



Rapid DNA Mass Fatality Response Operations and Kinship Testing

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Rapid DNA Technology Forum
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Outline

- Mass Fatality Response Operations
- Using DNA in Mass Fatality Response Operations
- DHS Participation in Mass Fatality Response Exercises
- Looking Forward



Potential DHS Applications

Border and Enforcement:

- Countering human smuggling and trafficking by verifying relationships of suspicious persons and claimed families.
- Supporting investigations by linking objects to known persons.
- Screening arrested/detained persons against DNA watch lists.

Immigration:

- Enabling officers to rapidly screen applicant relationships:
 - During refugee interviews and against remote family members.
 - For those putting children up for overseas adoptions.
 - Against federal watch lists/criminal databases

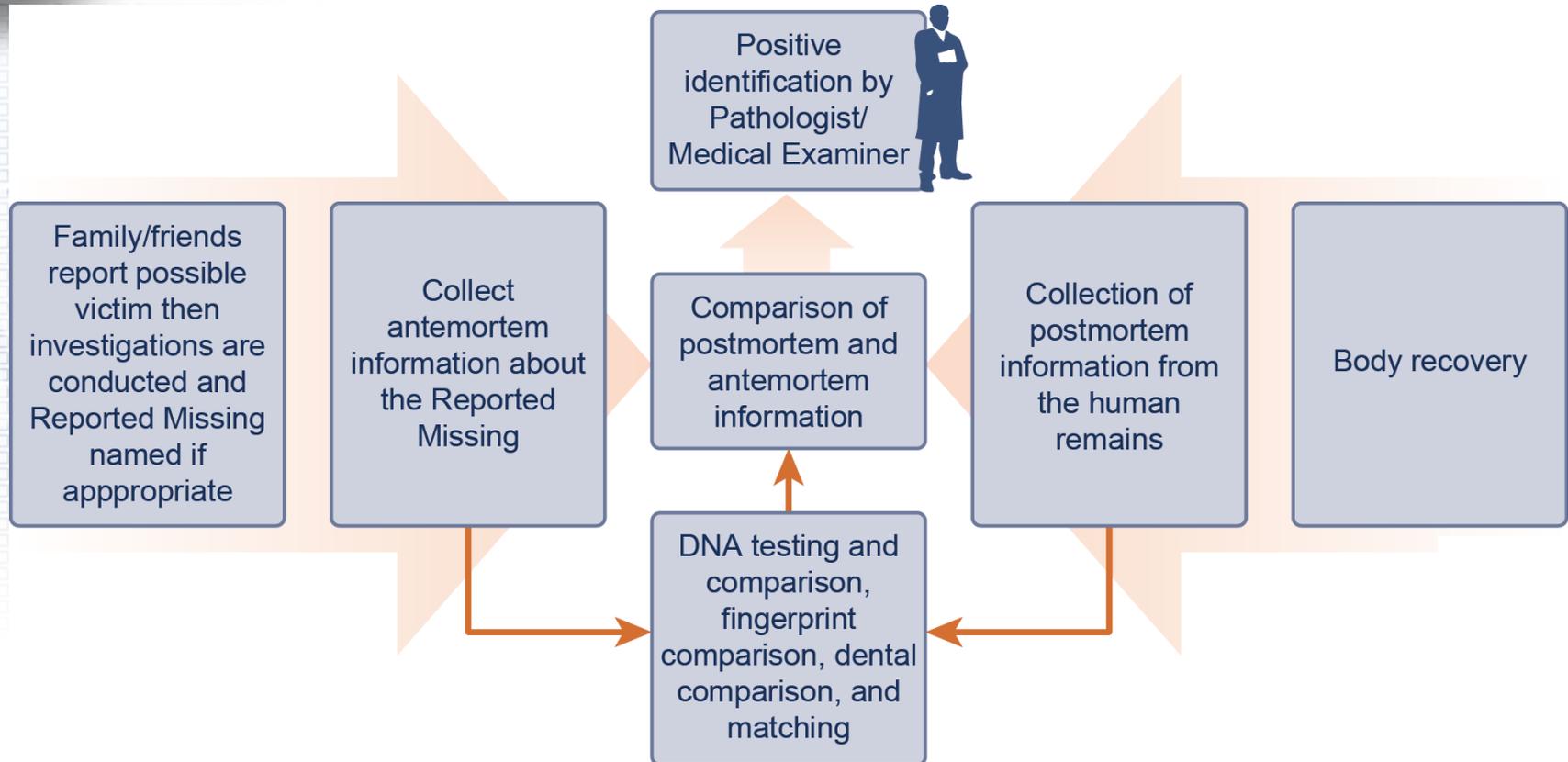
Disaster Recovery and Resilience:

- Medical Examiner/Coroner can use to type family members and human remains - expedites identifications and reduces mass fatality response costs
- Helps resilient communities rapidly recover by identifying victims – even before decontamination – and reuniting families.
- FEMA grants can fund system and consumables purchase.





Mass Fatality Human Identification Process





Objectives of a “Typical” MF Response

- Investigate and recover human remains
- Determine cause and manner of death
- Provide families with accurate and timely information
- Perform accurate and timely identification of victims
- Rapidly return the victims to their legal next of kin



Mass Fatality Factors Impacting the Identification Response



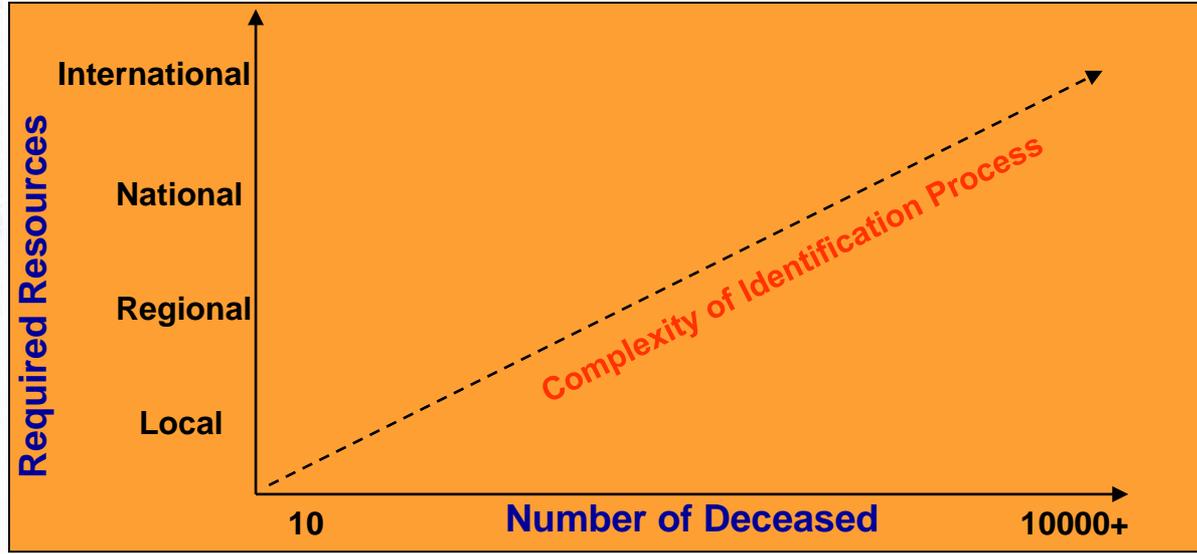
Area Impacted

- Effect of disaster on social and economic infrastructure
- Impact on the MEC/C's Office
- Financial and Political Considerations - availability of funds





Number of Deceased and Ability to Get to Them

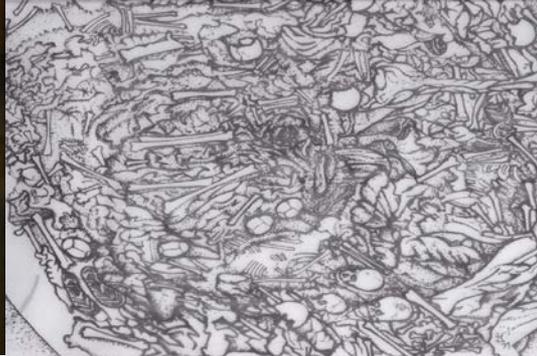


- Higher number of victims will require more resources from outside agencies
- Fast and unimpeded recovery results in large surge capacity early in the response
- Slow response results in resources scheduled over a longer period of time



Condition of Human Remains

- DNA becomes more important with:
 - Decomposition
 - Fragmentation

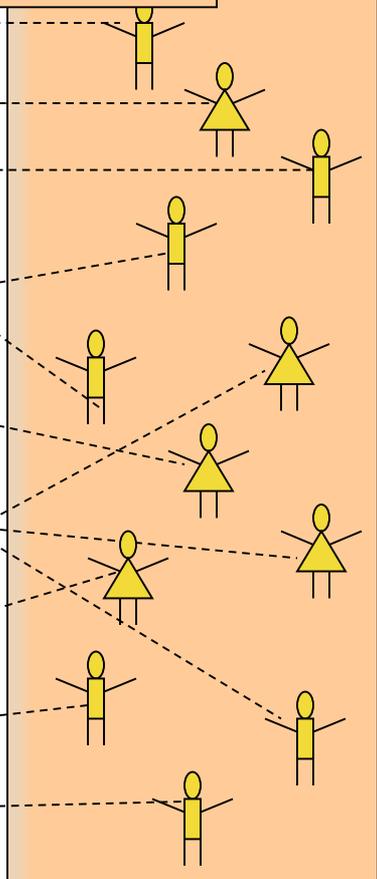




Closed vs. Open Event

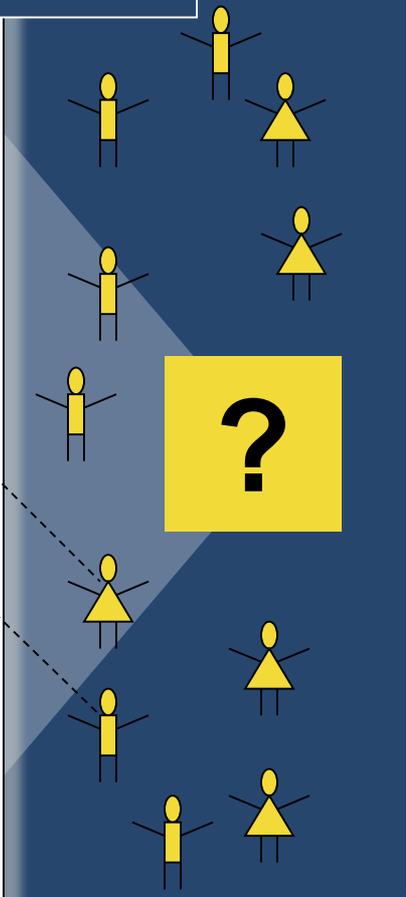
CLOSED

- Ste
- Mary Adell
- Jeremy Archer
- Kenneth Black
- John Brown
- Sally Brown
- Don Cartwright
- Doris Cartwright
- Virginia Smith
- Gloria Powers
- Joseph Powers
- Charles Pringle



OPEN

- Steven Able
- Mary Adell
- Jeremy Archer
- Kenneth Black
- John Brown
- Sally Brown
- Don Cartwright
- Doris Cartwright
- Virginia Smith
- Gloria Powers
- Joseph Powers
- Charles Pringle
- Kristine Pringle
- Mabel White
- Marshall West
- Cathy Wylie
- Nigel Zed
- Ian Zed
- Margaret Zed
- Catherine Zona





Availability of Information

- Availability of Ante mortem Data

- Ability to find family or for family members to come forward
- DNA references (if needed)





Health and Safety Concerns

1 Determine the nature of the situation and plan for environmental conditions.
(i.e.: biological contagion versus act of war)



2 Fully assess hazards of all types, including environmental, biological, chemical, and nuclear.



3 Advise personnel of potential health and safety concerns including dangerous animals, insects and plants. Include precautions and steps to neutralize the hazard.



4 Take necessary precautions, obtain protective gear and determine appropriate specialists to employ.





Fundamental Best Practices

- Identification procedures should be robust and withstand a court challenge. All activity and transfers should be documented to maintain a chain-of-custody.
- All participants in the identification process should follow standard procedures.
- Identification thresholds should be set and followed.



Incorrect Identifications Happen When:

- Non-scientific identification methods are used as primary method of identification
- Data is unreliable (AM or PM)
- There are no/low set standards/threshold for identification
- Succumb to pressure to make identifications
- Operations are disorganized/haphazard
- Response participants do not understand the overall operation
- Appropriate checks and balances are not in place
- Mass fatality is larger in scope/complexity

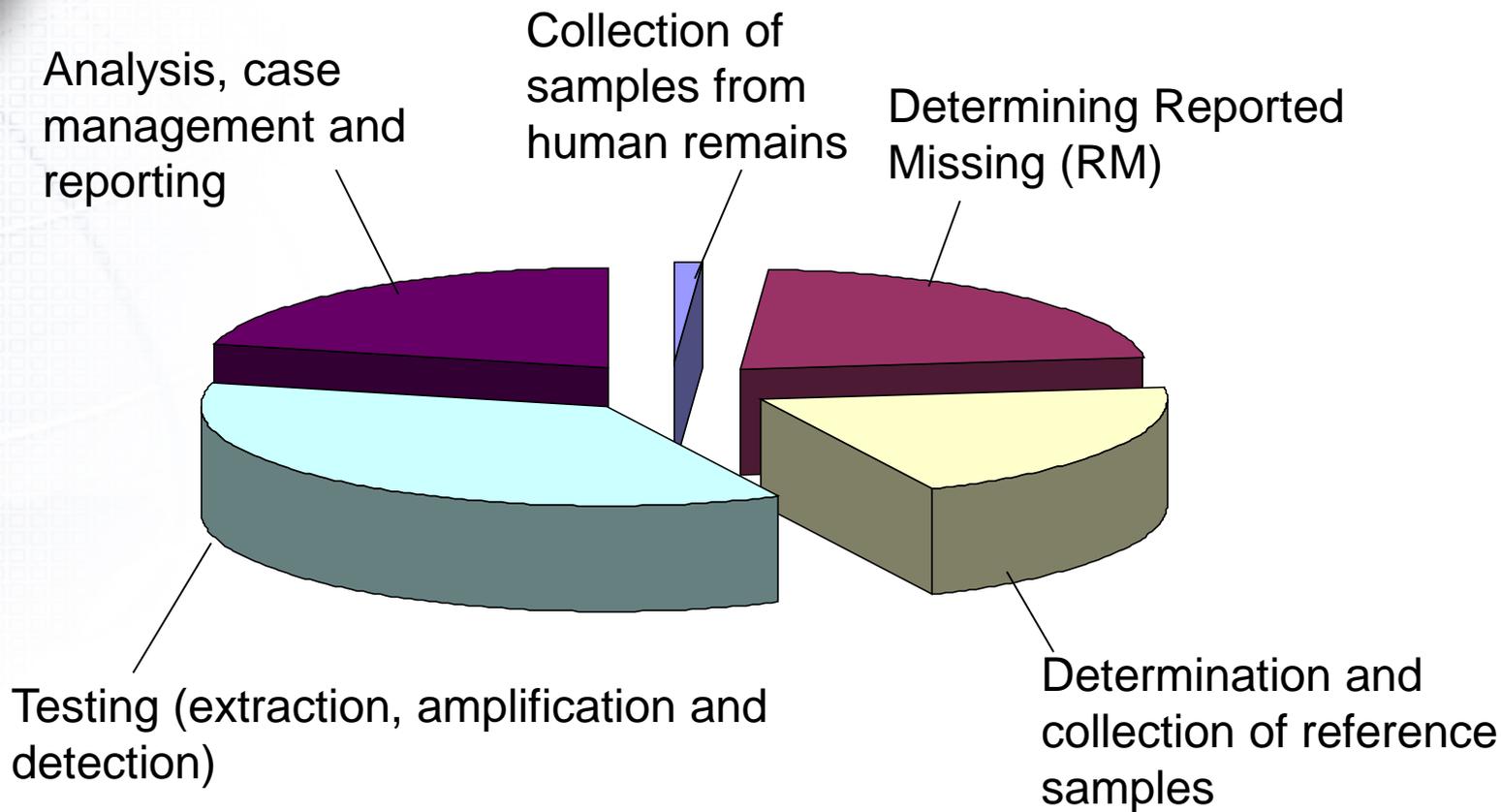


DNA Operations

- Collect samples from human remains at “morgue”
- Identify DNA cases
- Identify and collect potential reference samples (around the world)
- Track samples
- Test samples
- Review data
- Screen profiles and identify potential matches
- Verify reference samples are sufficient
- Report matches (according to specified threshold)
- *Provide additional support to ME/Coroner*



DNA Operations





Rapid DNA Business Use Case

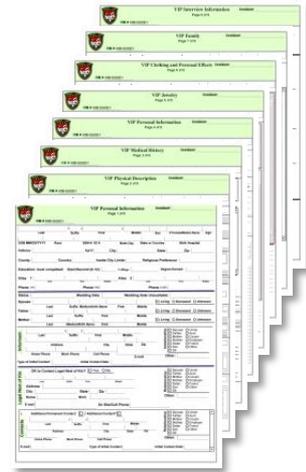
- Back of the Envelope Calculation
 - Saves time shipping to outside laboratory
 - Immediate information
 - Eliminates the need for duplicate testing
 - Know immediately if you have a good sample
 - Morgue
 - FAC/VIC - do we have enough references to make an identification
 - Families see “action”
- Does it make sense and will it work?



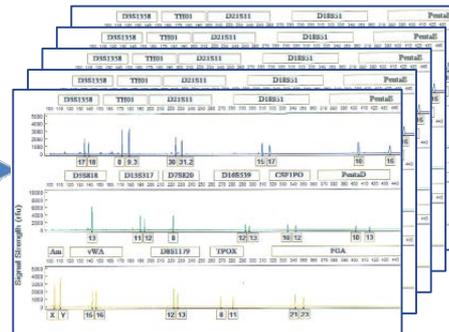
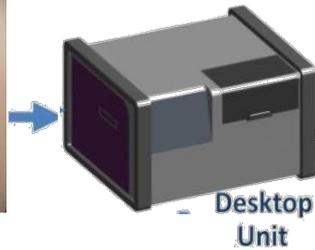
Family Assistance Center

Rapid DNA Can Expedite Family Reunifications:

- Samples tested faster than eight page VIP interview.
- Supports tests of either family buccal swabs (kinship) or direct identity references (hairbrush, toothbrush, etc...).
- Direct feedback on sufficiency of DNA for identification.
- Families receive immediate action.



Victim Identification Program (VIP) 8-page interview form



5 to 7 samples processed simultaneously





Morgue Operations

- Rapid DNA expedites morgue operations and reduces cost:
- Samples can be tested faster than it takes to complete the examination of the human remains in the morgue.
- Know in 90 minutes if there is an acceptable DNA profile.
- Speeding identification reduces cost of body storage and re-collections.



<https://www.fema.gov/media-library/assets/images/49614>





DHS S&T Participation in Exercises

Can we:

1. Just get the machines to the event?
2. Collect and test samples in an FAC/VIC?
3. Collect and test samples in the field/morgue?
4. Collect and test samples in the FAC/VIC and morgue at the same time?
5. Work with other outside responding agencies to collect and test samples in the FAC/VIC and morgue simultaneously?



Exercise #1: Operation Ready

- **Date:** October 2, 2015
- **Location:** Boston, Massachusetts, USA
- **Purpose:** Deploy of Rapid DNA instruments to FAC



Exercise #1: Operation Ready





Exercise #1: Findings

- Coordination important
 - Size of the vehicles
 - Access to buildings/parking
 - Important to be self sufficient
- Rapid DNA instruments can be transported and swiftly setup in the FAC of a mass fatality incident

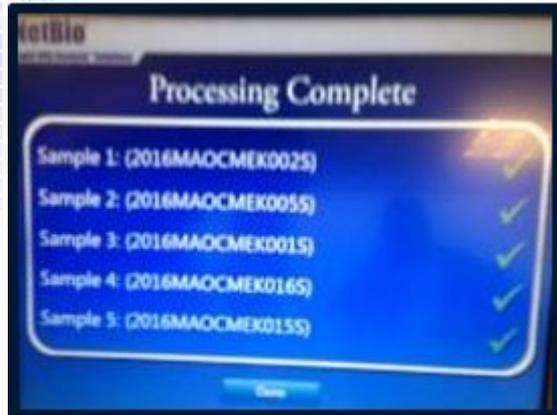


Exercise #2: Logan FAC Exercise

- **Date:** March 2, 2016
- **Location:** Boston, Massachusetts, USA
- **Purpose:** Determine if Rapid DNA can be successfully implemented into a Family Assistance Center in order to more efficiently reunify family members to the deceased victims of a mass fatality incident



Exercise #2: Logan FAC Exercise

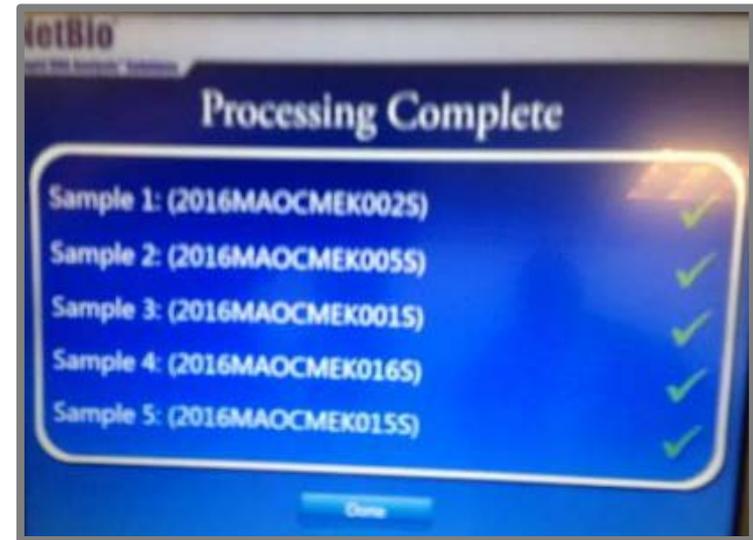




Rapid DNA: Family Reunifications

Great Experience at Boston Family Assistance Center Exercise

- **Collected 18 samples.**
- **All families successfully processed.**
- One profile had 3 flagged loci and needed review
- **Great interactions with Nurses in VIP collections.**
- Great triage.
- Believe nurses could easily do collections themselves.





Exercise #2: Findings

- Coordination is still very important
 - Access to buildings/parking
 - Support Medical Examiner/Coroner
 - Sample tracking
- There is great interest in having the DNA operations in the FAC
- Ideally, person working with family members to collect antemortem information for the VIP form should be collecting the DNA identification



Exercise #3: Vigilant Guard

- **Date:** July 29-30, 2016
- **Location:** Jericho, Vermont, USA
- **Purpose:** Determine if Rapid DNA instruments can be transported into a disaster site/portable morgue to process tissue from human remains



Mass Fatality Body Recovery Exercise





Mass Fatality Body Recovery Exercise





Mass Fatality Body Recovery Exercise





Mass Fatality Body Recovery Exercise



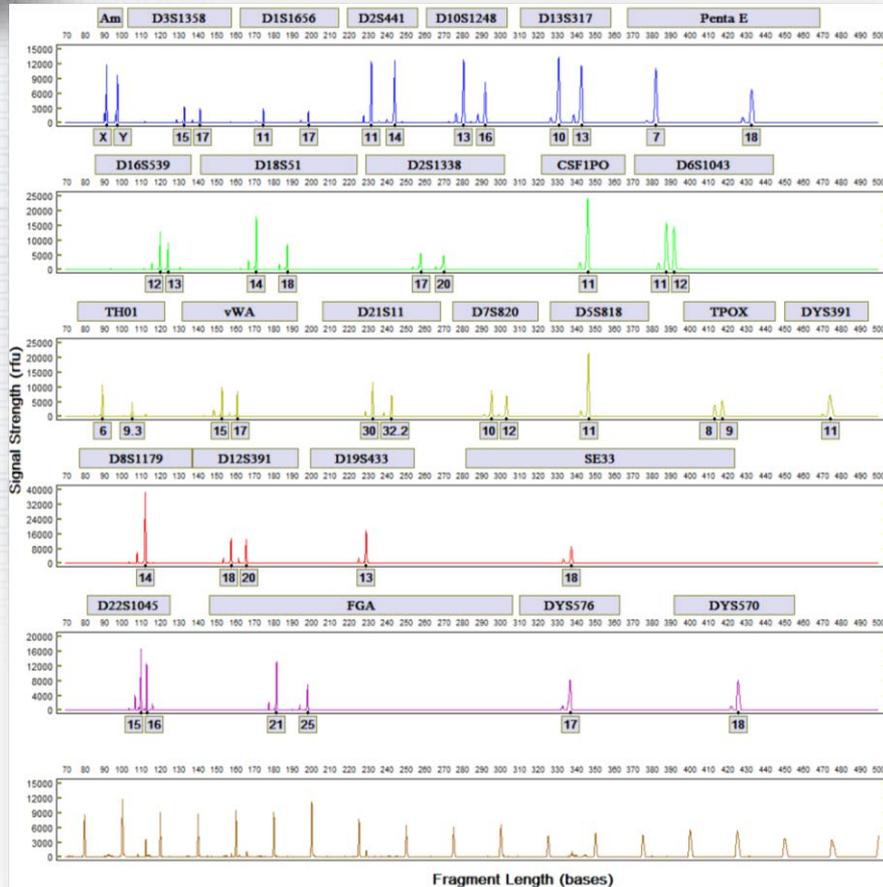


Mass Fatality Body Recovery Exercise



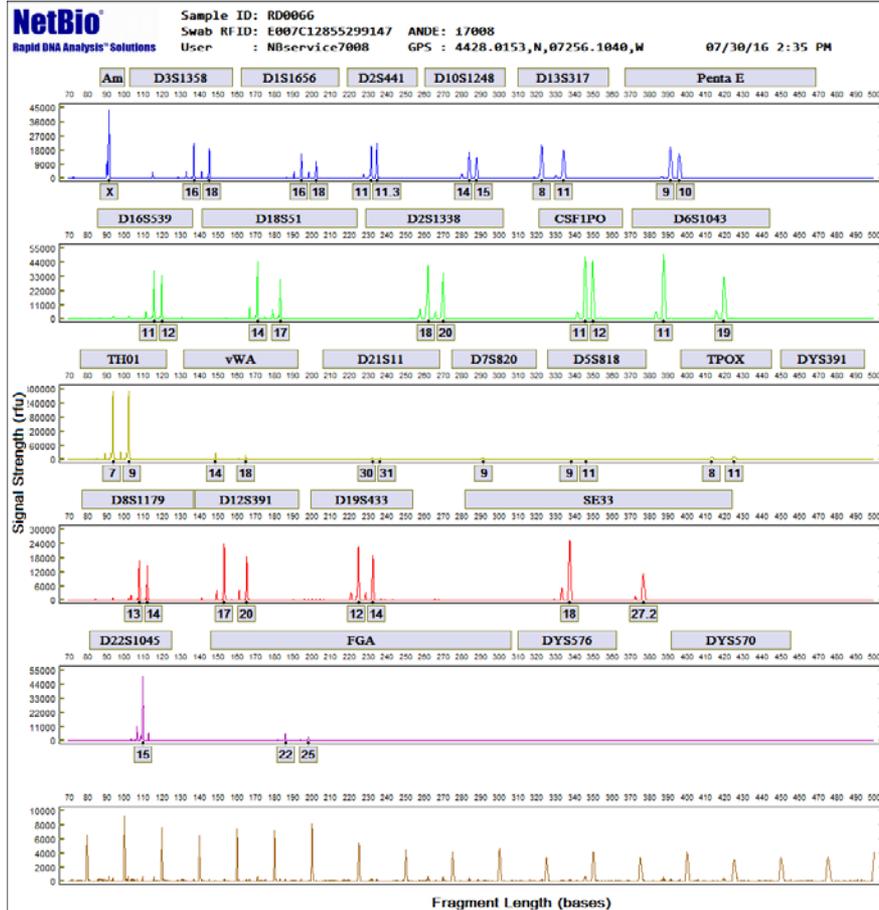


Rapid DNA: Muscle Tissue DNA Profile





Bone Sample





Exercise #3: Findings

- Coordination is still very important
 - Support Medical Examiner/Coroner
 - Sample tracking
 - Equipment and supplies
- There is great interest in Rapid DNA
- Rapid DNA is reliable and it is very portable (moved three times and run on generator power)
- DNA profiles can be generated from post mortem samples in the “field” especially important if human remains are contaminated and cannot be immediately transferred to a morgue.

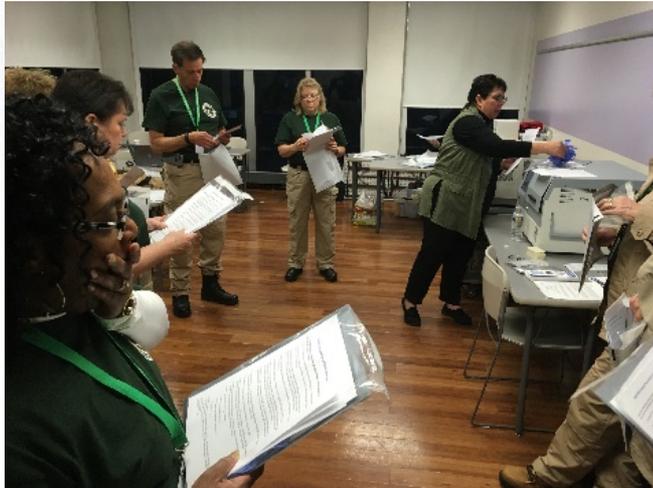


Exercise #4: Operation Mega Death & Operation Heartland

- **Date:** May 4 - 5, 2017
- **Location:** Dayton, Ohio, USA
- **Purpose:** Assess if Rapid DNA operations can be conducted simultaneously in the FAC and temporary morgue and assess how stakeholders feel about Rapid DNA

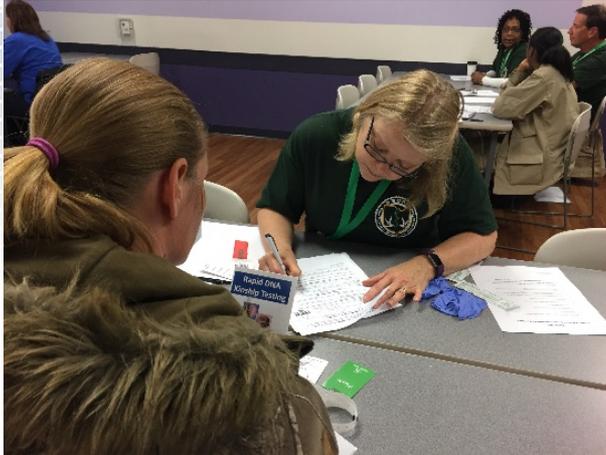


#4: Operation Mega Death - FAC





#4: Operation Mega Death - FAC





#4: Operation Mega Death - Morgue





#4: Operation Mega Death Findings

- Coordination is still very important
 - Support Medical Examiner/Coroner – need to implement sample numbering and procedures
 - Equipment and supplies need to be well organized inventoried and labeled
- Need fast and effective just-in-time training
- Collection procedures must be simple yet robust
- Rapid DNA can be deployed to generate reliable profiles
- There is great interest in Rapid DNA



Stakeholder Feedback

- **How do you feel about the use of Rapid DNA in a mass fatality response incident?** 100% - The use of Rapid DNA at this incident showed that the authorities were working diligently to identify my loved one.
- **How helpful do you find DNA profiles being generated at the Family Assistance Center?** 80% - Very helpful, 20% - Helpful
- **How supportive are you of the government's use of Rapid DNA for identification of missing persons in disasters?** 80% - Very supportive 20% - Supportive



#4: Operation Heartland





#4: Operation Heartland





#4: Operation Heartland





#4: Operation Hartland Findings

- Coordination is still very important
 - Support Medical Examiner/Coroner – need to implement sample numbering and procedures
 - Equipment and supplies need to be well organized inventoried and labeled
- Need fast and effective just-in-time training
- Collection procedures must be very simple simple yet robust
- Rapid DNA can be deployed to the hot zone
- Additional logistical challenges in the hot zone (e.g., gloves)
- There is great interest in Rapid DNA



#5: FEMORS & Florida Air National Guard

- Date: May 23-25, 2017
- Location: Miami, Florida, USA
- Purpose: Determine if identifications can be made through the use of multiple Rapid DNA instruments at both the VIC (FAC) and the temporary morgue.

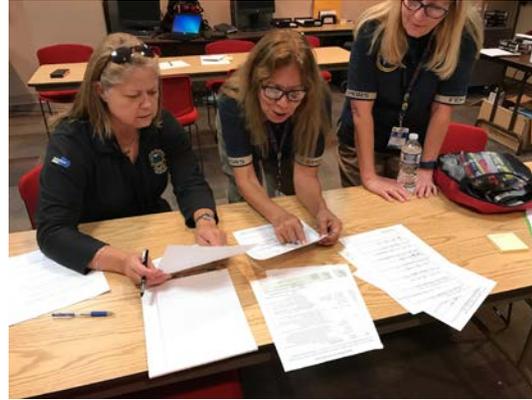


#5: FEMORS & Florida Air National Guard

VIC (FAC)	Portable Morgue
DHS S&T	DHS S&T
Indian River Sheriff's Department	CBP LSSD
IntegenX	Miami Beach Police Department
	ANDE



#5: FEMORS & Florida Air National Guard





Stakeholder Feedback

- **How do you feel about the use of Rapid DNA in a mass fatality response incident?** 100% - The use of Rapid DNA at this incident showed that the authorities were working diligently to identify my loved one.
- **How helpful do you find DNA profiles being generated at the Family Assistance Center?** 77% - Very helpful, 15% - Helpful, 8 % - Indifferent
- **How supportive are you of the government's use of Rapid DNA for identification of missing persons in disasters?** 77% - Very supportive 23% - Supportive



#5: FEMORS & Florida Air National Guard





#5: FEMORS & Florida Air National Guard





#4: Operation Hartland Findings

- Coordination is still very important
 - Need to standardize procedures (including reporting threshold), forms and sample numbering
 - Need to keep track of equipment and supplies
- Need fast and effective just-in-time training
- Collection procedures must be very simple and fast yet robust
- Need effective data management tools for reporting
- Rapid DNA is easier than sending samples out for testing
- Forensic DNA Cooperative model has promise to fill current gap



DHS S&T Tools



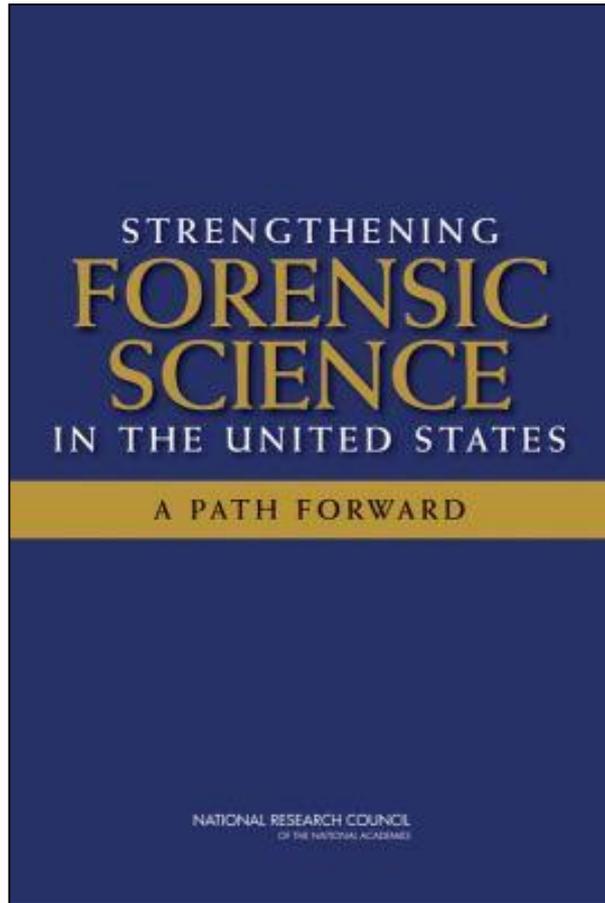
DHS S&T Rapid DNA Program Trip Preparation Check List

Trip Details		
Exercise/Event: FEMORS Mass Fatality Response Exercise: EGGI FESTIVAL Drill	Date(s): May 23 rd – 25 th , 2017	
Purpose: To conduct a proof of concept to determine if the following tasks are possible: 1) Just in-time training performed at the scene allows for individuals trained to properly collect, document, and run DNA samples with little to no prior DNA experience; 2) Rapid DNA operations can be run simultaneously in multiple venues of a mass disaster incident; and 3) radiologically contaminated remains can be run in the "hot zone" thus allowing identifications to be made prior to decontamination efforts.		
Destination(s): <ul style="list-style-type: none"> Disaster Site: 11380 NW 27th Avenue, Building 400, Miami, FL 33167 VIC: 1851 NW 9th Avenue, Miami, FL 33136 	Participants: Rapid DNA Team: DHS S&T, CBP LSSD (Savannah), IntegenX ANDE, SNA International Other Agencies: Indian River Crime Lab, Miami Beach PD, ORAU	
Goals/Desired Outcomes: <ul style="list-style-type: none"> Evaluate the effectiveness of "just in-time" training for DNA sample collection, documentation, testing, and analysis Evaluate the efficiency of running multiple Rapid DNA operations simultaneously at different exercise venues Assess the effectiveness of DNA sample collection and documentation Assess the ability and benefits of generating DNA profiles with instrumentation located within the radiologically contaminated zone Identify any operational and/or technology gaps that can be applied to future Rapid DNA field studies 		
Trip Duration: 4 - 7 Days May 20 th – 22 nd : Instrument Transport (Driving) May 23 rd : Travel Day and National Guard Training May 24 th : Exercise (Training and Demonstrations) May 25 th : Exercise (Training and Demonstrations) and Travel May 26 th – 27 th : Instrument Transport (Driving)	# of Samples to be Tested: <ul style="list-style-type: none"> Morgue (May 24th - 25th): (up to) 12 tissue samples, 15 buccal swabs VIC (May 24th - 25th): (up to) 56 buccal swabs 	



DHS S&T Rapid DNA Program Equipment and Supplies Check List

Rapid DNA Equipment & Supply List	Demo (4 th)		FAC (5 th)		Morgue (5 th)		ID Center (5 th)		Field (6 th)	
	Quantity	Comments	Quantity	Comments	Quantity	Comments	Quantity	Comments	Quantity	Comments
NetBio ANDE Rapid DNA instrument	1	DHS/SNA			1	DHS/SNA			1	DHS/SNA
NetBio ANDE Biochips	1	A-Chip			2	I-Chip			1	I-Chip
NetBio Bode Collector Swabs with Desiccant	5	(In Chip)			8	SNA			4	SNA
NetBio Laptop with Kinship Software	Will use KinCALC									
IntegenX RapidHIT 200 instrument	1	DHS/SNA	1	DHS/SNA					1	DHS/SNA
IntegenX RapidHIT 200 Globalfiller Express Kits	1	SNA	2	SNA					1	Must run muscle tissue prior
IntegenX RapidHIT 200 Storage Cartridge Kits	1	SNA							1	SNA
IntegenX RapidHIT 200 - 3" Puritan Cotton Swabs	7	SNA	14	SNA					7	
Laptop with LSAM Kinship Software	Will use KinCALC									
Rapid DNA System USB Thumb Drive (ANDE & RapidHIT)	1	SNA	1	SNA					1	SNA



“With the exception of some large city, county, and state systems, **the level of preparedness of ME/C jurisdictions is generally very low**” (page 260)

“**Uniform statewide and interstate standards of operation, consolidation of small systems, regionalization of services, and standardization of staff training are needed to assist in the management of interstate and cross-jurisdictional events.**” (pgs.29 and 261)



Looking Forward

- Continue to participate in full scale mass fatality exercises as appropriate to continue to improve the integration of Rapid DNA testing
- Partner with Federal, state, and local forensic agencies to:
 - Identify best practices
 - Generate standardized procedures
- Revisit Forensic DNA Cooperative
- Continue to support FEMA grant process
- ASCLD Rapid DNA Task Force



Questions?

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