



IN-BRIEF

Rapid DNA Technology Forum | August 15–17, 2017



“The panels were excellent and presentations were fantastic. The forum was very beneficial at all levels. Bringing the manufacturers and end users together to share their experiences was a great idea. I am more confident about the future of the technology.”

–Forum Attendee

Introduction

The Forensic Technology Center of Excellence (FTCoE) hosted the Rapid DNA Technology Forum in Alexandria, VA on August 15–17, 2017. Rapid DNA technology has advanced quickly over the past several years, with the development of commercially available systems that produce DNA profiles, which include the expanded Combined DNA Index System (CODIS) panel, and the introduction and passage of the Rapid DNA Act of 2017.¹

This forum provided more than 130 attendees from the forensic DNA community an opportunity to be informed of commercially available rapid DNA technologies, hear lessons learned from several early adopters from local law enforcement (LE) and federal agencies, and discuss how to move forward as a community.

Senator Orrin Hatch, co-author of the Senate version of the recently passed Rapid DNA Act, offered his gratitude to the attendees of the forum through a welcome letter featured in the forum’s program. In this welcome letter, Senator Hatch mentioned that he “stand[s] ready to continue our work together as we seek to improve DNA analysis and make our criminal justice system more efficient.”

Objectives

- ▶ Educate the forensic DNA community on the state of rapid DNA technologies.
- ▶ Showcase rapid DNA technologies that could be used to obtain investigative leads.
- ▶ Provide attendees access to a panel of experts who have adopted rapid DNA for various purposes.
- ▶ Discuss recent updates related to the current use of rapid DNA for CODIS and its future use for NDIS.
- ▶ Provide attendees with the opportunity to network with rapid DNA experts, current technology providers, researchers, developers, law enforcement professionals, legal professionals, and other users.



Background

Forensic Technology Center of Excellence

The FTCoE, led by RTI International, is supported through a cooperative agreement from the National Institute of Justice (NIJ), award number 2016-MU-BX-K110. The FTCoE supports the implementation of new forensic technology and best practices by end users, bridging the gap between the scientific and criminal justice communities. One way the FTCoE moves knowledge from research to impact is through hosting national meetings that bring together professionals spanning several areas of expertise to focus on an emerging topic within the forensic community.

Rapid DNA Analysis

In a forensic DNA laboratory, the standard sample processing workflow consists of extraction, quantitation, amplification, separation, detection, allele calling, and human review. Processing of reference samples (e.g., a buccal swab collected from a single person), does not require quantitation, and allows for some automated review. Rapid DNA describes the process of obtaining a CODIS core loci short tandem repeat (STR) profile from a reference sample without human intervention via an automated instrument that fully integrates the processing workflow, minus quantitation and human review.² The term 'modified rapid DNA analysis' also refers to this process, and requires the addition of a technical review of the results by a DNA analyst.²

Currently, two companies offer commercially available off-the-shelf rapid DNA technologies that can produce STR profiles that include the full 20 CODIS core loci: IntegenX, Inc. (Pleasanton, CA) and ANDE Corporation (Waltham, MA). The IntegenX systems (**Fig 1**) use GlobalFiler® Express and AmpFLSTR® NGM SElect™ Express chemistries and can process one to eight samples simultaneously (RapidHIT® 200) or a single sample (RapidHIT® ID) in under 2 hours.^{3,4}



Fig 1. The RapidHIT® 200 system (left) and RapidHIT® ID (right) system (right).

The ANDE system (**Fig 2**) uses FlexPlex™ 27 chemistry and can process one to five samples simultaneously in under 2 hours.⁵



Fig 2. The ANDE system.

The ParaDNA® System (LGC Group, Middlesex, UK) was also showcased at the forum to educate attendees on current initiatives that could potentially change the landscape of using DNA for investigative leads. Three assays are available on this system: (1) an mRNA-based body fluid identification test (vaginal fluid, seminal fluid, sperm cells, saliva, blood, and menstrual blood), (2) a screening test to determine the presence of human DNA and gender specification, and (3) an intelligence test that produces partial STR profiles (five STR loci plus amelogenin) for investigative leads. For each test, results are obtained within approximately 75-90 minutes (**Fig 3**).⁶



Fig 3. The ParaDNA® Screening Instrument (left) and Field Portable Instrument (right).

Rapid DNA Act of 2017

The Rapid DNA Act became law on August 18, 2017, amending the DNA Identification Act of 1994 and the DNA Analysis Backlog Elimination Act of 2000.¹ The amendments created the requirement that the Federal Bureau of Investigation (FBI) will develop guidelines for using rapid DNA instruments and allow the results obtained from rapid DNA instruments to be included in CODIS.¹ The Rapid DNA Act is critical to ensure LE's ability to utilize and benefit from rapid DNA technologies.



Recognizing a Gap within the Forensic Community

The FTCoE recognized a need for stakeholders to come together and address how to responsibly and effectively utilize rapid DNA technologies to improve the criminal justice system. The Rapid DNA Technology Forum provided the community an unprecedented opportunity to gain insight into the capabilities of commercially available instruments directly from the manufacturers and discuss the implementation of rapid DNA across several applications. This forum also allowed attendees to raise concerns surrounding addressing new technology in the courtroom and to explore future directions. Most importantly, this forum provided attendees the opportunity to network with rapid DNA experts, manufacturers, researchers, LE professionals, legal professionals, and other users. By bringing these stakeholders together, future adopters could envision how to successfully and responsibly implement a rapid DNA program in their organization.

“...this forum is an important opportunity for the hundreds of stakeholders of the forensic DNA and criminal justice communities to share the lessons learned from the early adopters of Rapid DNA technology and to discuss the evolution and development of the technologies...which will have a critical impact on the future of forensic DNA analysis.”

—Senator Orrin Hatch

Forum Highlights

A Historical Perspective on Rapid DNA Typing

Erica Romsos of the National Institute of Standards and Technology (NIST) provided an excellent overview of the major advancements in DNA typing that allowed rapid DNA analysis to become a reality and described how NIST has been involved in rapid DNA typing for almost 10 years.

FBI Vision for Rapid DNA

Dr. Tom Callaghan, Chief Biometric Scientist for the FBI Laboratory, has been intimately involved with rapid DNA analysis since its conception. Dr. Callaghan outlined major developments to date and discussed current rapid DNA initiatives at the FBI, including the enhancement of CODIS software in 2018 and the deliverance of a new capability

to booking stations that allows for arrestee DNA collection. During his presentation, Dr. Callaghan also stated that, for the purpose of uploading or searching CODIS, rapid DNA systems are not authorized for use on crime scene samples.²

Additionally, Dr. Doug Hares of the FBI gave an overview of the operation of the National DNA Index System (NDIS), in which he covered DNA sample collection laws in the U.S., privacy act protections, constitutional challenges to DNA databases, participation requirements, operational procedures on rapid DNA, and NDIS architecture. Dr. Hares explained that no rapid DNA system currently has NDIS approval, and he reiterated Dr. Callaghan’s statement that, at this time, rapid DNA technology can only be used for identification purposes, not crime scene analysis. He also highlighted the value of CODIS, which contained 16.5 million profiles as of July 31, 2017 and aided 40,000 investigations in the past year.



Dr. Tom Callaghan speaks to attendees about the FBI’s vision for the integration of rapid DNA in booking stations. Photo credit: RTI staff.

An Integrative Approach to Rapidly Solving Crime

Attorneys, investigators, and forensic scientists in the Orange County District Attorney’s (OCDA’s) DNA Program work together to accomplish their unit’s mission of applying science, technology, and the law to identify the guilty and exonerate the innocent. The OCDA became interested in rapid DNA after networking with rapid DNA technology providers at the International Symposium on Human Identification in 2011 and purchased the IntegenX RapidHIT® 200 two years later. The OCDA recognizes the importance of collaborating with a crime laboratory to ensure the responsible use of rapid DNA and always collects two samples when using the technology: one is



processed by the rapid DNA system, and the other is submitted for processing by their local crime laboratory. Currently, the results obtained from the RapidHIT® 200 system are used for investigative purposes only.

Rapid DNA Technology and the Crime Laboratory

The Miami Beach Police Department, under the direction of Chief Daniel Oates, has initiated a collaborative project with the FBI Biometric Analysis Section, the Miami-Dade Police Department Forensic Services Bureau, and the Florida Department of Law Enforcement to obtain investigative leads from crime scene samples analyzed by the ANDE system. Currently, two swabs of evidentiary items are collected; the first is submitted to the Miami-Dade Forensic Services Bureau, and the second is processed by the ANDE system. Chief Oates illustrated the power of rapid DNA through a case example involving a shooting that occurred over Memorial Day weekend in 2017. The suspect was apprehended within minutes of the shooting. Shortly thereafter, the ANDE system revealed a match of the suspect's DNA to a secondary swab of the handgun recovered at the crime scene.

DNA on the Investigative Timeline

The Kauai Police Department has been using the ParaDNA® Intelligence Test to obtain investigative leads from evidence collected at a crime scene since May 2016, particularly through search and arrest warrants. Stephanie Regan, a criminalist within the department, discussed how the ParaDNA® system has provided the ability to obtain cost-effective DNA information in a matter of hours and reduces the time spent focusing on false leads or uninformative evidence. Ms. Regan also addressed a recent cost analysis of the system performed by Kauai Police Department. As of her presentation at the forum, the department had screened 71 items using the system, which cost approximately \$6,000. For comparison, if the same items had been sent to a private laboratory for full STR testing, the cost would have been \$44,000-\$70,000.

Rapid DNA within the Department of Homeland Security

The Department of Homeland Security (DHS) currently has no in-house DNA capability, as explained by Chris Miles of the Science and Technology Directorate within DHS. Mr. Miles discussed how DHS foresees rapid DNA benefitting border security, immigration, and disaster recovery and resilience. SNA International has been

working with DHS to implement rapid DNA capabilities by providing validation tools, use-case priorities, and field evaluations.

John Boyd, Assistant Director of Futures Identity, further discussed the value of biometrics to DHS and how, through rapid DNA, first responders and border patrol agents can quickly identify individuals and ultimately prevent human trafficking across borders. DHS is planning to implement a DNA pilot program that will include developing DNA storage and matching capabilities for the Automated Biometric Identification System (IDENT), a central, DHS-wide database that currently includes basic biographic information, irises, fingerprints, and other biometrics. Through this pilot program, DNA data could be used to accurately identify and confirm familial relationships.



Mr. Chris Miles speaks to attendees about the applications and field tests of rapid DNA within DHS. Photo credit: RTI staff.

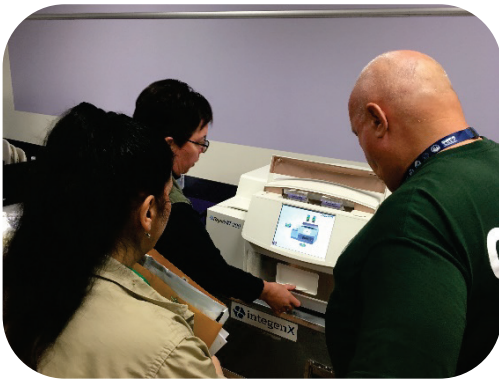
Rapid DNA for Mass Fatality Response Operations

One potential benefit of rapid DNA is the ability to deploy ruggedized instruments to the field, especially during mass fatality response operations. Dr. Amanda Sozer of SNA International detailed the role of rapid DNA in mass fatalities, the participation of DHS in several mass fatality response exercises, and looking forward. She further explained how rapid DNA is uniquely able to expedite family reunifications and morgue operations.

Kristine Cavicchi of Massachusetts' Office of the Chief Medical Examiner (OCME) also presented on the use of rapid DNA for mass fatality planning and daily operations. Making identifications through DNA can be challenging



for medical examiner’s offices that lack immediate access to a DNA laboratory. The OCME currently outsources samples for DNA testing to several external laboratories, which can lead to long turnaround times and chain of custody issues. Ms. Cavicchi explained how, in the future, bringing rapid DNA technology to the OCME could dramatically reduce turnaround times and expedite the release of decedents to families. The OCME purchased the ANDE system in June 2015 and continues to test its performance on pre-processed bone from decomposed human remains.



Dr. Amanda Sozer highlighted the value of rapid DNA in several mass fatality response exercises, including Operation Heartland (top) and Operation Mega Death (bottom) in Dayton, Ohio in May 2017. Photo credit: Dr. Amanda Sozer.

ASCLD Rapid DNA Ad Hoc Task Force Initiative

The American Society of Crime Laboratory Directors (ASCLD) recognizes the need for organized multilevel multi-jurisdictional coordination when it comes to rapid DNA implementation. ASCLD President Ray Wickenheiser discussed the Rapid DNA Ad Hoc Task Force, which was established to provide coordination and oversight, facilitate communication, and develop best practices, guidance documents, and uniform requirements and standards.

“For the first time, all actors were in the same room discussing what is best for the rapid DNA field and showing the potential for a wide range of applications. This was really informative and rich of information.”

–Forum Attendee

Impact of the Rapid DNA Act to the Criminal Justice System

Chris Asplen, the Executive Director of the National Criminal Justice Association, captured the audience’s attention during his presentation on the impact of the Rapid DNA Act to the criminal justice system. He explained how the most important factor in maximizing the value of rapid DNA technology is not scientific reliability or proper evidence collection but what the law allows you to do with it. A systematic approach to the utilization of this technology and the allocation of resources is critical. Mr. Asplen concluded his presentation by discussing how the failure to educate proactively, unrealistic expectations, and user misconduct have the potential to impede progress.

Networking Event

On the second day of the forum, attendees were provided with the opportunity to network with rapid DNA experts, technology providers, researchers, and other users during a networking event sponsored by ANDE, IntegenX, and LGC/Foster + Freeman. Additionally, during this event, ANDE, IntegenX, LGC, and DHS set up their instruments and performed successful demonstrations for attendees.

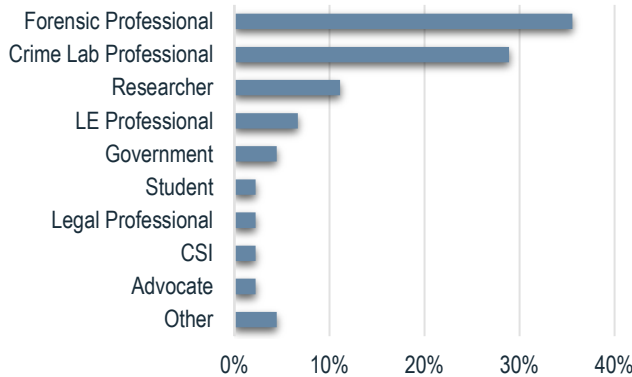


The Rapid DNA Technology Forum networking event. Photo credit: RTI staff.

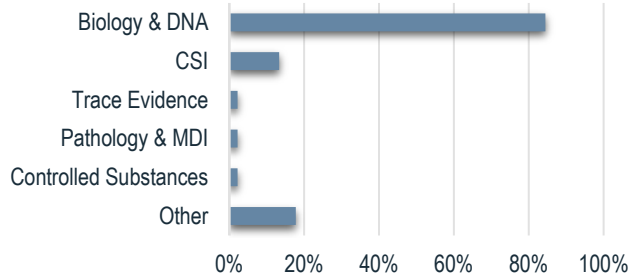


Attendee Overview

Attendee Professions



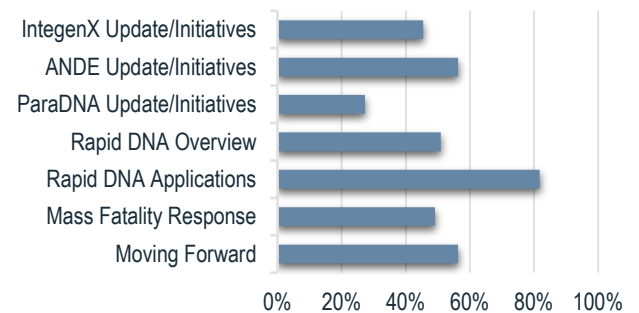
Attendee Forensic Disciplines



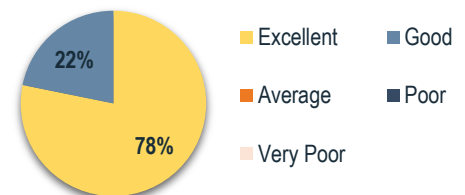
“This was the first time that there was a concerted effort to bring like-minded individuals together to discuss this novel technology. It helped me to formulate implementation plans.”

–Forum Attendee

Which session(s) did you find most beneficial?



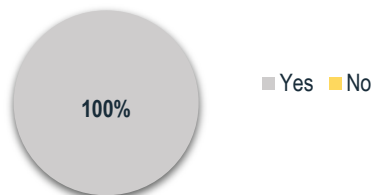
Rate the content of this forum on its ability to engage you.



Impact

Attendees were asked the following questions after the forum.

Were the objectives of this forum met?



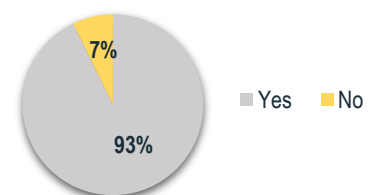
Did you find this forum to be beneficial?



“The content and discussion were outstanding. The full range of speakers, with excellent knowledge base, were not only able to present their material, but answer questions and engage in well-rounded discussion.”

–Forum Attendee

Does your organization plan to discuss/implement any ideas or concepts learned from the forum?





Presentation Archives

Access archived content and download presentations from the Rapid DNA Technology Forum at <http://www.forensiccoe.org/workshop/rdtf/>.

Resources

- [1] Rapid DNA Act of 2017, Pub. L. No. 115-50, 131 Stat. 1001 (2017).
- [2] FBI. (n.d.). Rapid DNA. Retrieved September 14, 2017, from <https://www.fbi.gov/services/laboratory/biometric-analysis/codis/rapid-dna-analysis>
- [3] IntegenX. (n.d.). RapidHIT® system. Retrieved September 14, 2017, from <https://integenx.com/rapidhit-system/>
- [4] IntegenX. (n.d.). RapidHIT® ID. Retrieved September 14, 2017, from <https://integenx.com/rapidhitid/>
- [5] ANDE. (n.d.). About. Retrieved September 14, 2017, from <https://www.ande.com/about/>
- [6] LGC Group. (n.d.). ParaDNA® systems. Retrieved September 14, 2017, from <https://www.lgcgroup.com/products/paradna-technology/#.Wbrm2LJ97RY>

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