The Integrated Chemical Environment: Tools and Data to Support Toxicity Assessments

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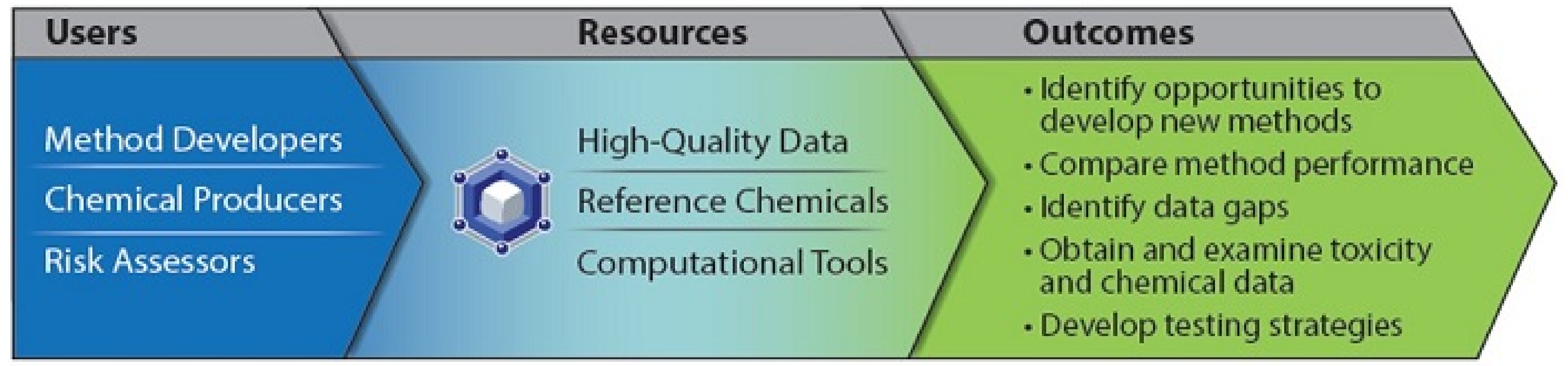
The Integrated Chemical Environment



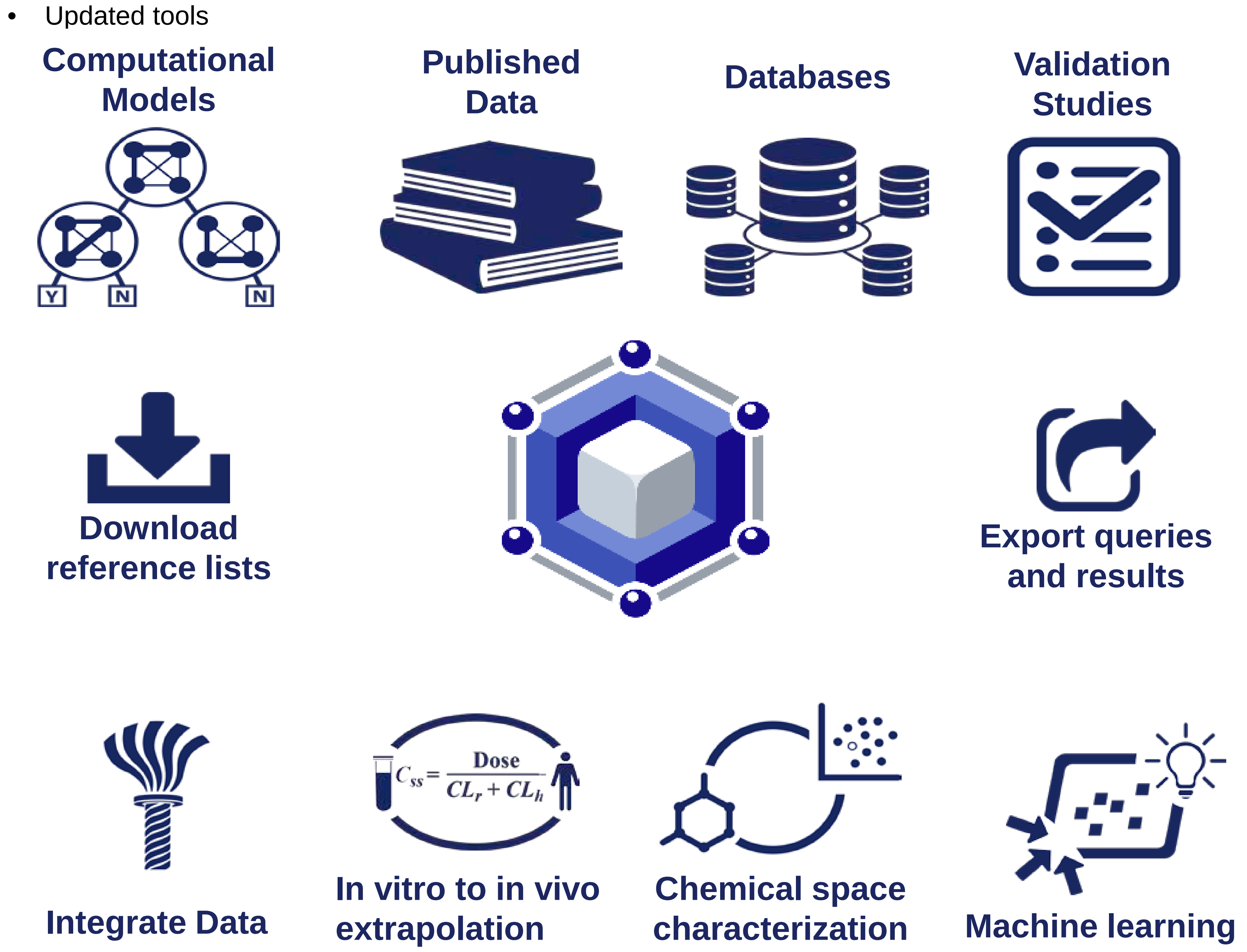
ICE provides free online access to:
- Curated in vivo and in vitro data related to toxicity testing
- In silico toxicity predictions and chemical property data
- Curated lists of chemicals with defined assays (reference chemical lists)
- Computational tools related to chemical characterization and predicting toxicity

ICE supports:
- Data integration: brings together available data, including data on formulations
- Results exploration: enables dynamic, graphical exploration with publication-quality graphics
- Data analysis: allows characterization of data using online workflows
- FAIR (findable, accessible, interoperable and reusable) data access

ICE 2.0

New Features in ICE 2.0:

- Expand your search by adding chemicals in ICE with the same QSAR-ready structures as your chemicals
- Simplified assay selection
- Updated tools



Contact Us

To get announcements of ICE updates and other NICEATM activities, visit the NIH mailing list page for NICEATM News at https://list.nih.gov/cgi-bin/wa.exe?SUBED1=niceatm-l&A=1 and click "Subscribe."

Visit ICE
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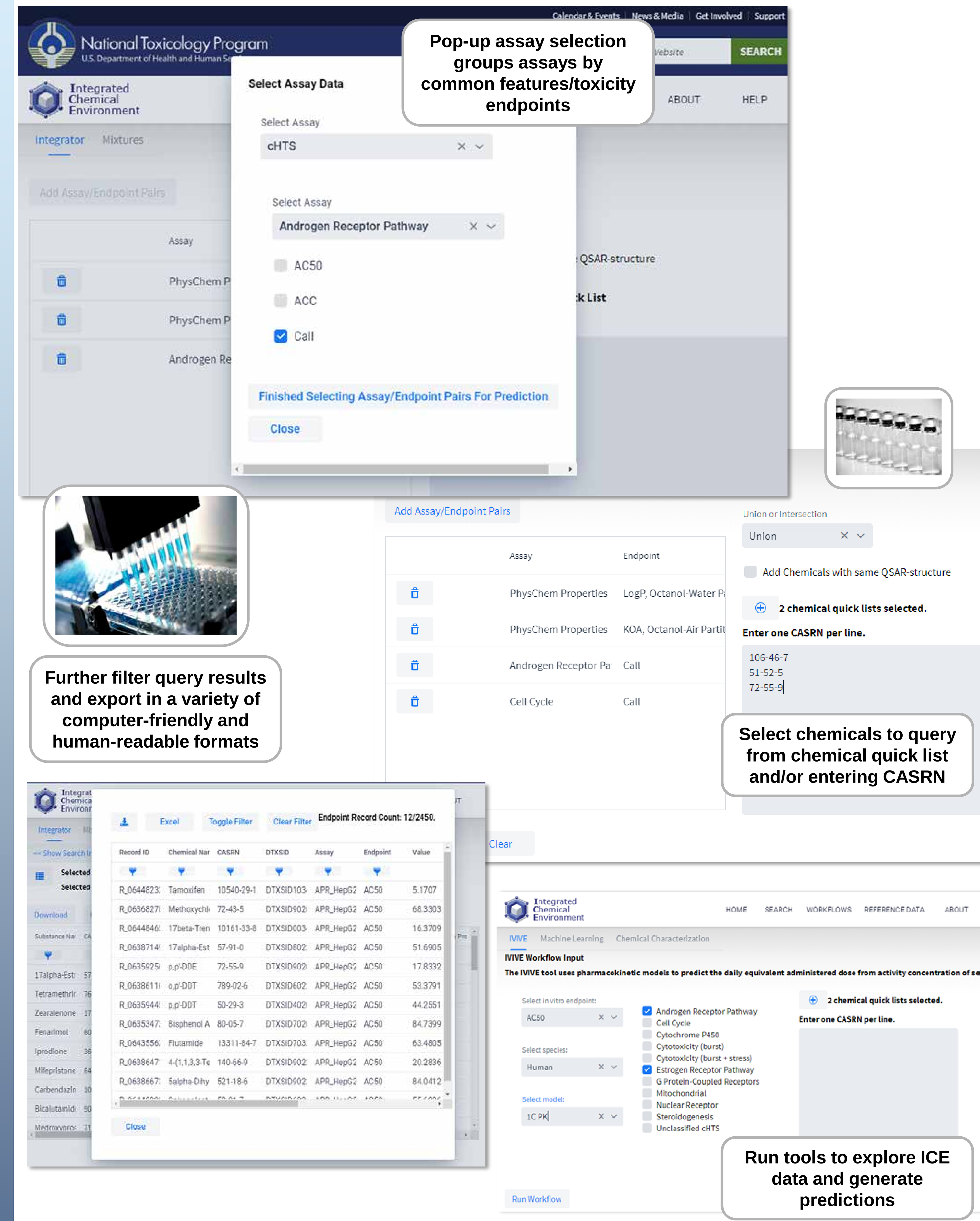
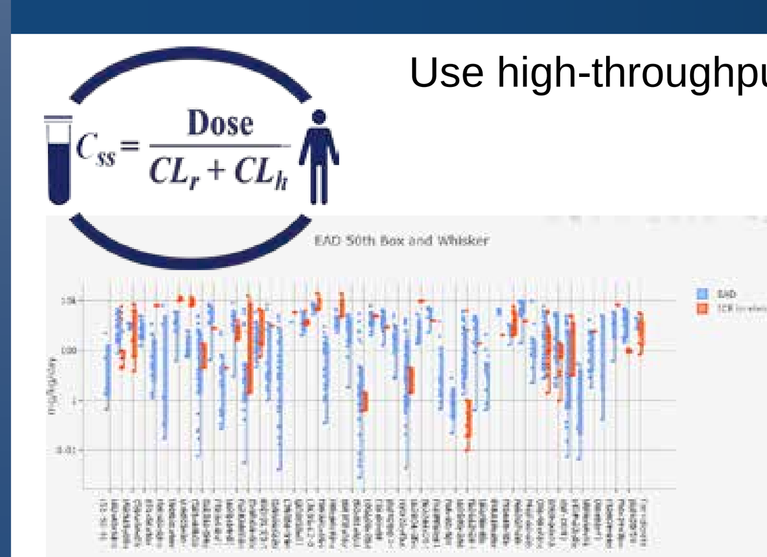
ICE Integrator



In Vitro to In Vivo Extrapolation

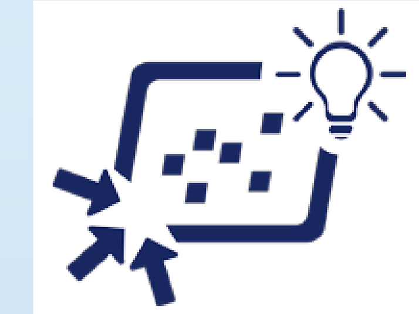


Use high-throughput in vitro data available from ICE to estimate external dose.

Choose from:
- One-compartment pharmacokinetic (1C PK) model including population simulation
- Two three-compartment physiologically-based pharmacokinetic (PBPK) models:
  - 3C Glu: incorporates gut glucuronidation for BPA-family compounds
  - 3C HTTK: uses the httk package model
- Three-compartment models include gut, liver, and kidney
- Rat and human predictions

- A stand-alone version is available for use with custom datasets: https://github.com/NIEHS/
- Find out more about the IVIVE workflow: Abstract 3138/Poster P886, Wednesday, March 13

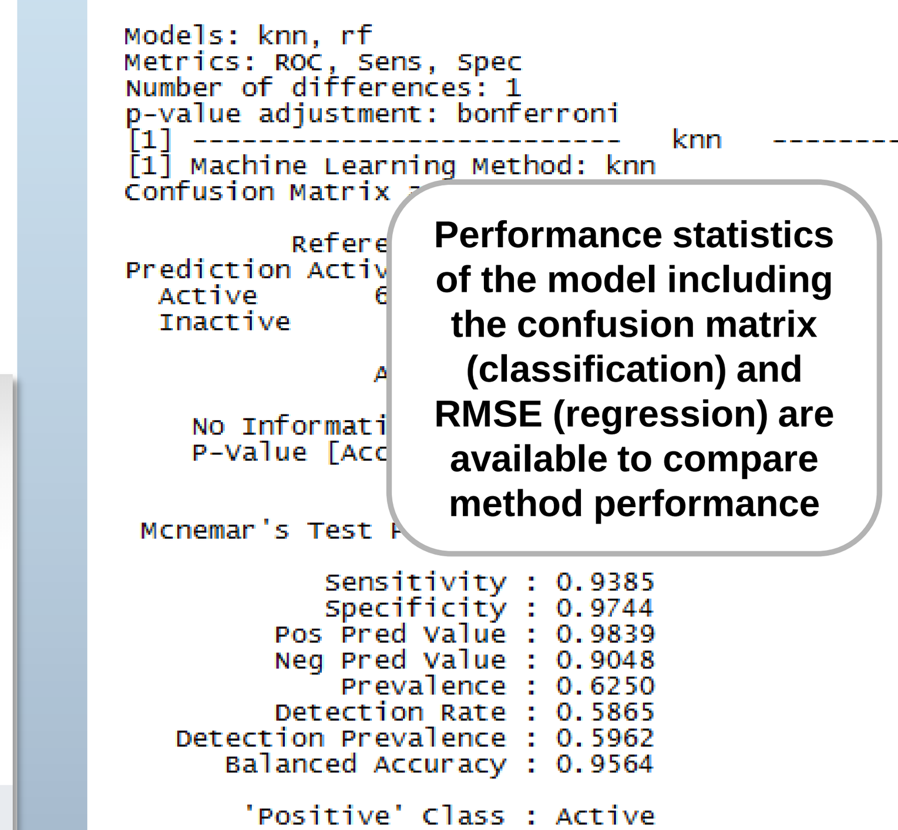
Machine Learning



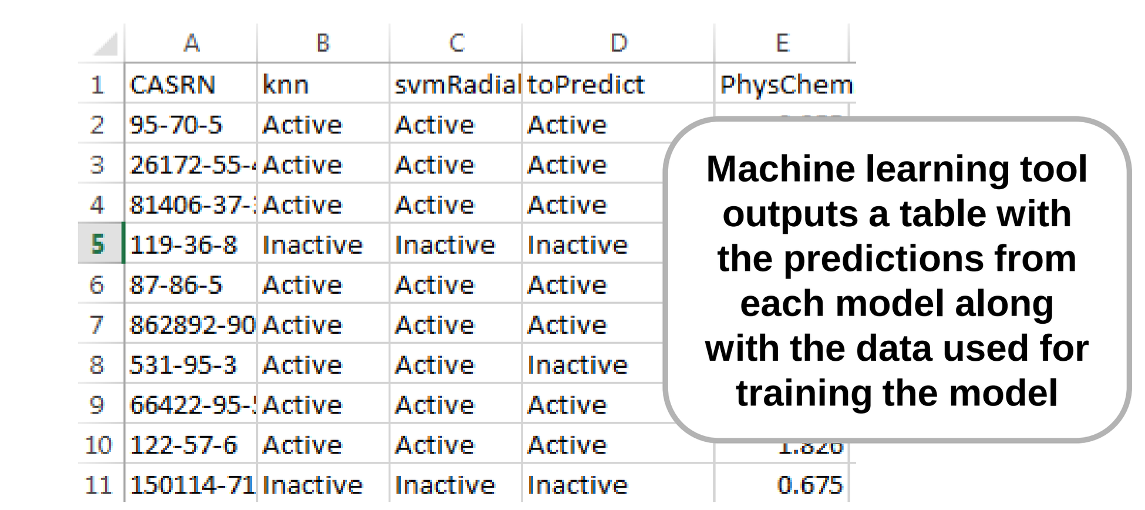
Use the machine learning tool for hypothesis generation and to explore different machine learning approaches using ICE data. Selected endpoints (for classification and regression modeling) and algorithms are available through ICE to facilitate ease of use by those with limited background in computational toxicology.

Predicts endpoints for in vivo assays:
- Local lymph node assay (skin sensitization)
- Uterotrophic (estrogenic activity)
- Human skin sensitization potency

Machine learning methods available*
- cforest: conditional random forest
- rpart: recursive partitioning
- knn: k-nearest neighbor
- svmRadial: support vector machine with a radial kernel
- pls: partial least squares regression



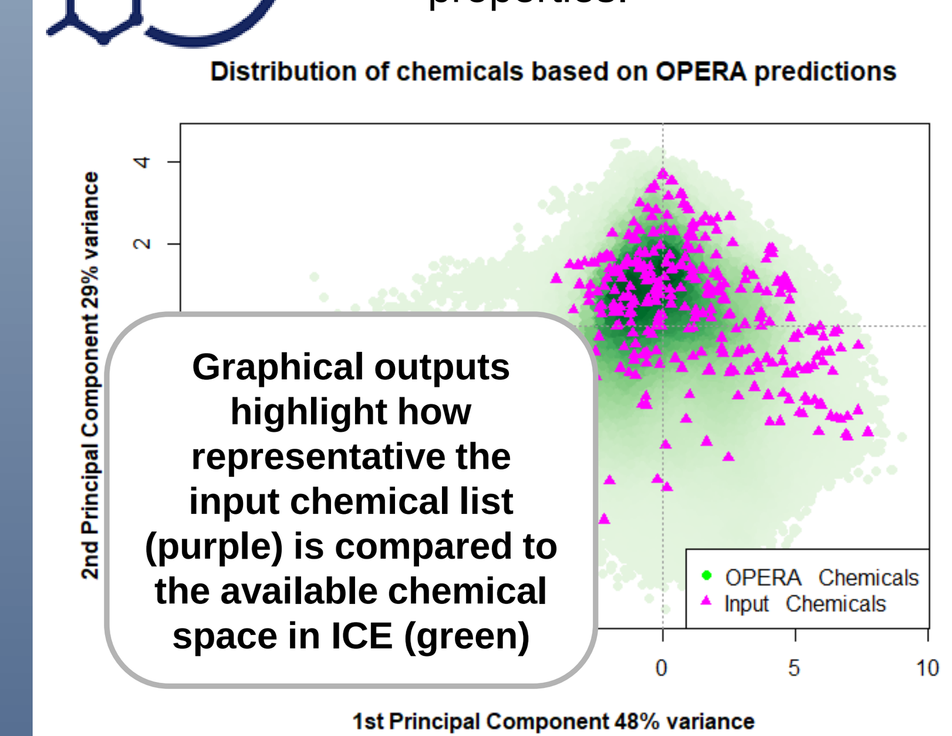
Stand-alone version available for use with custom datasets: https://github.com/NIEHS/Machine-Learning-Pipeline

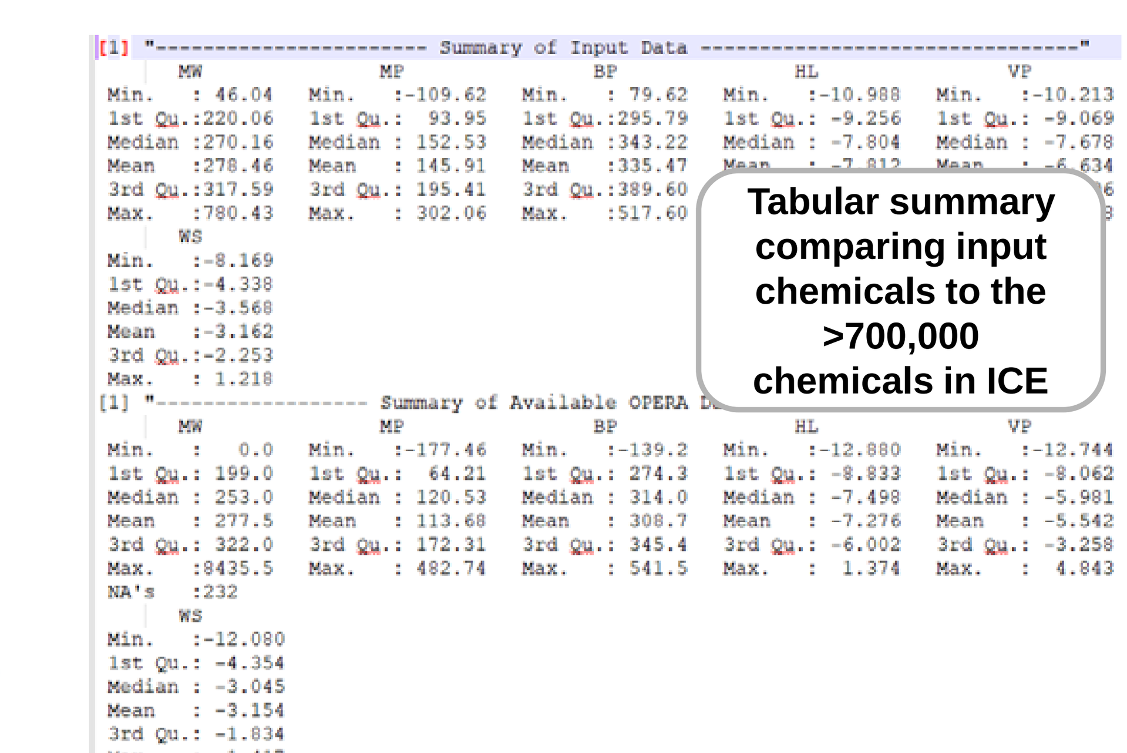


*Machine learning tool uses imputation and/or removes sparse assays/chemicals to permit use of methods requiring complete cases.

Chemical Space Characterization

Leverage ICE models to characterize a user-supplied chemical list, getting information on the chemical space covered based on different physicochemical properties.





Future plans for Chemical Characterization tool:
- Generate physchem and other structure-based predictions from user-provided chemical lists
- Prediction of chemical parameters for use in modeling (example: fraction unbound, pka)
- Chemical use category overview provided by EPA's Consumer Products Database, CPDat (https://www.epa.gov/chemical-research/chemical-and-products-database-cpdat)
- Integration with ChemMaps (http://www.chemmaps.com)

Acknowledgements

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