The emerging science of specifying & managing chemical classes
Perspectives from the National Academies of Sciences

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RESEARCH

Basic Science

Exposure Science

Epidemiology

Research Translation

CLINICAL ENGAGEMENT

POLICY

Transform Clinical Care and Public Policy

Healthy moms & kids

Transform Clinical Care and Public Policy
Roadmap

- Organohalogen flame retardant chemicals & Consumer Product Safety Commission (CPSC)
- National Academies of Sciences (NAS) 2019 report findings
2015 petition requests organohalogen flame retardant chemical class ban

Petitioners sought ban in children’s products, mattresses, furniture and electronics cases
Class definition: combination of structure and functional use

Organohalogen flame retardants

- Carbon (C)
- Chlorine (Cl)
- Bromine (Br)

* Lanthanide series
  - La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb

** Actinide series
  - Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No
2015 petition requests organohalogen flame retardant chemical class ban

Petitioners sought ban in children’s products, mattresses, furniture and electronics cases

2017: CPSC grants petition

Next step: How to make rule?

Petitioners sought ban in children’s products, mattresses, furniture and electronics cases
Organohalogen flame retardants are structurally diverse

Petition focus: non-polymeric, additive

PBDEs  Chlorinated phosphates  Cyclic aliphatic bromides

Cyclopentadiene derivatives  Brominated phthalates

How to assess as class?
Statement of task

“...develop a scientifically based scoping plan to assess additive, non-polymeric organohalogen flame retardants as a class for potential chronic health hazards under the Federal Hazardous Substances Act...”
“Chemotypes” used to divide into subclasses

100+ ‘seed’ flame retardant chemicals

Evaluate similarity by:
- Structure
- P-chem
- Biology

Not a single class

14 subclasses
Spectrum of data on subclasses

High agreement

1. Concordant data on many class members

2. Concordant data on a few class members

Low agreement

3. No relevant data on any members

Concordance

TOXICITY DATA

4. Discordant data on class members

Least data

Most data

NASEM 2019
Some options for discordant data

1. Policy decision: Precautionary-Highest hazard to subclass

2. Analyses: Attempt to resolve discordant data

3. Generate new data

4. Reclassify

NASEM 2019
## Class approach: benefits and challenges

<table>
<thead>
<tr>
<th>BENEFITS</th>
<th>CHALLENGES</th>
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<tr>
<td>Avoid regrettable substitution</td>
<td>Regulatory acceptance</td>
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<tr>
<td>More accurate evaluation—real-world cumulative exposures/ risks</td>
<td>Lack of data/ discordant data → policy/ value judgements</td>
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<tr>
<td>Improved efficiency and cost effectiveness</td>
<td>Specialized expertise required</td>
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NASEM 2019
Looking forward

“Sheer number of chemicals in use today demands a new approach to risk assessment...only possible practical approach [for a large set of chemicals] is a class approach.”
Program on Reproductive Health and the Environment

Thank you!

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