. 1131, 1138-39 (2011) (examining the Court’s early definition of what constitutes a search within the meaning of the Fourth Amendment). Early Fourth Amendment cases, such as *Olmstead v. United States*, 277 U.S. 438 (1928), focused on material things such as “the person, the house, the papers or his effects” to determine if a search was conducted. *Id.* at 1140. An example of a constitutionally protected area would be a man’s home. *Id.*

⁷⁹ See *United States v. Jones*, 132 S. Ct. 945, 949 (2012) (asserting that most of the Fourth Amendment’s early history was tied to common law trespass); see also *Olmstead v. United States*, 277 U.S. 438, 465-66 (1928) (inferring that a trespass or physical intrusion is required to implicate the Fourth Amendment); Weaver, *supra* note 78, at 1139 (explaining early Fourth Amendment jurisprudence focusing on a trespass or intrusion).

⁸⁰ See Weaver, *supra* note 78, at 1141 (exposing the Court’s concern with how the Fourth Amendment will be applied to advances in technology); see also *Olmstead*, 277 U.S. at 474 (Brandeis, J., dissenting) (noting the court’s skepticism regarding Fourth Amendment protections with relation to advancements in technology). The court stated:

The progress of science in furnishing the government with means of espionage is not likely to stop with wiretapping. Ways may some day be developed by which the government, without removing papers from secret drawers, can reproduce them in court, and by which it will be enabled to expose to a jury the most intimate occurrences of the home.

addressed these concerns about the Fourth Amendment's application to advancing technology in the seminal case *Katz v. United States*.⁸¹ Justice Harlan's concurring opinion announced a new approach for defining the term "search" under the Fourth Amendment, which was largely in response to advances in technology.⁸² Justice Harlan declared that the Fourth Amendment protects people and not places, and a search occurs when: "(1) a person exhibits a subjective expectation of privacy and (2) the expectation is one that society recognizes as objectively 'reasonable'."⁸³ Commentators have used this two-part analysis to declare that a search occurs when a person has a "Reasonable Expectation of Privacy."⁸⁴

It is settled law that the compelled collection of DNA by buccal swab or blood extraction constitutes a search under the *Katz* framework because this physical intrusion into the body infringes an expectation of privacy that society is prepared to recognize as reasonable.⁸⁵ Additionally, the subsequent analysis of the extracted blood

Id.

⁸¹ See *Katz v. United States*, 389 U.S. 347, 359 (1967) (holding that an unwarranted wiretap on a phone booth constitutes an illegal search under the Fourth Amendment). In *Katz*, a man suspected of running an illegal gambling operation placed a phone call from a public telephone booth. *Id.* at 354. Police had previously placed an electronic bug on the outside of the booth which enabled them to record the conversation. *Id.* During *Katz*'s conversation, he made incriminating statements that were recorded by police, and later used against him during trial. *Id.* at 352. Relying on precedent cases focusing on "trespass" and "intrusion," the government argued that the police had not conducted a "search" as defined by the Fourth Amendment as there was no "intrusion" into a "constitutionally protected area." *Id.* at 351-53.

⁸² See *Weaver*, *supra* note 78, at 1150 (identifying a new approach to the Fourth Amendment formulated in response to advances in technology).

⁸³ See *Katz*, 389 U.S. at 360-61 (Harlan, J., concurring) (defining the proper framework to determine if a search occurred); see also Phyllis T. Bookspan, *Re-working the Warrant Requirement: Resuscitating the Fourth Amendment*, 44 VAND. L. REV. 473, 490 (1991) (explaining the subjective and objective elements of what constitutes a search).

⁸⁴ See *Molko*, *supra* note 75, at 189 (elaborating on the two part analysis of what constitutes a search). First, a court must determine whether a person has "an actual expectation of privacy," then look to whether that expectation is "reasonable." See *Molko*, *supra* note 75, at 189.

⁸⁵ See *King*, 133 S. Ct. 1958, 1968-69 (2013) (stating that a cheek swab and blood extraction of DNA constitutes a search); see also *Skinner v. Railway Labor Exec. Ass'n*, 489 U.S. 602, 616 (1989) (announcing that a "compelled intrusion into the body for blood to be analyzed" qualifies as a search under the Fourth Amendment); *Schmerber v. California*, 384 U.S. 757, 767 (1966) (concluding that extracting

or saliva sample is also a search under the Fourth Amendment because it reveals a host of private facts about a person such as health issues.⁸⁶ Therefore, because the collection of DNA is physically intrusive and its analysis reveals private information, all circuit courts that have addressed the issue and the Supreme Court have held that compelled DNA collection is a search under the Fourth Amendment.⁸⁷

2. The “Reasonableness” Inquiry and the “Special Needs Doctrine.”

Even if a person has a reasonable expectation of privacy and the government’s actions are deemed a search, inquiry into whether a Fourth Amendment violation has occurred does not end there.⁸⁸ As noted above, in addition to a person having a reasonable expectation of privacy, a search also has to be considered “unreasonable” to violate the Fourth Amendment.⁸⁹ This is consistent with the Supreme Court’s announcement that the proper function of the Fourth Amendment is not to constrain all searches, but rather to constrain unjustified or improper searches.⁹⁰ Therefore, inquiry now turns on whether a search was “unreasonable” by determining: “whether the officer’s action was justified at its inception, and whether it was reasonably related in scope to the circumstances which justified the in-

blood “plainly involves the broadly conceived reach of a search and seizure under the Fourth Amendment”).

⁸⁶ See *Skinner*, 489 U.S. at 616 (finding “[t]he ensuing chemical analysis of the sample to obtain physiological data is a further invasion of the tested employee’s privacy interests”); see also *Biancamano*, *supra* note 73, at 631 (asserting that analysis of the extracted samples constitutes an additional search).

⁸⁷ See *Biancamano*, *supra* note 73, at 631 (acknowledging that all circuits have declared the collection and analysis of DNA samples establishes a search); see also *King*, 133 S. Ct. at 1969 (announcing that extraction of DNA by cheek swab or blood extraction constitutes a search).

⁸⁸ See *Molko*, *supra* note 75, at 190 (inferring that the two part inquiry used to trigger Fourth Amendment protection is not by itself conclusive in determining if a Fourth Amendment violation has occurred). Additionally, courts will look to “(1) the extent of bodily intrusion; (2) the nature of the information extracted; and (3) the exposure of the DNA to the public.” See *Molko*, *supra* note 75, at 190.

⁸⁹ See *Molko*, *supra* note 75, at 189 (expanding on the discussion of what triggers Fourth Amendment protection).

⁹⁰ See *King*, 133 S. Ct. at 1969 (clarifying the proper function of the Fourth Amendment); see also *Schmerber*, 384 U.S. at 768 (1966) (limiting the use of the Fourth Amendment to reasonable searches).

terference in the first place.”⁹¹ The text of the Fourth Amendment reads:

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.⁹²

The reasonableness inquiry begins by examining the two clauses in the text of the Fourth Amendment: the “Reasonableness Clause” and the “Warrant Clause.”⁹³ The text of Reasonableness Clause states who is covered (“the people”); what is covered (“persons, houses, papers, and effects”); and the nature of the protection (“to be secure ... against unreasonable searches and seizures”).⁹⁴ The “Warrant Clause” focuses on the requirements for a warrant to issue (“probable cause [for the search or seizure], supported by oath or affirmation”), and tells us about what is contained in the warrant itself such as information on the place to be searched or the persons or things to be seized.⁹⁵ For years, Courts and commentators alike have debated whether to interpret these two clauses of the Fourth Amendment as one interconnected set or two separate and distinct clauses.⁹⁶

⁹¹ See *Terry v. Ohio*, 392 U.S. 1, 19-20 (1968) (defining reasonableness of a search and seizure under the Fourth Amendment).

⁹² See U.S. CONST. amend. IV (reciting language of Fourth Amendment).

⁹³ See, e.g., Fabio Arcila, Jr., *The Death of Suspicion*, 51 WM. & MARY L. REV. 1275, 1292 (2010) (explaining two clauses of the Fourth Amendment).

⁹⁴ See U.S. CONST. amend. IV (describing coverage and protection of the reasonableness clause within the Fourth Amendment); see also Rachael A. Lynch, *Two Wrongs Don't Make A Fourth Amendment Right: Samson Court Errs In Choosing Proper Analytical Framework, Errs In Result, Parolees Lose Fourth Amendment Protection*, 41 AKRON L. REV. 651, 655 n.18 (2008) (discussing the reasonableness Clause of the Fourth Amendment).

⁹⁵ See U.S. CONST. amend. IV (explaining the warrant requirement); see also Lynch, *supra* note 94, at 655 n.18 (explaining the Warrant Clause of the Fourth Amendment).

⁹⁶ See *Groh v. Ramirez*, 540 U.S. 551, 571-72 (2004) (Thomas, J., dissenting) (stating “[t]he precise relationship between the Amendment's Warrant Clause and Unreasonableness Clause is unclear . . . [T]he Court has vacillated between imposing a categorical warrant requirement and applying a general reasonableness standard”); see also Cynthia Lee, *Reasonableness with Teeth: The Future of Fourth*

Traditionally, the Supreme Court read the two clauses together meaning a search would be reasonable only if supported by probable cause and executed pursuant to a warrant that specifically described the scope of the search.⁹⁷ However, the Supreme Court created many exceptions over the years that excuse noncompliance with the probable cause and warrant requirements of the “Warrant Clause,” and therefore allow law enforcement officials in certain situations to execute warrantless searches that are still considered reasonable.⁹⁸ Consequently, in more recent times, the Supreme Court interprets the text of the Fourth Amendment as two separate clauses focusing exclusively on the Reasonableness Clause.⁹⁹ Under this interpretation, the reasonableness of the search does not depend on whether the government obtained a warrant.¹⁰⁰ Therefore, searches

Amendment Reasonableness Analysis, 81 MISS. L.J. 1133, 1137 (2012) (expanding on the discussion of the confusion between the “Reasonableness Clause” and the “Warrant Clause”).

⁹⁷ See *Katz*, 389 U.S. at 357 (stating “[s]earches conducted . . . without prior approval by judge or magistrate, are per se unreasonable under the Fourth Amendment—subject only to a few specifically established and well-delineated exceptions”); see also *United States v. Stewart*, 468 F. Supp. 2d 261, 266 (D. Mass. 2007) (interpreting the Fourth Amendment to mean that “a search would be reasonable only if supported by probable cause and executed pursuant to a warrant specifically describing its scope”), *rev’d*, 532 F.3d 32 (1st Cir. 2008). This interpretation has been coined the “unitary” approach to Fourth Amendment analysis because it requires the presence of both predicates. See *Stewart*, 468 F. Supp. 2d at 266.

⁹⁸ See *United States v. Kincade*, 379 F.3d 813, 822 (9th Cir. 2004) (noting the Warrant Clause in not “unyielding” and many exceptions exist that allow for a valid warrantless search); see, e.g., *New Jersey v. T.L.O.*, 469 U.S. 325 (1985) (announcing the “regulatory authority” exception); *United States v. Jacobsen*, 466 U.S. 109 (1984) (explaining the “third party intervention” exception); *Thompson v. Louisiana*, 469 U.S. 17 (1984) (describing the “emergency” exception); *Texas v. Brown*, 460 U.S. 730 (1983) (illustrating the “plain view” exception); *South Dakota v. Opperman*, 428 U.S. 364 (1976) (setting forth the “inventory search” exception); *United States v. Santana*, 427 U.S. 38 (1976) (highlighting the “hot pursuit” exception); *Cady v. Dombrowski*, 413 U.S. 433 (1973) (identifying the “community caretaking” exception); *Schneckloth v. Bustamonte*, 412 U.S. 218, 280 (1973) (discussing the “consent search” exception); *Chimel v. California*, 395 U.S. 752, 773-74 (1969) (presenting the “search incident to arrest” exception); *Lewis v. United States*, 385 U.S. 206 (1967) (highlighting the “deceptive guest” exception); *Carroll v. United States*, 267 U.S. 132, 156-57 (1925) (discussing the “automobile” exception).

⁹⁹ See *Stewart*, 468 F. Supp. 2d at 266 (observing the recent decision of the Supreme Court to interpret the Fourth Amendment as two separate clauses).

¹⁰⁰ See *Lee*, *supra* note 96, at 1140 (elaborating on the interpretation of the Reasonableness Clause which is not dependent of the Warrant Clause).

and seizures conducted without a warrant may be constitutional under one of the exceptions as long as they are reasonable, which means law enforcement officials need comply with the Warrant requirement only when they seek a warrant.¹⁰¹ Although courts prefer a warrantless search to be supported by “some quantum of individualized suspicion”,¹⁰² this is not always necessary to support a finding that a search is reasonable.¹⁰³ The Supreme Court has reinforced the idea that some warrantless searches, executed in the absence of reasonable suspicion may be justified under the Fourth Amendment by repeatedly stating that the “touchstone of the Fourth Amendment is reasonableness.”¹⁰⁴

In addition to the list of searches the Supreme Court has deemed exceptions to the warrant requirement, two additional exceptions are frequently used to assess the reasonableness of searches when no warrant or individualized suspicion of wrongdoing is present: the “Special Needs” doctrine and the “Totality of the Circumstances” test.¹⁰⁵ The Special Needs Doctrine justifies searches conducted without a warrant or individualized suspicion of wrongdoing based upon “[A] careful balancing of governmental and private interests.”¹⁰⁶ For a warrantless search to qualify under this exception, it must be conducted to further a government “special need” other than investigation of criminal activity and the furtherance of this special need would be jeopardized by a warrant or probable cause requirement.¹⁰⁷ Thus, a general scheme of coordinated searches qualifies for

¹⁰¹ See Lee, *supra* note 96, at 1140 (explaining how searches are considered reasonable in the absence of a warrant).

¹⁰² United States v. Martinez-Fuerte, 428 U.S. 543, 560 (1976).

¹⁰³ See *id.* at 560-61 (stating that “the Fourth Amendment imposes no irreducible requirement of such suspicion”); see also *Skinner*, 489 U.S. at 624 (announcing “individualized suspicion is not a constitutional floor, below which a search must be presumed unreasonable”); Nat’l Treasury Employees Union v. Von Raab, 489 U.S. 656, 665 (1989) (asserting “neither a warrant nor probable cause, nor, indeed, any measure of individualized suspicion, is an indispensable component of reasonableness in every circumstance”).

¹⁰⁴ See, e.g., *King*, 133 S. Ct. at 1970; United States v. Knights, 534 U.S. 112, 118 (2001).

¹⁰⁵ See Charles Nerko, *Assessing Fourth Amendment Challenges to DNA Extraction Statutes After Samson v. California*, 77 FORDHAM L. REV. 917, 926 (2008) (adding to the list of warrantless search exceptions announced by the Supreme Court).

¹⁰⁶ See *T.L.O.*, 469 U.S. at 351 (Blackmun, J., concurring) (outlining the special needs doctrine and its requirements to excuse compliance with the warrant clause).

¹⁰⁷ See *Griffin v. Wisconsin*, 483 U.S. 868, 873 (1987) (asserting searches conducted in the absence of reasonable suspicion may be justified “when ‘special needs,

treatment under the special needs doctrine only if the program's primary purpose is not a general interest in crime control.¹⁰⁸ Conversely, the mere fact that crime control is one purpose, but not the primary purpose of a program of searches, does not bar the application of the special needs doctrine.¹⁰⁹

If the court finds that the primary purpose of a program of searches is a "special need" and not a general interest in crime control, the court then must weigh the special need against the privacy interest to determine the reasonableness of the search program.¹¹⁰ To accomplish this, the court will conduct a balancing test based on an examination of three factors: "(1) the nature of the privacy interest involved; (2) the character and degree of the governmental intrusion; and (3) the nature and immediacy of the government's needs, and the efficacy of its policy in addressing those needs."¹¹¹ This balancing test determines the reasonableness of the search, which ultimately dictates if a Fourth Amendment violation has occurred.¹¹²

beyond the normal need for law enforcement, make the warrant and probable-cause requirement impracticable" (quoting *New Jersey v. T.L.O.*, 469 U.S. 325, 351 (1985)); see, e.g., *Warrantless Searches and Seizures*, 40 GEO. L.J. ANN. REV. CRIM. PROC. 44, 134-37 (2011) (explaining what is required for a search to qualify under the special needs exception).

¹⁰⁸ See *City of Indianapolis v. Edmond*, 531 U.S. 32, 44, 48 (2000) (holding the special needs doctrine does not apply to a checkpoint program that is ultimately indistinguishable from the general interest in crime control and therefore violates the Fourth Amendment); see also *Ferguson v. City of Charleston*, 532 U.S. 67, 83-84 (2001) (holding that the special needs doctrine does not apply to hospitals urines that test for cocaine because the "immediate objective of the searches was to generate evidence for law enforcement purposes"); *Nicholas v. Goord*, 430 F.3d 652, 663 (2d Cir. 2005) (clarifying that the special needs doctrine applies only when the "searches serve as their immediate purpose an objective distinct from the ordinary evidence gathering associated with crime investigation").

¹⁰⁹ See *Lynch v. City of New York*, 589 F.3d 94, 102 (2d Cir. 2009) (announcing that the special needs doctrine may still apply even if crime control is a secondary purpose of the search); see also *United States v. Amerson*, 483 F.3d 73, 81 (2d Cir. 2007) (announcing that some special law enforcement concerns will justify "suspicionless" searches under the special-needs doctrine).

¹¹⁰ See *Lynch*, 589 F.3d at 102 (discussing the appropriate steps taken to determine if a search is reasonable under the special needs doctrine).

¹¹¹ See *Amerson*, 483 F.3d at 83-84 (outlining the balancing test the court will conduct to determine the reasonableness of a search after a special need has been identified).

¹¹² See *Lynch*, 589 F.3d at 102 (demonstrating how the courts determine reasonableness under the special needs doctrine).

When faced with the issue of whether a DNA collection statute is reasonable under the Fourth Amendment, the circuits are split as to which warrantless exception analysis they should apply.¹¹³ The majority of circuits—the First, Third, Fourth, Fifth, Sixth, Eighth, Ninth, Eleventh, and District of Columbia—use a totality of the circumstances analysis.¹¹⁴ A minority of circuits—the Second, Seventh, and Tenth Circuits—apply the special needs doctrine.¹¹⁵ The Sixth Circuit has not choose to use one test over another, previously held that a DNA collection statute was constitutional under either a totality of the circumstances or a special needs analysis.¹¹⁶ Despite the circuit split, the Supreme Court used a totality of the circumstances test to determine the constitutionality of collecting DNA samples from arrestees in the only DNA case it ever chose to accept to date.¹¹⁷

The circuits that apply the special needs doctrine to justify the constitutionality of DNA collection statutes focus on the special need to obtain a reliable record of an offender's identity in order to create a DNA-identification index to assist in solving crimes.¹¹⁸ Courts have justified this special need as not a general interest in crime control by stating, “although the DNA samples may eventually help law enforcement identify the perpetrator of a crime, at the time of collection, the samples in fact provide no evidence in and of themselves of

¹¹³ See *Mitchell*, 652 F.3d at 403 (clarifying the divide between circuits on the correct framework to analyze the reasonableness of DNA collection statutes).

¹¹⁴ See *id.* (listing the circuits that apply a totality of the circumstances analysis).

¹¹⁵ See, e.g., *United States v. Amerson*, 483 F.3d 73, 78 (2d Cir. 2007) (applying the special needs doctrine to DNA collections statutes); *United States v. Hook*, 471 F.3d 766, 772-74 (7th Cir. 2006) (applying the special needs doctrine to a DNA collection statute); *United States v. Kimler*, 335 F.3d 1132, 1146 (10th Cir. 2003) (concluding that a compelled collection of DNA as a condition of a convicts supervised release is a reasonable search and seizure under the special needs exception because the desire to build a DNA database goes beyond the ordinary law enforcement need).

¹¹⁶ See *United States v. Conley*, 453 F.3d 674, 679, 680-81 (6th Cir. 2006) (holding the “special needs” of law enforcement in obtaining a convicted felon’s DNA outweighs his greatly reduced expectation of privacy; and also holding “[u]nder a totality of the circumstances analysis, the search is reasonable, and does not violate the Fourth Amendment”).

¹¹⁷ See *King*, 133 S. Ct. at 1970 (announcing, “This application of traditional standards of reasonableness requires a court to weigh the promotion of legitimate governmental interests against the degree to which [the search] intrudes upon an individual's privacy”).

¹¹⁸ See *Amerson*, 483 F.3d at 81 (emphasizing the special need of collecting DNA for identity purposes).

criminal wrongdoing, and are not sought for the investigation of a specific crime.”¹¹⁹ This statement reinforces the various circuits’ assertions that although an interest in crime control cannot qualify as special needs, some special law enforcement concerns will justify suspicionless searches under the special-needs doctrine.¹²⁰

After identifying this special need for collecting DNA without suspicion, the Court then begins its balancing test by focusing on the reasonable expectation of privacy of the person from whom the DNA is extracted.¹²¹ However, The Supreme Court announced that certain people, such as those on probation, have a diminished expectations of privacy because probation is a form of criminal sanction and does not allow probationers to enjoy the same freedom which every citizen is entitled to.¹²² Additionally, the Supreme Court explained that “[P]arolees have fewer expectations of privacy than probationers, because parole is more akin to imprisonment than probation is to imprisonment.”¹²³ Furthermore, the Supreme Court concluded that prisoners have no reasonable expectation of privacy.¹²⁴ Finally, the Supreme Court declared the expectations of privacy of an individual taken into police custody is diminished because this class of people is subject to an extensive search of both himself and his property as part of the booking process.¹²⁵

After determining a person’s reasonable expectation of privacy, the court balances the severity of the government’s intrusion on the person’s interests while taking into consideration the person’s diminished expectation of privacy.¹²⁶ Two privacy interests that are

¹¹⁹ See *Goord*, 430 F.3d at 669 (noting that DNA collection’s initial purpose is not to provide evidence of whether an individual committed criminal violations of law).

¹²⁰ See *Amerson*, 483 F.3d at 81 (noting that some law enforcement concerns will justify suspicionless searches).

¹²¹ See *Amerson*, 483 F.3d at 83 (considering the privacy interest as part of the balancing test).

¹²² See *Knights*, 534 U.S. at 119-20 (describing the diminished expectation of privacy of probationers).

¹²³ See *Samson v. California*, 547 U.S. 843, 850-852 (2006) (explaining the privacy expectations of parolees).

¹²⁴ See *Hudson v. Palmer*, 468 U.S. 517, 530 (1984) (holding that prisoners have no reasonable expectation of privacy).

¹²⁵ See *King*, 133 S. Ct. at 1978 (reviewing an arrestee’s diminished expectation of privacy).

¹²⁶ See *Amerson*, 483 F.3d at 84 (conditioning the government’s intrusion based on a diminished expectation of privacy).

commonly examined in the taking of DNA samples are: (1) the physical intrusion associated with taking the sample and (2) the analysis and storage of the information.¹²⁷ In *Schmerber v. California*, the Supreme Court held that the methods of collecting DNA samples through blood extraction and buccal swab are only minimal physical intrusions because such tests are often performed by primary care physicians in these involves virtually no risk, trauma, or pain.¹²⁸ The Supreme Court more recently announced that the analysis of the DNA sample does not intrude on a person's privacy in a way that would make his DNA identification unconstitutional because DNA statutes have safeguards to insure that the privacy invasion of analyzing and storing of the DNA profiles is minimal.¹²⁹ Various courts, including the Supreme Court, have gone as far as paralleling the privacy interest associated with analyzing DNA samples to the routine booking procedure of fingerprinting.¹³⁰

The final step of the balancing test is to weigh the intrusion of the DNA collection statute on a person's privacy against the nature

¹²⁷ See *id.* (describing the two privacy interests of persons compelled to submit DNA samples).

¹²⁸ See *Schmerber*, 384 U.S. at 771 (declaring the extraction of blood a minimal intrusion); see also *King*, 133 S. Ct. at 1979 (determining the buccal swab of a cheek is a minimal intrusion).

¹²⁹ See *King*, 133 S. Ct. at 1979 (noting that no other purpose other than identification is a permissible use of the DNA sample); see also *Amerson*, 483 F.3d at 86 (concluding the additional intrusion of privacy resulting from analyzing the DNA is small); *Mitchell*, 652 F.3d at 400 (listing the protection against the improper use of the DNA profiles set forth in DNA statutes such as the DNA Act). The safeguards that protect a person's privacy interest of sensitive material after submitting a DNA sample are that the databases that store the DNA only contain "(1) the DNA profile; (2) a number identifying the agency that submitted the DNA profile (the 'Agency Identifier'); (3) a 'Specimen Identification Number' which the FBI states is 'generally a number assigned sequentially at the time of sample collection' and 'does not correspond to the individual's social security number, criminal history identifier, or correctional facility identifier;' and (4) information identifying the laboratory personnel associated with creating the profile." *Id.* No names or other personal identifiers are stored. *Id.*

¹³⁰ See, e.g., *King*, 133 S. Ct. at 1962 (explaining that "taking and analyzing a cheek swab of the arrestee's DNA is, like fingerprinting and photographing, a legitimate police booking procedure that is reasonable under the Fourth Amendment."); *Amerson*, 483 F.3d at 86 (enunciating that "we see the intrusion on privacy effected by [the collecting of DNA samples] as similar to the intrusion wrought by the maintenance of fingerprint records, which are collected as a part of everyday routine booking procedures").

and immediacy of the government's needs.¹³¹ Courts considering this issue have concluded that the government has a compelling need to obtaining and store accurate identifying information from convicted offenders and persons in police custody.¹³² The reasons associated with such a strong need to identify such persons are: “(1) the ability to rapidly and accurately solve crimes; (2) the ability to exonerate people wrongly convicted of a crime; (3) the ability to prevent innocent individuals from becoming suspects when their DNA does not match that of a perpetrator;¹³³ (4) the ability to help law enforcement officials make critical choices of how to proceed after detaining a suspect; (5) the ability to assess the likelihood that persons charged with crimes are available at trial; (6) the ability to assess the future dangerousness of an arrestee which is critical to such court procedures as bail hearings.”¹³⁴ These reasons reflect the many benefits that stem from the ability to identify individuals quickly, accurately, and at reasonable expense.¹³⁵

3. “Totality of the Circumstances” Framework

The second exception courts use to assess the reasonableness of searches when no warrant or individualized suspicion of wrongdoing is present is the “Totality of the Circumstances” test.¹³⁶ As previously noted, the circuits are split regarding the correct method of Fourth Amendment analysis to apply to DNA collection statutes with the First, Third, Fourth, Fifth, Sixth, Eighth, Ninth, Eleventh, the District of Columbia, and the United States Supreme Court, endorsing a

¹³¹ See *Amerson*, 483 F.3d at 87 (examining the final step of the balancing test).

¹³² See *id.* (announcing the compelling state interest the government has at stake in collecting DNA from persons with a diminished expectation of privacy); see also *King*, 133 S. Ct. at 1970 (stating the government has an interest in identifying persons arrested for a crime).

¹³³ See *Amerson*, 483 F.3d at 87-88 (explaining the reasons the government has a compelling interest in identifying individuals through DNA collection).

¹³⁴ See *King*, 133 S. Ct. at 1978 (describing the government’s interest in DNA identification of arrestees).

¹³⁵ See *Amerson*, 483 F.3d at 89 (concluding that the government’s interest in DNA identification provides overall benefits to law enforcement agencies as well as the rest of society).

¹³⁶ See Nerko, *supra* note 105, at 926 (adding totality of the circumstances to the list of exceptions of warrantless searches).

totality of the circumstances approach.¹³⁷ Like the special needs doctrine, courts use the totality of the circumstances test to determine whether a search is reasonable by assessing the degree of intrusion on an individual's privacy while considering the degree to which the intrusion is needed to promote legitimate governmental interests.¹³⁸ However, unlike the special needs doctrine, the totality of the circumstances framework does not require the government to first identify a special need other than crime control before proceeding to a balancing test.¹³⁹

The reasoning behind the multiple circuits decision to abandon the special needs test in favor of the totality of the circumstances framework, is the difficulty in finding a government need other than fighting crime to justify collecting DNA samples.¹⁴⁰ In support of this reasoning, the Third Circuit points to the CODIS informational brochure, which explicitly states that the collection and storage of DNA is an "effective tool for solving crime" and that it was formed in 1990 "for law enforcement purposes."¹⁴¹ Despite the lack of identifying a special need, the totality of the circumstances framework proceeds in a similar like manner to that of the special needs doctrine to determine the reasonableness of DNA collection by conducting a balancing test based on: "(1) the degree DNA collection intrudes on

¹³⁷ See discussion *supra* Part II.B.2 (explaining the circuit split when analyzing the collection of DNA samples).

¹³⁸ See *Samson v. California*, 547 U.S. 843, 848 (2006) (outlining the totality of the circumstances test to determine the reasonableness of a search).

¹³⁹ See *id.* (inferring no requirement for identifying a special need by announcing "[w]hether a search is reasonable 'is determined by assessing, on the one hand, the degree to which it intrudes upon an individual's privacy and, on the other, the degree to which it is needed for the promotion of legitimate governmental interests'").

¹⁴⁰ See *U. S. v. Weikert*, 504 F.3d 1, 9-10 (1st Cir. 2007) (highlighting the reasons why compelled DNA collection does not qualify under the special needs doctrine); see also *U.S. v. Sczubelek*, 402 F.3d 175, 184 (3rd Cir. 2005) (inferring that the compelled collection of DNA's primary purpose is criminal investigation because it goes well beyond any other government special need). In *Maryland v. King*, the Supreme Court used the totality of the circumstances test to announce that Maryland statute that allows law enforcement officials to extract DNA from people arrested but not yet convicted is constitutional. See *King*, 133 S. Ct. at 1979-80.

However, it is unclear if the Supreme Court was announcing that that the totality of the circumstances test is the proper framework to use when assessing the constitutionality of a DNA collection statute. See *id.* at 1969-70.

¹⁴¹ See *CODIS Brochure*, *supra* note 40 (stating the purpose for the collection and storage of DNA samples); see also *Weikert*, 504 F.3d at 10 (pointing out the purpose of collecting DNA samples as set forth in the CODIS brochure).

individual privacy; (2) the nature of the intrusion; and (3) the degree to which DNA collection is needed for promotion legitimate government interests.”¹⁴²

C. RFID Tags and the Human Implantable Microchip Technology

1. Understanding the Procedure of Human Microchipping Using RFID Technology

The human-implantable microchip is approximately the size of a grain of rice and is coated with biocompatible glass.¹⁴³ The chip is implanted in humans by administering a local anesthetic to the upper arm and then using “a large-gauge, hypodermic needle to inject the chip under the skin on the back of the arm, midway between the elbow and the shoulder.”¹⁴⁴ The chip operates by using Radio Frequency Identification (RFID) technologies in which radio waves “transmit[] the identity of an object or person wirelessly.”¹⁴⁵ In simpler terms, the RFID technology used in human microchips function similarly to a Universal Product Code (UPC) or bar code on a consumer product that is scanned in a checkout line at a supermarket.¹⁴⁶ However, RFID tags offer several advantages over barcodes with the most notable advantage being RFID’s ability to capture data on tags and transmit it to a computer system without the need of a human to

¹⁴² Compare *Mitchell*, 652 F.3d at 406-16 (discussing the balancing test conducted under the totality of the circumstances framework), with *Amerson*, 483 F.3d at 83 (discussing the balancing test conducted under the special needs doctrine).

¹⁴³ See Elizabeth G. Currid, *More Bite Than Bark: The Legal and Social Consequences of Microchipping Individuals With Alzheimer’s Disease*, 6 IND. HEALTH L. REV. 357, 367-69 (2009) (describing the characteristics of a human microchip); see also Elaine M. Ramesh, *Time Enough?: Consequences of Human Microchip Implantation*, 8 RISK: HEALTH SAFETY & ENV’T 373, 375 (1997) (explaining the implant procedure of a microchip).

¹⁴⁴ See Currid, *supra* note 143, at 360 (illustrating the procedure of implanting a microchip in a human).

¹⁴⁵ See Bob Violino, *What is RFID?*, RFID J. (Jan. 16, 2005), archived at <http://perma.cc/3C2T-MVXD> (discussing RFID technology); see also Currid, *supra* note 143, at 359 (elaborating on the science behind the microchip technology).

¹⁴⁶ See Currid, *supra* note 143, at 359 (analogizing RFID technology to UPC codes).

manually scan a tag while barcodes require a human to operate properly.¹⁴⁷

The RFID technology works by placing a “tag,” a microchip with an antenna, on an item and then using a device known as a reader, a device with one or more antennas, to read data off of the tag using radio waves.¹⁴⁸ The reader passes the information taken from the tag to a computer so that the data can be read and used to accomplish an objective.¹⁴⁹ The microchip tags which store the information can be either Active or Passive tags.¹⁵⁰ Active tags have their own transmitter, battery power source, and have a read range of up to 300 feet.¹⁵¹ Conversely, passive tags have a read range of only thirty feet, have no transmitter nor power source, and operate by simply reflect-

¹⁴⁷ See Violino, *supra* note 145 (pointing out a distinguishing feature of RFID tags); see also *A question we are asked often: “When is RFID better than barcodes?”*, ATLAS RFID SOL., archived at <http://perma.cc/7CDA-DHWC> (comparing and contrasting RFID tags to bar codes). Other advantages that RFID tags have over bar codes include: 1) RFID tags have read/write technology which allows to modify or update the information contained on the tag as needed; 2) RFID tags do not require line of sight proximity meaning the information they store can still be read while the products are enclosed in boxes and crates; 3) RFID tags can be used to trigger events such as door opening, alarm sounding, or toll gate opening; 4) RFID tags are more durable than bar codes and are not subject to problems caused by tearing, creasing or alteration. *Id.*

¹⁴⁸ See Bob Violino, *The Basics of RFID Technology*, RFID J. (Jan. 16, 2005), archived at <http://perma.cc/JT5U-FD2M> (expanding on the discussion of RFID technology).

¹⁴⁹ See *id.* (continuing the explanation of the science behind RFID technology).

¹⁵⁰ See *id.* (identifying the different RFID tags).

¹⁵¹ See *id.* (outlining the characteristics of an active RFID tag). “There are two types of active tags: transponders and beacons . . . Transponders conserve battery life by having the tag broadcast its signal only when it is within range of a reader.” *Id.* An example of a transponder is a “fastpass” toll payer mounted on a car windshield. *Id.* When a car with an active transponder approaches a tollbooth, a reader at the booth sends out a signal that wakes up the transponder on the car windshield. *Id.* “The transponder then broadcasts its ID to the reader” and the result is the toll booth recognizing that this particular car is authorized to proceed. *Id.* A beacon is used when “the precise location of an [object or] asset needs to be tracked.” *Id.* The beacon will “emit[] a signal with its unique identifier at pre-set intervals . . . every three seconds or once a day, depending on how important it is to know the location of an asset at a particular moment in time . . . The beacon's signal is picked up by at least three reader antennas positioned around the perimeter of the area where assets are being tracked.” *Id.* Beacons are popular in distribution yards and among automakers to track parts bins. *Id.*

ing back radio waves coming from the reader antenna.¹⁵² It is important to note that as late as 2009, RFID technology only allowed for the storage of information and did not possess such tracking capabilities as the Global Positioning System (“GPS”) technology.¹⁵³

2. *The History of RFID Technology: From WWII Planes to Humans?*

The history of RFID technology can be traced to World War II when Scottish physicist Sir Robert Alexander Watson-Watt placed transmitters in British planes to reflect back a radio signal and thus alert that allied forces that a “friendly” aircraft was approaching.¹⁵⁴ In 1973, the first RFID patents were issued to Mario W. Cardullo and Charles Walton.¹⁵⁵ The 1970’s also saw the United States government utilize RFID technology to track the transportation of nuclear material while the private sector saw farm ranchers beginning to use RFID technology to track cattle.¹⁵⁶ By the 1980’s, RFID tags infil-

¹⁵² See *id.* (describing the characteristics of a passive tag). Passive tags are very popular among retailers and manufacturers because they cost less than one dollar, require no maintenance, and are increasingly effective in supply chain management. *Id.*

¹⁵³ See Currid, *supra* note 143, at 357-58 (identifying a main difference in the technology of RFID tags and GPS); see also Darren Handler, *The Wild, Wild West: A Privacy Showdown on The Radio Frequency Identification (RFID) Systems Technological Frontier*, 32 W. ST. U. L. REV. 199, 204 (2005) (recognizing that RFID tags require a reader for the information to be transmitted). Although RFID tags are not yet marketed with a GPS like tracking system, strategic placement of the tag readers in such places as floor tiles or in the doorways of buildings a tag might pass by will provide tracking-like capabilities. *Id.* at 204.

¹⁵⁴ See Mark Roberti, *The History of RFID Technology*, RFID JOURNAL, archived at <http://perma.cc/ZH9U-4XTS> (highlighting the history and development of RFID tags); see also Kyle Sommer, *Riding the Wave: The Uncertain Future of RFID Legislation*, 35 J. LEGIS. 48, 51 (2009) (expanding on the discussion of RFID tags first being used in WWII).

¹⁵⁵ See Roberti, *supra* note 154 (tracing the history of RFID development).

¹⁵⁶ See Handler, *supra* note 153, at 203 (exploring the early uses of RFID tags in livestock). Farmers began using RFID tags placed in molded collars around the necks of cattle. Eventually, RFID technology became so advanced that Farmers were able to inject their cattle with a microchip containing an RFID tag. *Id.*; see also Currid, *supra* 143, at 360 (stating that by the 1990’s “millions of chips were implanted in livestock, fish, pets, even racehorses”); Roberti, *supra* note 154 (discussing how the Energy Department asked Los Alamos National Laboratory to develop a system for tracking nuclear materials).

trated the marketplace and their use began to gain wide spread popularity in the United States and Europe.¹⁵⁷

From the 1980's until the present, major corporations continue to utilize RFID technology in areas such as: asset tracking, manufacturing, supply chain management, security and access control, retailing, and payment systems.¹⁵⁸ Retail giants such as Wal-Mart, Best Buy, Metro, Target, and Tesco, all utilize use RFID technology for business applications.¹⁵⁹ Wal-Mart displayed its confidence in RFID technology when it announced in June 2003 that it would require its top 100 suppliers to tag pallets and cases of goods with RFID tags and that it would require all of its suppliers to implement RFID technology by 2006.¹⁶⁰ Although unsuccessful in meeting its goal of streamlining RFID technology by 2006, Wal-Mart's use of

¹⁵⁷ See Currid, *supra* note 143, at 360 (noting the 1980's as the time when RFID technology first came into "vogue"); see also Handler, *supra* note 153, at 203 (identifying the country of Norway as the first to use RFID tags for toll roads followed shortly by the U.S. states of Georgia, Texas, and Oklahoma); Roberti, *supra* note 154 (explaining how RFID technology was developed for toll road use). Scientists from Los Alamos National Laboratory that aided the U.S. government in developing the RFID technology to track nuclear material during transit eventually left to form their own company designed to develop automated toll payment systems. *Id.* These systems have become widely used on roads, bridges and tunnels around the world. *Id.*

¹⁵⁸ See Bob Violino, *RFID Business Applications*, RFID J. (Jan. 16, 2005), archived at <http://perma.cc/TGC9-V27N> (illustrating the various ways major corporations use RFID technology).

¹⁵⁹ See *id.* (identifying industry leaders that used RFID technology). Other corporations that utilized or currently utilize the technology include Air Canada, Johnson Controls, Boeing, AM General, and Proctor and Gamble. *Id.* Delta Airlines has also experimented with the use of RFID technology which allows them to track luggage more accurately. See Bob Brewin, *RFID Bag-Tag Test Proves a Soaraway Success*, COMPUTER WEEKLY (Jan. 2004), archived at <http://perma.cc/3QVF-4PG5> (explaining Delta's usage of RFID luggage tags). Delta continued to utilize RFID technology in business applications other than baggage tracking such as inventory and inspection management of safety equipment. See *Delta Tracks Vital Parts with RFID; Saves 7,000 Hours in Labor*, RFID24-7.COM (Apr. 16, 2013), archived at <http://perma.cc/U8H7-3Y4Y> (describing unique applications of RFID technology in the context of inspection and maintenance tasks).

¹⁶⁰ See Matthew Malone, *Did Wal-Mart Love RFID to Death?*, ZDNET, archived at <http://perma.cc/T4JA-VGMV> (exploring Wal-Mart's early plan for RFID technology in business application). On June 11, 2003, Wal-Mart CIO Linda Dillman announced at the Retail Systems Conference in Chicago that it would now require its top 100 suppliers to tag pallets and cases of goods with radio-frequency identification (RFID) tags. *Id.* That same summer, then company spokesman Tom Williams stated in an interview that "By 2006, we will roll it out with all suppliers . . ." *Id.*

RFID tags is considered a success because it introduced the technology to the world while realizing in what areas of its own business the use RFID technology is most effective.¹⁶¹

Today, RFID technology is being used in almost every industry and on every continent.¹⁶² The United States government even recognized the current benefits of RFID technology when the Department of State announced in 2006 that all U.S. passports are now issued with an RFID chip.¹⁶³ Additionally, with the passage of the Real ID Act of 2005, many commentators predict that the government will soon require RFID tags be placed in our state issued driver's licenses to meet compliance standards set forth in the act.¹⁶⁴ As

¹⁶¹ See *id.* (examining the results of Wal-Mart's decision to use RFID technology). Pushback from suppliers contributed to the failure Wal-Mart's plan to require all suppliers to tag pallets and products with RFID tags. *Id.* Some consumer products such as toilet paper and detergent have small profit margins and labeling these products and pallets with RFID tags could now mean a loss. *Id.* Also, Walmart recognized its own internal problem when it was found that the company's database wasn't big enough to handle the volume of data generated by the new RFID technology. *Id.* Despite these setbacks, Wal-Mart continues to use the RFID technology and has also inspired other industry giants such as Airbus to implement the technology. *Id.*

¹⁶² See *id.* (proclaiming the widespread use of RFID technology).

¹⁶³ See *RFID Chips in Passports*, PASSPORT OFFICE, archived at <http://perma.cc/FD6V-GBFD> [hereinafter *RFID Chips in Passports*] (stating the requirements of RFID chips in U.S. passports). The RFID chip only contains the information that is printed on your passport. *Id.* It also contains a number that is linked to a database at the U.S. Department of State, which allows for tracking the passport in the event it is lost. *Id.*

¹⁶⁴ See Anita Ramasastry, *Why the 'Real ID' Act is a Real Mess*, CNN (Aug. 12, 2005), archived at <http://perma.cc/6P9L-TCN6> (cautioning the beliefs of many that RFID tags in state issued identification cards will soon be required); see also Real ID Act of 2005, Pub. L. No. 109-13, 119 Stat. 231 (announcing the federal standards states must meet when issuing a driver's license or identification card). The Act leaves it to the digression of the Secretary of Homeland Security as to the standards a state issued license must meet. *Id.* One of the minimum requirements set forth in the act is that all state issued drivers licenses must have "[a] common machine-readable technology, with defined minimum data elements." *Id.*; see e.g., *REAL ID Enforcement in Brief*, DEPT. OF HOMELAND SECURITY, archived at <http://perma.cc/H8QC-QMDF> (explaining the purpose of the Real ID Act). The Act is a coordinate effort by state and the federal government to prevent terrorists from evading detection by using fraudulent identification. *Id.* The Act established minimum-security standards states must meet when issuing licenses and identification cards. *Id.* Failure to meet these standards will prohibit Federal agencies from accepting driver's licenses and identification cards as acceptable forms of ID used

of January 2015, five states already issue what is called an “Enhanced Drivers Licenses” (EDL) that contain RFID tags and may be used in place of a passport when entering the United States from Canada, Mexico or the Caribbean pursuant to the Western Hemisphere Travel Initiative (WHTI).¹⁶⁵

RFID tags even cracked the barrier of the medical field when its technology was used to develop the first human implantable microchip to reach the market.¹⁶⁶ In 2004, VeriChip Corporation received clearance from the United States Food and Drug Administration to market its human implantable microchip as a class II medical device.¹⁶⁷ The chip was designed for patients who suffer from conditions that could cause them to arrive at a hospital unresponsive and unable to provide identification.¹⁶⁸ In an untimely event such as this,

to access Federal facilities, nuclear power plants, and federally regulated commercial aircrafts. *Id.*

¹⁶⁵ See *REAL ID Frequently Asked Questions for the Public*, DEPT. OF HOMELAND SECURITY (Jan. 11, 2015), archived at <http://perma.cc/LHN3-G5BN> (confirming the states of Michigan, Minnesota, New York, Vermont, and Washington as the only states that currently issue EDL’s); see also *Enhanced Drivers Licenses: What Are They?*, DEPT. OF HOMELAND SECURITY (Nov. 6, 2014), archived at <http://perma.cc/4WWP-4TQR> (describing how state-issued EDLs provide proof of U.S. citizenship and are accepted in place of a passport to make traveling more convenient when entering the United States from Canada, Mexico or the Caribbean through a land or sea port of entry); *Western Hemisphere Travel Initiative: The Basics*, DEPARTMENT OF HOMELAND SECURITY (Aug. 9, 2012), archived at <http://perma.cc/64NY-WX5X> (listing the requirements for travel in the western hemisphere by air, land, and sea). As of January 23, 2007, all travelers of all ages including citizens of the United States, Canada, and Bermuda are now required to present a valid passport when entering the United States at any airport. *Id.* However, as of January 2008, EDL’s are generally acceptable in place of a passport when entering the United States by land or by sea. *Id.*

¹⁶⁶ See Kenneth R. Foster & Jan Jaeger, *Ethical Implications of Implantable Radiofrequency Identification (RFID) Tags in Humans*, 8 AM. J. BIOETHIC 44, 44-45 (2008) (recognizing RFID tags as the technology used in the first human implantable microchip); see also Currid, *supra* note 143, at 360-61 (explaining how RFID tags were used in the human microchip technology); Morrissey, *supra* note 13 (acknowledging RFID tags are now used in people).

¹⁶⁷ See Foster & Jaeger, *supra* note 166, at 45 (confirming VeriChip corporations as the first to receive FDA approval to market a human microchip).

¹⁶⁸ See Foster & Jaeger, *supra* note 166, at 45 (describing the intended use of the human implantable microchip). VeriChip’s promotional literature describes candidates for the VeriChip include patients who suffer from: Alzheimer’s disease, severe mental illness, coronary artery disease, chronic obstructive pulmonary disease, diabetes mellitus, seizure disorders, cognitive impairment, people who have suf-

the RFID tag in the implantable microchip would be scanned to receive vital information such as the person's identity and medical history.¹⁶⁹ Despite the potential lifesaving benefits of the implantable chip, low sales, privacy concerns from the public, and potential harmful side effects caused VeriChip to stop marketing its medical records microchip implant for humans in 2010.¹⁷⁰ VeriChip Corporation subsequently rebranded as Positive ID Corporation and has again started working on another human implantable microchip that can detect glucose levels in the body and transmit a blood sugar reading to a scanner.¹⁷¹

III. FACTS

Despite existing legislation that deals with wiretapping and RFID tags, there is currently very little legislation and case law, at both the Federal and State level, which deals specifically with microchipping.¹⁷² In fact, only three states have enacted legislation that regulate forced bodily implementation of an RFID chip.¹⁷³ Similarly, case law provides little help by offering only brief insight and discussion on human Microchipping.¹⁷⁴ In particular, in *Rise v. State of*

ferred a stroke, and patients with complex medical device implants such as pacemakers, stents, or joint replacements. See Foster & Jaeger, *supra* note 166, at 45.

¹⁶⁹ See Foster & Jaeger, *supra* note 166, at 45 (outlining how the chip can be useful to patients). The cost to get the chip implanted is \$200 and the patients would pay a yearly data registry fee of \$100, yet Verichip would distribute the "readers" used to scan the chips to hospitals for free. *Id.*

¹⁷⁰ See Jim Edwards, *Down With the Chip: PositiveID Axes Its Scary Medical Records Implant*, CBS NEWS (July 15, 2010), archived at <http://perma.cc/ZC2H-ZYR5> (observing the reasons why Verichip discontinued to market the human implantable microchip); see also Amy Keller, *A Chip Off the Old Block: Update on Implanted Microchips*, FLORIDA TREND (July 1, 2010), archived at <http://perma.cc/ZM8N-2YW2> (noting the reasons why the human microchip was discontinued).

¹⁷¹ See Keller, *supra* note 170 (reporting on the liquidation of Verichip Corp. and the next usage for a human microchip).

¹⁷² See Currid, *supra* note 143, at 369, 383 (exposing the lack of legislation and "scant" case law specifically detailing microchipping).

¹⁷³ See Sommer, *supra* note 154, at 62 (listing Wisconsin, North Dakota, and California as the states that have passed legislation dealing with human microchipping); see also Wis. Stat. § 146.25 (2009) (making it illegal to implant an RFID tag in an individual); N.D. Cent. Code § 12-1-5 (2009) (referencing the same violation and penalty); Cal. Civ. Code § 52.7 (West 2009) (referencing the same violation and penalty).

¹⁷⁴ See Currid, *supra* note 143, at 367 (listing the cases that briefly mention microchipping).

Oregon, the dissent briefly mentions possible consequences society could one day face if confronted with a human microchipping issue.¹⁷⁵ Additionally, in *State v 1993 Chevy Pickup*, the concurring opinion makes note of how microchipping is becoming a part of this technologically advanced society.¹⁷⁶ With a lack of legislation and case law to regulate human microchipping, there is an increasing worry amongst the public that the government will eventually declare mandatory microchipping in humans or at least in humans with a diminished expectation of privacy such as those on probation or parole.¹⁷⁷

With an increasing number of commentators predicting that human microchipping is “inevitable,”¹⁷⁸ the public may want to start thinking of ways to challenge the government if this prediction

¹⁷⁵ See *Rise v. State of Oregon*, 59 F.3d 1556, 1569 n.3 (9th Cir. 1995) (Nelson, J., dissenting) (stating “[t]oday, technology allows us to insert a microchip beneath the skin and later scan the microchip for a positive identification of the individual. Under the majority’s analysis, such microchip insertion would be permissible . . .”).

¹⁷⁶ See *State v. 1993 Chevy Pickup*, 116 P.3d 800, 806 (Mont. 2005) (Nelson, J., concurring) (announcing “[l]ike it or not, I live in a society that accepts . . . microchip radio frequency identification devices already implanted in the family dog and soon to be integrated into my groceries, my credit cards, my cash and my new underwear. . . . I don’t like living in Orwell’s 1984; but I do. And, absent the next extinction event or civil libertarians taking charge of the government (the former being more likely than the latter), the best we can do is try to keep Sam and the sub-Sams on a short leash”).

¹⁷⁷ See *Pet Lovers Protest Micro-Chipping Law*, CBN NEWS, archived at <http://perma.cc/9PHX-SKS2> (discussing the increasing concerns that pet microchipping may lead to mandatory human microchipping). The article contains commentary from microchip expert Katherine Albrecht, who warns the public that if we allow pets to be microchipped “[i]t’s just a matter of time before that government says we must microchip our children and even ourselves.” *Id.* In her book, Albrecht further warns “[i]t’s just a matter of time before society finds a compelling reason to permanently identify and track ‘captive’ populations with implantable microchips.” See KATHERINE ALBRECHT & LIZ MCINTYRE, *SPYCHIPS: HOW MAJOR CORPORATIONS AND GOVERNMENT PLAN TO TRACK YOUR EVERY MOVE WITH RFID 218* (2005) (predicting the governments transition from harmless animal microchipping to invasive human chipping).

¹⁷⁸ See Ramesh, *supra* note 143, at 375 (predicting that human microchipping is inevitable); see also Currid, *supra* note 143, at 358 (stating how the human-implantable microchip, may fulfill the “Orwellian” predictions that our government will one day be able to monitor our every move); Kristina M. Willingham, Note, *Scanning Legislative Efforts: Current RFID Legislation Suffers from Misguided Fears*, 11 N.C. BANKING INST. 313, 331 (2007) (inferring from some states’ recent actions to pass legislation against human microchipping that the phenomenon will one day become a real issue).

proves true.¹⁷⁹ Many commentators agree that the avenue to take for constitutional challenges to human microchipping must be through the Fourth Amendment right to privacy.¹⁸⁰ Due to the arguably invasive procedures common in both DNA extraction and human microchipping, the same unsuccessful challenges to the constitutionality of DNA collection should be used to challenge the constitutionality of human microchipping and may prove victorious.¹⁸¹ However, the Supreme Court's recent holding in *Maryland v. King* that police may take DNA samples from people arrested in connection with serious crimes, but not yet convicted, may prove constitutional challenges to human microchipping problematic.¹⁸²

¹⁷⁹ See Currid, *supra* note 143, at 371-72 (describing the areas of law that have been previously used to challenge the constitutionality of spying technology similar to microchipping); see also Ramesh, *supra* note 143, at 387-00 (highlighting the rights infringed by human microchipping and the possible constitutional challenges available).

¹⁸⁰ See Currid, *supra* note 143, at 372-79 (describing the constitutional challenges available for human microchipping); see also Sommer, *supra* note 154, at 64 (describing the Fourth Amendment as a possible safeguard against human microchipping); Ramesh, *supra* note 143, at 387-00 (adding property rights to the list of possible challenges to the constitutionality of human microchipping).

¹⁸¹ See William A. Herbert & Amelia K. Tuminaro, *The Impact of Emerging Technology in the Workplace: Who's Watching the Man? (Who's Watching Me)*, 25 HOFSTRA LAB. & EMP. L.J. 355, 358 (2008) (comparing modern technologies such as collection of DNA samples, global positioning systems, radio frequency identification, and biometrics).

¹⁸² See *King*, 133 S. Ct. at 1980 (holding "[u]pon these considerations the Court concludes that DNA identification of arrestees is a reasonable search that can be considered part of a routine booking procedure . . . [is] a legitimate police booking procedure that is reasonable under the Fourth Amendment"); see also Adam Lip-tak, *Justices Allow DNA Collection After an Arrest*, N.Y. TIMES (June 3, 2013), archived at <http://perma.cc/6MYU-K3YD> (announcing the ruling of the Supreme Court). In 2009, police collected a DNA sample from Alonzo Jay King Jr. after his arrest on assault charges in Wicomico County, MD. *Id.* His DNA matched DNA evidence collected from a 2003 rape case, and King was later convicted of that crime. *Id.* The Maryland Court of Appeals ruled that a state law authorizing DNA collection from people who had been arrested but not yet convicted violated the Fourth Amendment's prohibition of unreasonable searches. *Id.* As the articles states, the Supreme Court held the practice to be constitutional. *Id.*; see also Angela Foster, *Maryland v King; Has Mandatory DNA Testing Been Resolved?* 286-FEB N.J. LAW. 18, 19-20 (2014) (providing background information regarding constitutional challenges to collecting DNA samples from people arrested but not yet convicted). Since the passage of the DNA Fingerprint Act of 2005 and the Supreme Court ruling in *King*, twenty-eight states and the federal government have

When analyzing the available constitutional challenges of human microchipping and collecting DNA analogously, the hurdles that plague the human microchip challenges are: (1) the Supreme Court in 2013 reaffirmed the idea that DNA collecting is constitutional;¹⁸³ (2) all fifty states and the Federal Circuits have held DNA evidence is admissible in a criminal trial;¹⁸⁴ and (3) all fifty states and the Federal government have passed legislation requiring certain classes of convicted felons to submit DNA samples to be stored in DNA databanks.¹⁸⁵ These facts may suggest that challengers of human microchipping may want to emphasize the characteristics of human microchipping that will distinguish it from the procedures required to collect DNA samples.¹⁸⁶ For example, DNA collection constitutes a search under the Fourth Amendment and courts have evaluated the reasonableness of the search to determine whether DNA collection statutes entails a constitutional violation.¹⁸⁷ Since DNA collection has survived the “reasonableness” challenge to the Fourth Amendment, opponents of human microchipping may want to emphasize that although drawing blood from a convicted felon might be reasonable, implanting a microchip underneath one’s skin may not be.¹⁸⁸ Additionally, the challengers may want to emphasize that

passed legislation authorizing the collection of DNA after an arrest yet before a conviction. *Id.* at 18.

¹⁸³ See *King*, 133 S. Ct. at 1980 (holding that collecting DNA samples from arrestees is constitutional).

¹⁸⁴ See *Gaudet*, *supra*, note 48, at 109 (stating “[t]oday, courts in all fifty states accept that DNA evidence meets the thresholds for admissibility established in both the *Daubert* and *Frye* decisions”); see also *GRIFFITH & OAKS*, *supra* note 56 (addressing the admissibility of DNA evidence by federal courts); *Cronan*, *supra* note 7, at 128 (holding that DNA evidence has never been held inadmissible for lack of scientific theory).

¹⁸⁵ See *Brower*, *supra* note 70 (explaining the development of DNA databanks).

¹⁸⁶ See *Herbert & Tuminaro*, *supra* note 181, at 357 (comparing modern technologies such as collection of DNA samples, global positioning systems, radio frequency identification, and biometrics).

¹⁸⁷ See *Cronan*, *supra* note 7, at 140-45 (describing how courts evaluate the constitutionality of collecting DNA under the Fourth Amendment).

¹⁸⁸ See *Cronan*, *supra* note 7, at 140-45 (explaining the “reasonableness” standard used by the courts); see also *Boling v. Romer*, 101 F.3d 1336, 1339 (10th Cir. 1997) (holding that while the collection and analysis of DNA does raise Fourth Amendment concerns, the search and seizure is still reasonable); *Rise v. Oregon*, 59 F.3d 1556, 1566-67 (9th Cir. 1995) (affirming the lower court's decision that a State may interfere with an individual's Fourth Amendment rights, without probable cause or a warrant when the intrusion is minimal and justified); *Jones v. Mur-*

while confirming one's identity through DNA extraction might outweigh a person's privacy interest, tracking a person's movements and whereabouts using RFID technology is not outweighed by a legitimate government interest.¹⁸⁹ The distinguishing of these characteristics may be the only available tactic that will lead a court in the direction of holding that forced human microchipping on individuals with a diminished expectation of privacy is unconstitutional.

IV. ANALYSIS

Compelled human microchipping in convicted felons or persons arrested for felonies could be used as a future law enforcement tool to solve crime if its analysis provides affirmative answers to two questions (1) Will it be admissible in court?; and (2) Is compelled microchipping of a human being with a diminished expectation of privacy a violation of the Fourth Amendment? Because of the scientific nature of microchipping and the arguably intrusive means of implanting a microchip, the admissibility and Fourth Amendment questions will be analyzed by using the standards for DNA evidence.

A. Will Human Microchipping be Admissible in Court?

In the event a human implanted with a microchip commits a crime, human microchipping will most likely be considered scientific evidence, and therefore its admissibility will have to be analyzed under the Frye test or the Daubert test when confronted with the issue of

ray, 962 F.2d 302, 306-07 (4th Cir. 1992) (finding that no case establishes a per se requirement of reasonableness in probable cause searches under the Fourth Amendment); *People v. Wealer*, 636 N.E.2d 1129, 1136 (Ill. App. Ct. 1994) (holding that the state's legitimate interest in reducing recidivism among sex offenders is compelling and outweighs the minimal intrusions against a person's privacy); *State v. Olivas*, 856 P.2d 1076, 1088 (Wash. 1993) (agreeing with other courts that warrantless searches are reasonable so long as justified by the "special needs beyond normal law enforcement").

¹⁸⁹ See *King*, 133 S. Ct. 1958, 1979 (2013) (inferring that the minimal intrusion of DNA extraction in a person with a diminished expectation of privacy is outweighed by a legitimate government interest). *But see* *Rise v. Oregon*, 59 F.3d at 1569 n.3 (Nelson, J., dissenting) (inferring that human microchipping is unconstitutional because the intrusion of implanting a chip under one's skin is an invasion of bodily integrity).

whether the data from the microchip is admissible in court.¹⁹⁰ Under the Frye test, data recovered from a human microchip such as a person's location at a specific time a crime occurred will most likely be determined inadmissible by the court because it does not pass the general acceptance theory.¹⁹¹ Under this theory, expert testimony based on scientific principles is admissible only after the scientific community, in that particular field of science, has given the principles "general acceptance."¹⁹² For example, courts have held DNA admissible under the Frye test because of its reliability and general acceptance in the scientific community.¹⁹³ This reliability stems from the proven fact that DNA can prove with 99% accuracy whether skin, hair, or other bodily fluids left at a crime scene match that of a certain suspect.¹⁹⁴ Furthermore, scientific experts and members of the judiciary consider DNA testing to be the most reliable forensic testing method.¹⁹⁵ This is unlike the relatively new procedure of human microchipping that was first developed in 2004¹⁹⁶ and has only been performed on 2,000 humans since the time the science became available.¹⁹⁷ Additionally, some studies conducted on laboratory animals with microchips suggest the chips may cause cancer.¹⁹⁸ Because microchipping is a relatively new procedure and because of the health safety concerns raised by some studies, the courts will most likely determine that microchipping is not as generally accepted by the scientific community as DNA testing and therefore inadmissible evidence under the Frye test.

¹⁹⁰ See Baggett, *supra* note 49, at 150-51 (explaining the standards for scientific evidence to be declared admissible).

¹⁹¹ See Baggett, *supra* note 49, at 150 (inferring that expert testimony pertaining to microchipping would likely be found inadmissible by a court because microchipping is likely not considered "generally accepted by the scientific community.>").

¹⁹² See *supra* text accompanying notes 50-51 (describing the general acceptance theory for scientific evidence to be admitted in court).

¹⁹³ See *State v. Vandebogart*, 616 A.2d 483, 491-92 (N.H. 1992) (acknowledging the general acceptance of DNA admissibility using various court holdings).

¹⁹⁴ See James, *supra* note 4 (stating the accuracy of DNA testing).

¹⁹⁵ See Holland, *supra* text accompanying note 6 (illustrating the reliability and general acceptance of DNA testing).

¹⁹⁶ See Foster & Jaegar, *supra* note 166, at 45 (stating that 2004 was the year the first microchip received FDA approval).

¹⁹⁷ See Morrissey, *supra* note 13 (providing the number of humans that have undergone the procedure of having a microchip implanted in their arm).

¹⁹⁸ See Morrissey, *supra* note 13 (identifying studies that suggest microchipping may cause cancer).

Proponents of the admissibility of human microchipping will argue that the science of microchipping does in fact pass the Frye test because although microchipping is relatively new, the RFID technology the microchip employs is generally accepted and has gained wide spread popularity since the 1980s.¹⁹⁹ The proponents will further argue the general acceptance of RFID technology by pointing out that it is currently being used in every industry on every continent and even the United States government has recognized and utilized the benefits of this technology.²⁰⁰ Furthermore, they will argue that the studies that show microchipping causes cancer in laboratory animals is inconsistent with at least thirty-four other studies which showed that less than 1% of 4,279 chipped mice developed tumors clearly due to the implanted microchips.²⁰¹ Although the proponents present valid arguments, the disagreement amongst experts regarding the health safety of microchipping and the relative newness of the science will most likely sway courts to conclude that human microchipping used as a law enforcement tool is inadmissible under the Frye test.

This conclusion, however, is not the end of the microchipping admissibility analysis because compelled human microchipping may prove to be admissible under the Daubert test. Only 15 states still apply the Frye test, with 25 states and the Federal courts applying the Daubert test and the remaining states applying their own variation of the two standards.²⁰² Under the Daubert two prong test, DNA evidence passes the relevance prong because expert testimony explaining DNA analysis in a case where DNA evidence is collected from a crime scene will help the jury in resolving a factual dispute of whether or not the defendant was present at the scene.²⁰³ Under the second prong of the Daubert framework, DNA evidence passes the reliability prong because: (1) the theory behind matching DNA and calculating

¹⁹⁹ See Currid, *supra* note 143, at 360 (stating that by 1980 RFID technology gained wide spread popularity throughout the United States and Europe).

²⁰⁰ See Malone, *supra* note 160 (observing the wide spread use of RFID technology); see also *RFID Chips in Passports*, *supra* note 163 (recognizing the United States government's use of RFID technology).

²⁰¹ See Morrissey, *supra* note 13 (expanding on the discussion of the inconsistent studies done on laboratory animals).

²⁰² See Hasani, *supra* note 54, at 95-96 (highlighting the different standards used to determine admissibility of scientific evidence in different U.S. jurisdictions).

²⁰³ See *Bonds*, 12 F.3d at 557 (confirming DNA evidence passes the relevance prong under the Daubert framework); see also *supra* p. 12 (explaining the relevancy prong of the Daubert framework).

probabilities can be and has been tested by comparing the results generated from one set of samples with the results reached after repeating the matching and probability estimate process on control samples; (2) DNA collection theory and procedures have been submitted to the scrutiny of the scientific community; and (3) DNA profiling procedures are sufficient to meet the requirement of general acceptance in the scientific community.²⁰⁴ Therefore, as previously stated, from the time DNA evidence was first declared admissible in both federal and state courts, no court has found DNA evidence inadmissible under either the Frye test or the Daubert test.²⁰⁵

The Daubert test may prove more favorable to admissibility proponents when determining the admissibility of data from a human microchip. Reading the data from a person's microchip will most likely pass the first prong because the tracking capabilities of the RFID technology in the microchip will help the jury in resolving a factual dispute of whether or not the defendant was near or present at the crime scene.²⁰⁶ Under the reliability prong, the court will most likely find this evidence is scientifically valid because: (1) Microchipping, although relatively new, is technique can be and has been tested;²⁰⁷ (2) its theory or technique has been subjected to peer review and publication;²⁰⁸ (3) sources are currently unavailable that would provide us with data on the potential rate of error in using the microchipping technology, yet this is only one negative in a list of nonexclusive factors that bears on the admissibility question;²⁰⁹ and (4) although it has been already established that microchipping will most

²⁰⁴ See *Bonds*, 12 F.3d at 558-62 (providing the reasoning DNA evidence passes the reliability prong under the Daubert framework.); see also *supra* p. 13 (defining the reliability prong of the Daubert framework).

²⁰⁵ See Cronan, *supra* note 7, at 128 (asserting that DNA evidence has never been held inadmissible for lack of general acceptance or invalidity of scientific theory).

²⁰⁶ See Handler, *supra* note 153, at 204 (recognizing that although RFID technology is not yet equipped with GPS, it still possess tracking capabilities); see also *Bonds*, 12 F.3d at 557 (describing why the court considers scientific evidence such as DNA relevant).

²⁰⁷ See Foster & Jaegar, *supra* note 166, at 45 (stating the year the first microchip received FDA approval was in 2004); see also Morrissey, *supra* note 13 (illustrating the newsworthiness of the microchipping technique by stating that only 2,000 people are microchipped).

²⁰⁸ See, e.g., Morrissey, *supra* note 13 (acknowledging that 34 studies are available on microchipping in laboratory animals).

²⁰⁹ See *Bonds*, 12 F.3d at 558 (asserting that the rate of error requirement is a non-exclusive factor in the overall framework).

likely not be regarded as “generally accepted”, scientific validity analysis does not require, although it does permit, the court to consider the degree to which the human microchipping principles and methodology are generally accepted in the relevant scientific community.²¹⁰ Furthermore, proponents will argue general acceptance exists because a substantial portion of the scientific community accepts the theory, principles, and methodology of microchipping as grounded in the valid scientific principles of RFID technology.²¹¹ As a result, microchipping is consistent with existing case law that discusses general acceptance in terms of “reliability” of the procedures and process, not the reliability of the results of the procedures.²¹² For the reasons mentioned above, courts will most likely find the readable data from a human microchip admissible if held in a jurisdiction that utilizes the Daubert test.

B. Fourth Amendment Challenges to Compelled Human Microchipping

In order to claim a Fourth Amendment violation in regards to human microchipping, a court must determine whether implanting a chip in a human is considered a “search” and whether this search is unreasonable.²¹³ If there is an affirmative answer to both of these inquiries, the Fourth Amendment’s protections can be triggered.²¹⁴

²¹⁰ See *id.* (confirming that general acceptance is not required).

²¹¹ See *id.* (Expanding on the discussion of what is considered by “generally accepted”); see also Currid, *supra* note 143, at 360 (inferring that RFID principles are grounded in the scientific community because of its widespread use in all industries since 1980).

²¹² See *Bonds*, 12 F.3d at 558 (explaining that “general acceptance” focuses on the procedure and not the results); see also Currid, *supra* note 143, at 360 (inferring microchipping procedures are generally accepted because they use RFID technology); Morrissey, *supra* note 13 (illustrating the unreliable results of human microchipping by explaining inconsistent studies).

²¹³ See *Molko*, *supra* note 75, at 189-90 (listing the requirements that will trigger Fourth Amendment protection).

²¹⁴ See *Molko*, *supra* note 75, at 189 (reaffirming the requirement to trigger the Fourth Amendment).

1. Who Should be Microchipped?

Currently, all 50 states and the federal government have passed legislation that allow for the collection and storage of DNA from anyone convicted of a felony or on probation for a felony.²¹⁵ Additionally, twenty-nine states and the Federal government have passed laws that allow for the collection of DNA from persons arrested for a felony but not yet convicted.²¹⁶ When used for law enforcement purposes, the likely candidates for human microchipping will be similar to those individuals who are required to submit a DNA sample because human microchipping will likely seek to accomplish one of the goals of DNA collection which is to deter recidivism.²¹⁷

2. Is Implanting a Microchip a “search” under the Fourth Amendment?

Implanting a microchip under the skin of a human will most likely be considered a “search” under the Fourth Amendment for similar reasons that the extraction of blood for DNA analysis is considered a search.²¹⁸ Under the Katz framework, a search occurs when “(1) a person exhibits a subjective expectation of privacy; and (2) the expectation is one that society recognizes as objectively reasonable.”²¹⁹ Like DNA extraction from blood or buccal swap, implanting a chip underneath someone’s skin constitutes a search because the procedure is a physical intrusion that infringes an expectation of pri-

²¹⁵ See 42 U.S.C. § 14135a(a)(1)(A) (2012) (describing the requirements for collecting DNA samples and announcing who DNA samples may be collected from); see also *King*, 133 S. Ct. at 1968 (noting that “[a]ll 50 states require the collection of DNA from felony convicts . . .”); Wehunt, *supra* note 68, at 1064 (recognizing that legislation permits all states and the federal government to collect and store DNA samples).

²¹⁶ See 42 U.S.C. § 14135a (2012) (confirming that DNA samples may be taken from Federal arrestees); see also *28 States Have Passed The Law*, *supra* note 71 (highlighting the twenty-eight states that have passed laws authorizing DNA collection from felony arrestees).

²¹⁷ See *Hook*, 471 F.3d at 773 (identifying the goals of collecting DNA).

²¹⁸ See, e.g., *Molko*, *supra* note 75, at 190 (explaining how the Supreme Court has held that DNA blood drawing is considered a “search”).

²¹⁹ See *Katz*, 389 U.S. at 361 (Harlan, J., concurring) (declaring the proper framework for determining if a search occurred).

vacy that society is prepared to recognize as reasonable.²²⁰ Equally important, the future reading of the information contained on the chip also constitutes a search because it reveals private information about a person such as his location or where he has recently traveled.²²¹ As a result of this analysis, courts will most likely conclude that compelled microchipping constitutes a search under the Fourth Amendment just as all circuit courts and the United States Supreme Court have concluded that DNA collection is a search.²²²

3. *The “reasonableness” Inquiry of Microchipping Under the Special Needs Doctrine*

A statute that authorizes implanting a human microchip into a convicted felon or felony arrestee would most likely qualify as a suspicionless search because of the lack of probable cause and a warrant and therefore must qualify under one of the exceptions to be declared reasonable.²²³ Under the special needs doctrine, courts will most likely conclude that implanting a microchip in a human arrested for or convicted of a felony is unreasonable under the Fourth Amendment because of the lack of a special need other than crime control.²²⁴ Unlike DNA collections, where courts justify the compelled collection of DNA by focusing on the special need to obtain an offender’s identity,²²⁵ the compelled microchipping of convicted felons or ar-

²²⁰ See *King*, 133 S. Ct. at 1969 (stating that a cheek swab and blood extraction of DNA is a search); see also *Skinner*, 489 U.S. at 616 (announcing that a compelled intrusion into the body for blood to be analyzed must be deemed a Fourth Amendment search); *Schmerber*, 384 U.S. at 767 (concluding that extracting blood plainly involves the broadly conceived reach of a search and seizure under the Fourth Amendment); Currid, *supra* note 143, at 368 (discussing the procedure of implanting a microchip beneath the skin).

²²¹ See, e.g., *RFID Chips in Passports*, *supra* note 163 (analyzing the use of microchips in passports).

²²² See *Biancamano*, *supra* note 73, at 631 (asserting that all the circuits which have considered the issue have concluded that the collection of DNA is a search); see also *King*, 133 S. Ct. at 1969 (announcing that DNA extraction by cheek swab or blood is a search).

²²³ See *Lee*, *supra* note 96, at 1158 (acknowledging that suspicionless searches may qualify as reasonable).

²²⁴ See *Griffin*, 438 U.S. at 873 (suggesting that a special need beyond crime control will justify a warrantless search).

²²⁵ See *Amerson*, 483 F.3d at 81 (explaining the special need of collecting DNA for identity purposes).

restees does not constitute a special need other than crime control.²²⁶ Although crime control does not bar the application of the special needs doctrine as long as it is “a” purpose and not the “primary” purpose, microchipping will have a huge obstacle to overcome in searching for a special need whose primary purpose is not crime control.²²⁷ Therefore, there is no need to conduct a subsequent balancing test under the special needs doctrine because it will be extremely difficult to identify a primary purpose for microchipping convicts and arrestees without suspicion other than crime control.²²⁸

4. The “reasonableness inquiry” under the Totality of the Circumstances framework.

Under the totality of the circumstances framework, courts will most likely find that human microchipping of felons and felony arrestees is unreasonable under the Fourth Amendment because the promotion of crime control is outweighed by the degree to which microchipping intrudes on a felon or felony arrestee’s privacy.²²⁹ Because we do not need to first find a special need, this framework proceeds directly to the balancing test to determine reasonableness based on: (1) the degree of intrusion of an individual’s privacy; (2) the nature of the intrusion; and (3) the degree to which the action is needed for promotion of legitimate government interests.²³⁰

²²⁶ See Brandon, *supra* note 16 (listing the possible uses of human microchipping). Although this list is purely speculative and hypothetical, the only relevant purpose on this list for microchipping felons would be for the primary purpose of crime control. See Brandon, *supra* note 16.

²²⁷ See *Amerson*, 483 F.3d at 81 (announcing that some law enforcement concerns will justify suspicionless searches under the special needs doctrine); see also Brandon, *supra* note 16 (listing the possible uses of human microchipping).

²²⁸ See *Lynch*, 589 F.3d at 102 (explaining that a special need must first be found before proceeding to a balancing test).

²²⁹ See *Samson*, 547 U.S. at 848 (articulating the “totality of the circumstances” test).

²³⁰ See *id.* (inferring no requirement for identifying a special need under the totality of the circumstances framework); see also *Mitchell*, 652 F.3d at 406-16 (discussing the balancing test conducted under the totality of the circumstances test).

a. Privacy

Like individuals compelled to give a DNA sample, individuals that are microchipped- probationers, parolees, prisoners, and those arrested for felonies- all have a diminished expectation of privacy.²³¹ Therefore, this class of people does not enjoy the absolute liberty of which every citizen is entitled.²³²

b. The Nature of the Intrusion

Two privacy concerns that will most likely be raised when a person is microchipped are the physical intrusion of implanted the microchip underneath the skin and the maintenance of the information that can be read from the microchip.²³³ Although the Supreme Court has held that extracting blood for DNA analysis is a minimal physical intrusion because such test are common place and involve no risk, trauma, or pain; microchipping is distinguishable from DNA extraction because it is not common place to insert a tracking device underneath ones skin as part of a routine physical examination.²³⁴ Furthermore, studies show health risks involved with microchipping such as cancer that are not associated with extracting blood.²³⁵ While the Supreme Court might have held that drawing blood for DNA analysis is minimal, implanting a microchip beneath a person's skin is will most likely not be classified as a minimal intrusion.²³⁶

²³¹ See *Knights*, 534 U.S. at 119 (describing the diminished expectation of privacy of probationers); see also *Samson*, 547 U.S. at 850 (explaining the privacy interests of parolees); *Hudson*, 468 U.S. at 530 (holding that prisoners have no reasonable expectation of privacy); *King*, 133 S. Ct. at 1978 (reviewing an arrestee's diminished expectation of privacy).

²³² See *Knights*, 534 U.S. at 119 (inferring that all people with a diminished expectation of privacy are deprived of some liberties).

²³³ See *Beaugh*, *supra* note 72, at 187 (evaluating an individual's right to privacy in the context of physical government intrusion).

²³⁴ See *Schmerber*, 384 U.S. at 771 (declaring the extraction of blood to be a minimal intrusion); see also *Currid*, *supra* note 143, at 368 (explaining the procedure of microchipping).

²³⁵ See *Morrissey*, *supra* note 13 (stating that studies in laboratory animals may show that microchipping causes cancer).

²³⁶ See *Currid*, *supra* note 143, at 372 (suggesting how microchipping will be classified as significant government intrusion).

In the event that a crime occurred near a RFID or microchip reader, the subsequent reading of the microchip will also intrude on a person's privacy unless safeguards are put into place to prevent such an intrusion.²³⁷ For example, most DNA profiles contain nothing more than a specimen identification number and the name of agency that submitted the sample.²³⁸ A built in safeguard such as this has lead courts to explain that the analysis and storage of DNA samples is not an intrusion because a person's privacy is ensured through such safeguards.²³⁹ Though information on the safeguards of human microchipping is unavailable, microchipping technology should implement an infrastructure similar to that of DNA databanks in order to prevent such privacy issues.²⁴⁰

c. Legitimate Government Interests

Human microchipping used as a law enforcement tool supports a compelling interest of the government to prevent crimes and to solve crimes.²⁴¹ This compelling interest in solving crime is very similar to the governments compelling interest in obtaining and storing accurate identifying information from convicted offenders through DNA collection.²⁴² Some of the reasons that are associated with DNA collection as promoting the government's interest can also be associated with the governments need for microchipping to prevent and solve crimes.²⁴³ Those reasons are: (1) microchipping has the ability to rapidly and accurately solve crimes; (2) the ability to exonerate people wrongly convicted of a crime; (3) the ability to prevent innocent individuals from becoming suspects; and (4) the ability

²³⁷ See *Mitchell*, 652 F.3d at 390 (acknowledging the Court's balancing test between privacy and government interests).

²³⁸ See *id.* at 400 (listing the safeguards against the improper use of DNA); see also Polanco, *supra* note 42, at 489-90 (listing what information is contained in the stored DNA profiles).

²³⁹ See *Mitchell*, 652 F.3d at 400 (explaining the Court's conclusion that built in safeguards minimize privacy intrusion).

²⁴⁰ See *id.* at 414 (explaining the use of a DNA bank in the context of criminal conduct).

²⁴¹ See, e.g., Currid, *supra* note 143, at 367 (providing an example of state legislators contemplating microchip implants for those convicted of crimes).

²⁴² See *Amerson*, 483 F.3d at 87 (announcing the compelling state interest of collecting DNA).

²⁴³ See Currid, *supra* note 143, at 374 (noting society's justification for implanting microchips).

to assess the likelihood that persons charged with crimes are available at trial.²⁴⁴ Because of these benefits that are added to society, the courts will likely find that the government does have a legitimate interest in microchipping humans who have been convicted of a felony or arrested for a felony.²⁴⁵

The final step of the totality of the circumstances analysis is to weigh the diminished privacy interest of people convicted of a felony and the nature of the intrusion (actually implanting the chip) against the need for microchipping to promote the government interest of solving and preventing crime.²⁴⁶

V. CONCLUSION

Courts will likely find that implanting a microchip in a human to solve crime or prevent crime is unreasonable under the Fourth Amendment. Although the people who microchipping will be aimed—probationers, parolees, inmates, and felony arrestees—have a diminished expectation of privacy and do not enjoy the same liberties as everyday citizens, the drastic measure of implanting a microchip underneath a person's skin and monitoring their movement cannot be considered a minimal intrusion. Health and safety issues, the newness of the technology, the constant ability to track people, and the risk of hackers actually breaking into a person's chip and tampering with their information is not outweighed by the governments compelling interest in solving crimes. Microchipping may sound like a good idea now, but it could also prove to be disastrous. Thankfully, the Fourth Amendment might not ever let microchipping get the chance to prove itself.

²⁴⁴ See *Amerson*, 483 F.3d at 87 (explaining the reasons the government has a compelling state interest in identifying individuals).

²⁴⁵ See *id.* (analyzing the government interests associated with microchipping humans).

²⁴⁶ See *id.* at 89 (discussing the final step in the totality of the framework balancing test).