American Society of Crime Laboratory Directors' Research Priorities - 2017

ASCLD Board of Directors' Research Priorities

Discipline	Research Topic
Chemistry	Drug analysis acceptance criteria: establish standardized practices for interpretation of chromographic, spectrometric and spectroscopic data. Examples: i. Mass spectral criteria for matching to a standard. How skeletal is "too skeletal"? Must the molecular ion with heavy isotope peaks from molecular ion be present? ii. For chromatography, retention time windows - absolute or relative? iii. Positional isomers - what are the requirements to be able to call one positional isomer vs another?
Chemistry	Inter-laboratory study on current toxicology practices: conduct a survey of board-certified forensic toxicologists on the standards of testing in different circumstances to include accepted specimens, methods of testing with the limits of detection, the scope of testing including the list of drugs in at least DUID, DFSA, postmortem: homicides (with gunshot, without), suspected overdose, neonate deaths, suicide, pedestrians, in custody death, in workplace death, and other common circumstances.
Chemistry	Create collaborative partnerships between medical toxicology practices and forensic toxicology labs to identify toxic ranges of novel psychoactive substances. Establishment of funding programs to facilitate send-out for identification and/or quantitation of emerging NPS by hospitals at the early stage, not upon overdose deaths. Sharing of data with forensic community. Exploration of cross-reactivity of non-similar panels to designer substances.
Chemistry	Toxicology: develop analytical methods for identification and quantification of emerging drugs of abuse and new therapeutic agents to enhance scope of capability. i. Reduced LOD for emerging substances, such as fentanyl analogs and synthetic cannabinoids. ii. Development of suitable screening techniques (with appropriate sensitivity) to identify emerging substances.
Multiple Disciplines	Data analytics: Big Data (BD) implementation; data retention and storage issues that come with BD generation; expert systems and super computers to process BD to minimize review/interpretation by analyst.
Multiple Disciplines	Limited national comparison databases and datasets: promote the development of national databases and open-source datasets (e.g. datasets for pattern and impression evidence, emerging drugs, human identification, fingerprints).
Pattern Evidence	Statistical approaches for forensic comparison disciplines: design and initiate studies to evaluate the innate baseline characteristic features important to the statistical interpretation of associations.

Identified Research Areas/Opportunities

Discipline	Research Topic
Biology	Massively parallel sequencing implementation: i. Explore implications of supplementing current statistics and analyzing additional polymorphisms, especially those that may not be in Hardy Weinberg equilibrium. ii. Sequencing strategies for mixture deconvolution using traditional markers, and novel markers such as microhaplotypes. iii. The potential for surname predictions from the sequencing of genomic loci of interest.
Biology	DNA mixture interpretation: develop solutions that evaluate signal in an objective manner and are not confounded by artifacts.
Biology	Long-term DNA extract storage: determine best practices via longitudinal studies comparing known and novel methods of extract preservation techniques (e.g. desiccation, addition of preservatives, standard temperature, etc.).
Chemistry	Advancing chemistry source attribution: develop methods to determine the geographic origin or source of drugs, explosives, ignitable liquids, or precursor chemicals associated with drugs or explosives including known sample/source database generation, interpretation thresholds, and real-world capability demonstration/evaluation.
Chemistry	Network for improved responsiveness to new drugs of abuse: develop sustained network for sharing newly synthesized standards and/or analytical capabilities to improve community responsiveness to new drugs of abuse.
Crime scene	Blood stain pattern analysis: i. Improving blood pattern analysis based on objective, physical characteristics. Typically, blood pattern types are described in terms of the mechanism of pattern formation rather than grouping according to observable pattern characteristics. Classification based on physical characteristics would provide more objective and measurable units based on the fluid-dynamics of bloodstain formation. ii. Design and initiate black box and white box studies to better understand examiner reliability and error rates. Studies performed have shown inconsistencies with classification of blood stain patterns on rigid non-absorbent substrates and on porous textile materials.
Digital Evidence	Facial identification: i. Improving image resolution; accuracy. ii. Resolving imaging issues. iii. Validation and evaluation of systems/softwares.
Multiple Disciplines	Improving evidence collection for sexual assault cases: i. Improving evidence collection techniques and specimen processing (i.e., sensitivity, stability, time or cost reduction), for both biological and physical evidence. ii. Standardization of sexual assault evidence collection and processing to include sexual assault evidence kits (state and national); collection procedures to streamline DNA analysis; special specimen type collection methods (anogenital; bite-mark/oral contact samples; hair samples; nasal cavity post oral assault; vaginal washes, rinses, and aspirates; postmortem); low copy DNA sample collection (touch DNA from clothing or other surfaces, dental floss oral sample collections); timing of kit collection; sample collection from suspects and accused. iii. Advancing the ability to recognize, collect and preserve evidence for all alleged sexual assault cases including infants, children, teenagers, and the elderly for both male and female victims.
Multiple Disciplines	DNA from latent prints: i. Compare the quality of DNA results from fingerprints found on handled objects and documents both before and after fingerprint development techniques have been applied. ii. Develop methods for DNA sampling from fingerprints that are non-destructive to the print evidence.
Multiple Disciplines	Human factors: design and develop educational materials to define and address the impact of human factors in the various forensic disciplines with specific emphasis on patterned evidence (e.g. firearms, tools marks, etc.)
Pattern Evidence	Assessing the sufficiency and strength of friction ridge features: i. Assess weight of FR damage. ii. Qualification of sufficiency to support examination decisions. iii. Develop tools to assist examiners in measuring localized quality of friction ridge features..
Pattern Evidence	Close non-match assessment using AFIS database: determine the likelihood of finding close mon-matches, assess examiners' ability to discriminate, create close non-match dataset for training and research purposes.