

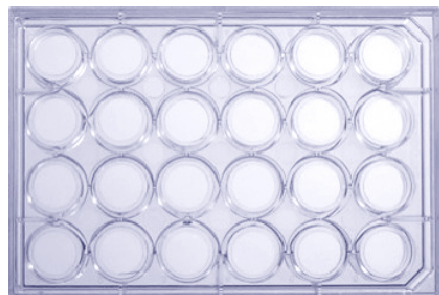
Computationally-predicted AOPs

Shannon M. Bell

Staff Toxicologist

Integrated Laboratory Systems

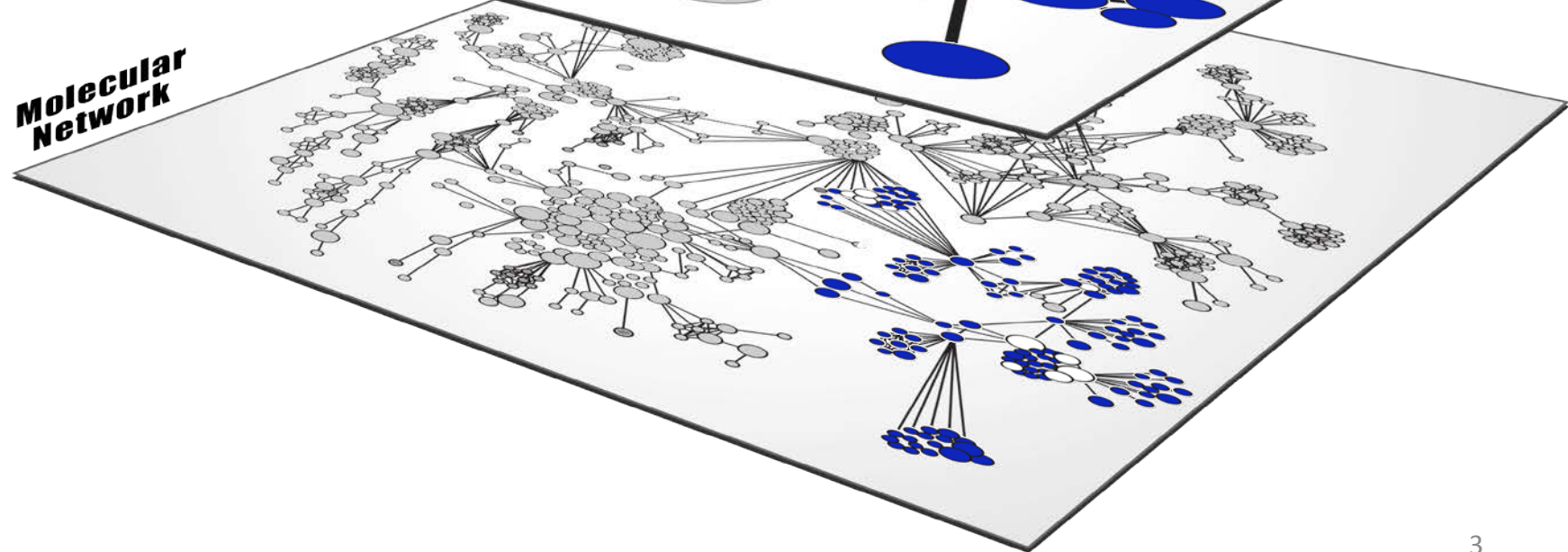
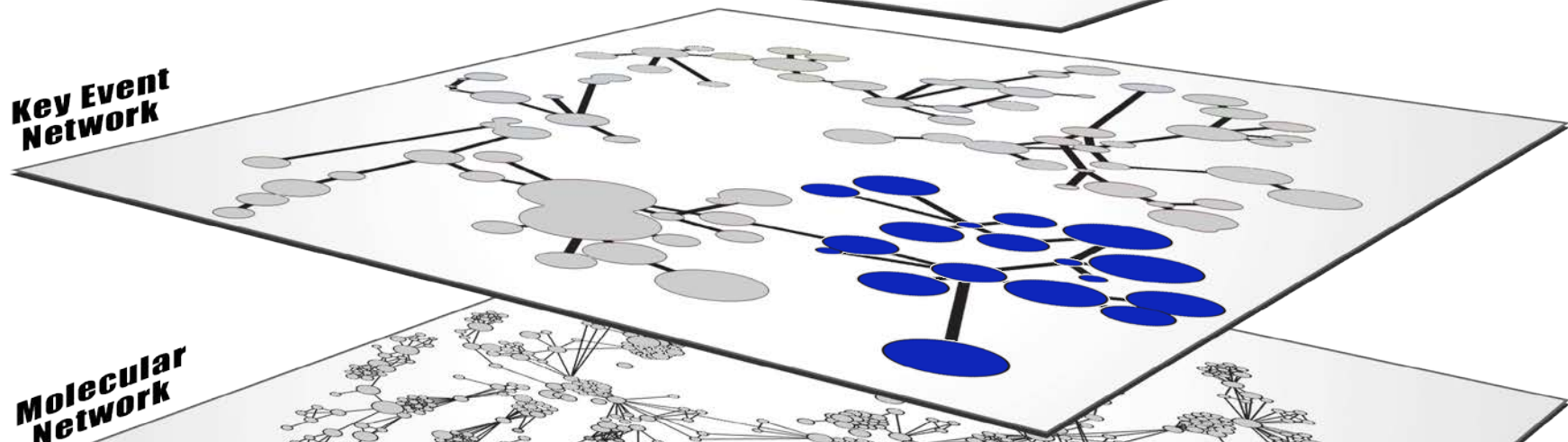
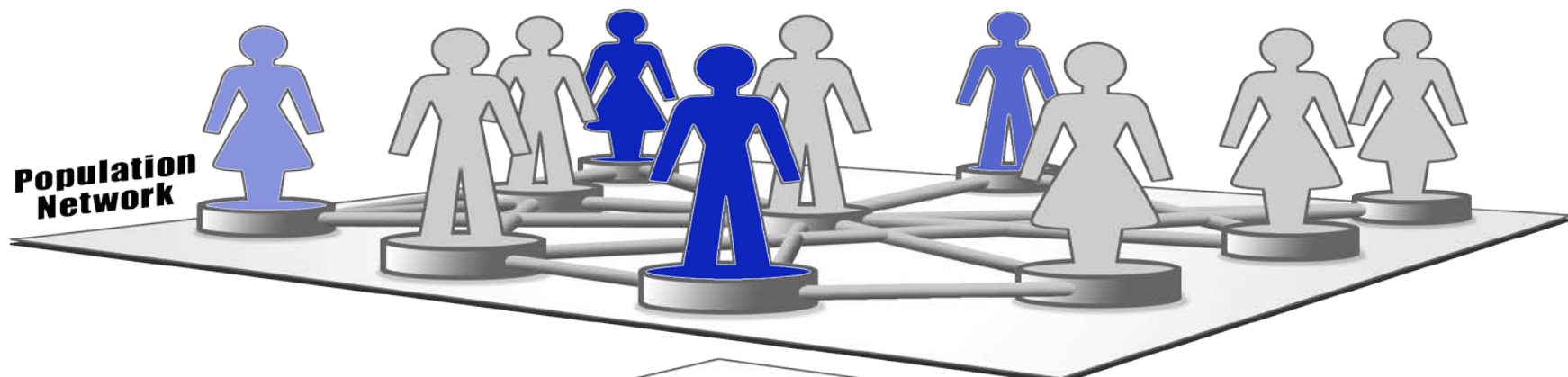
How do we go from a mouse, a chip/plate, or a poke to a population... Quickly, easily, cheaply, and transparently?



Individual

Tissue

Molecular



Overview of the AOP framework

Omics/HTT

Phenotyping

Biomonitoring

Molecular

Cellular

Tissue

Organ

Individual

Population

Molecular initiating event (MIE)

Chemical induced perturbations that affect biological systems at the molecular level.

One MIE may lead to multiple AO

Key events (KE)

Intermediate effects or predictive associations spanning several levels of biological association
KE are measurable

Adverse Outcome (AO)

This may occur at the population level for ecological outcomes or at the individual level for human health outcomes

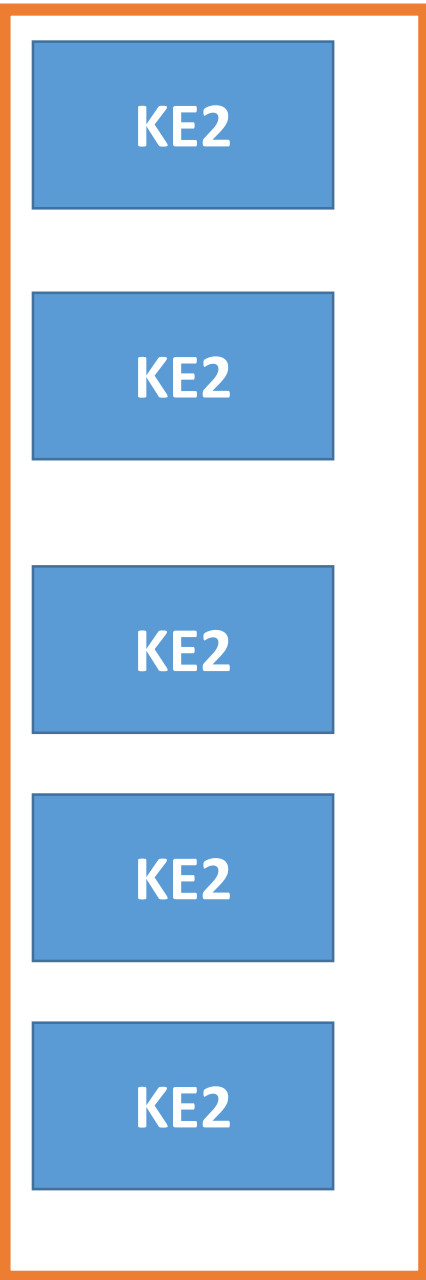
KE1

KE1

KE1

KE1

KE1



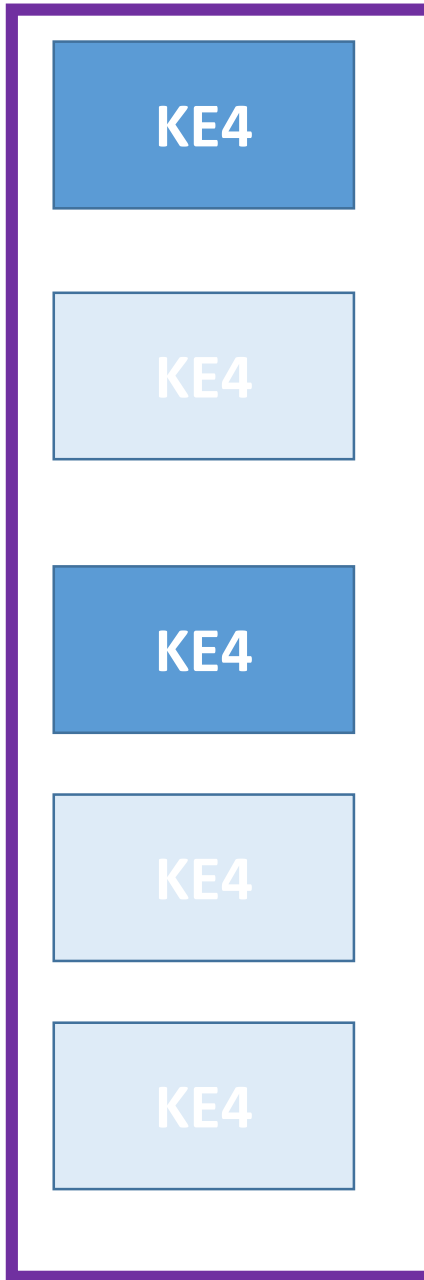
KE3

KE3

KE3

KE3

KE3



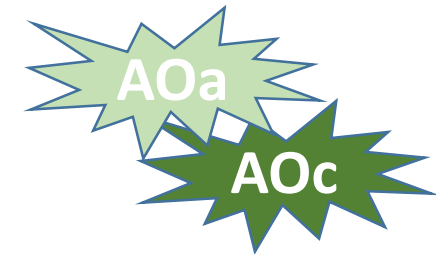
KE5

KE5

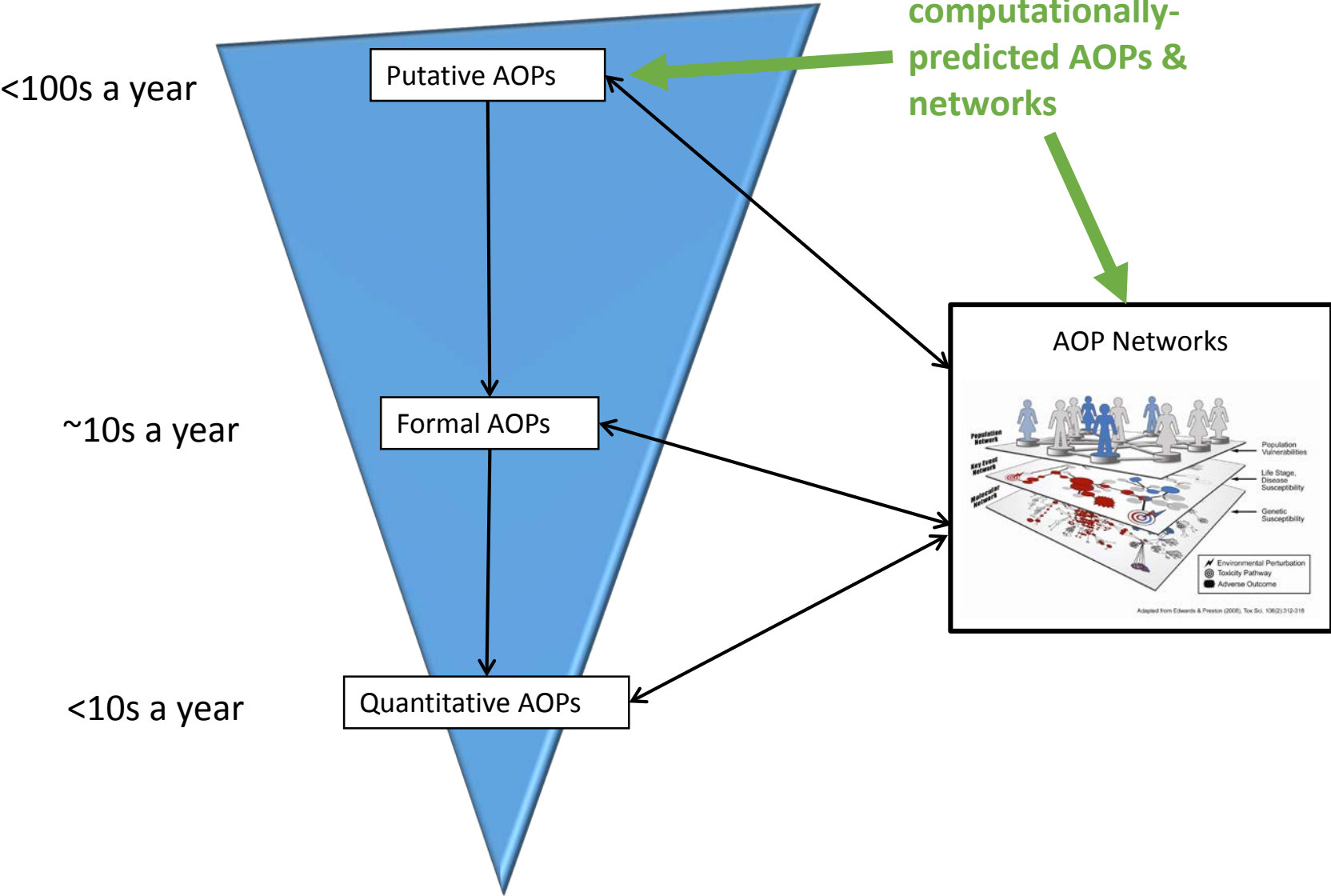
KE5

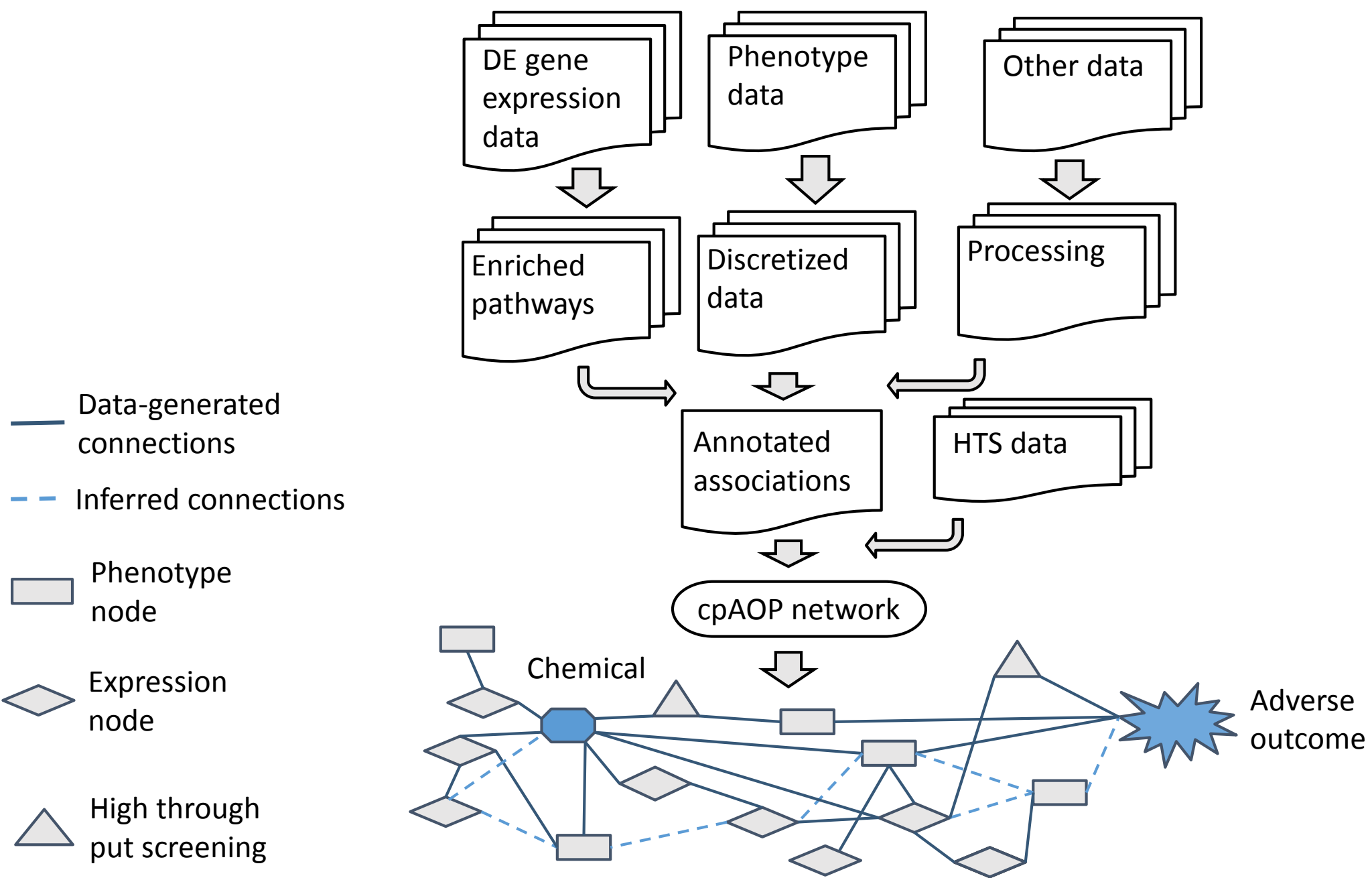
KE5

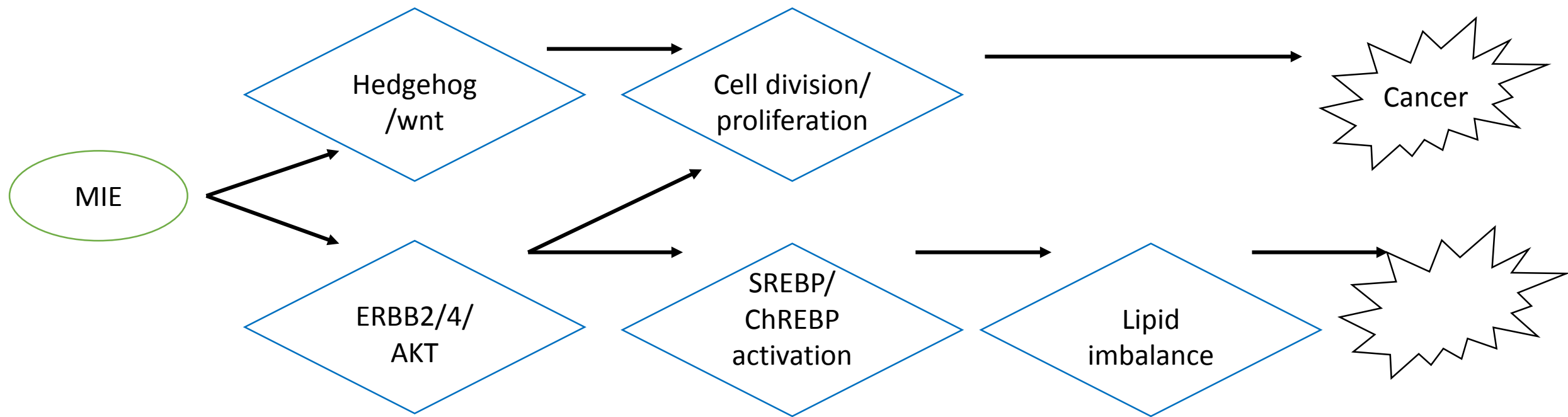
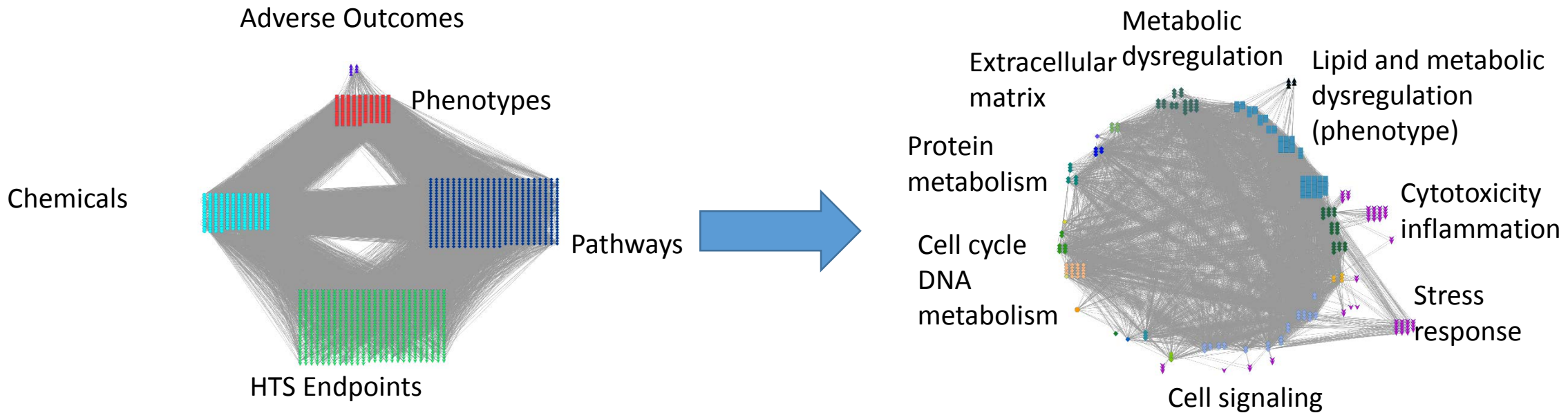
KE5





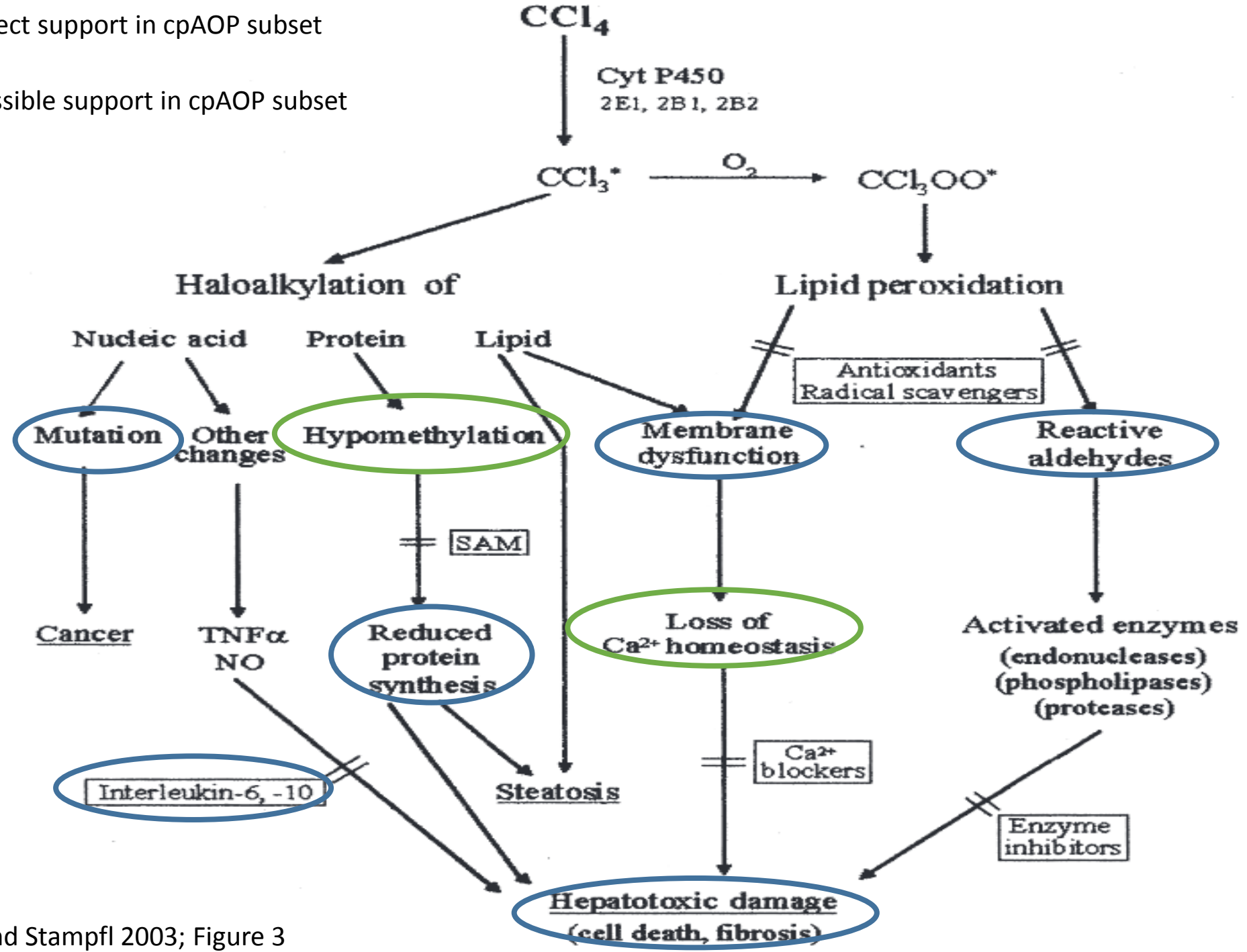
AOP Discovery & Development



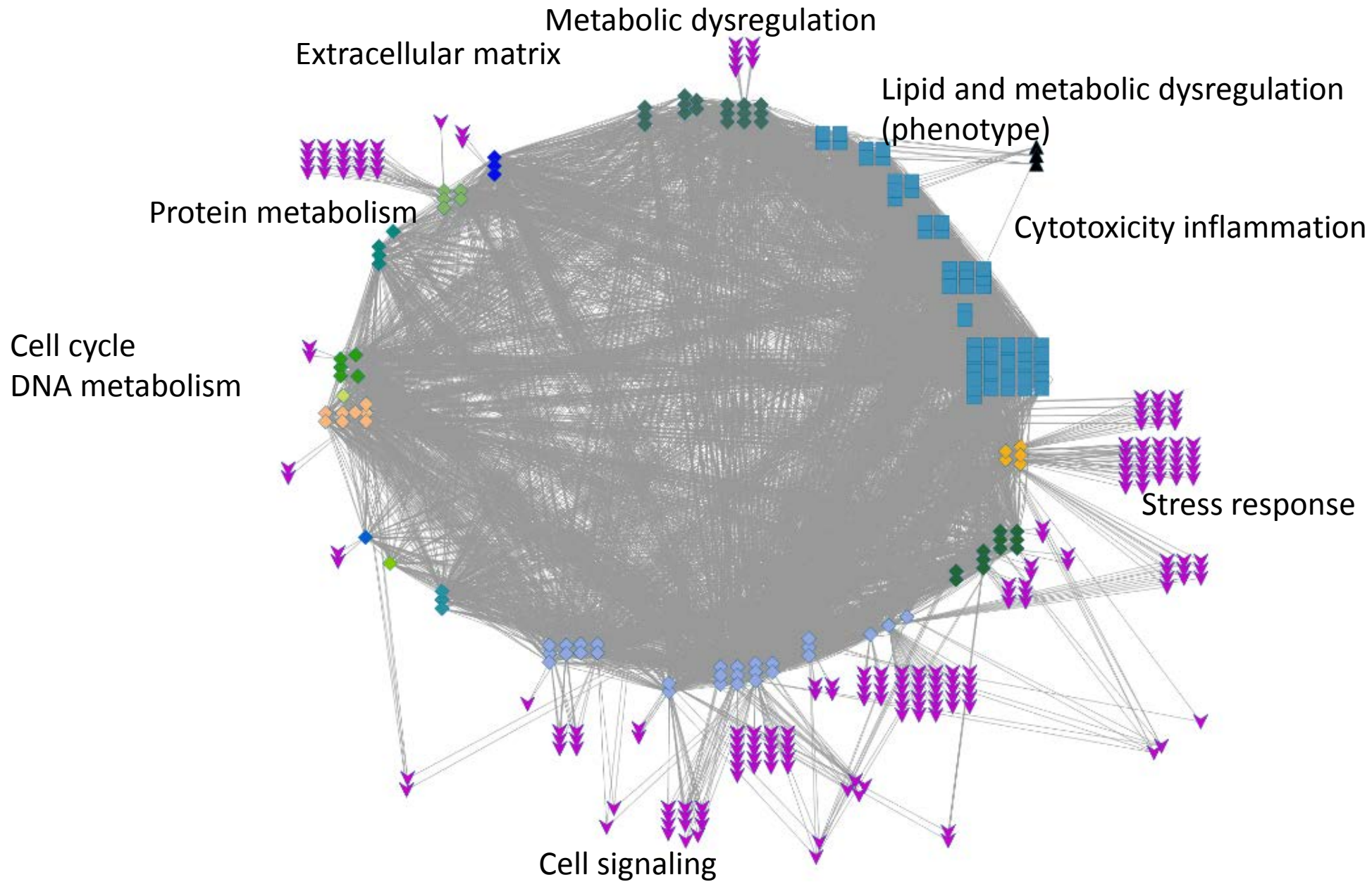


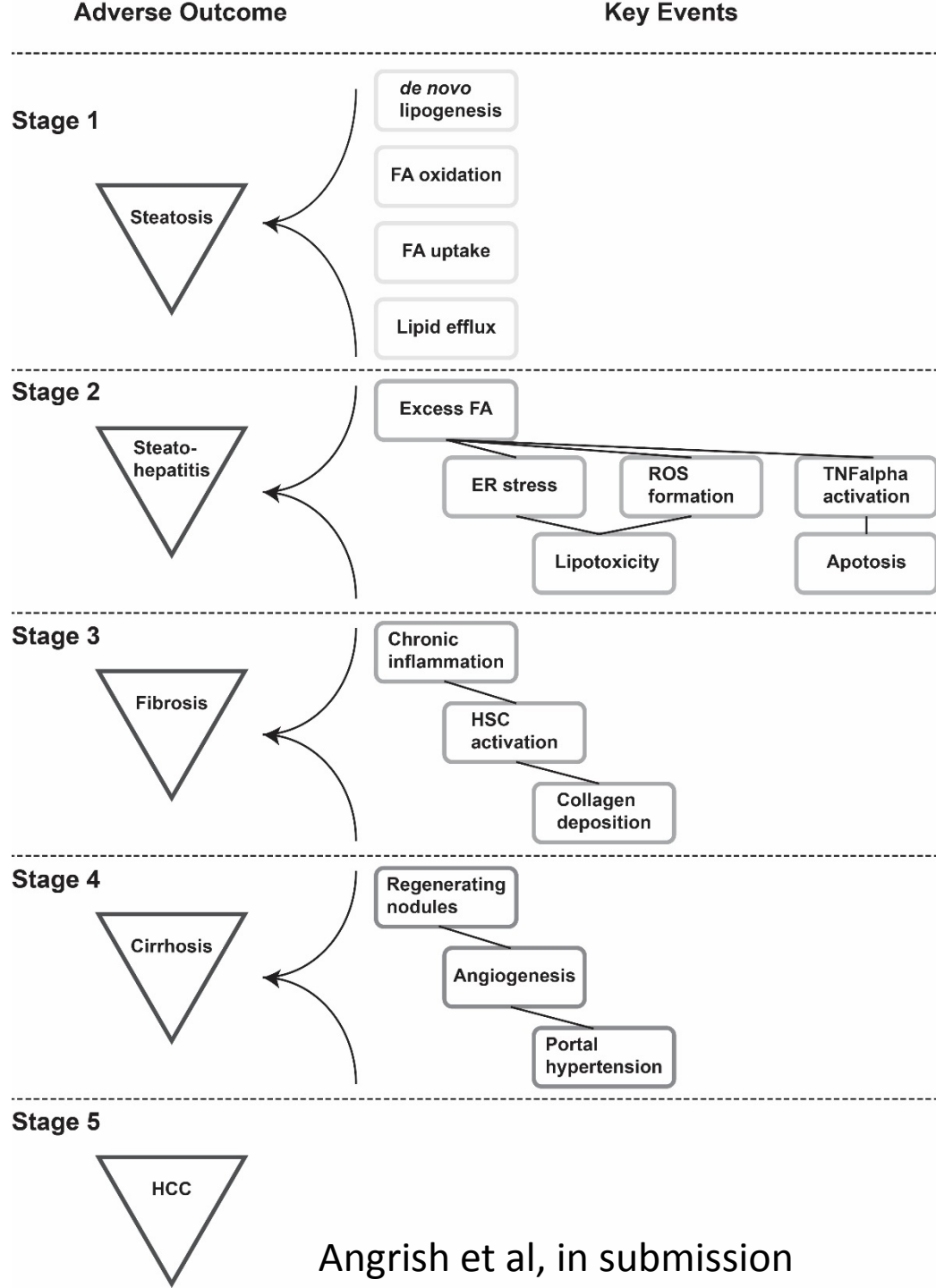


-  Direct support in cpAOP subset
-  Possible support in cpAOP subset

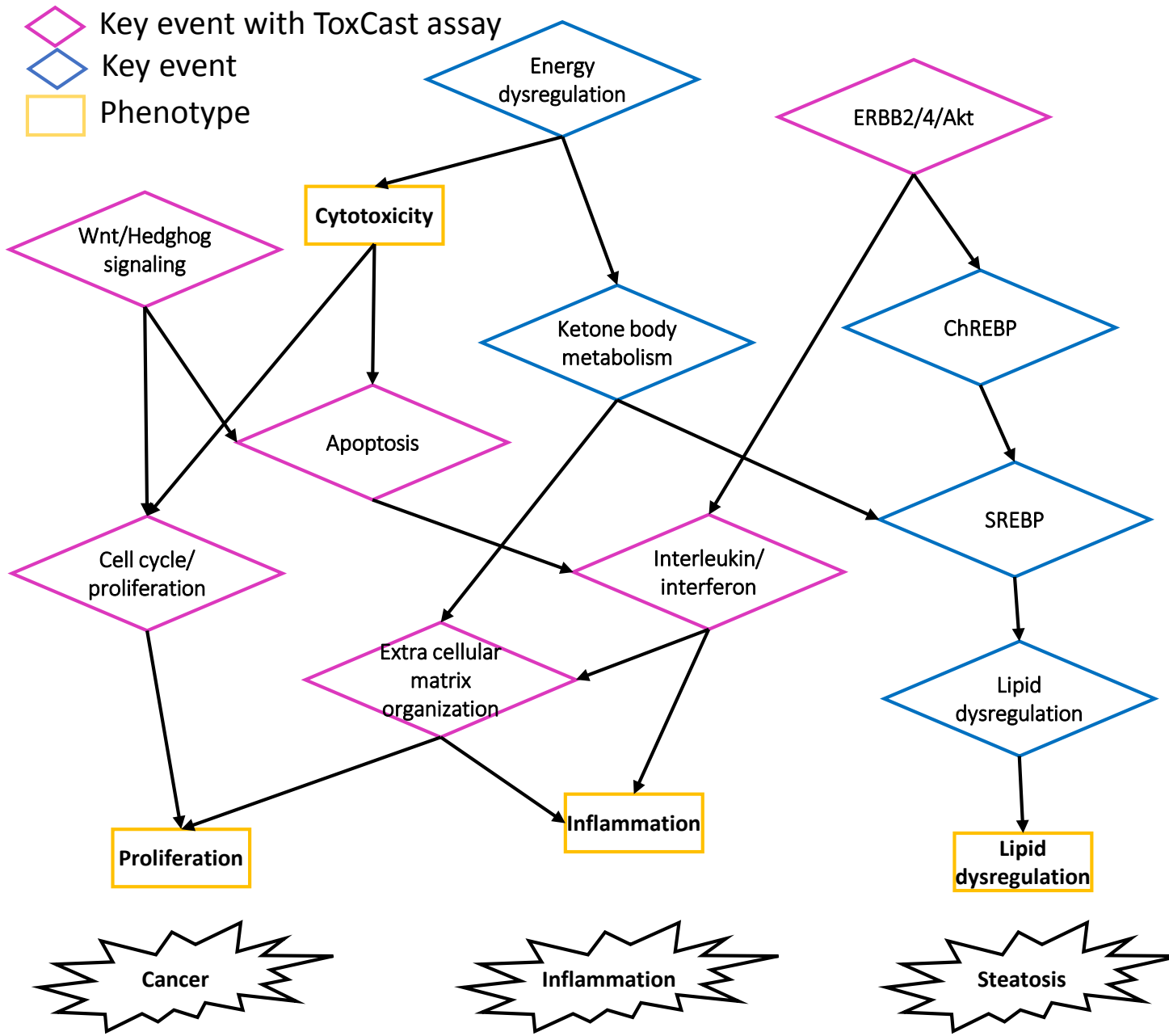


Weber, Boll and Stampfl 2003; Figure 3

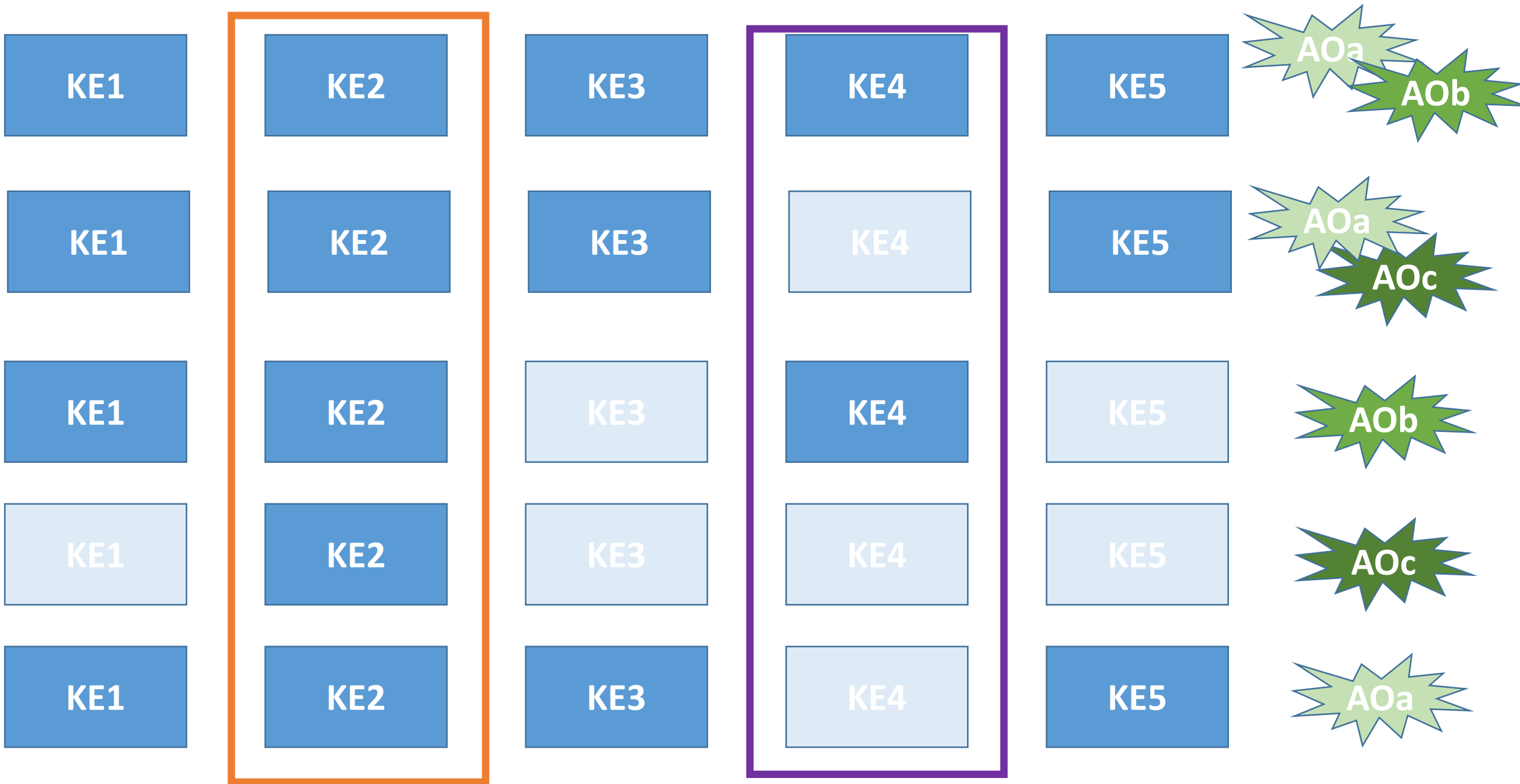




Angrish et al, in submission



Bell et al, in submission



So how do we start integrating the AOPs and cpAOPs in a computational manner?

Ingest AOPs and Evidence



Quantitative AOP-based Modeling



REACH Tox21 Omics

AOP Ontology



AOP Network Analysis
Causal AO Inference
Assay Battery Identification
Risk Values

Risk Assessment/Management



A free and open web application where you can visualize and analyze Adverse Outcome Pathway (AOP) Networks.

[Learn more](#)

View an AOP

Search for an AOP and visualize it.

View an AOP Network for an Outcome

Search for all of the AOPs associated with a given outcome and view the network

Perform a Risk Screening

Use data from a number of sources to perform a quantitative risk screening for your favorite chemicals.

Related Efforts

AOPXplorer is part of the Automated Chemical Risk Screening (ACRS) System. Other related projects include:

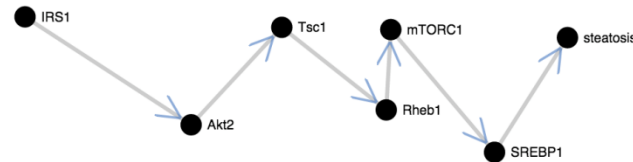
- AOP Ontology (AOPO)
- R/Bioconductor **aop** package
- Bayesian Point of Departure estimates
- Natural splined-based Meta-Regression of High Throughput Screening data

AOPXplorer is also part of the [Adverse Outcome Pathway Knowledgebase \(AOP-KB\)](#) Universe of programs.

AOP Steatosis Via FXR and HSD17B4 AOP



AOP Steatosis Via IRS1, AKT2, TSC1 or TSC2 and Lipogenesis AOP

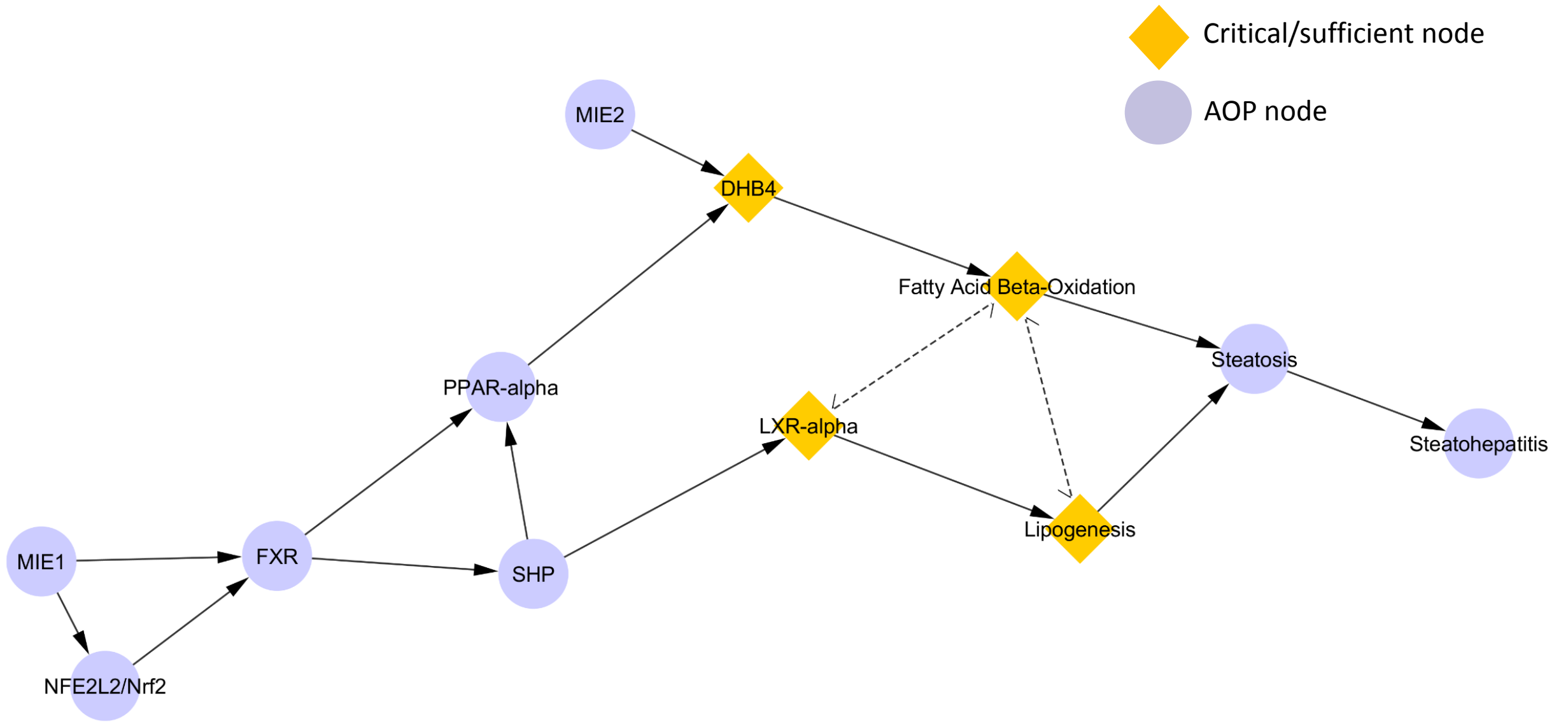


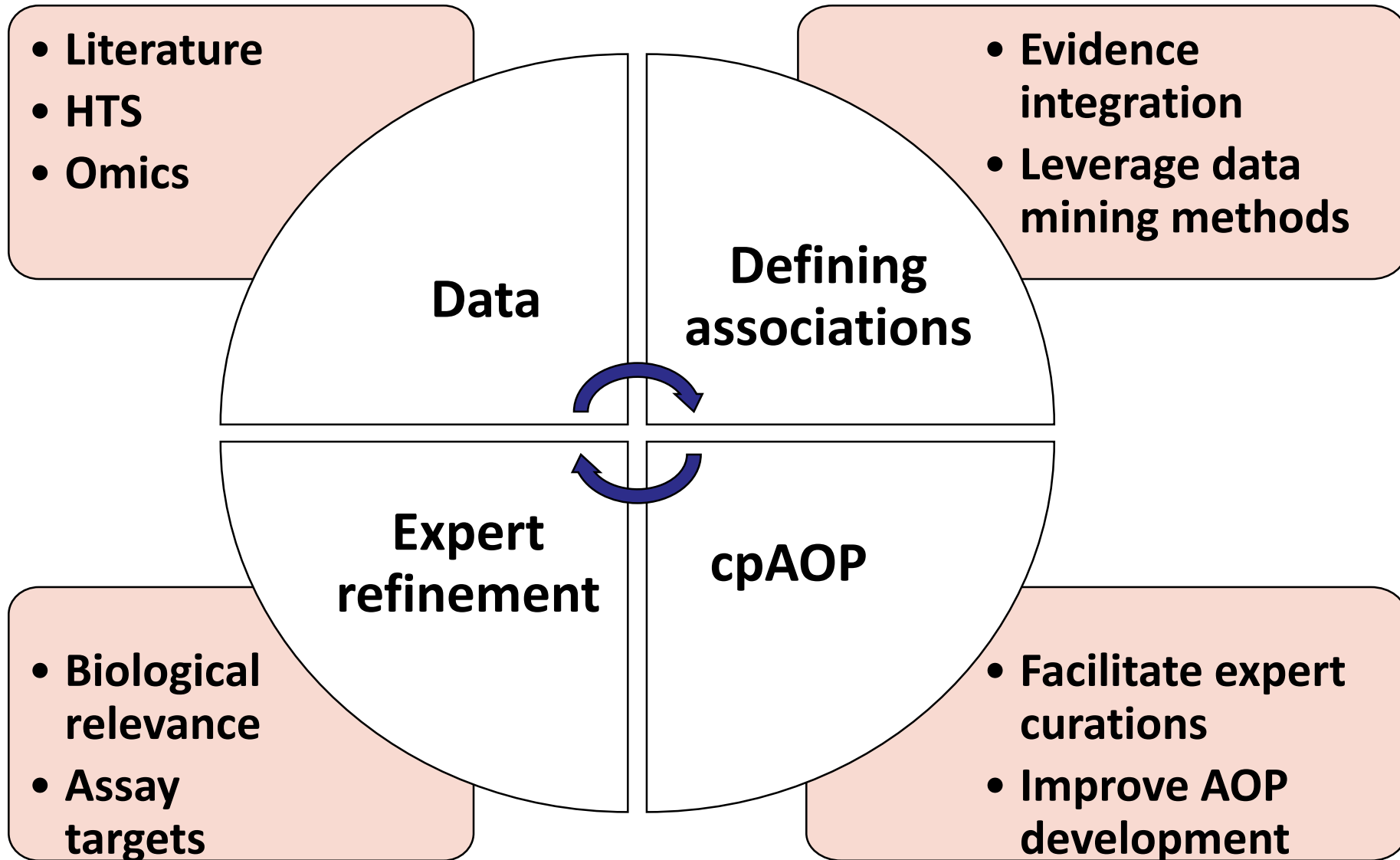
AOP Steatosis Via IRS1, AKT, GSK3 and Lipogenesis AOP



AOP Steatosis Via DHB4 AOP







Thank you

Steve Edwards, US EPA

Michelle Angrish, US EPA

Charles Wood, US EPA

Noffisat Oki, ORISE/US EPA

Lyle Burgoon, US Army