U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

Forensic Science Technology Working Group Operational Requirements

April 2024

The Forensic Science Technology Working Group (TWG) is a committee of approximately 50 experienced forensic science practitioners from local, state, and federal agencies and laboratories.

Through the Forensic Science TWG, NIJ reaches out to the forensic science practitioner community to identify, discuss, and prioritize operational needs and requirements. These needs and requirements help inform NIJ's planned and ongoing research and development activities, and ensure that future research and development investments meet practitioners' needs. TWG meetings are the first phase in NIJ's research and development process.

Disciplines represented by the Forensic Science TWG include:

- Crime Scene Examination
- Forensic Anthropology and Odontology
- Forensic Biology/DNA
- Forensic Pathology
- Physics and Pattern Interpretation
- Medicolegal Death Investigation
- Seized Drugs
- Toxicology
- Trace Evidence

Scan here for an updated list of Forensic Science TWG Operational Requirements:

NIJ's Research and Development Process

NIJ's research and development process helps ensure that projects are relevant to the field and produce valid, actionable results. The process typically includes:

1 IDENTIFYING NEEDS

In addition to working group meetings, NIJ sponsors workshops and other events to guide future research.

2 DEVELOPING A RESEARCH AGENDA

Our long-term research agenda is guided by our strategic goals.

3 IMPLEMENTING RESEARCH

NIJ funds research at external organizations, supplemented by the in-house research of our science staff.

4 POST-AWARD ACTIVITIES

NIJ scientists and grants managers monitor research projects and conduct site visits.

5 EVALUATING RESEARCH RESULTS

Results from awards inform future funding opportunities and become part of the process of developing NIJ's research agenda.

6 DISSEMINATING TO THE FIELD

NIJ spreads knowledge to policymakers, practitioners, and other researchers to advance science and practice.

For more information go to NIJ.ojp.gov, keyword: TWG.

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ADVANCING JUSTICE THROUGH SCIENCE

Technology Working Group Operational Requirements (updated January 2024)	**Forensic Discipline(s)**	**Scientific Research**	**Technology Development**	**Policy or Protocol Development**	**Assessment & Evaluation**	**Dissemination or Training**	**Databases or Reference Collections**
New foundational data to support the fundamental scientific basis for analysis and conclusions.	Physics & Pattern Interpretation; Trace Evidence	✓					
Development and validation of standardized forensic methods and conclusions.	Physics & Pattern Interpretation; Trace Evidence	✓	✓	✓	✓		
Evaluation of qualified language of association along the continuum from investigative leads to definitive conclusions.	Physics & Pattern Interpretation; Trace Evidence	✓		✓			
Accuracy and reliability of forensic examinations and conclusions, including potential sources of error and how examiners arrive at their decisions.	Physics & Pattern Interpretation; Trace Evidence	✓	✓				
Practical statistical approaches for the interpretation of forensic evidence.	Physics & Pattern Interpretation; Trace Evidence	✓	✓		✓		✓
Evaluation of the effectiveness of varied types of review and/or verification of casework, testimony, and investigative leads.	Physics & Pattern Interpretation; Trace Evidence	✓		✓	✓		
Novel/improved evidence detection, recognition, visualization, and collection tools and analytical instrumentation for field or lab use.	Physics & Pattern Interpretation; Trace Evidence	✓	✓		✓		
Evaluation of the effects of inter- and intra-disciplinary sequential evidence processing and analytical methods.	Physics & Pattern Interpretation; Trace Evidence	✓	✓	✓	✓		
Determination of the optimal content and frequency of proficiency tests to evaluate performance and mitigate risk.	Physics & Pattern Interpretation; Trace Evidence	✓		✓			
Understanding of the cognitive processes involved in pattern recognition as applied to forensic comparative analysis.	Physics & Pattern Interpretation; Trace Evidence	✓					
Replacement of HFE7100 with a non-flammable, environmentally friendly, and cost-effective carrier solvent for latent print development visualization reagents.	Latent Prints	✓	✓		✓		
Quantitative methods to augment visual trace evidence screening and examinations.	Trace Evidence	✓	✓		✓		
Development of a comprehensive extraction method to allow for both DNA and sexual lubricant analysis from a single sample.	Trace Evidence	✓	✓	✓	✓		
Understanding the interference of or chemical interaction between sexual lubricants, personal care products, and the human body.	Trace Evidence	✓	✓				
Construction of new and updating of existing databases with properties of manufactured materials.	Trace Evidence						✓
Evaluation of non-DNA approaches for human hair screening or comparison.	Trace Evidence	✓			✓		
Fundamental understanding of how environmental factors can affect trace evidence.	Trace Evidence	✓					
Determination of the causes of textile physical damage (e.g., tear, cut, stab, shot, burn) and evaluation of the persistence of damage characteristics.	Trace Evidence	✓					
Comprehensive evaluation of the detection and utility of organic gunshot residues.	Trace Evidence	✓	✓		✓		
Identification and characterization of nanomaterials in evidentiary materials or as taggants.	Trace Evidence	✓					✓

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Objective and validated methods to classify bloodstain patterns on non-absorbent surfaces by the mechanism of formation.	Bloodstain Pattern Analysis	✓	✓		✓		
Objective and validated methods for distinguishing spatter from transfer stains on clothing.	Bloodstain Pattern Analysis	✓					
Fundamental understanding of droplet formation, droplet trajectory, and the resultant formation of bloodstain patterns.	Bloodstain Pattern Analysis	✓	✓				
Understanding of the creation and obscuration of fire patterns due to ventilation effects.	Fire Investigation	✓					
Use of AI for identification of important information, hypothesis development and testing, bias mitigation, and repeatability for fire scene analysis of origin and cause determination.	Fire Investigation	✓	✓		✓		
Evaluation of methods for origin and cause determination.	Fire Investigation				✓		
Standardized procedures for collecting, preserving, and analyzing building system electronic data.	Fire Investigation; Digital Evidence		✓		✓		
Field and laboratory techniques for the quantitative measurement of fire patterns.	Fire Investigation	✓	✓		✓		
Understanding of the effect of materials properties on the development and interpretation of fire patterns.	Fire Investigation	✓	✓				✓
Tools for fire investigators to evaluate the effects of fuel characteristics on the growth and spread of fires.	Fire Investigation		✓				✓
Adequate materials property data inputs for accurate computer fire models.	Fire Investigation						✓
Evaluation of incident heat flux profiles to walls and neighboring items in support of fire model validation.	Fire Investigation	✓					
Size determinations from questioned footwear impressions.	Footwear	✓					
Prevalence/yield of footwear impressions from crime scenes.	Footwear	✓					✓
Evaluation of the probative value of general wear on outsoles during footwear examinations.	Footwear	✓					
Determination of relevant populations for the interpretation of class associations in footwear/tire impression evidence.	Footwear; Tire Tread	✓					✓
Evaluation of Schallamach features on footwear outsoles and their utility for source determination.	Footwear	✓					
Algorithms for automated searching of make and model of crime scene footwear or tire impressions within a database of known footwear outsole or tire tread patterns.	Footwear; Tire Tread		✓		✓		✓
Understanding of the variability of dimensional characteristics that occur during the replication of impressions.	Footwear	✓	✓				
Characterization of footwear and tire impressions made from geologically based materials for selecting appropriate chemical enhancement techniques.	Footwear; Tire Tread	✓	✓		✓		
Understanding of the morphological variability of the shape of the foot and the resulting shoeless impression [barefoot and socked].	Footwear	✓					
Understanding of the relationship between manufacturing techniques and the resultant features used for outsole comparisons.	Footwear	✓			✓		✓

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Reference collection databases of handwriting samples, copybook curricula, and typewriter and computer font styles.	Forensic Document Examination						✓
Quantitative assessment of intra- and inter-person handwriting and handprinting variation.	Forensic Document Examination	✓	✓		✓		✓
Comparative dynamic age dating of documents (inks and paper).	Forensic Document Examination; Trace Evidence	✓			✓		
Assessment of the comparability of different forms of writing from individuals (e.g., initials, signatures, handwriting, hand printing, foreign writing).	Forensic Document Examination	✓					
Understanding of the kinematics of handwriting and digitally captured signatures.	Forensic Document Examination; Digital Evidence	✓					
Comparative evaluation of automated handwriting identification systems.	Forensic Document Examination				✓		
Frequency, terminology, and significance of inconclusive source conclusions in firearms and toolmarks (also applies to friction ridge, footwear, etc.)	Firearms; Tool Marks	✓		✓			
Source attribution of illicit and/or counterfeit pharmaceutical tablets using tool marks from the pill making process.	Tool Marks; Seized Drugs	✓	✓				✓
Optimal methods and materials for the preservation, visualization, recovery, and comparison of tool marks in cartilage and bone.	Tool Marks; Forensic Pathology; Forensic Anthropology	✓	✓		✓		
Enhanced, and cost-effective, development/improvement of technologies and capabilities for visualizing and imaging evidence at the scene.	Crime Scene Examination			✓		✓	
Development of novel, improved, or enhanced presumptive tests (rapid, accurate, and nondestructive) for evidence analysis and interpretation at the scene and in the morgue/lab. Although presumptive tests exist, there is always an opportunity for improved, enhanced, or novel tests.	Crime Scene Examination; Medicolegal Death Investigations; Toxicology	✓	✓		✓		
Development of a multidisciplinary statistical model (e.g., likelihood ratios for use in personal identification) based on population frequencies of traits (anthropological, friction ridge, radiological, odontological, pathological, biological, etc.) to reduce subjectivity in decedent identifications.	Forensic Anthropology	✓					
Further research on bone healing rates, at the macro- and micro-levels, and the quantification of healing rate differences by age of individual and by skeletal element.	Forensic Anthropology; Forensic Pathology	✓					
Difficulty for MDIs to locate and obtain medical and dental records to assess history and assist in identification of decedent.	Forensic Anthropology; Forensic Pathology		✓	✓			✓
Difficulty in locating clandestine graves.	Forensic Anthropology; Medicolegal Death Investigations	✓	✓		✓	✓	
Enhancement of human identification database systems; current human identification systems could be improved to more efficiently and effectively identify potential decedents/missing persons.	Forensic Anthropology; Medicolegal Death Investigations		✓		✓		✓

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Difficulty in identifying geographical origin of remains. Development of novel methods for determining region of origin and estimating population affinity.	Forensic Anthropology; Forensic Pathology; Medicolegal Death Investigations	✓					
There is a lack of innovation and collaboration with other communities of practice outside of the forensic arena.	Forensic Anthropology; Forensic Pathology; Medicolegal Death Investigations	✓	✓	✓	✓	✓	✓
Required policies/procedures/activities and standards that do not have a supporting evidence-base to demonstrate benefit or best-practice.	Forensic Anthropology; Forensic Pathology; Medicolegal Death Investigations	✓		✓	✓		
Lack of knowledge about cultural/religious beliefs and practices around death, and treatment and disposition of remains.	Forensic Anthropology; Forensic Pathology; Medicolegal Death Investigations	✓		✓	✓	✓	
The lack of current research in bitemark injury analysis to differentiate human vs. animal and adult vs. child.	Forensic Odontology	✓					
Difficulty in determining the cause and manner of death of infants and children, distingushing between natural, accidental, and non-accidental, in sudden fatal events.	Forensic Pathology	✓					
Further research studies on force measurement, fracture mechanics, modeling of injuries (to include hard tissue and soft tissue), and/or utilization of advanced imaging technologies to improve accuracy of trauma analysis and quantify error rates associated with trauma interpretation.	Forensic Pathology	✓					
Difficulty in detecting subtle soft tissue findings of forensic significance (to include deep tissue bruising, tattoos, and other soft tissue modifications) on bodies, both living and deceased.	Forensic Pathology			✓		✓	
What are the comparative outcomes of the extent and quality of death investigation? How does the extent and quality of a death investigation affect the determination of cause and manner of death? Is there an unknown error rate in diagnosis of cause and manner of death due to the necessity to decide field investigation vs. no-field investigation, autopsy vs. not-autopsy, external exam vs. autopsy, impact of full-body imaging, ancillary tests (toxicology, histology, microbiology, genetic, metabolic, and criminalistics), and consultation of forensic experts (e.g. medicolegal death investigator, anthropologist, neuroscientist, etc.)?	Forensic Pathology	✓		✓	✓	✓	
Inability to read through hypoxic artifacts in order to identify possible traumatic brain injury in pediatric patients who have been hypoxic for any period of time.	Forensic Pathology	✓					
There is a lack of information regarding the intention and impact of QA/QC processes in forensic pathology.	Forensic Pathology	✓		✓	✓		
Impact of death notification and viewing procedures on both MDI practitioners and loved ones is unknown. There is lack of resiliency training and support for MDI staff within this context.	Forensic Pathology; Medicolegal Death Investigations			✓	✓	✓	

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Challenges in collection of reliable, appropriate, well-documented toxicology samples. It is unknown whether the site (e.g. femoral artery vs. femoral vein) and technique (e.g. blind stick vs. cut-down) influence toxicology interpretation based on the results obtained.	Forensic Pathology; Toxicology; Medicolegal Death Investigations	✓		✓		✓	
The lack of effective biometric capture techniques and devices for the digital acquisition of decedent data. Effective technologies do exist for biometric capture for living persons, but not decedents, including decedents exhibiting various postmortem artifacts.	Medicolegal Death Investigations	✓	✓		✓	✓	✓
Difficulty in determining precise time of death. Further studies of innovative methods or technologies to determine precise time of death.	Medicolegal Death Investigations	✓	✓		✓		
Potential loss of forensic evidence due to decedent recovery, transport, and handling from scene to morgue. What evidence is lost by not performing evidence recovery prior to removal from the scene?	Medicolegal Death Investigations	✓		✓	✓		
Difficulty in recruitment and retention of MDIs.	Medicolegal Death Investigations					✓	
There is a lack of training, educational opportunities, and resources within the MDI community.	Medicolegal Death Investigations					✓	
Biological evidence screening tools that can address any or all of the following: identifying areas on evidence with DNA, time since sample deposition, detection of single source vs. mixed samples, proportions of contributors, or sex of contributors.	Forensic Biology	✓	✓	✓			
Methods by which to identify areas on a swab with DNA to determine how much is needed for testing prior to beginning extraction.	Forensic Biology	✓		✓			
The ability to differentiate, physically separate, and selectively analyze DNA and/or cells from multiple donors or multiple tissue/cell types contributing to mixtures, with minimal or no sample loss. For example, alternative methods of differential extraction with limited sample manipulation (no centrifugation step) and/or automatable sperm capture that can be utilized on existing lab equipment (EZ2, Hamilton, etc.).	Forensic Biology	✓	✓				
Improved DNA collection devices or methods for recovery and release of human DNA (e.g., from metallic items).	Forensic Biology	✓	✓	✓	✓		
Research that documents the various impacts of methods, reagents, and materials on the recovery, repair, and/or preservation of low-quantity and/or low-quality DNA from various cell types.	Forensic Biology	✓	✓	✓			
Approaches where elimination or modification to steps from typical DNA processing workflows (e.g., extraction, quantitation, amplification) improves efficiency, increases through-put, and conserves sample while maintaining robustness of obtaining a full DNA profile.	Forensic Biology	✓	✓	✓			
Research to understand the limitations and/or variability of Rapid DNA within a forensic science laboratory in order to inform best practice recommendations.	Forensic Biology			✓	✓		

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Alternative ways to enrich or target genomic areas of forensic DNA interest, especially in challenging samples (e.g. rootless hair, burned bone), as opposed to a traditional PCR-based approach.	Forensic Biology	✓	✓	✓			
The ability to associate cell type and/or fluid with a DNA profile, to include mixed DNA profiles, enabling profiles to be reported at source level within existing laboratory instrumentation.	Forensic Biology	✓	✓	✓			
Mixture interpretation algorithms for all forensically relevant markers, including lineage markers (e.g., STRs, sequence-based STRs, X-STRs, Y-STRs, mitochondrial, microhaplotypes, SNPs).	Forensic Biology		✓	✓	✓		
Machine Learning and/or Artificial Intelligence tools for mixed DNA profile evaluation (e.g., artifact designation, number of contributors, degradation assessment).	Forensic Biology	✓	✓				
Improved methods and evaluation of tools for identifying the number of contributors for all marker types (e.g., STRs, sequence-based STRs, X-STRs, Y-STRs, mitochondrial, microhaplotypes, SNPs).	Forensic Biology		✓	✓	✓		
Kinship software solutions using single or multiple marker systems (e.g., STRs, sequence-based STRs, X-STRs, Y-STRs, mitochondrial, microhaplotypes, SNPs).	Forensic Biology	✓	✓		✓		
Statistical tools/methods for combining marker types for weight of evidence estimations.	Forensic Biology	✓	✓	✓	✓		
Additional characterization of existing databases and further development of population data of forensically relevant genetic markers (e.g., sequence-based STRs, X-STRs, Y-STRs, mitochondrial, microhaplotypes, SNPs) to include populations that are currently underrepresented in existing databases.	Forensic Biology	✓			✓		✓
Development and evaluation of genealogy research tools that support forensic investigative genetic genealogy (FIGG).	Forensic Biology		✓	✓	✓		
Improved methods and tools to understand the limitations and/or variability of probabilistic genotyping software implementation and use that inform best practice development.	Forensic Biology			✓	✓		✓
Development of methods for database entry, search, and match resolution that utilize probabilistic genotyping results.	Forensic Biology		✓	✓	✓	✓	
Research to identify accurate and effective language to communicate likelihood ratios or other probabilistic results in laboratory reports or during testimony that inform best practice development.	Forensic Biology	✓		✓	✓	✓	
Guidelines for the formation of likelihood ratio propositions including complex conditioning in order to inform best-practice development.	Forensic Biology			✓	✓	✓	
Ground truth data sets across a range of evidence types for source and activity level inferences, and implementation guidance.	Forensic Biology	✓		✓	✓		✓
Foundational research related to the discriminatory power and sensitivity of alternate biological analyses (e.g., proteomics, microbiome, plants, animals) to associate individuals with crime scene evidence.	Forensic Biology	✓					

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Research that supports forensic investigative genetic genealogy testing and tree building procedures, policies, and practices by criminal justice organizations to result in a roadmap for practitioners covering QA, workflow, and triage for both tree building and SNP generation.	Forensic Biology		✓	✓	✓	✓	
Comprehensive, systematic, well-controlled studies that provide both foundational knowledge and practical data related to DNA transfer (e.g., primary, secondary), prevalence, persistence, and recovery (TPPR) in the real world, as well as best practices for interpretation.	Forensic Biology	✓		✓	✓	✓	
Development of infrastructure to compile and share resources (e.g., theory materials, training plans, training assessment tools, lab created mixtures, raw data files, protocols, validation summaries) for training; assessment and evaluation; and tool development with appropriate human subjects and privacy oversight.	Forensic Biology		✓		✓	✓	✓
Error rate studies on qualitative analysis (single tests and schemes), recognizing different contributions of analytical sufficiency, data interpretation, and considering effects of sample suitability. The conclusion of such a study should also explain its limitations. Priority should be given to the most prevalent drugs in casework.	Seized Drugs; Forensic Toxicology	✓			✓		
Research into scientifically based acceptance criteria of analytical data generated in case samples. The effectiveness of this study could be improved if performed in conjunction with the study for error rate on qualitative analysis (single tests and schemes).	Seized Drugs; Forensic Toxicology	✓			✓		
Robust, flexible, configurable, cost-effective laboratory information (data) management systems and/or add-on components/modules that allow for data migration from legacy systems.	Seized Drugs; Forensic Toxicology		✓	✓			✓
Evaluation of root causes of occupational stress and their effect on forensic lab work quality, employee well-being and longevity, and organizational health. Development of strategies to mitigate these causes and/or their effects.	Seized Drugs; Forensic Toxicology				✓		
Tools for effective communication between forensic laboratories and policy makers related to resource allocation, public safety, public health, etc.	Seized Drugs; Forensic Toxicology			✓	✓	✓	
Solutions for attracting and retaining quality forensic science professionals (managers and practitioners), with policy-required education or appropriate experience.	Seized Drugs; Forensic Toxicology			✓			
Create selection criteria (e.g., minimum requirements) and test processes for forensic science professionals (including managers), to include evaluation of critical thinking abilities and data analysis skills, in order to attract and retain quality candidates.	Seized Drugs; Forensic Toxicology			✓		✓	
Better education for future forensic scientists to include practical, hands-on laboratory experience, critical thinking skills, and communication/public speaking. Increased and improved communication between education service providers and laboratory management to better define requirements and equip graduates for casework, testimony readiness, and the professional workplace.	Seized Drugs; Forensic Toxicology			✓		✓	

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Forensic laboratory process optimization, which may include: evidence recognition, collection, and packaging on scene, submission acceptance criteria, analysis, data management, and/or reporting, with consideration of future flexibility.	Seized Drugs; Forensic Toxicology	✓	✓	✓	✓		
Improved, broader (e.g., scope of analytes, matrices), more challenging (e.g., mixtures, sensitivity), more representative proficiency testing to include some blind testing.	Seized Drugs; Forensic Toxicology				✓	✓	
Continued advancement of practical forensic application/development of emerging or current instrumentation and software. A clear case should be made for how new technology either may do something that current technology cannot or may be an improvement over current technology (more sensitive, faster, more cost-effective, etc.)	Seized Drugs; Forensic Toxicology	✓	✓		✓		
Access to other forensic laboratories' methods, SOPs, validation plans, automation workflows, and macros.	Seized Drugs; Forensic Toxicology					✓	
Creation of a national expert working group of forensic chemists and toxicologists to develop and share comprehensive, cohesive drug-related legislative language (e.g., structural class, per se limits, minimum testing), and to inform and educate legislators and practitioners.	Seized Drugs; Forensic Toxicology			✓			
Long-term resources (e.g., capacity enhancement, technical assistance, Daubert packets) for continuous method development, validation, and implementation for laboratories.	Seized Drugs; Forensic Toxicology		✓	✓	✓	✓	✓
Research to establish validated methods for quantitation of delta-9-THC, delta-9-THC-A, or combination thereof in edibles, extracts, other cannabis-based products, etc.	Seized Drugs	✓					
Research to establish validated methods for identification and/or quantitation of cannabinoids (naturally occurring and semi-synthetic, such as delta-8-THC, THC-O, HHC, and exo-THC) in plant materials, edibles, extracts, other cannabis-based products, etc.	Seized Drugs	✓					
Stability studies for THC/marijuana material including plants, edibles, extracts, vape liquid, etc. to include recommendations for storage conditions. At a minimum, such studies should be conducted at a range of temperatures, humidity, and time periods.	Seized Drugs	✓					
Field test for discrimination of hemp versus marijuana that meets acceptability criteria for evidentiary purposes.	Seized Drugs	✓			✓		
Research into the identification of by-products formed during CBD conversion.	Seized Drugs	✓					
Creation and inclusion of scientific definition of derivatives as associated with the Farm Bill of 2018.	Seized Drugs			✓			
Compilation of state legislation nationwide regarding hemp-related definitions (e.g., for hemp, hemp products, hemp derivatives, semi-synthetic, etc.) with the intention to produce best practices for lawmakers' consideration.	Seized Drugs				✓		✓
Updated accessible comprehensive continuous training for drug chemists to include current drug trends, testing methodologies, instrumental theories and applications, critical thinking skills, and current applications to the law.	Seized Drugs			✓		✓	

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Prioritization of agencies for adequate externally sourced training and continuing development of drug chemists.	Seized Drugs			✓		✓	
Expanded auto-sampling capabilities for DART-TOF for increased workflow efficiency.	Seized Drugs	✓	✓				
Qualitative HPLC-diode array screening method for all cannabis-related compounds.	Seized Drugs	✓	✓				
Assessment of the operational independence of laboratories managed by law enforcement or prosecutors' offices and associated effects on public perception, judicial outcomes, impartiality, and freedom from conflicts of interest resulting from financial or other pressures.	Seized Drugs				✓		
Solutions to challenges identifying NPS, such as novel benzodiazepines and opioids, with limited resources (instruments, software, financial, personnel, knowledge of/access to external resources).	Seized Drugs			✓			✓
Evaluation of efficient methods of triaging cases and successful case management agreements among labs and customer stakeholders.	Seized Drugs	✓			✓		
Tools to address expectation of practitioners to definitively render legal opinion regarding scheduling of novel psychoactive substances that are not specifically scheduled by name/class but may meet the criteria.	Seized Drugs			✓		✓	
Process to assess "structural similarity" and "substantially similar" from a legal standpoint as it relates to analog laws.	Seized Drugs			✓		✓	
Suggested standardized language for reports, based on data gathered from diverse agencies, to include a glossary of terms to clarify commonly misunderstood words and phrases (e.g., identification uncertainty versus misidentification) to improve written communication with stakeholders.	Seized Drugs				✓	✓	✓
Research to determine limitations of GC/MS-only schemes to correctly identify controlled substances and other compounds of interest, to include analogs, as well as suggestions for reporting those limitations.	Seized Drugs	✓	✓		✓		
Study of interpretation of scientific report and testimony language by non-scientist stakeholders, including juries, attorneys, and the public.	Seized Drugs	✓			✓		
Research to determine optimal GC/MS parameters for drug cases, to ensure low false negative rate.	Seized Drugs	✓					
Research to determine stability of controlled substances (excluding THC) in relevant storage conditions (e.g., temperatures, humidities, light conditions) in different matrices (e.g., solvents, baby formula, juice, alcoholic and other beverages, food products).	Seized Drugs	✓					
Research into psilocin/psilocybin and related analogs (e.g., acetylated) to include extraction methods, stability studies, and analysis methods in complex matrices (e.g., gummies, candies, and chocolates).	Seized Drugs	✓					
Continued development and evaluation of chemometric mass spectral analysis for isomer determination using different GC/MS instruments and methods.	Seized Drugs	✓					

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Improved benchtop NMR analysis to be more in-line with real-world, street-level drug concentrations for determination of novel psychoactive substances/isomers.	Seized Drugs	✓					
Expanded color testing for novel psychoactive substances to include determination of sensitivity and specificity.	Seized Drugs	✓					
Research on the correlation of blood and oral fluid concentrations, particularly with regard to DUID and postmortem interpretation, with an emphasis on studies pertaining to pharmacokinetics and pharmacodynamics of drug partitioning into oral fluid. Ensure dissemination reaches policymakers.	Forensic Toxicology	✓					
Solutions to interpretation challenges affected by inconsistent and unreliable toxicology results or consolidated toxicology data due to widely variable collection techniques, inappropriate matrix selection, and inaccurate descriptions of specimen collection sites by pathologists, autopsy technicians, hospital phlebotomists, and law enforcement.	Forensic Toxicology			✓		✓	
Solutions to challenges in drawing appropriate conclusions from composite toxicology data (e.g., NFLIS, medical examiner/coroner survey) with unstated limitations (e.g., differences in testing regime, scope of analytes, reporting limits) due to unrestricted self-reporting and non-standardized testing.	Forensic Toxicology			✓		✓	
Solutions to challenges of implementation and integration of high resolution mass spectrometry in the toxicology workflow (e.g., data storage, interpretation of non-traditional data, appropriate validation parameters, efficiencies in workflow, determination and application of acceptance criteria).	Forensic Toxicology					✓	
Access to new pharmaceutical and emerging illicit substance analytical standards (to include certified reference materials and isotopically labeled internal standards) for use in forensic and research laboratories (to include parent drugs and metabolites).	Forensic Toxicology						✓
Research into prevalence, concentrations, impairment, toxicity, etc. on new non-delta-9-THC compounds, isomers, derivatives, and metabolites.	Forensic Toxicology	✓					
More research and data collection to gain a better understanding of the relevance of novel psychoactive substances, such as (but not limited to) synthetic opioids, cannabinoids, benzodiazepines, and substituted cathinones, and related isomers.	Forensic Toxicology	✓					
Basic pharmacology training for forensic toxicologists.	Forensic Toxicology					✓	
Basic statistics and data analysis training for forensic toxicologists.	Forensic Toxicology					✓	
Increased understanding of the impact of vaping substances (licit and illicit) and need for vaping paraphernalia collection and testing.	Forensic Toxicology	✓		✓	✓	✓	
Research to determine drug stability, in years, at different temperatures (refrigerated, frozen, deep freeze) in different solvents, blood, and other matrices.	Forensic Toxicology	✓					
Research on THC concentrations and toxicity, to include cardiac effects, in living subjects, with current THC street potency levels.	Forensic Toxicology	✓					

Technology Working Group Operational Requirements (updated January 2024)	**Forensic Discipline(s)**	**Scientific Research**	**Technology Development**	**Policy or Protocol Development**	**Assessment & Evaluation**	**Dissemination or Training**	**Databases or Reference Collections**
Proof-of-concept to support portable, reliable, and robust roadside devices to test for marijuana use and/or measure impairment, including scientific foundation for new or existing devices.	Forensic Toxicology	✓	✓		✓		
Nationwide assessment of reasons for non-adoption (to include root cause analysis) and impact of implementation of ASB standards for forensic toxicology testing.	Forensic Toxicology			✓	✓		
Determination of drug prevalence and relevance in DFC casework.	Forensic Toxicology	✓					
Research to determine electrolyte stability in postmortem vitreous fluid for up to a year.	Forensic Toxicology	✓					