

# Research Initiatives

at the

Bureau of Alcohol, Tobacco, Firearms &  
Explosives



**U.S. Department of Justice**

Bureau of Alcohol, Tobacco, Firearms and Explosives

# About ATF

- A small agency
- A specialized agency
- An agency focused on operations
- Laboratories comprising practitioners

**These agency characteristics have a profound effect on how research is conducted within ATF**

# A small agency

- No dedicated budget for research
- Leverage partnerships and collaborations
- Mentoring

# A specialized agency

- Both regulatory & criminal enforcement
- Unique focus on core mission; crimes involving:
  - Firearms
  - Fire/arson
  - Explosives
- Research initiatives focus on techniques and methods that support these areas

# An agency focused on operations -- a laboratory comprising practitioners

- Research efforts are primarily aimed at applications rather than foundational validity
- Focus on improving how casework is done & challenges faced in dealing with actual evidence
- Frequently inspired by actual casework challenges or questions
- Includes research related to investigative techniques as well as some regulatory issues

# A unique blend of Investigative and analytical capabilities

- National Center for Explosives Training and Research (NCETR)
  - Certified Fire Investigator (CFI) Programs
  - Certified Explosive Specialist (CES) Programs
  - Homemade Explosives (HME) Training
- National Firearms Examiner Academy (NFEA)
- Fire Research Laboratory (FRL)
- Traditional Forensic Science Labs (FSLs)

# Highlights of research supporting fire investigations

Includes fire testing-related &  
fire debris/chemistry-related



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# Practical fire research

- Research almost exclusively starts from a question posed in an actual case
- Working toward greater distribution and easier public access to test data
  - Mentoring/CFI-C research projects
  - Tests that impact cause and origin investigations/understanding of fire dynamics
  - Tests that impact public &/or firefighter safety



# Fire – selected highlights

- Understanding the modern fire environment flow paths, fuels and ventilation
- Baby seat on stove
- Fire hose failures
- Flame jetting

**These are just a select few projects.**  
Numerous other research projects have been conducted and are underway.

# Flame jetting test



# Fire Debris – recent chemistry research

- Examination of methods used to reduce contamination on scenes and during the collection of evidence
- Partnership with Oklahoma State University looking at the preservation of both drug- and fire-related evidence from clandestine meth labs
- Various other projects often conducted via mentoring interns

# Highlights of specific research

## DNA



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# DNA – Focusing on challenges faced by ATF

- Evidence is almost exclusively touch
  - Low-level samples
  - Complex mixtures
  - Degraded samples
- Challenging substrates

# DNA – selected highlights

- Numerous small adjustments to analytical methods
- Able to nearly double our recovery of usable profiles from guns from to nearly 45%.
- Numerous projects that aren't widely publicized
- Post-blast work
  - DNA survival post-blast
  - Where & how to collect
  - Shared with relevant agencies

# DNA – selected highlights

- Why copper is such a challenge -
  - Ways to mitigate–collection
  - Polymorphic peptide analysis
- Cell-free DNA
- DNA repair
- Applications of Bovine Serum Albumin

# DNA – selected highlights

- Other work aimed at moving the science forward
  - Using the quantitation process to direct sample combinations
  - “NextGen” sequencing



# Other critical areas

- Explosives
  - Analytical methods
  - Functionality and effectiveness
  - Regulatory-related
- Firearms and Tool marks
  - Relevant to ATF cases
  - Foundational

# Conclusions



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