

## Scope of Work

Development of analytical tools to detect hallmarks of genetic engineering to determine the type and location of the change and the penetrance of the modification in a population.

## Battelle Team and Facilities

Lead Investigator: Dr. Rachel Spurbeck  
 Team Members: Dr. Alisa Blazek  
 Dr. Mike Dickens

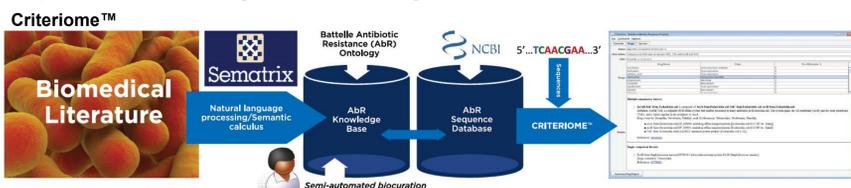
### Facilities for Data Generation

- Next generation sequencing capabilities on multiple platforms: Illumina, ThermoFisher, and Oxford Nanopore Technologies
- BSL-3 and BSL-2 state-of-the-art laboratories in microbiology, virology, molecular biology and biochemistry
- Custom and all-scale test fixtures, including chambers for aerosol testing

## Capabilities and Qualifications

### Subject Matter Expert Driven Data Curation

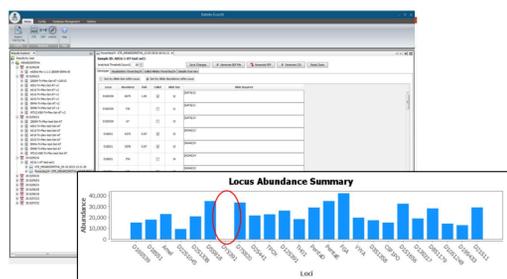
Battelle brings subject matter expertise and unique approaches to big data mining.



- Criteriome: A curated database for use in identifying antibiotic resistance elements from genomic data.
- Metallic Materials Properties Development and Standardization (MMPDS) Handbook: A cost-effective collaboration between industry and government agencies to establish allowable properties for aerospace metallic materials and fasteners. Battelle serves as the vendor-neutral, impartial data reviewer.
- Predictive Toxicology: A random forest algorithm utilized for prediction of interindividual toxicology response variation.
- Wayfinder: A quality improvement analytical tool to organize, display and analyze a hospital's Agency for Healthcare Res and Quality and CMS data.

### Data Analytics

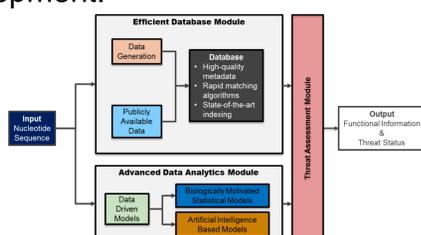
Developing and implementing novel genetic data analytics for forensics, and environmental and public health surveillance



- Forensic Genomics: Massively parallel sequencing for enhanced identity verification and mixture deconvolution
- Gene Editing Detection: Capability to screen host for evidence of 'hacking' by silent, engineered agents
- Viral Population Dynamics: Metagenomics approach to predicting disease spread and source traceability
- Predictive Disease Diagnostics: Machine learning method uncovering relationships in multimodal datasets to enable disease development prediction and proactive treatment.

## Systems Integration & Custom Software Development

Battelle excels at integration of complex systems and custom software development.



- Integrated Forensics: Multidisciplinary sample exploitation process for more comprehensive and timely intelligence
- Predictive Functional Genomics: Computational biothreat modeling to limit high-risk synthetic biology activities
- ExactID: Software developed by Battelle to extract loci of interest from next generation sequencing data that outputs genotypes useful for law enforcement.

## Our Approach

- Develop gene editing tool mark dataset from literature for genome editing technologies such as:
  - zinc finger nucleases (ZFNs)
  - transcription activator-like effector nucleases (TALENs)
  - clustered regularly interspaced short palindromic repeats/Cas (CRISPR/Cas)
    - Types I, II, and III
- Generate tool mark ontology
- Annotate sequence types with ontology categories
- Develop a detection tool to identify and score the probability that genome editing technology/genetic engineering was utilized in areas of genetic variation based on genomic data.

## Research Areas of Interest

### Gene Editing Detection

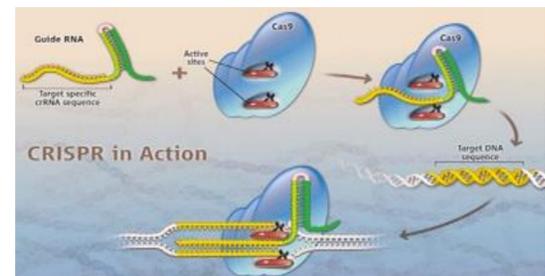


Image from Science 23 Aug 2013; Vol. 341, Issue 6148, pp. 833-836

Signature database combined with rapid processing of deep sequence data to reveal purpose-manipulated genetic loci in organisms of interest

### Viral Population Dynamics



Metagenomics approach to predicting disease spread and source traceability: custom extraction, deep sequencing (RNA-Seq) and efficient analytics pipeline to enable rapid characterization of viral quasi-species

## FELIX Partnering

- Battelle envisions contributing to a team by offering subject matter expertise, data analytic development, and systems integration.
- Seeking partners with large datasets to be mined

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