



OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need:

Keyword(s):

Submitting subcommittee(s): **Date Approved:**

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Description of research need:

“Big data” is a term that equates with data analytics or informatics. Industries worldwide are using analytics in a multitude of ways to determine everything from geographical flu outbreaks to cancer treatments. In forensic toxicology, laboratories accumulate large amounts of data, but rarely have the time or capability to use those data in a fashion that facilitates smart analytical design and data interpretation. In respect to analytical design, data can be tied to case history (circumstances of death, known medications, pathologies, etc.) to design what testing needs to be performed. By performing such “smart design” of testing, cost-savings to laboratories would be expected to be substantial compared to the general unknown approach. Additionally, such a process would be capable of being automated and tied into a LIMS for test ordering. In respect to data interpretation, a synthesis of case history and analytical findings in relation to informatics derived from data mining would provide data interpretations with much greater clarity and statistical significance compared to the empirical method of data interpretation performed today. Only through analysis of large amounts of data can either goal be realized. Such analysis requires skilled individuals in data analysis, high-level computing capabilities and individuals capable of integrating the information gleaned into practical applications. Such tools are already being used in clinical laboratory testing.

2. Key bibliographic references relating to this research need:

1. Zhu H, et al. Big data in chemical toxicity research: The use of high-throughput screening assays to identify potential toxicants. 2014. *Chem Res Toxicol*, 27: 1643-1651.
2. Martin-Sanchez F, Verspoor K. Big data in medicine is driving big changes. 2014. *IMIA Yearbook of Med Informatics*: 14-20.
3. Krumholz HM. Big data and new knowledge in medicine: The thinking, training, and tools needed for a learning health system. 2014. *Health Affairs*, 33: 1163-1170.
4. McAfee A, Brynjolfsson E. Big data: The management revolution. Oct. 2012. *Harvard Bus Rev*, 1-9.
5. Hartung T. Making big sense from big data in toxicology by read-across. 2016. *Altex*, 33: 83-93.
6. Brayne, S. Big data surveillance: the case of policing. 2017. *Am Sociologic Rev*, 82(5): 997-1008.

3a. In what ways would the research results improve current laboratory capabilities?

Current laboratory capabilities in forensic toxicology have not made significant advancements in the use of critically collected data over years. These data are of remarkable value in guiding the assignment and interpretation of toxicological testing. An additional benefit is economical savings by providing smart test assignment as opposed to the general unknown approach. Laboratories will be able to automate case-specific testing requirements in forensic toxicology. Additionally, forensic toxicologists will be able to provide interpretation of findings with greater confidence and in a statistically-sound fashion.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

This particular research would allow the subcommittee to develop a scientific basis for standard or guideline production in the specific areas of the use of analytics in forensic toxicology. This area is virtually unexplored in forensic toxicology. Without such research, the huge amounts of data collected by forensic toxicology laboratories will continue to go unused in a codified, practical means to facilitate both economical, analytical and interpretive benefits.

3c. In what ways would the research results improve services to the criminal justice system?

Data analytics will provide better case-specific testing in forensic toxicology. Cost-savings will accrue based on focused testing as opposed to performing multiple testing protocols used in the general unknown analysis as it occurs today. More importantly, data mining would provide greater confidence in interpretation of the role of toxicants in human performance and death investigation.

4. Status assessment (I, II, III, or IV):

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Approvals:

Subcommittee	Approval date: <input type="text" value="4/2/18"/>
<i>(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)</i>	

SAC

1. Does the SAC agree with the research need? Yes No

2. Does the SAC agree with the status assessment? Yes No

If no, what is the status assessment of the SAC:

Approval date:

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)