Ontologies for Environmental Exposure Applications

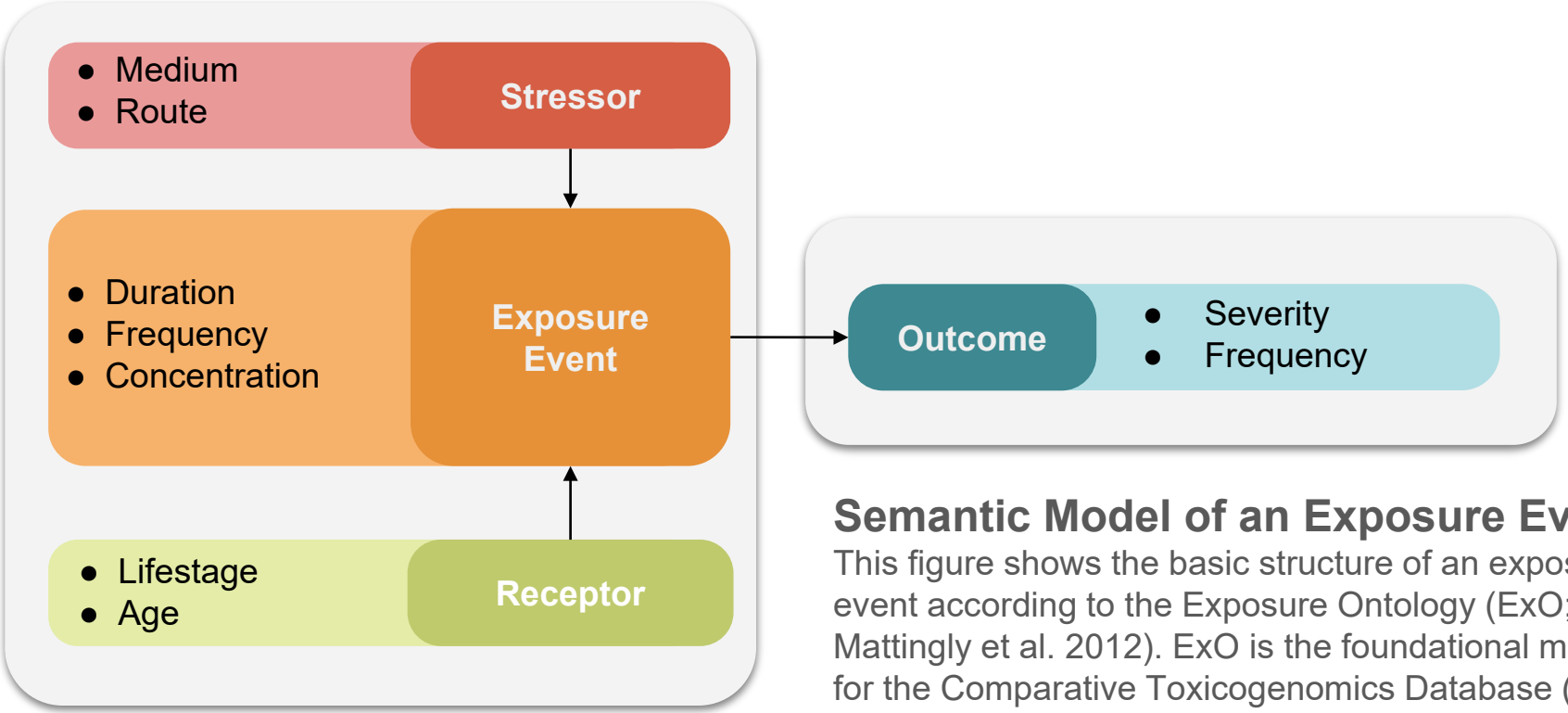
Anne E Thessen
Center for Health AI
University of Colorado Anschutz Medical Campus

annethessen@gmail.com

@diatomsRcool

University of Colorado
Anschutz Medical Campus

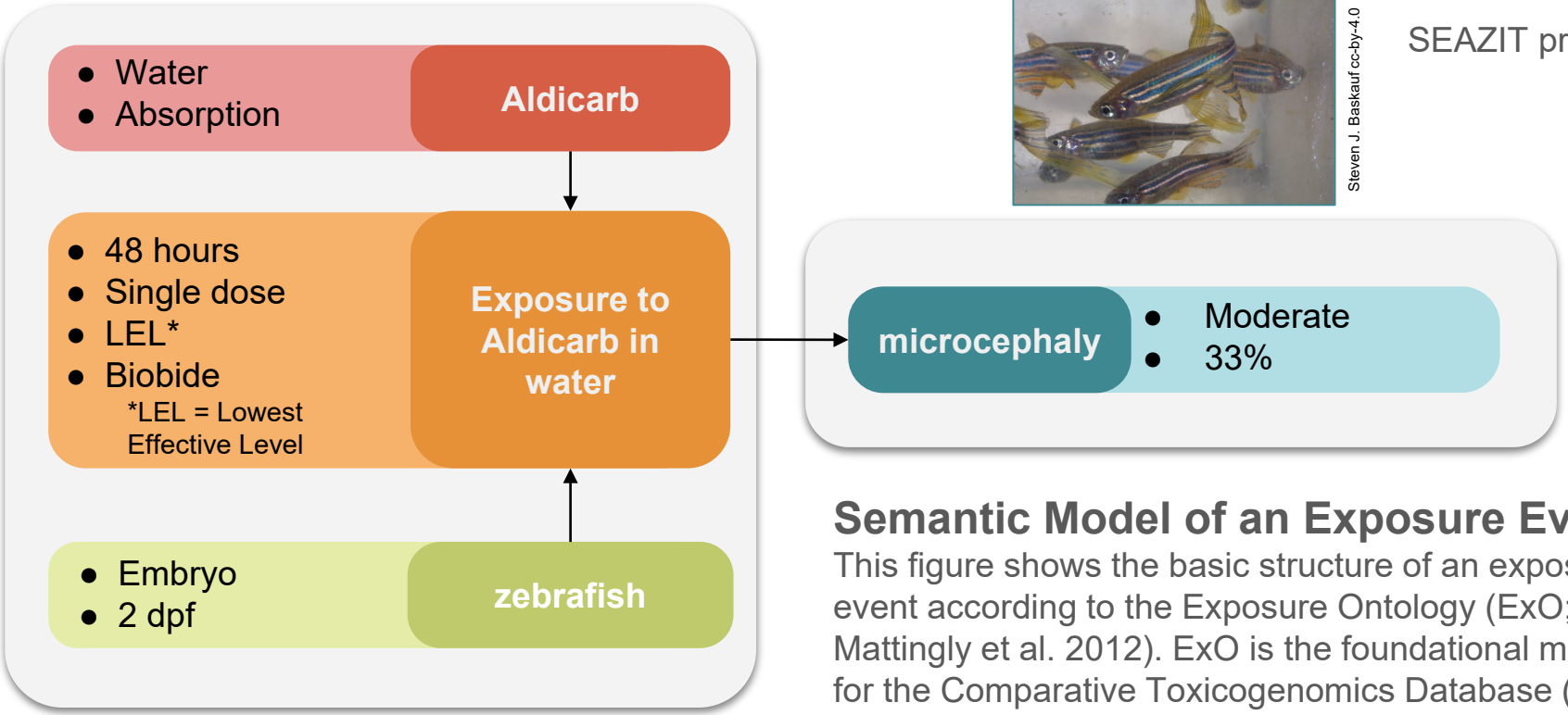
Environmental Exposures Modeling with ExO



Semantic Model of an Exposure Event.
This figure shows the basic structure of an exposure event according to the Exposure Ontology (ExO; Mattingly et al. 2012). ExO is the foundational model for the Comparative Toxicogenomics Database (CTD; Mattingly et al. 2006).

Environmental Exposures Modeling with ExO - Example

SEAZIT project



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Ontologies for Environmental Exposures Modeling

- Environment Ontology (EnvO)
  - Environmental materials
  - Biomes
  - Manufactured products
  - Geographic features
- CheBI
- NCBITaxon
- Medical Action Ontology (MAxO)
- FOODON
- NCIt
- Neurobehavior Ontology

Ontologies for Environmental Exposures Modeling

- Medium
- Route

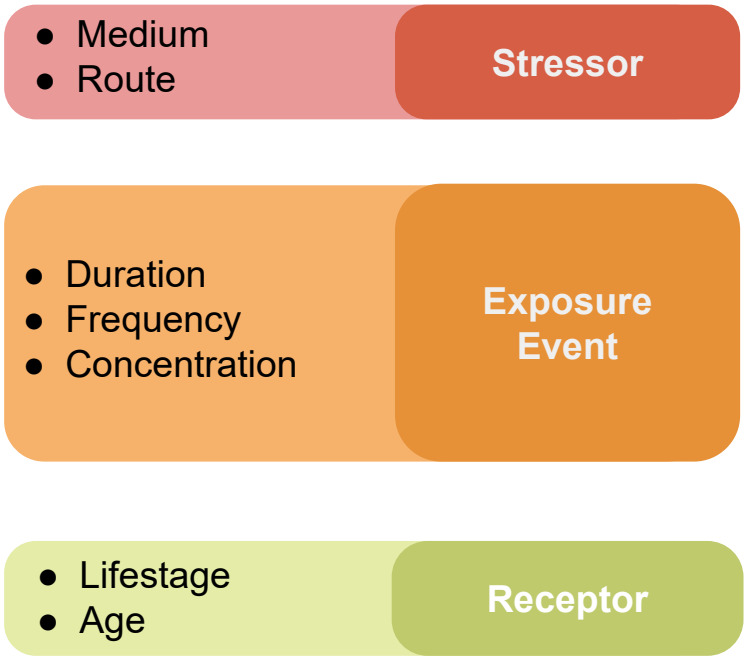
Stressor

- Lifestage
- Age

Receptor

- NCBITaxon
- Anatomy ontologies
  - UBERON
  - Tons of taxon-specific ontologies
- Gene Ontology
- Cell Ontology

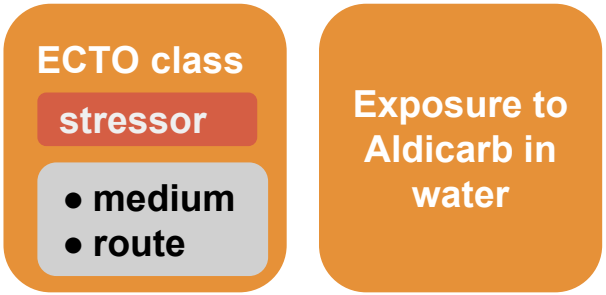
Ontologies for Environmental Exposures Modeling



- ECTO

ECTO: Environmental conditions, treatments and exposures

- Exposure event
  - Exposure to Aldicarb
    - Exposure to Aldicarb in water
      - Exposure to Aldicarb in water via ingestion



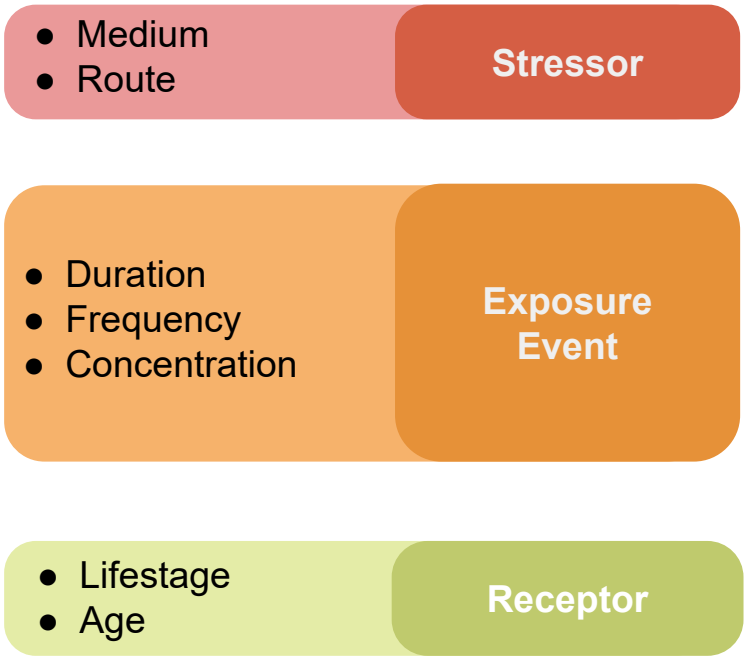
Exposure event from ExO
Aldicarb from CHEBI (stressor)
Water from ENVO (medium)

*exposure event and (has_exposure_stimulus some Aldicarb) and (has_exposure_medium some **water**)*

github.com/EnvironmentOntology/environmental-exposure-ontology

ecto
ENVIRONMENTAL CONDITIONS TREATMENTS & EXPOSURES ONTOLOGY

Ontologies for Environmental Exposures Modeling



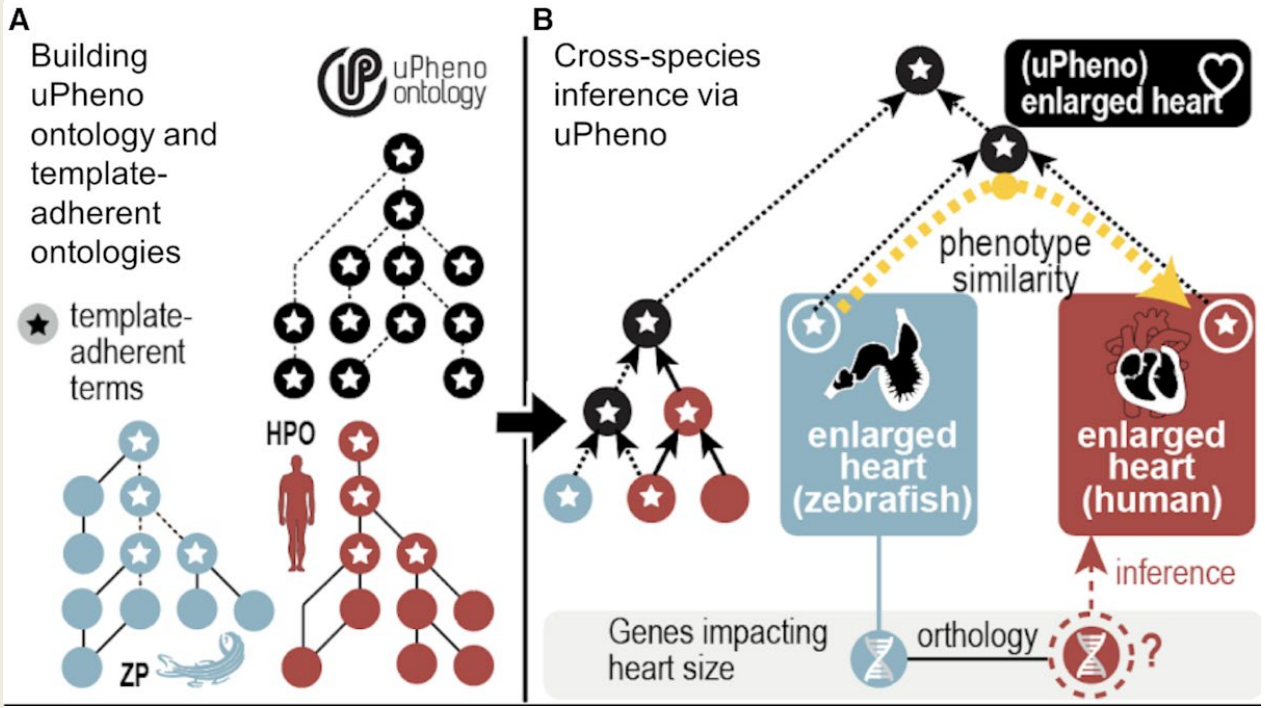
Outcome

- Severity
- Frequency

- Phenotype Ontologies
  - uPheno
  - From Humans to Ascomycete and everything in between
- Mondo disease ontology

How Can A Knowledge Graph Help?

- Integrating data across species
- Fuzzy matching
- Rare disease diagnostics
- Make inferences about humans



doi.org/10.1093/nar/gkz997

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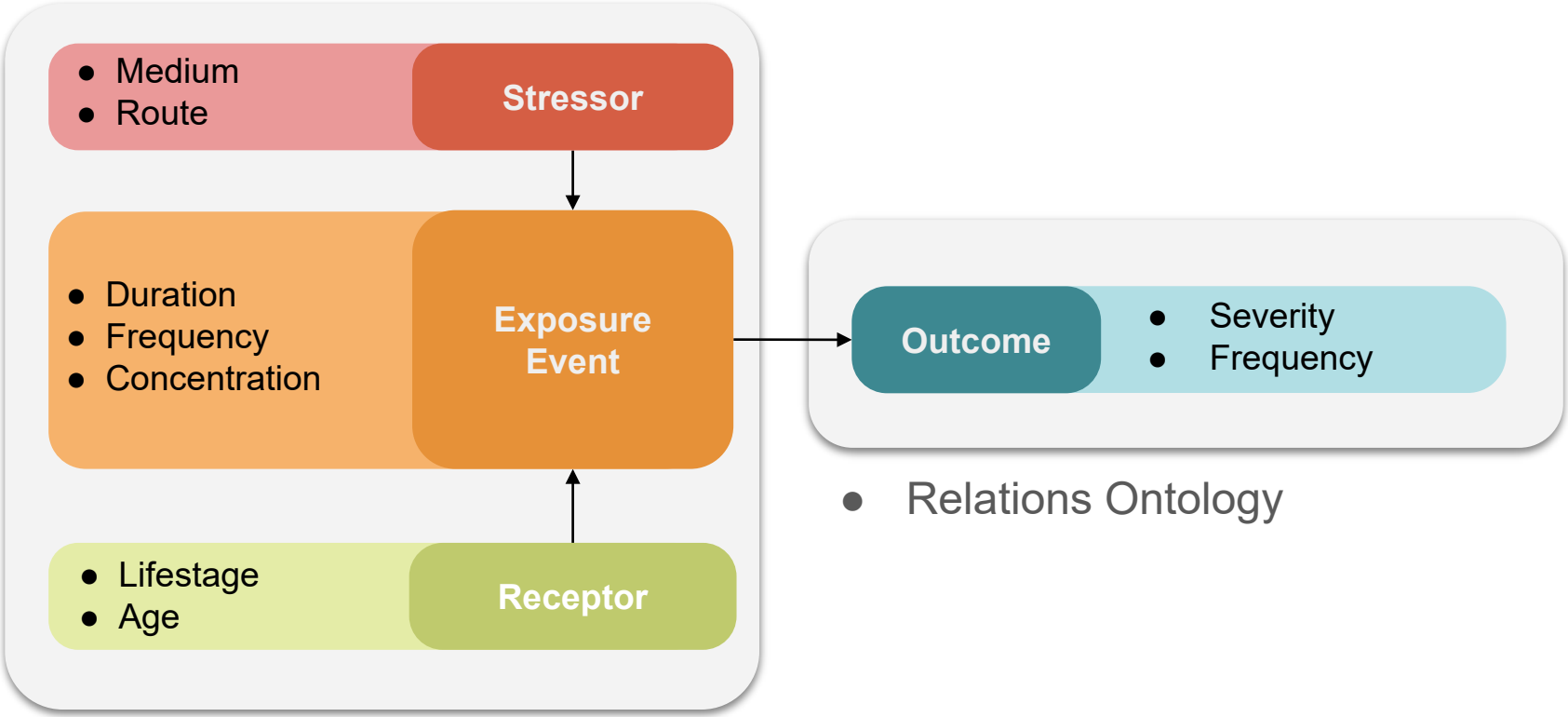
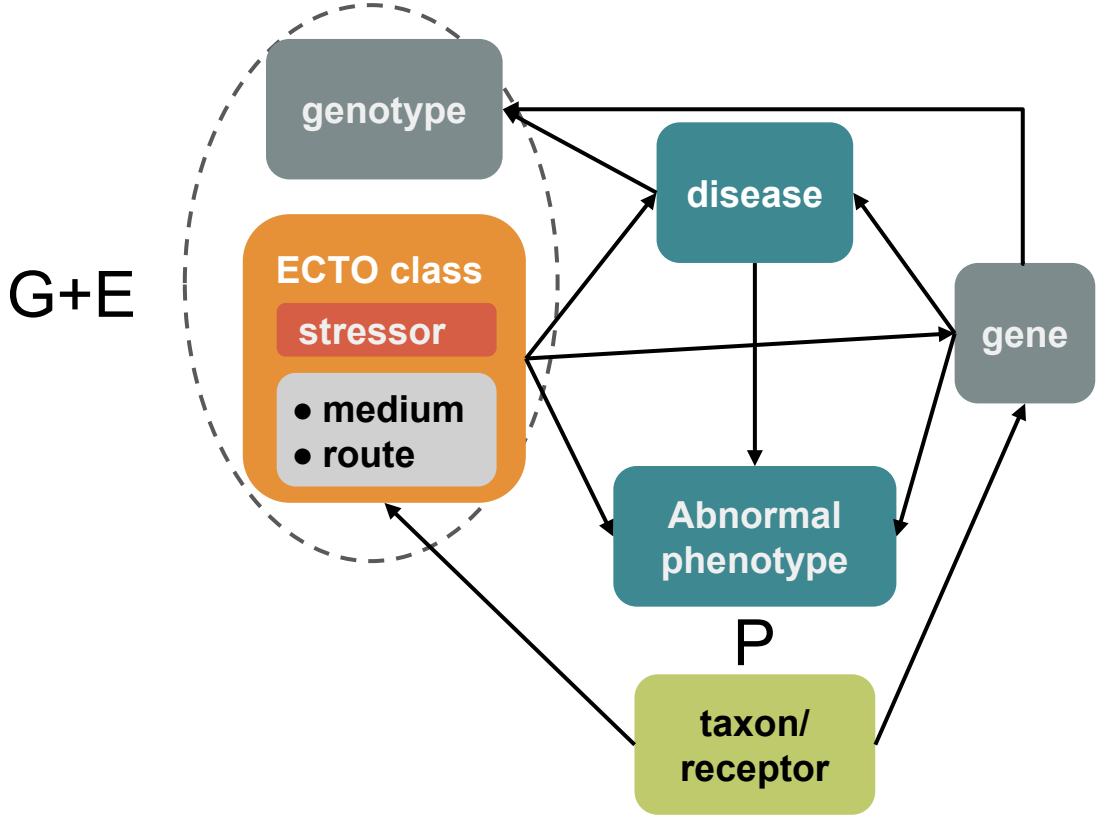
Ontologies for Environmental Exposures Modeling



- Relations Ontology

Integration with the Monarch Knowledge Graph



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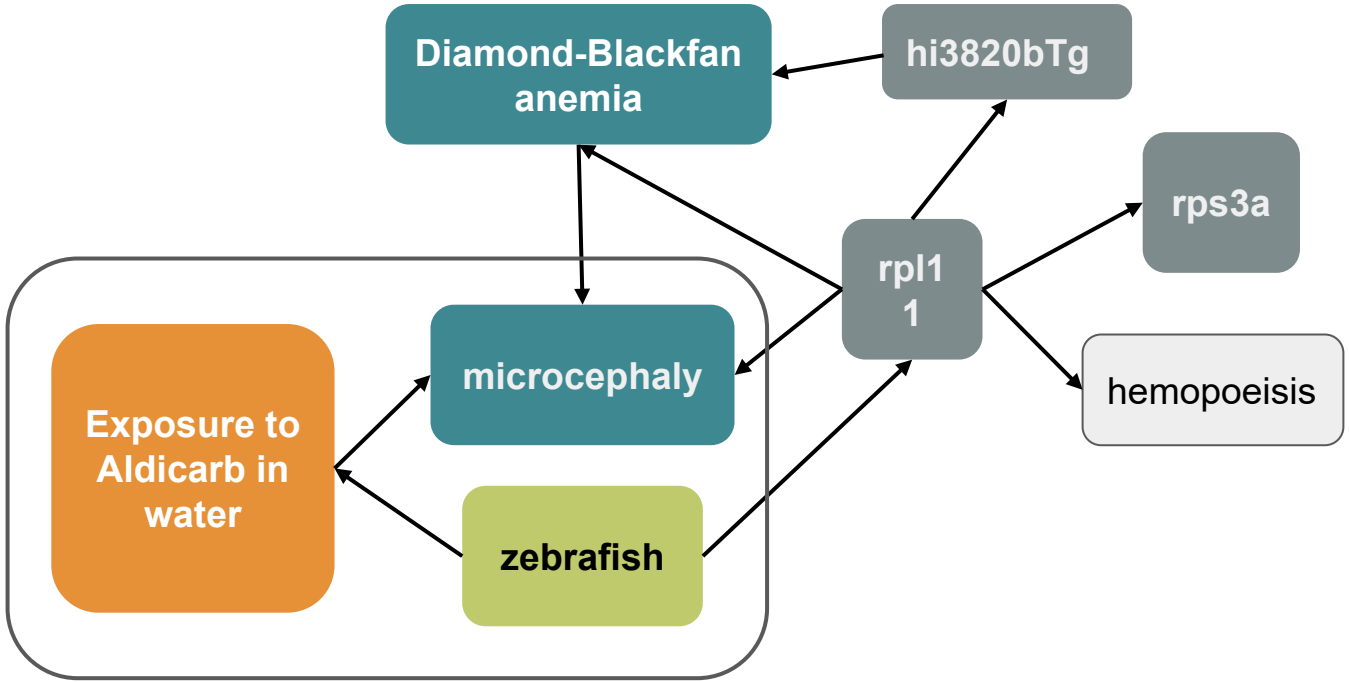
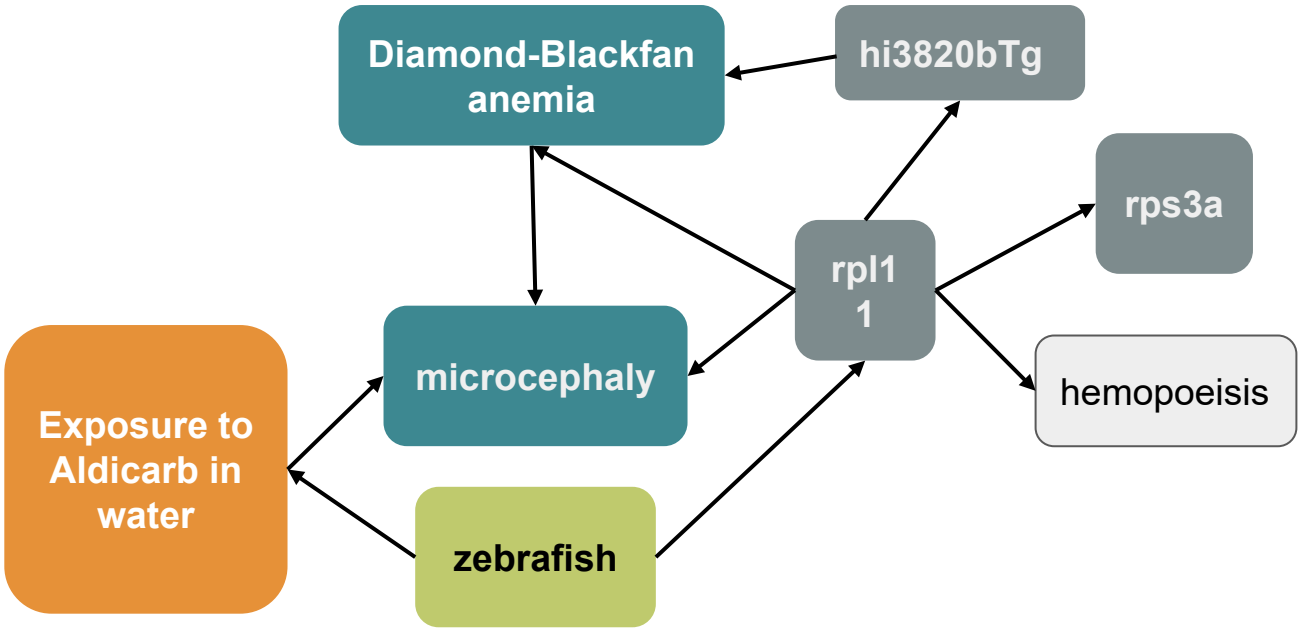


Integration Using Related Ontologies



obofoundry.org

What is the Monarch Knowledge Graph?

- monarchinitiative.org
- Integrator of cross species genotype-phenotype data
- OWL and DOS-DP
- Uses OBO Foundry ontologies
- obofoundry.org

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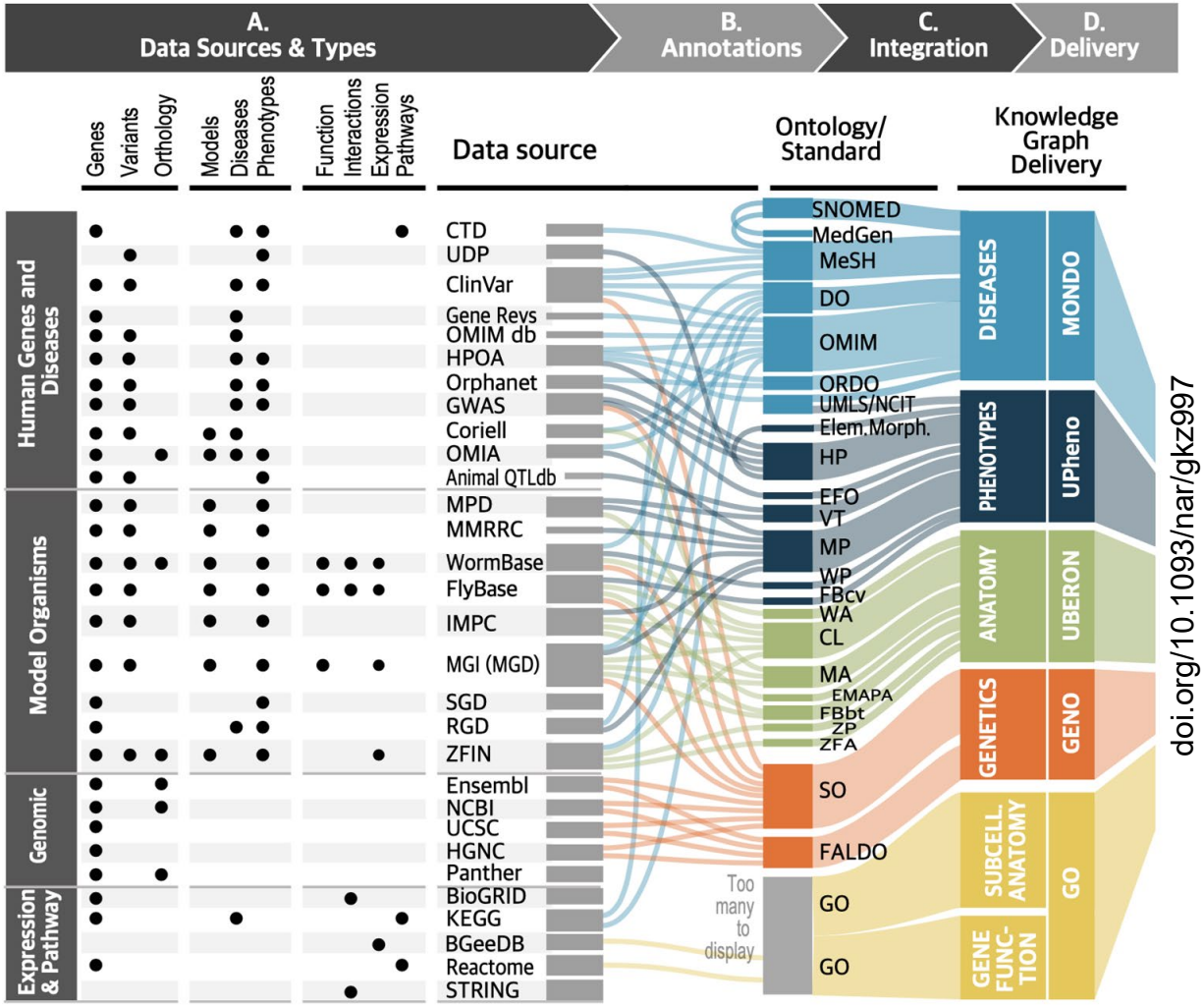

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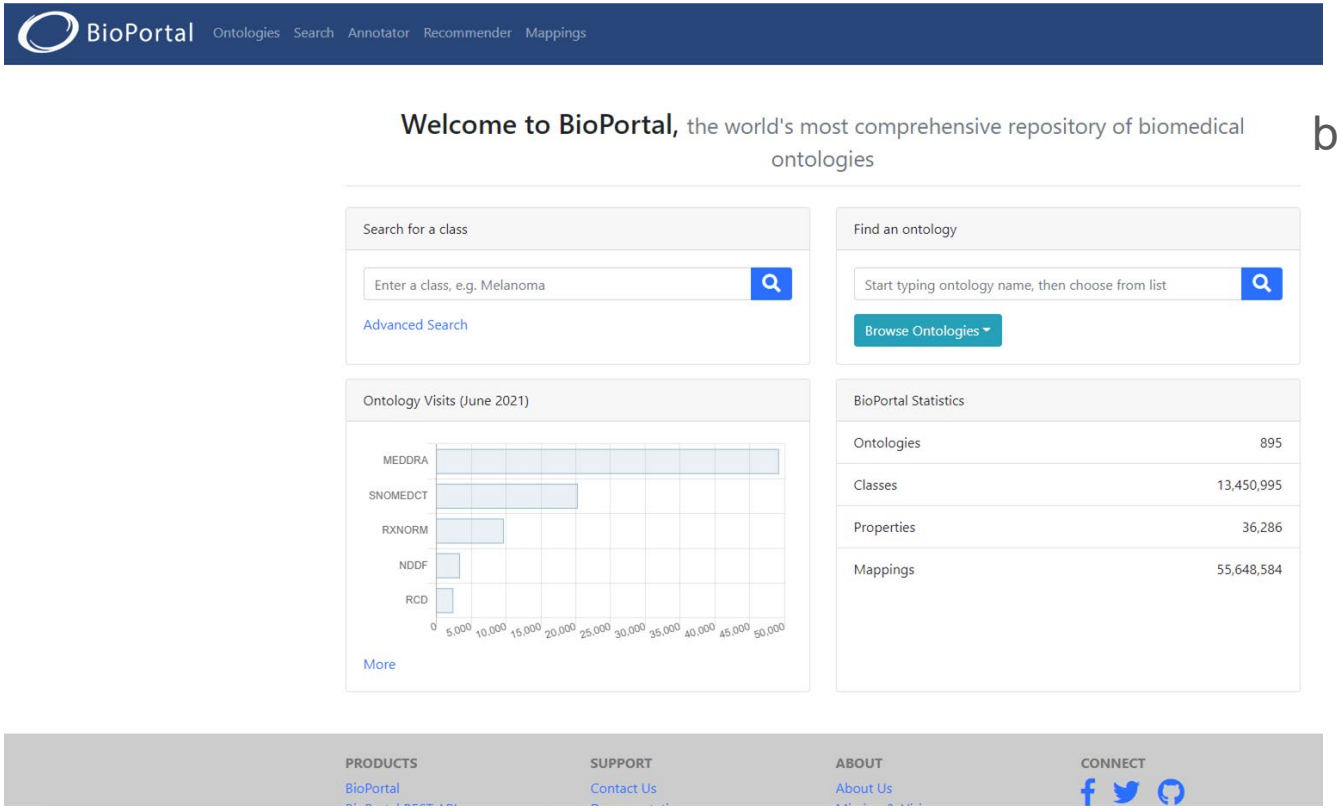
OBO Foundry is not the Only Source for Ontologies



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