# Exposures Workshop Proposed Agenda

RSVP at [bit.ly/rsvp-exposures-workshop](http://bit.ly/rsvp-exposures-workshop)

Meeting zoom at [bit.ly/unconferencezoom](https://lbnl.zoom.us/j/730048874)

**Recommended readings:**

**Background**

1. [Exposure Science in the 21st Century](https://www.nap.edu/catalog/13507/exposure-science-in-the-21st-century-a-vision-and-a) (This is a book. Read the summary and peruse the figures to get a sense of contents.)
2. [Using 21st Century Science to Improve Risk-Related Evaluations](https://www.nap.edu/catalog/24635/using-21st-century-science-to-improve-risk-related-evaluations) (This is a book. It is more data oriented. Read the summary and peruse the figures to get a sense of contents.)
3. [A call for action: Improve reporting of research studies to increase the scientific basis for regulatory decision‐making](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5901032/) (Brief position paper justifying our approach)

**Ontologies and Informatics**

1. [Ontology-based data integration for advancing toxicological knowledge](https://www.sciencedirect.com/science/article/pii/S2468202019300051) (Boyles et al 2019. Position paper on the advantages of using ontologies in toxicology)
2. [Providing the missing link: the exposure science ontology ExO](https://pubs.acs.org/doi/abs/10.1021/es2033857) (Mattingly et al 2012. Describes exposure ontology)
3. [The Monarch Initiative: an integrative data and analytic platform connecting phenotypes to genotypes across species](https://academic.oup.com/nar/article/45/D1/D712/2605791) (Describes ontology-based data integration in the Monarch Initiative)
4. [Human phenotype ontology annotation and cluster analysis to unravel genetic defects in 707 cases with unexplained bleeding and platelet disorders](https://genomemedicine.biomedcentral.com/articles/10.1186/s13073-015-0151-5) (Describes one method for using ontologies in medicine)
5. [The Human Phenotype Ontology project: linking molecular biology and disease through phenotype data](https://academic.oup.com/nar/article/42/D1/D966/1042793) (Describes the human phenotype ontology)
6. [A proposal for creating a taxonomy of chemical interactions using concepts from the aggregate exposure and adverse outcome pathways](https://www.sciencedirect.com/science/article/pii/S2468202019300142) (Price and Leonard 2019. Categories of chemical interactions that could be translated to an ontology.)

**Exposome**

1. [Redefining environmental exposure for disease etiology](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6119193/) (Discusses EWAS in detail)
2. [From the exposome to mechanistic understanding of chemical-induced adverse effects](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6116522/) (combines exposome and AOP)
3. [Use of the “Exposome” in the Practice of Epidemiology: A Primer on -Omic Technologies](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5025320/)
4. [Informatics and Data Analytics to Support Exposome-Based Discovery for Public Health](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5774331/) (This paper discusses the nature of exposure data and data models.)

**Adverse Outcome Pathways and Aggregate Exposure Pathways**

1. [Adverse outcome pathways: A conceptual framework to support ecotoxicology research and risk assessment](https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/etc.34) (Ankley et al 2010 in Google Folder. Seminal paper on AOP)
2. [Application of three approaches for quantitative AOP development to renal toxicity](https://www.sciencedirect.com/science/article/pii/S2468111318301324) (Discusses methods to create AOP)
3. [A case study application of the Aggregate Exposure Pathway (AEP) and Adverse Outcome Pathway (AOP) frameworks to facilitate the integration of human health and ecological endpoints for Cumulative Risk Assessment (CRA)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6003653/) (Discusses AEP and AOP. The figures are really helpful.)
4. [Adverse outcome pathway (AOP) development I: Strategies and principles](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4318923/) (Describes AOP in detail)
5. [Adverse Outcome Pathway Development II: Best Practices](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4318924/) (Community-developed best practices for developing and describing AOP)

**Environmental Epidemiology**

1. [How Environmental Hazards in Childhood Have Been Discovered: Carcinogens, Teratogens, Neurotoxicants, and Others](https://www.ncbi.nlm.nih.gov/pubmed/15060186) (Miller 2004. Case studies in environmental epidemiology and identifying disease clusters)
2. [A Matrix for Bridging the Epidemiology and Risk Assessment Gap](https://www.sciencedirect.com/science/article/pii/S2590113319300057) (description of community needs)

# Sept 9

8:30

* Welcome and Introduction by Anne Thessen
* Exploring Ontologies for Exposure Studies by Sarah Rothenberg
* Common early life stage responses identified in zebrafish following chemical exposures by Lisa Truong
* Evidence Integration to Advance Assessments: Transitions and Translations by Annie Jarabek

10:30 -10:45 BREAK

10:45

* Ecotoxicology in the 21st century: Progress and challenges in assessing organism and population-level responses to environmental stress by Susanne Brander

=> Morning Objectives: Reveal fundamental challenges and opportunities in environmental health and exposure science.

11:30

LUNCH

13:30

**All about Ontologies**

* Towards an Environmental Health Sciences Ontology (from CHEAR to HHEAR and beyond) by Deborah McGuinness
* Ontologies 101: semantic data modeling by Nicole Vasilevksy
* Monarch Initiative example of a Community-Driven Knowledge Graph (what are they, why are they important, how do we use them) by Melissa Haendel
* Intro to competency questions for search, discovery, analytics (Melissa and Nicole)

15:00

BREAK

15:30

**Breakout 1: Competency questions.** Participants will investigate integrated resources (such as [Monarch](https://monarchinitiative.org/), Illuminating the Druggable Genome, [DisGeneNet](http://www.disgenet.org/), [Biothings Explorer](https://biothings.io/explorer/navigator/)), community database resources (e.g. [Comparative Toxicogenomics Database](https://ctdbase.org/), [Online Mendelian Inheritance in Man](https://www.omim.org/), [Tox21](https://ntp.niehs.nih.gov/go/tox21), etc), explore ontologies such as Mondo and ECTO, and capture gaps and opportunities. We could have two or three epidemiologists paired with one or two ontologists in each group.

1. In an ideal world, what would you want the integrated resources and/or databases to be able to do?
2. What data standards and/or terminology standards are you currently using for data query and aggregation?
3. What data fields or properties are most important to represent the kind of data you manage?
4. What are your biggest data pain points?

[Link to Breakout 1](https://drive.google.com/open?id=1ek85c0op7e4kglLGxyWrlYhZ78Pi-SIuYXiy3A9tUws) doc:

Group 1: Sheri de Coronado, Peter Robinson, Kent Shefchek, David Williams, Monica Munoz-Torres, Tiffany Callahan

Group 2: Susan Korrick, Susanne Brander, Jim Balhoff, Lauren Chan, Julie McMurry, Nicole Vasilevsky

Group 3: Sarah Rothenburg, Celia Quevedo, Deborah McGuinness, Ramona Walls, Perry Hystad, Resham Kulkarni

16:30

**Return to the group**. Report out and group discussion

=> Afternoon Objectives: Grow cross-domain collaboration in order to better understand problems, tools, and possible solutions, specifically as they relate to data modeling and ontologies.

17:30

ADJOURN

18:30 reservation

GROUP DINNER

**Block15 Brewery and Tap Room**

3415 SW Deschutes St, Corvallis, OR 97333

<https://goo.gl/maps/dnNHt41e6jfoeTj68>

Note that this is south of town - you will need a ride or an uber.

# Sept 10

8:30

**Facilitated Networking Exercise**

9:00

**Review the proposed model and ECTO**

Talk about ECTO and proposed model - show some examples. Group discussion of model.

10:00

BREAK

10:30

**Group Brainstorm**

Let’s start thinking about what we could do if exposures and treatments were a part of Monarch. What kinds of questions would we ask? What kinds of additional features (like phenogrid) would be helpful? Can we brainstorm some use cases? Competency questions?

=> Morning Objective: Document and prioritize data capture and computational needs using the competency questions and the data models needed to support them

11:30

LUNCH

12:30

**Review of Repositories and Data Submission Tools**

* Review of data submission tools with representation in the room (CTD, CHEAR)
* Small group review of tools that do not have representation in the room (Tox21, FDA, others?)

15:00

BREAK

15:30

[**Breakout 2**](https://docs.google.com/document/d/16Z5-spQ659QijkSWZdN8M6Bbo-Qu480nmXF21G8fjDc/edit)**: Data submission questions.**

1. What are the biggest barriers to submitting data (which would meet the discovery needs of our first breakout)? For example, you can’t find the term you need
2. How would you combine automated methods with manual processes for efficiency and efficacy? How could these combined methods be used for data QA and/or prompting the user for additional information?

16:30

**Return to large group** to summarize action items and next steps, community development, and adjourn.

**Action Items:**

(Copied from [Breakout 2 doc](https://docs.google.com/document/d/16Z5-spQ659QijkSWZdN8M6Bbo-Qu480nmXF21G8fjDc/edit))

* Adjust model
* Compare surveys
* Get date from B + R, combine with CTD & AOP Wiki. Test!
	+ Should happen within the next year
* Workshop report
	+ (UDN exposures, surveys, more complicated terms…)
	+ Wood working as a hobby, what exposures are you in contact with?
	+ Lightweight assessment of database resources and what they are good for. From the perspective from data integration and data modeling. Prospectively do better as data generators, and allow for improvements in data reuse.
* Explore ingesting resources
* Listserv of emails, will keep you in the loop for conference grant and community building
* Tell your friends - RE symposium + webinar series
* Find AOP ontology pub applied
* AOP Wiki & AOP ontology
	+ May need better integration of Uberon
	+ Bioassay ontology is included
	+ Creating classes for adverse outcomes, wiki is further than this, needs updating. ~150 key events to add. Wiki is still maintained.
	+ If we can update the ontology, may have better pressure to push onto the Wiki folks and encourage NTRs from Wiki group. OACD is looking at abandoning the Wiki, if it was interoperable, we may get support. (Lyle)
	+ Align of the target site exposure (Annie!)
* Taxonomy paper in Current Opinions in Toxicology 2016, chemical taxonomy
	+ Document workflow for the translation to ontology
* Once ECTO is released (end of Sept?), please look at it and submit issues or NTRs
* Consider an ontology workshop at a toxicology meeting!
	+ Biostars?
	+ Anaheim SOT annual meeting in March (Annie), CE course April/May deadline (Lyle)
	+ Risk assessment specialty section (RASS), webinar (Annie)
		- How to use an ontology to curate your data, what are best practices?
	+ Bootcamp for a tox meeting?
		- Generators of primary data, improving reuse of data

=> Afternoon Objective: Identify the key processes and approaches to provide semantics support for data submission

17:30

ADJOURN