

Department of the Interior: Potential Metrics to Track and Encourage Use of Alternative Methods in Ecotoxicological Research and Testing

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Mission

Protect and manage the Nation's **natural resources** and cultural heritage

Provide scientific and other information about those resources

Honor trust responsibilities & commitments to American Indians, Alaska Natives and affiliated island communities



Categories of Activity

1. Research: Laboratory & field studies that assess exposure and adverse effects (molecular through population level), often generating toxicity thresholds, biomarkers and diagnostics, to assist with decision making for natural resource management

Inverts, Fish & Wildlife: ARs, EDCs, HAB toxins, Pb

In vivo studies (trend toward sublethal and minimally invasive),
in vitro test systems not classified as animals (cells, embryos)

2. Biomonitoring: Environmental contaminants to track and model status and trends

Water, soil, plants, SPMDs, inverts, F&W: metals, POPs, pesticides
inanimate devices, in vivo (e.g., fish, wildlife, ES like CACO)



3. Damage Assessment: Natural Resource Damage Assessment & Restoration

Habitat affected by mining, smelting and manufacturing, oil spills
Water, soil, plants, SPMDs, inverts, F&W: metals, PAHs, PCBs
in vivo (trend toward sublethal and minimally invasive)

4. Diagnostics: Cause of death determinations in biota Exposure and “poisoning” Forensic investigations

F&W: metals, pesticides, economic poisons, natural toxins



5. Product Approval

Chemicals for invasive species control - USGS

Fish Toxicants

in vivo, in silico, in vitro

Alternatives to lead shot used in hunting - Registrant

Ingestion of spent shot is the issue

13 “non-toxic” shot types approved over past ~25 years

Tiered protocol for approval with No toxicity testing in two decades

Currently extant data and crude read across method



Challenges within DOI

- Animal Use in Federal Research (GAO-18-459)

Animal Welfare Act

- birds, cold-blooded vertebrates (fish!),
and invertebrates not covered

- comment period extended on potential
change in AWA reporting for birds

- guidance on field studies confusing

- Some agencies and science/research centers that conduct studies with cold blooded vertebrates believed they were EXEMPT from reporting animal use (FWS, USGS, NPS)

- Research versus Operations (maybe one size does not fit all?)

Need Toxicity Testing Definition

- Yes

Product Approval

Ecotoxicological laboratory and field studies

- Maybe ?

Biomonitoring

Damage Assessment

- No

Diagnostics



Who has responsibility ?

- U.S. Geological Survey, Ecosystems Mission Area (WMA)
IACUC, CEO – Anne Kinsinger, M.A.
Institutional IACUC Officials – Res/Sci Ctr Directors
(e.g., CERC, EESC, FRESA, WARC, WFRC, UMESC)
- National Park Service, Biological Resources Division
IACUC – Laurie Baeten, DVM, PhD
- Fish and Wildlife Service, Refuges
IACUC – Samantha Gibbs, DVM, PhD



Need to Establish a Goal Specific to DOI

Reduce animal use in ecotoxicological research and testing without compromising data needed for decision making related to conservation and management of natural resources

Ultimate Goal: “zero impact” on natural resources due to environmental contaminants and anthropogenic activities

No effect at population level for abundant species

No effect at individual level for threatened or endangered species



Survey on DOI Toxicity Testing Activities and Animal Use Alternatives

- USGS (targeted 12 Centers), BIA, BLM, FWS, NPS (N=25)
- Tox Testing (5), Biomonitoring (12), Diagnostics (1), Product Approval (1)
- FIFRA (10), Industrial (12), Metals (11), Pharms (4), “Toxins” (5)
- Molecular (7), cellular (6), tissue → organism (10-12), population → ecosystem (5-7)
- In vitro toxicity tests (5) embryos, cell lines
- In silico evaluations (7) QSARs, SeqAPASS, Populations
- Diverse taxa: birds, herps, fishes, mollusks, invertebrates
- Barriers: data requested/required (DOJ, biomonitoring), IVIVE, biological relevancy
- Needs: database tools, predictive toxicology, modeling, training

Some Ideas for Metrics

Training on alternatives

Meeting information needs of AWA (OSU)
AWIC workshop & training (NLA)

-Scientists current on training requirement (%) and track over time

Empirical data related to use of animals and alternatives in ecotoxicological research and testing

-Data from annual IACUC reporting

-Data from publications and data releases

-Initiate specific reporting requirement for ecotoxicological research and toxicity testing



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Comments, Suggestions and Questions?