Determination of Ecotoxicology Testing Needs Among Selected U.S. Federal Agencies

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Ecotoxicology Testing

- U.S. agencies use ecotoxicology data to protect human and animal health and natural resources, and to assess the impact of human activity on the environment.
- Testing can encompass everything from soil microbes to entire ecosystems - many methods utilizing living organisms.

ICCVAM EcoWG

- The Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) identifies opportunities to develop non-animal alternatives to satisfy agency data and testing needs.
- ICCVAM established its Ecotoxicology Workgroup (EcoWG) to identify opportunities for the replacement of animal tests in ecotoxicity testing.
- The EcoWG includes members from the agencies below.

Information Gathering

- Which federal statutes and regulations consider ecotoxicology data.
- Which test guidelines and guidance documents use multicellular organisms.
- What are commonly used test species and endpoints in those guidelines.
- Which agencies require, use, or consider ecotoxicology data and how those data are used.
- Whether some federal agencies have flexibility to use alternative methodologies.
- Whether any non-animal alternative data are currently accepted by their federal agency.
- Challenges to the development and/or adaptation of non-animal alternatives for ecotoxicology testing.

Statutes, Guidelines, and Methods

- 18 different U.S. statutes were identified that either require or make use of ecotoxicity data.
- 87 U.S. and international ecotoxicity test guidelines and guidance documents that use multicellular organisms and are used by some federal member agencies.
- The complete list of statutes, guidelines, and methods will be provided in a manuscript “Current Ecotoxicity Testing Needs Among Selected U.S. Federal Agencies” (In Preparation)

Statutes/Regulations and Agencies

U.S. statute/regulation	Applicable Agency
Animal Damage Control Act	DOI, USDA
Animal Welfare Act	USDA
Bald and Golden Eagle Protection Act	DOI, USDA
Comprehensive Environmental Response, Compensation, and Liability Act	DOD, DOI, EPA
Clean Water Act	DOD, DOI, EPA
Endangered Species Act	DOI, USDA
Federal Insecticide, Fungicide, and Rodenticide Act	DOI, EPA, USDA
Federal Land Policy and Management Act of 1976	DOI
Food Quality Protection Act	EPA
General Mining Act of 1872	DOI
Marine Protection, Research, and Sanctuaries Act	DOD
Migratory Bird Treaty Act	DOI
National Environmental Policy Act	DOI, FDA, USDA
National Wildlife Refuge System Administration Act	DOI
Oil Pollution Act of 1990	DOD, DOI, EPA
Outer Continental Shelf Lands Act	DOI
The Organic Act Establishing the U.S. Geological Survey as a Research Entity	DOI
Toxic Substances Control Act	EPA, USDA

Cross-taxa Extrapolation and Toxicity Endpoint Classifications

- A relatively narrow selection of surrogate test species is used to represent many different species across taxonomic groups.
  - For example, data from the medaka one generation test are extrapolated to hundreds of other ray-finned fish species.
- To facilitate discussion on cross-taxa extrapolation the 87 ecotoxicity guidelines that were identified were broadly classified as follows:
  - Endpoints: acute, chronic/growth/reproduction, bioaccumulation, microcosm, field testing
    - Endpoints were further subclassified into those using aquatic (freshwater and/or marine) or terrestrial organisms
  - Systems: amphibians, avians, bioaccumulation, field-testing, fish, invertebrates, mammals, microcosm, or pollinators.
  - An example is presented below.

Endpoint	Test guideline or guidance document title	Avians	Fish	Invertebrates	Mammals	Pollinators	Guideline identifier
Acute Toxicity	***Aquatic Organisms [Freshwater (FW)/Saltwater (SW)]***						
	Freshwater and Saltwater Fish Acute Toxicity Test	-	FW/SW	-	-	-	EPA OCSPP 850.1075
	Daphnia sp., Acute Immobilisation Test	-	-	FW	-	-	OECD 202
	Oyster Acute Toxicity Test (Shell Deposition)	-	-	SW	-	-	EPA OCSPP 850.1025
	Terrestrial Organisms						
	Avian Acute Oral Toxicity Test	X	-	-	-	-	EPA OCSPP 850.2100
	Earthworm, Acute Toxicity Tests	-	-	X	-	-	OECD 207
	Wild Mammal Toxicity Testing	-	-	-	X	-	EPA OCSPP 850.2400
	Honeybees, Acute Oral Toxicity Test	-	-	-	-	X	OECD 213

Cross-taxa Extrapolation

- Advances in bioinformatics, non-animal test methods, and adverse outcome pathways provide opportunities to strengthen cross-taxa extrapolation
  - For example, *in silico* methods to predict toxic effects can provide additional valuable information to support decisions

Considerations for Waiving the Need for Certain Ecotoxicity Tests

- Agencies have identified circumstances where *in vivo* tests for certain ecotoxicity tests can be waived, resulting in reduced animal use.
  - Chemical registrants can request a waiver of data requirements or can bridge information from one data set to another.
  - Federal agencies may waive the need for ecotoxicity tests when existing data for risk assessment and regulatory decisions are adequate.

Conclusions

- The breadth of data used to support U.S. Federal ecological risk-based decisions varies with each program and objective.
- The broad nature of these needs, the limitations of cross-taxa extrapolation, and the large number of test endpoints captured within existing guidelines represents challenges in the development of non-animal methods.
- Alternative test methods can facilitate cross-taxa extrapolation or provide bridging data to support experimental waivers.
- While there are challenges to the development and use of non-animal ecotoxicology tests, U.S. Federal agencies remain committed to their development and use in appropriate contexts.

Acknowledgements

Drs. Judkins, Norberg-King, and Odenkirchen are now retired.

Dr. Arnold was previously with the EPA Office of Water and Office of Pesticide Programs. She is presently with the USDA.

Dr. Brennan was previously with the USGS, Columbia Environmental Research Center. She is presently with the EPA, OPPT.

The Intramural Research Program of the National Institute of Environmental Health Sciences (NIEHS) supported this poster. Technical support was provided by ILS under NIEHS contract HHSN273201500010C. ILS staff provide technical support for the National Toxicology Program Interagency Center for the Evaluation of Alternative Toxicological Methods, but do not represent NIEHS, the National Toxicology Program, or the official positions of any federal agency.

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