



## **Risk Evaluation Gone Awry?**

# **US EPA's Draft Risk Evaluation for Formaldehyde**

Presentation to the AHFA Regulatory Summit  
August 6, 2024

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# Intrinsic reviewed the Draft Risk Evaluation on Behalf of the AHFA, IWPA and NRF

- AHFA is the voice of the U.S. residential furniture industry, representing more than 200 of the industry's leading manufacturers and importers.
- IWPA is the leading international trade association for the North American imported wood products industry.
- NRF, the world's largest retail trade association, passionately advocates for the people, brands, policies and ideas that help retail succeed.
  
- Intrinsic is a science-based consulting firm
- 80 employees including 8 DABTs, 6 ERTs, 10 PhDs, Occupational Physician
- Elliot Sigal, B.Sc.(Hon.), QPRA, UKRT, ERT
- Vice President and Senior Toxicologist – Intrinsic Corp.
- 30+ years of experience in risk assessment and toxicology, specializing in human health related issues, exposure assessment and risk communications

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# Summary of Comments

- In the final risk evaluation, EPA should find and state with clarity that exposure to formaldehyde from the COU for wood articles in residences, including furniture, upholstered furniture, mattresses, furnishings, and other interior wood finishes, **does not present** an unreasonable risk of injury to human health.
- This determination should expressly apply to all types of risk (acute, chronic, and cancer), all exposures (consumers, the general population and occupational), and across all potential pathways (dermal and inhalation).
- The EPA risk evaluation must be based on the “best available science” and rely on sound and credible science.
- The risk evaluation should have considered the actual data available regarding furniture and furniture manufacturing

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# Focus of Review

- The EPA risk evaluation consisted of approximately 50 separate documents
- Our review focused on the following:
  - Draft Consumer Exposure Assessment for Formaldehyde and supporting spreadsheets
  - Draft Indoor Air Exposure Assessment for Formaldehyde and supporting spreadsheets
  - Unreasonable Risk Determination of the Draft Risk Evaluation for Formaldehyde
  - Draft Occupational Exposure Assessment for Formaldehyde and supporting spreadsheets
- EPA focused on the following furniture related exposure scenarios
  - Plastic articles: foam insulation (Living room)/Foam seating (residential)
  - Fabrics: furniture covers, car seat covers, tablecloth (living room)
  - Furniture and furnishings – wood articles: furniture
  - Occupational exposures

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# Condition Of Use (COU)

- The EPA has included furniture related items in the following consumer use Conditions of Use (COU) categories/subcategories:
  - Consumer Uses: Chemical substances in furnishing treatment/care products: Floor coverings; Foam seating and bedding products; Cleaning and furniture care products; Furniture & furnishings including stone, plaster, cement, glass and ceramic articles; metal articles; or rubber articles
  - Consumer Uses: Chemical substances in furnishing treatment/care products: Fabric, textile, and leather products not covered elsewhere
- These COU resulted in the evaluation of the following furniture related exposure scenarios:
  - Plastic articles: foam insulation (Living room)/Foam seating (residential)
  - Fabrics: furniture covers, car seat covers, tablecloth (living room)
  - Furniture and furnishings – wood articles: furniture

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# SCCC comment on Condition Of Use (COU)

- Wood articles, including home furniture, furnishings, and other interior wood finishes, need to be considered in a separate condition of use (“COU”)
- Currently, EPA has incorrectly placed “wood articles: hardwood floors, furniture and foam seating” into the same category as cleaning products
- The estimated 15-minute peak concentrations for items in this category were:
  - Foam seating: consumer – 4.91 ppm; bystander - 0.49 ppm
  - Wood articles: consumer – 2.04 ppm; bystander - 0.2 ppm
  - Drain and toilet cleaners: consumer - 49.8 ppm; bystander - 41 ppm
- “Furniture seat coverings” are improperly combined with automotive seat coverings.

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# Consumer/Indoor Air Exposure

- The data show that formaldehyde emissions from furniture, including component parts such as fabric, foam and composite wood elements, along with associated furnishings are lower than the benchmarks EPA has proposed for acute and chronic exposure.
- Recent data are the best available information for EPA's risk evaluation.
- This data should include testing conducted on wood articles that meet EPA's strict TSCA Title VI emission standards and emission levels from assembled furniture with coatings on the composite wood panels.
  - EPA relied on a calculated analysis based on deconstructed wood articles, instead of assembled wood products with some form of finish, laminate, painting, or coating
  - EPA acknowledges that their CEM model is unable to account for emission decay

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# Foam Seating (Residential)

- EPA considered formaldehyde exposure from foam seating in the draft risk evaluation
- EPA states that they had a low confidence in the assessment of potential exposures from furniture foam insulation scenarios because formaldehyde exposures from such products are expected to be minimal
- The available information/data support this conclusion
  - Many furniture foams are manufactured without formaldehyde. For example, slabstock and molded flexible polyurethane foam, including memory foam used in furniture products, is certified through the CertiPUR-US® program. The results of 1800 analytical tests for formaldehyde emissions have revealed no failures of the formaldehyde limit of 0.1 mg/m<sup>3</sup> since data collecting started in 2015. Emissions ranged between 0.0001 mg/m<sup>3</sup> and 0.061 mg/m<sup>3</sup> with an average emission rate of 0.004 mg/m<sup>3</sup>.
  - AHFA had Benchmark conduct chamber tests on foam samples. Emission rates at all time points was <24 µg/m<sup>3</sup>·hr (<0.024 mg/m<sup>3</sup>·hr). These test results are consistent with those reported by the CertiPUR-US® program and provide further evidence of very low level formaldehyde emissions from foam-based products



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# Fabrics: Furniture Covers, Car Seat Covers, Tablecloth (Living Room)

- The data demonstrates the furniture seat covers (residential) do not contribute to the unreasonable risk determination
- Only small amounts of formaldehyde are emitted into the air from textiles and fabric materials are not expected to significantly increase the formaldehyde concentration in room air
- Benchmark conducted chamber testing of fabric and leather samples

Sample Description	Air Sampling Time Point (hours)	Calculated Emission Factor
Valdero Fog (Leather from kit)	24	14 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$
	72	6.6 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$
	96	4.9 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$
Brogan Bay (Cloth from kit)	24	19 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$
	72	5.4 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$
	96	4.2 $\mu\text{g}/\text{m}^2 \cdot \text{hr}$

- These test results are similar to or less than the median emission rates reported by EPA providing further evidence that furniture seat coverings result in very low levels of formaldehyde emissions

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# Furniture and Furnishings – Wood Articles: Furniture

- The Draft Risk Evaluation indicates 15-minute peak formaldehyde concentrations from wood articles: furniture exceeds the Acute benchmark established by EPA
- EPA failed to consider recent literature and data generated by AHFA, and others, to illustrate the differences in formaldehyde emission from composite wood products and finished furniture products containing composite wood products. In addition, EPA failed to account for emission decay and emission reductions due to coverings and coatings
- By failing to account for these emission reduction factors, EPA overstates wood furniture related exposures and incorrectly concludes that furniture and furnishings – wood articles: furniture contribute to an unreasonable risk determination for formaldehyde
- The weight of scientific evidence supports the conclusion that exposure in residences from wood furniture containing composite wood does not contribute to the unreasonable risk of formaldehyde

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# Why Are We Concerned About Formaldehyde

- Formaldehyde can be a constituent of materials such as the resins used in the manufacture of composite wood products (i.e., hardwood plywood, particleboard and medium-density fiberboard), fiberglass acoustic insulation, glues, fabrics, paints and coatings, lacquers and finishes, and paper products, all commonly used to produce home furnishings
- Due to the volatility of formaldehyde, the primary concern related to formaldehyde in composite wood products is the potential inhalation of vapors released from products to indoor air, a process commonly known as off-gassing
- Historically this may have been a concern but...
  - Formaldehyde in composite wood is Federally and State regulated (TSCA Title VI and CARB 2)
  - Composite wood emissions  $\neq$  finished furniture emissions
  - Emission rates decay over time
  - Wood/furniture finishing reduces emissions significantly

# Deconstructed Wood Articles vs. Assembled Wood Products

Furniture Description	Predicted Exposure Concentration			
	Composite Wood Estimates (modeled)		Chamber Study Estimates (measured)	
	$\mu\text{g}/\text{m}^3$	ppb	$\mu\text{g}/\text{m}^3$	ppb
<b>Shabby 1 Drawer Elegance Cabinet</b>	<b>40</b>	<b>32</b>	<b>4.2</b>	<b>3</b>
<b>Winston End Table</b>	<b>35</b>	<b>29</b>	<b>18.2</b>	<b>15</b>
<b>Alligton 2 Drawer Nightstand</b>	<b>29</b>	<b>23</b>	<b>8.2</b>	<b>7</b>
<b>Mission 2 Door Corner Cabinet</b>	<b>62</b>	<b>50</b>	<b>13.9</b>	<b>11</b>
<b>Small Furniture Set (7 piece)</b>	<b>303</b>	<b>247</b>	<b>60.5</b>	<b>50</b>
<b>Large Furniture Set (12 piece)</b>	<b>387</b>	<b>315</b>	<b>40.8</b>	<b>33</b>
FEMA Trailer 1	231	188	NA	NA
FEMA Trailer 2	70	57	NA	NA
FEMA Trailer 3	35	29	NA	NA
FEMA Trailer 4	298	243	NA	NA

- Actual emissions from assembled wood products are a small fraction of deconstructed panels relied on by EPA

# Finished Furniture

Furniture Description	Product Composition	Measured/Allowable Emission Factor	Product/Wood Surface Area	Predicted Room Concentration*		Concentration Reduction
		µg/m <sup>2</sup> *hr	m <sup>2</sup>	µg/m <sup>3</sup>	ppm	%
Shabby 1 Drawer Elegance Cabinet, 39093	<b>Piece</b>	<b>29.2</b>	<b>2.3</b>	<b>4.3</b>	<b>0.003</b>	89.3%
	MDF	260	1.84	40	0.032	
	Thin MDF	307	0.47			
Winston End Table, TY-ET820 MISOK	<b>Piece</b>	<b>100.4</b>	<b>2.8</b>	<b>18</b>	<b>0.015</b>	48.6%
	Particleboard	128	1.27	35	0.029	
	MDF	260	1.5			
Alligton 2 Drawer Nightstand, 13911	<b>Piece</b>	<b>68.4</b>	<b>1.9</b>	<b>8</b>	<b>0.007</b>	72.4%
	Particleboard	128	0.68	29	0.023	
	MDF	260	0.32			
	Thin MDF	307	0.90			
Mission 2 Door Corner Cabinet, 70680OAK	<b>Piece</b>	<b>57.2</b>	<b>3.81</b>	<b>14</b>	<b>0.011</b>	77.4%
	Particleboard	128	0.05	62	0.050	
	MDF	260	2.34			
	Thin MDF	307	0.97			
Small Furniture Set	<b>7 Piece Set</b>	<b>25.2</b>	<b>38</b>	<b>61</b>	<b>0.050</b>	79.9%
	Plywood	32	18.52	303	0.247	
	Particleboard	128	8.17			
	MDF	260	7.68			
	Thin MDF	307	3.64			
Large Furniture Set	<b>12 Piece Set</b>	<b>24.8</b>	<b>61.6</b>	<b>41</b>	<b>0.033</b>	89.4%
	Plywood	32	9.218	388	0.315	
	Particleboard	128	1.748			
	MDF	260	33.658			
	Thin MDF	307	17.005			

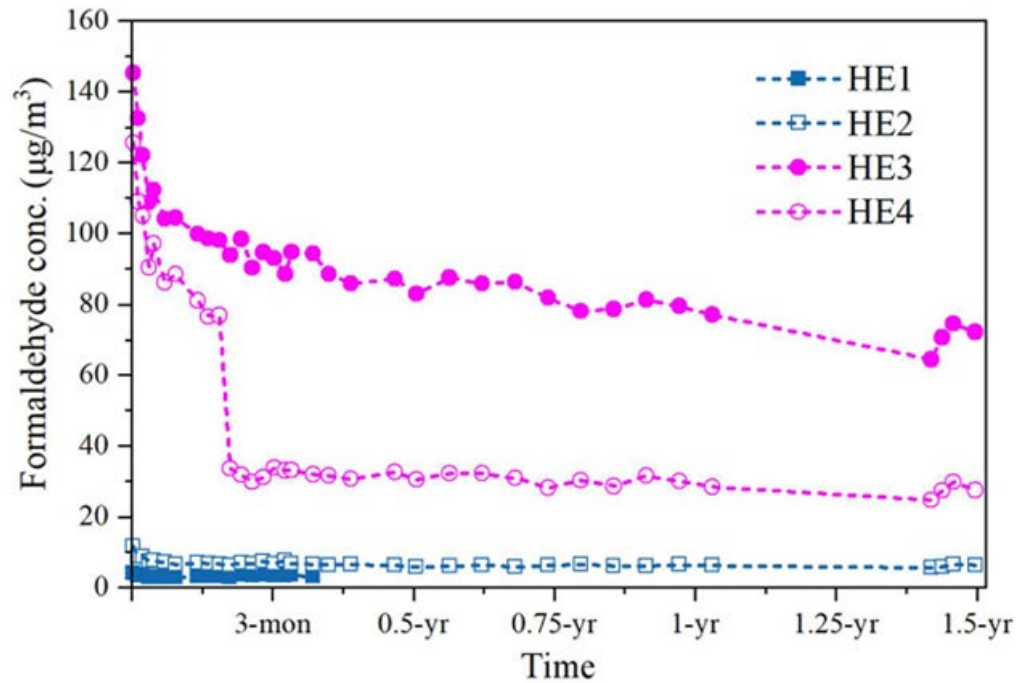
- Chamber studies demonstrate 50-90% lower emissions for finished goods than unassembled panels that meet TSCA Title VI

# Emission Barrier Effectiveness

Effectiveness	Material Designation	Type
Range - 80 thru 95+ %	Acrylate, UV cured	Coating
	Acrylic, electronic cured	Coating
	Alcohol sealer	Coating
	Alkyd	Coating
	Alkyd and latex	Coating
	High pressure laminates	Thin Laminate
	Thermally Fused Laminate (TFL)	Thin Laminate
	Phenol backer sheets	Thin Laminate
	Polyester low pressure laminates	Thin Laminate
	(Polyester saturated paper)	
	Polyurethane, two component	Coating
	(water-based)	
	Polyvinyl acetate	Coating
Powder Coatings	Coating	
Vinyl laminates	Thin Laminate	
Range - 70 thru 90+ %	Alkyd primer sealer Coating	Coating
	Polyurethane Coating	Coating
	Vinyl coated papers	Thin Laminate
Range - Above 50 %	Polyethylene films Thin Laminate	Thin Laminate
	Foils	Thin Laminate
Laminates that can achieve 80% and greater effectiveness when used in combination with coatings	Paper laminates Thin Laminate	Thin Laminate
	Paper, low basis weight Thin Laminate	Thin Laminate
	Veneers	Wood Veneer
Materials that are effective in reducing emissions of VOCs or are low in VOC content	High pressure laminates Thick Laminate	Thick Laminate
	High solids liquid coatings Coating	Thin Laminate
	Thermally Fused Laminate (TFL) Thin Laminate	Coating
	Vinyl, certain films Thick/Thin Laminate	Thick/Thin Laminate
	Veneers	Wood Veneer

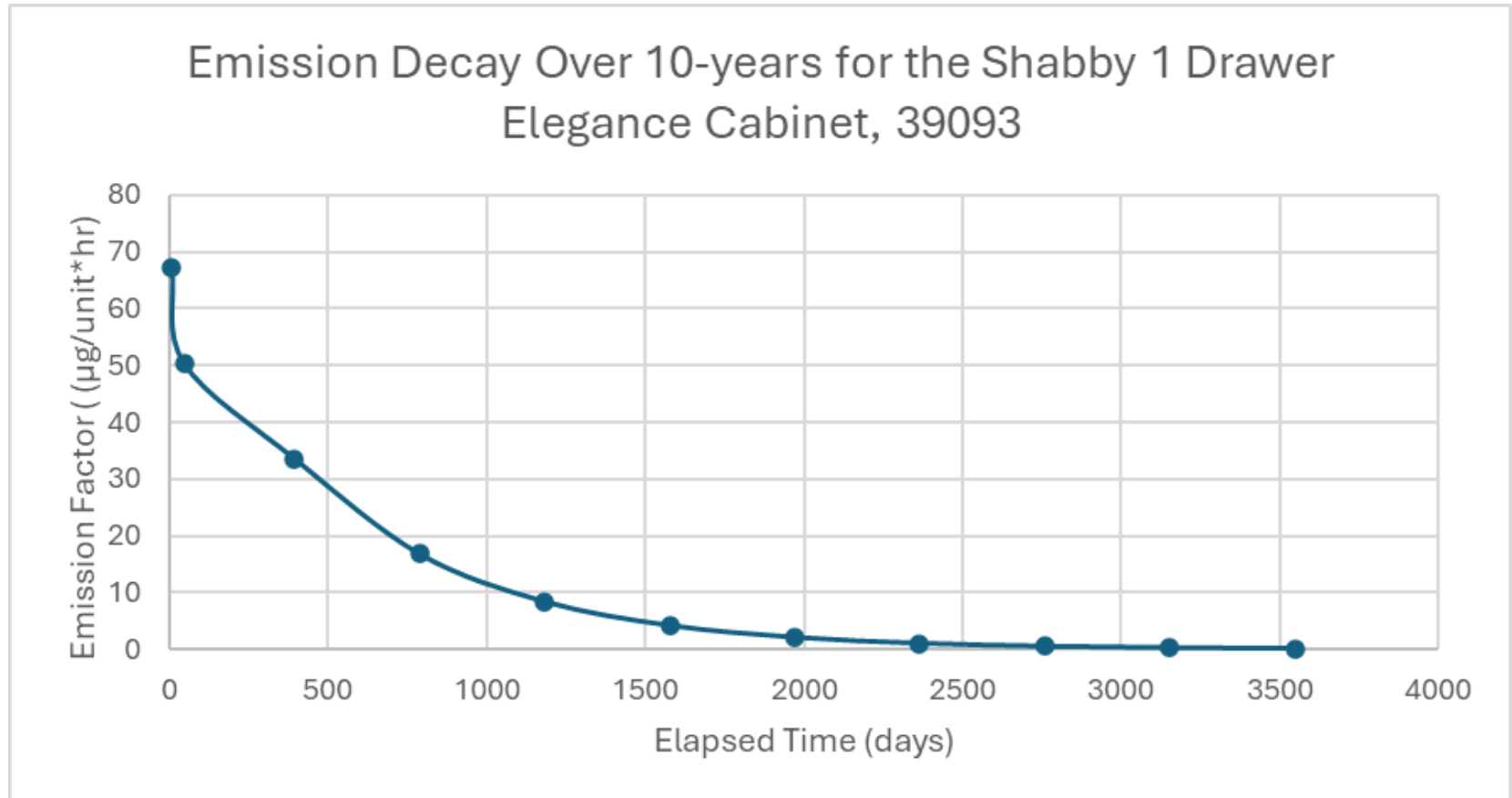
- CPA studies demonstrate laminates, coatings are 70-95+% effective at reducing potential emissions from panels

# Emission Decay



- EPA acknowledges that their CEM model is unable to account for emission decay

# Long-term Decay



- Chronic exposure evaluation for endpoints such as cancer must account for long-term emission decay



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# Occupational Exposure

- EPA has also established OELs for formaldehyde that are well below current standards
- EPA has the regulatory authority to impose their OELs on other federal agencies

	US EPA	NIOSH	OSHA	ACGIH
TWA (8-hour)	11 ppb	16 ppb	750 ppb	100 ppb
STEL (15-min)	50 ppb	100 ppb	2000 ppb	300 ppb

- Most workplaces currently follow the OSHA standards
- It will be difficult to attain the 'new' EPA standards without extensive upgrades and/or PPE use
- ACC recommends a TWA of 300 ppm which is consistent with a recently derived ECHA value

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# EPA OELs

- The Occupational OELs derived by EPA are not based on the best available science
- EPA should rely on reasonably available information that demonstrates that current wood article manufacturing under the current U.S. regulatory framework does not contribute to an unreasonable risk of occupational exposure to formaldehyde
  - EPA’s draft evaluation considers outdated occupational studies from furniture production that pre-date more current occupational standards, as well as the reduced emissions mandated by TSCA Title VI
  - The studies on which EPA relies includes foreign facilities, with no analysis demonstrating how exposure levels at a facility in Brazil, southeast Asia, or Nigeria, would be relevant to or in any way comparable to a U.S. facility

# EPA vs Furniture Industry Occupational Data

## EPA Data

Exposure Concentration Type	Exposure Estimates		Number of samples	Studies	US EPA Data Rating
	Central (ppm)	High-end (ppm)			
15-minute TWA	0.11	1.0	N=111	OSHA 2019	Medium
Short-term TWA	1.63	2.18	N=2	Akinyemi et al. 2019; Ioras et al. 2010	Medium
8-hour TWA	0.09	0.76	N=169	Marlow 1995, Peteffi et al. 2015, OSHA 2019	Medium to high

## Industry Data

Facility or Process Type and Year	Sample Number and Duration/Method	Average Formaldehyde Concentration (ppm)	Range of Formaldehyde Concentration (ppm)
Furniture, board warehouse (2011)	N=6 (8-hour TWA, OSHA)	0.081	0.066 – 0.11
Furniture, lamination (2017)	N=4 (8-hour TWA, OSHA)	0.12	0.06 – 0.22
Furniture manufacturing, various activities (2024)	N=5 (40-min, NIOSH)	0.017	0.014 – 0.02

- The data collected from furniture manufacturing facilities indicate that worker exposure to formaldehyde is much less than that relied on by EPA