The webinar will begin shortly.

Per- and Polyfluoroalkyl Substances in Food Packaging Alternatives Assessment

June 6, 2022
Webinar logistics

• Technical issues? Send to **host** in chat
• Questions/comments? Send to **everyone** in chat
• We will address at the end during discussion
• Raise hand to share verbal input or ask questions
Per- and Polyfluoroalkyl Substances in Food Packaging Alternatives Assessment

June 6, 2022
1. Regulatory overview and statutory requirements
2. Background and first assessment summary
3. Scope of second assessment
4. Second assessment findings
5. Next steps and third assessment
6. Questions and discussion
ESHB 2658 (2018)—what it does

• Codified at RCW 70A.222.070
• In WA, prohibits sale of food packaging with intentionally added PFAS
• Prohibitions are by “specific food packaging application,” not all packaging generally

• BEFORE restriction can take effect, Ecology must:
  • Identify safer alternatives are available
  • Publish findings in Washington State Register
  • Submit report to the Legislature
Statutory elements—determinations

• Must make determinations using alternatives assessment
  • Must evaluate less toxic chemicals and nonchemical alternatives
  • Must follow Interstate Chemicals Clearinghouse (IC2) guidelines
  • Must use IC2 modules to evaluate alternatives for:
    • Chemical hazards
    • Exposure
    • Performance
    • Cost
    • Availability

• External peer review must support results
  • For second assessment, used IC2
Definitions

• "Perfluoroalkyl and polyfluoroalkyl substances" or "PFAS chemicals":
  • A class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom

• Food package:
  • Intended for direct food contact
  • Comprised, in substantial part, of paper, paperboard, or other materials originally derived from plant fibers
First PFAS in Food Packaging Alternatives Assessment
Scope

- PFAS provide oil, grease, and water resistance to packaging
- Applied to surface or into plant fiber slurry
- Considered PFAS common in fiber-based food packaging:
  - Side-chain fluorinated polymers
    - Chemical manufacturers voluntarily phasing out several of these
  - Perfluoropolyethers
  - Residual PFAS
Alternatives assessments

- Alternatives assessment framework focuses on reducing risk by avoiding exposure to hazardous chemicals.
- Identify safer alternatives that are:
  - Commercially available
  - Technically and economically feasible

Hazard → Exposure → Risk

Waste Management Hierarchy

- Source reduction and reuse
- Recycling and composting
- Energy recovery
- Treatment
- Disposal and release

Preferable → Less preferable
IC2 AA Guide 1.1 evaluation process

What will be evaluated

| Food packaging applications | Alternatives |

Modules to evaluate alternatives

| Hazard | Performance evaluation | Cost and availability | Exposure assessment |

Determinations reached

| Meets statutory definition of safer alternative | Insufficient data to reach conclusion | Known to not meet statutory definition of safer—fails at least one module |
Stakeholder involvement

• Stakeholders include:
  • Chemical and packaging manufacturers
  • Nonprofits
  • Trade organizations
  • State, local, federal government
  • Product users

• Provided input on:
  • Project scope
  • Evaluation methodologies
  • PFAS and alternative technologies
First AA scope

Identified ten food packaging applications from three categories.

<table>
<thead>
<tr>
<th>Category 1: Food contact paper</th>
<th>Category 2: Dinnerware</th>
<th>Category 3: Take-out containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wraps and liners</td>
<td>• Plates</td>
<td>• Pizza boxes</td>
</tr>
<tr>
<td>• Bags and sleeves</td>
<td>• Bowls</td>
<td>• French fry cartons</td>
</tr>
<tr>
<td></td>
<td>• Trays</td>
<td>• Clamshells</td>
</tr>
<tr>
<td></td>
<td>• Food boats</td>
<td>• Interlocking folded</td>
</tr>
<tr>
<td></td>
<td></td>
<td>containers</td>
</tr>
</tbody>
</table>
# Alternative substances reviewed

<table>
<thead>
<tr>
<th>Alternative substance</th>
<th>Alternative substance type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncoated paper</td>
<td>Process</td>
</tr>
<tr>
<td>Petroleum-based waxes</td>
<td>Chemical</td>
</tr>
<tr>
<td>Bio-based waxes</td>
<td>Chemical</td>
</tr>
<tr>
<td>Kaolin clay</td>
<td>Chemical</td>
</tr>
<tr>
<td>PVOH—polyvinyl alcohol</td>
<td>Chemical</td>
</tr>
<tr>
<td>Siloxanes (based on vinyl silicone polymer)</td>
<td>Chemical</td>
</tr>
<tr>
<td>PLA—polylactide (based on degradation and residual breakdown products)</td>
<td>Chemical or material</td>
</tr>
<tr>
<td>PE—polyethylene</td>
<td>Chemical</td>
</tr>
<tr>
<td>PET—polyethylene terephthalate</td>
<td>Chemical</td>
</tr>
<tr>
<td>EVOH—ethylene vinyl alcohol</td>
<td>Chemical</td>
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</table>
## Findings: Food packaging applications

<table>
<thead>
<tr>
<th>Application reviewed</th>
<th>Determination</th>
</tr>
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<tbody>
<tr>
<td>Wraps and liners</td>
<td>Wax-coated alternatives safer</td>
</tr>
<tr>
<td>Bags and sleeves</td>
<td>Insufficient information available</td>
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<tr>
<td>Interlocking folded containers</td>
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</table>
First assessment impact

• Ecology submitted report in February 2021
• Effective date of prohibition is February 2023
• Applies only to:
  • Wraps and liners
  • Plates
  • Food boats
  • Pizza boxes
Second assessment purpose

• Collect new information and address data gaps for these applications
• Focused on six applications where we did not identify safer alternatives in first assessment:
  • Bags and sleeves
  • Bowls
  • Trays
  • French fry cartons
  • Clamshells
  • Interlocking folded containers
Feedback addressed in second assessment

• Revised definitions of food packaging applications:
  • Original definitions focused on both similar structure and function
  • Examined when packaging products are used interchangeably

• Assessed PFAS as a group

• Revised method for determining cost
Second Assessment Scope
General process: Second assessment

<table>
<thead>
<tr>
<th>Identify scope of work (what we are assessing)</th>
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<th>Initial evaluation (hazard assessment)</th>
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<td>Alternatives that are less hazardous than PFAS</td>
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<th>Other evaluations (simultaneously)</th>
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<td>Performance</td>
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</table>
Defining “specific food packaging applications”

- Bags and sleeves
- Bowls: Bowls, portion cups
- Open-top containers: French fry cartons, paper trays*

*Bowls, bags, or sleeves can function as open-top containers
Defining “specific food packaging applications”

- Closed containers: Clamshells, bakery boxes, deli containers
- Flat serviceware: Plates, cafeteria-style trays
## Alternative substances reviewed

We added several alternatives based on stakeholder input

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<td>PVOH—polyvinyl alcohol</td>
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<td>Siloxanes</td>
<td>Chemical</td>
</tr>
<tr>
<td>PLA—polylactide</td>
<td>Chemical or material</td>
</tr>
<tr>
<td>PE—polyethylene (multiple forms)</td>
<td>Chemical or material</td>
</tr>
<tr>
<td>PET—polyethylene terephthalate</td>
<td>Chemical or material</td>
</tr>
<tr>
<td>PP—polypropylene (alone or as composite with talc)</td>
<td>Chemical or material</td>
</tr>
<tr>
<td>EVOH—ethylene vinyl alcohol</td>
<td>Chemical</td>
</tr>
<tr>
<td>Aluminum metal</td>
<td>Material</td>
</tr>
</tbody>
</table>
Talking about alternatives

PLA
• Can be chemical (PLA-coated paper) or material (PLA Foam)
• Hazard
• Exposure

PLA Foam Tray
• Performance
• Cost
• Availability
Second Assessment
Findings
General process: Second assessment

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Hazard module

- Based on IC2 Guide Level 2 Hazard Module
- “Data rich PFAS” are chemicals that meet our definition of PFAS with well characterized hazards

*Multiple Chemical Abstract Services Registration Numbers can be used in a single alternatives evaluation
Hazard module

GreenScreen for Safer Chemicals® evaluation

• Based on EPA Safer Choice hazard criteria

• 18 endpoints for human and environmental health

• Translates into four benchmarks from 1 (Avoid) to 4 (Prefer)
Hazard module

• Considered GreenScreen® or equivalent hazard assessment
• Criteria for equivalent hazard assessment included:
  • Ingredient disclosure
  • Hazard endpoint transparency and equivalency to 18 GreenScreen hazard endpoints
  • Assessment method transparency and equivalency
  • Transparency in the process for assessment and re-assessment
  • Independent third-party review
• Identified Scivera GHS+ and ChemFORWARD as equivalent sources for hazard assessments
Findings: Hazard module

EPA Safer Chemicals Ingredients List

- Assessed using EPA Safer Choice hazard criteria
- Only chemicals listed with “green circle” designated low concern
  - Indicating they are less hazardous than PFAS

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<tr>
<td>Uncoated paper</td>
<td>Low concern</td>
</tr>
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<td>Petroleum-based or bio-based waxes</td>
<td>Low concern</td>
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<td>Low concern</td>
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<td>PVOH—polyvinyl alcohol</td>
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</table>
Findings: Hazard module

Based on evaluation of data rich PFAS, alternatives must score the equivalent of BM-2 or better to be less hazardous than PFAS

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<tr>
<td>Siloxanes (based on vinyl silicone polymer)</td>
<td>NOT less hazardous than PFAS—not assessed further</td>
</tr>
<tr>
<td>PLA—polylactide (based on components of polymer)</td>
<td>Less hazardous than PFAS—low concern</td>
</tr>
<tr>
<td>PE—polyethylene (LDPE, based on components of polymer)</td>
<td>Less hazardous than PFAS</td>
</tr>
<tr>
<td>PE (other forms, based on components of polymer)</td>
<td>Not enough information—not assessed further</td>
</tr>
<tr>
<td>PET—polyethylene terephthalate</td>
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General process: Second assessment

Identify scope of work (what we are assessing)

- Food packaging applications
- Alternatives

Initial evaluation (hazard assessment)

- Alternatives that are less hazardous than PFAS

Other evaluations (simultaneously)

- Performance
- Cost and availability
- Exposure

Determinations reached

- Meets statutory definition of safer alternative
- Insufficient data to reach conclusion
- Known to not meet statutory definition of safer—fails at least one module
Exposure module

• Based on IC2 Guide Level 1 Exposure Assessment Module
• Compares chemicals by evaluating differences in:
  • Chemical properties
  • Exposure pathways
  • Exposure concerns
• Goal: Identify exposure concerns that might change our decision on whether alternative is safer than PFAS
• If we determined the alternative was of low concern during the hazard evaluation, skipped exposure evaluation
  • EPA SCIL green circle, Benchmark-3, -4, or equivalent
Findings: Exposure module

• Evaluated three alternatives:
  • Aluminum
  • Polyethylene
  • Polypropylene

• Based on available data, determined aluminum is likely to have similar exposure concerns to PFAS

• Not enough data to evaluate exposure pathways for polyethylene and polypropylene
Performance module

• Beyond IC2 Guide: Alternatives should “perform as well as or better than PFAS chemicals”

• Based on the IC2 Guide Level 1 Performance Assessment Module:
  • Is the alternative being used for the same or similar function?
  • Is the alternative available on the commercial market?
  • Do promotional materials state this alternative provides the desired function?

• If performance was unclear after answering these questions, we answered more guiding questions
Findings: Performance module

• Performance requirements
  • Oil and grease resistance (all)
  • Leak/spill resistance (as applicable)

• Findings
  • Generally found alternatives functionally equivalent to PFAS-containing food packaging
  • Rigid polylactic acid (PLA) plastic products had limited performance
    • Temperature dependent
  • Certain untreated paper materials did not meet performance requirements for these types of food packaging
Cost and availability module

- Beyond IC2 Guide
  - “Safer alternatives must be readily available in sufficient quantity and at a comparable cost”
- Based on the IC2 Guide Level 1 Cost and Availability Module
  - Is the alternative currently used in the application of interest?
  - Is the alternative currently offered for sale for the application of interest? Is the price of the alternative close to the current?
Cost and availability module

• Stakeholder feedback about cost evaluation in first assessment
  • Packaging costs didn’t account for other costs:
    • Health
    • Environmental impact
    • Cost to switch
  • Prices don’t reflect the market or changes in market well

• Changed evaluation to whether packaging manufacturers currently use the alternative to make specific types of food packaging

• New approach presumes manufacturers would not use an alternative substance that is not available and cost comparable for them
Findings: Cost and availability module

• Found PFAS-free food packaging products in all applications we considered
• For each type of food packaging, identified at least three alternatives multiple manufacturers use
• PLA raw material shortage no longer a concern
Reusable options

• Findings similar to first assessment
  • Availability of reusable options depends on:
    • Food packaging type
    • Location
    • Access to additional equipment
  • Reusable dinnerware is readily available
  • Many businesses use reusable dinnerware as a cost competitive option

• Conclusion: Reusable bowls, flat serviceware, and open-top containers are a favorable option for some
## General process: Second assessment

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<tr>
<td>Known to not meet statutory definition of safer—alternative not less hazardous</td>
</tr>
</tbody>
</table>

Known to not meet statutory definition of safer—alternative not less hazardous
Findings: Simultaneous assessment

To qualify as a safer alternative, a product or substance:

- Is **less hazardous** than the PFAS option
- Shows similar or **improved exposure concerns** than the PFAS option (if required)
- “**Performs** as well or better than the PFAS option”
- Is “**readily available** in sufficient quantity”
- Is available “at a **comparable cost**”
**Example: Simultaneous assessment**

Alternative product: Wax-coated bags and sleeves

<table>
<thead>
<tr>
<th>Application and alternative reviewed</th>
<th>Hazard module</th>
<th>Exposure assessment module</th>
<th>Performance evaluation module</th>
<th>Cost and availability module</th>
<th>Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bags and sleeves, wax-coated</td>
<td>U.S. EPA Safer Choice—Low concern</td>
<td>Low concern—Not applicable</td>
<td>Favorable</td>
<td>Favorable</td>
<td>Wax-coated alternatives meet criteria</td>
</tr>
</tbody>
</table>
## Conclusions

<table>
<thead>
<tr>
<th>Food packaging application</th>
<th>Total number identified</th>
<th>Densified paper</th>
<th>Wax-coated</th>
<th>Clay-coated</th>
<th>PLA-coated</th>
<th>PLA foam</th>
<th>Aluminum</th>
<th>Reusable versions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bags and sleeves</td>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bowls</td>
<td>4</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Flat serviceware</td>
<td>4</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Open-top containers</td>
<td>7</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Closed containers</td>
<td>4</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
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Final considerations

• Challenges remain
  • Access to proprietary information such as alternative substance formulations
  • Knowledge of fundamental product information
    • Such as the identity of the alternative product (when labeled generically)

• Companies switching from PFAS can use this assessment to identify safer alternatives
  • May need more information to choose alternatives
Next Steps and Third Assessment
Sale and distribution prohibition

• Ecology submitted report in May 2022
• Effective date of prohibition is May 2024
• Applies to:
  • Bags and sleeves
  • Bowls
  • Flat serviceware (such as trays)
  • Open-top containers (such as fry cartons)
  • Closed containers (such as clamshells)
Next step: Third assessment

• First and second assessment covered packaging that holds food for less than 1 week

• Third assessment looking at pre-packaged food
  • Packaging holding food for much longer (days to weeks or years)
  • Packaging involved in cooking or heating products
Next step: Third assessment

- Focused on packaging “comprised, in substantial part, of paper, paperboard, or other materials originally derived from plant fibers”

- Possible packaging types we may include:
  - Microwaveable popcorn bags
  - Wrappers for butter or other foods
  - Baking paper
  - Pet food bags
Get involved!

• Join our mailing list
  https://public.govdelivery.com/accounts/WAECY/subscriber/new?topic_id=WAECY_30

• To suggest products we should assess, contact Rae Eaton
  rae.eaton@ecy.wa.gov

• For compliance questions, contact Kathleen Gilligan
  kathleen.gilligan@ecy.wa.gov
Alternatives assessment team

• Ecology team
  • Rae Eaton, Minerva Teli, Marissa Smith, Craig Manahan, Kimberly Goetz, Lauren Tamboer, Autumn Falls, Amber Sergent

• Washington State Department of Health
  • Holly Davies
Questions?

Contact us!


Rae Eaton: rae.eaton@ecy.wa.gov