Managing PFASs with Class-Based and Essential Use Approaches

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From a refrigerant and an atomic bomb...
...to hundreds of consumer products
“Forever chemicals”

\[ \delta^+ \text{C} \rightarrow \delta^- \text{F} \]

One of the strongest bonds in chemistry, leads to environmental persistence
PFASs are widespread in...

- Environmental media (indoors and outdoors)
- Plants, animals, and humans
- Human food and drinking water
PFAS exposure is highly complex
PFASs can be grouped into 4 main subclasses:
Most of the research has focused on PFAAs

- Carcinogenicity
- Cardiovascular toxicity
- Developmental toxicity
- Endocrine toxicity
- Hepatotoxicity
- Immunotoxicity
- Nephrotoxicity
- Ocular toxicity
- Reproductive toxicity

- Environmental persistence
- Mobility in the environment
- Bioaccumulation
- Lactational and transplacental transfer

- Phytotoxicity and wildlife developmental, reproductive, and survival impairment
- Proteinophilic
- Can cross the blood-brain barrier
“All roads lead to PFAAs”
Over 80 percent of PFASs may degrade to PFAAs

TOWARD A NEW COMPREHENSIVE GLOBAL DATABASE OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFASs):

SUMMARY REPORT ON UPDATING THE OECD 2007 LIST OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFASs)

http://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/
PFAA precursors play a key role in exposure

McDonough et al. (2022) https://doi.org/10.1021/acs.est.2c00254
Different approaches to PFAS regulation

- **Single Chemical Approach**
  - PFOA and its salts

- **Chemical Mixture Approach**
  - PFOA plus several other PFASs

- **Class Approach**
  - All PFASs

**Arrowhead Approach**
- PFOA, its salts, and precursors
Regulating PFAS as a Chemical Class under the California Safer Consumer Products Program

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Abstract

**Background:** Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a group of manmade chemicals containing at least one fully fluorinated carbon atom. The widespread use, large number, and diverse chemical structures of PFAS pose challenges to any sufficiently protective regulation, emissions reduction, and remediation at contaminated sites. Regulating only a subset of PFAS has led to their replacement with other members of the class with similar hazards, that is, regrettable substitutions. Regulations that focus solely on perfluoroalkyl acids (PFAs) are ineffective, given that nearly all other PFAS can generate PFAs in the environment.

**Objectives:** In this commentary, we present the rationale adopted by the State of California's Department of Toxic Substances Control (DTSC) for regulating PFAS as a class in certain consumer products.

**Discussion:** We at the California DTSC propose regulating certain consumer products if they contain any member of the class of PFAS because: a) all PFAS, or their degradation, reaction, or metabolism products, display at least one common hazard trait according to the California Code of Regulations, namely environmental persistence; and b) certain key PFAS that are the degradation, reaction or metabolism products, or impurities of nearly all other PFAS display additional hazard traits, including toxicity: are widespread in the environment, humans, and biota; and will continue to cause adverse impacts for as long as any PFAS continue to be used. Regulating PFAS as a class is thus logical, necessary, and forward-thinking. This technical position may be helpful to other regulatory agencies in comprehensively addressing this large class of chemicals with common hazard traits.

https://doi.org/10.1289/EHP7431
The SCP regulatory framework

There are potential exposures to a Candidate Chemical in the product

AND

One or more exposures have the potential to contribute to or cause significant or widespread adverse impacts

California Code of Regulations, Title 22, Division 4.5, Chapters 54 and 55
“if a chemical is highly persistent, its continuous release will lead to continuously increasing contamination (...) [and] result in increasing probabilities of the occurrence of known and unknown effects.” (Cousins et al. 2019)

“Because persistence is an inherent property of a chemical in the environment that results in increased exposure to the chemical and consequently potential for health risks, it can appropriately be identified as a hazard trait.” (OEHHA 2012)
Priority Product as of July 1, 2021: Carpets and Rugs with PFASs

In California, 75% (257 million pounds) of the carpet discarded in 2016 was landfilled.

https://calsafer.dtsc.ca.gov/cms/commentpackage/?rid=12751
Priority Product as of April 1, 2022

Treatments with PFASs for use on converted textiles or leathers

https://calsafer.dtsc.ca.gov/cms/commentpackage/?rid=12759
AB 1200 (Ting) bans plant fiber-based food packaging with intentionally added PFASs as of January 1, 2023

https://dtsc.ca.gov/scp/food-packaging-containing-pfass/
Other PFAS product bans in California

- Class B firefighting foam as of January 1, 2022 (SB 1044, Allen)
- Juvenile products as of July 1, 2023 (AB 652, Friedman)
- Textile articles as of January 1, 2025 (AB 1817, Ting & Garcia)
- Cosmetics as of January 1, 2025 (AB 2771, Friedman)
Are all these PFAS uses essential?

The essential-use approach

The use, function, or service provided by a chemical may be essential, but **not the chemical itself**!

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>PFAS examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uses that are not essential for health and safety, and the functioning of society. The use of substances is driven primarily by market opportunity.</td>
<td>Dental floss, water repellent surfer shorts, ski waxes</td>
</tr>
<tr>
<td>2</td>
<td>Uses that have come to be regarded as essential by society because they perform important functions, but where alternatives to the substances have now been developed that have equivalent functionality, which makes those uses of the substances no longer essential.</td>
<td>Most uses of AFFFs, certain water-resistant textiles.</td>
</tr>
<tr>
<td>3</td>
<td>Uses considered essential by society because they are necessary for health or safety or other highly important purposes <em>and for which alternatives are not yet established.</em></td>
<td>Certain medical devices, occupational protective clothing.</td>
</tr>
</tbody>
</table>

* This essentiality should not be considered permanent, rather, a constant pressure is needed to search for alternatives in order to move these uses into Category 2 above.

SCP’s menu of options through 2023

Building Products and Materials Used in Construction and Renovation

Beauty, Personal Care, and Hygiene Products

Food Packaging

Children’s Products

Motor Vehicle Tires

Cleaning Products


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Thank you!

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