Human Health Hazard Indicators Workshop

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Overview of Workshop

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CA Green Chemistry Mandates

- SB 509 Legislation requires establishing a Toxics Information Clearinghouse (TIC)
- OEHHA is required to "evaluate and specify hazard traits, toxicological and environmental endpoints and other relevant data" that should be included in the TIC
- DTSC has the mandate to build the TIC
- **What is a hazard trait?**

Hazard Traits

- OEHHA viewing hazard traits as the “icities”, e.g., carcinogenicity, developmental toxicity, neurotoxicity, etc.
- Endpoints measured in toxicological studies can be grouped under the “icities”.
- Other relevant data can function as indicators of hazard traits
- Need to cover both human and ecological health

Workshop Purpose

- This workshop is focusing on human health hazard indicators that inform the toxicity of a chemical, especially in the absence of robust toxicological data.
- Bring together various experts to discuss what types of information or data are useful to describe hazard traits of chemical.

- A little background on Green Chemistry…..

What's Green Chemistry?

"Green chemistry is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products."

"Benign by Design"

Green Chemistry Theory and Practice

Anastus and Warner 1998

What's Green Chemistry?

- Pollution prevention at its core
- Changes the intrinsic nature of a product towards benign
- Design products to contain **inherently less hazardous materials**, breakdown to **environmentally innocuous chemicals**, be recyclable, **not persistent**, etc.
- Less focus on costly end-of-pipe controls (the current paradigm) and much more focus on front-end design.

12 Principles of Green Chemistry – a few paraphrased here

- Better to prevent waste than treat it later.
- Use and ***generate chemicals with little to no toxicity***
- Preserve efficacy of function while ***reducing toxicity***
- Produce "stuff" that breaks down to ***benign substances*** at the end of life

What is the Role of Toxicology in Green Chemistry?

- Primary Green Chemistry Principle is to use and generate *chemicals with little to no toxicity*
  - *Substitute "bad actor" with "safer" chemicals*
- **Need to know what constitutes a "safer" chemical**

But, so little data to decide what is a “safer” chemical

- **And, so many chemicals, so little time..(and lab animals, labs, scientists…)**

So,

- Green Chemistry is converging with the paradigm outlined in *Toxicity Testing in the 21st Century*, National Academy of Sciences, 2007

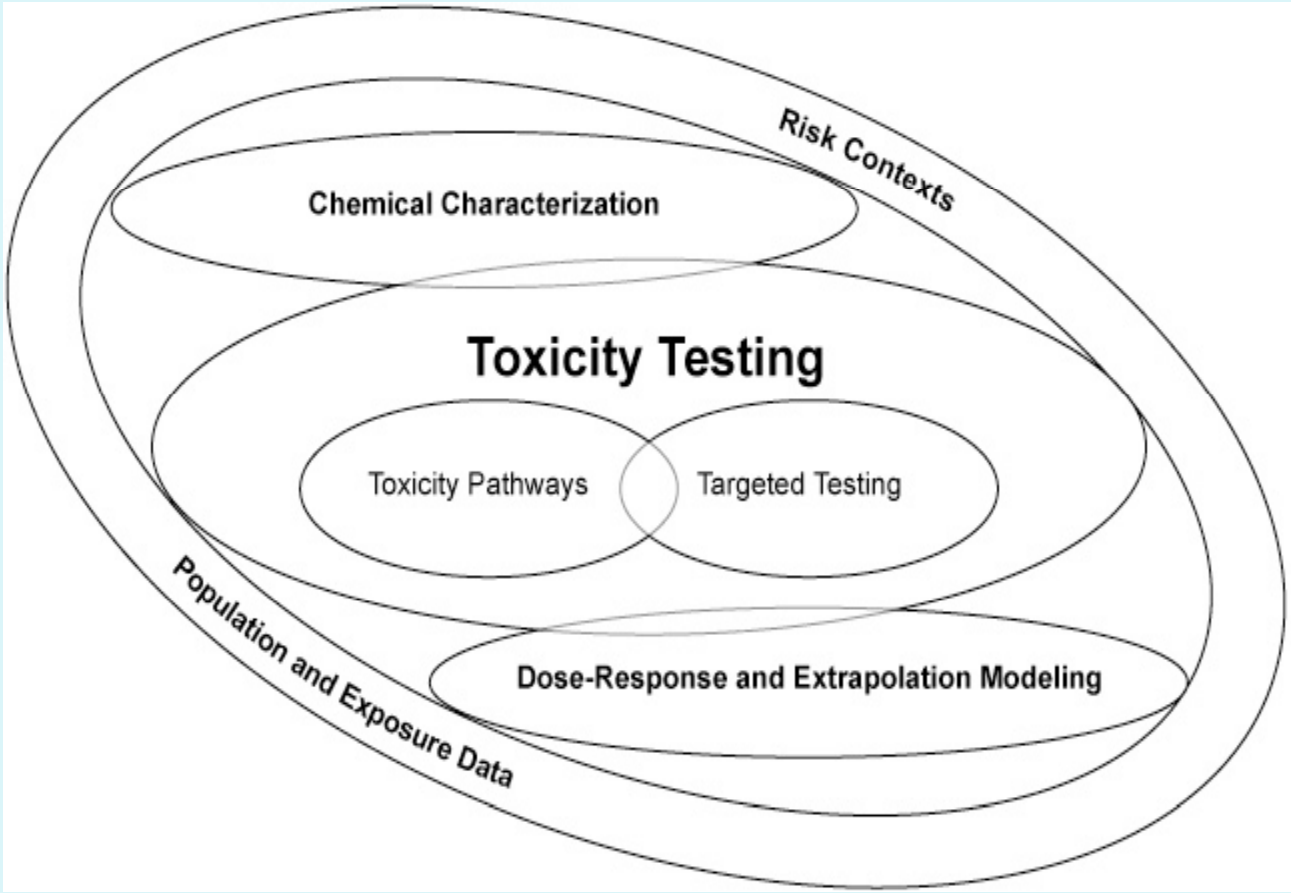
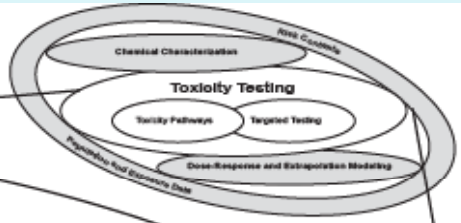


Figure 1. The committee's vision for toxicity testing is a process that can include chemical characterization, toxicity testing, and dose-response and extrapolation modeling as part of broader agency decision-making.

Toxicity Testing



Toxicity Pathways

- Evaluation of perturbations in toxicity pathways rather than apical end points.
- Emphasis on high-throughput approaches using cells or cell lines, preferably of human origin.
- Use of medium-throughput assays of more integrated cellular responses.

Targeted Testing

- Testing conducted to evaluate metabolites, assess target tissues, and develop understanding of affected cellular processes at genomics level.
- Limited types and duration of in vivo studies, focusing on up to 14-day exposures.
- More extensive testing for representative compounds in novel chemical classes.

Goals of this session

Explore:

- emerging methods to identify hazards (a la Tox21)
- inherent properties of chemicals indicating potential toxicity
- computational toxicology as a way to screen for hazard
- screening methods already in use in the pharmaceutical sector
- how the above can inform thinking about hazard indicators and hazard traits of chemicals