FLAME RETARDANT EXPOSURE ASSESSMENT: Findings from a Behavioral Intervention Study

Julie Herbstman, PhD ScM
Associate Professor, Environmental Health Sciences
Background: Flame Retardants

Chemicals found in building materials, electronics, furniture, vehicles, plastics, polyurethane foams, and textiles.
Exposure in Children is a Major Concern

New risks replace old ones

Records show that the U.S. government has allowed generation after generation of flame retardants onto the market without thoroughly assessing the potential health risks. Many of the chemicals remain in use today.

| 1920s | 1930s | 1940s | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|       |       |       |       |       |       |       |       |       |       |

- PCBs
- PBBs
- Chlorinated tris
- PBDEs
- Firemaster 550

- Exposure constellation has changed over time.
- Children typically have more exposure than adults.
- Children are likely more sensitive to the effects of exposure
  - Developmental neurotoxicity

http://media.apps.chicagotribune.com/flames/index.html
What does EPA say?

REDUCING YOUR CHILD’S EXPOSURE TO FLAME RETARDANT CHEMICALS

- Wash your hands and your children’s hands often, especially before eating.
- Dust frequently with a moist cloth.
- Wet mop or vacuum with a HEPA filter attachment often.
- Prevent small children from chewing on products that may contain these chemicals.
- Repair tears to upholstered furniture.
- Wipe and vacuum the interior of your car often as seats and dashboards contain flame retardant chemicals.

https://www.epa.gov/sites/production/files/2016-05/documents/flame_retardant_fact_sheet_3-22-16.pdf
Study Design

Study Population:

- Cohort: Sibling-Hermanos Study in Northern Manhattan/South Bronx

Study Sample:

- 32 mothers and their 3-6 year old children
  - 16 African American
  - 16 Dominican

Timeframe:

- 2 weeks between December 2015 and May 2016
Study Design

Gibson et al. JESEE (2019)
Measurements: only in mothers

| Parent compound on hand wipe | Urinary metabolite |
|-----------------------------|--------------------|
| TDCIPP                      | BDCIPP             |
| TPHP                        | DPHP               |
| TCIPP                       | BCIPP              |
|                             | BCIPHIPP           |
| TCEP                        | Not measured       |
| Not measured                | ip-DPHP            |
| Not measured                | tbutyl-DPHP        |
| PBDEs                       | Not measured       |
| Alt-BFRs                    | Not measured       |
Results: All women

Gibson et al. JESEE (2019)
Results: Baseline exposure above the median

Flame Retardants on Handwipes
Verified

Gibson et al. JESEE (2019)
Conclusions

• 100% of participants had detectable levels of PBDEs, OPFRs, and Alt-BFRs at baseline.

• Both house cleaning and handwashing reduced exposure by up to 50%.

• This was most evident among individuals with ”high” (above the median) exposure at baseline.

• No intervention reduced exposure below the limit of detection.

• Behavioral change can reduce but not eliminate flame retardant exposure.
Additional Thoughts/Caveats

• Only tested in mothers; does it also work in children?

• Evaluated only a 2 week period: are these behaviors sustainable?

• Hand washing is a habit that can be practiced anywhere; but house cleaning is only effective for exposure in homes.

• Given that exposure was reduced but not eliminated, this behavioral intervention is not a substitute for policy.
Full text (Open Access):

Gibson EA, Stapleton HM, Calero L, Holmes D, Burke K, Martinez R, Cortes B, Nematollahi A, Evans D, Herbstman JB. Flame retardant exposure assessment: findings from a behavioral intervention study. J Expo Sci Environ Epidemiol. 2019 Jan;29(1):33-48. doi: 10.1038/s41370-018-0049-6. Epub 2018 Jun 28. https://www.ncbi.nlm.nih.gov/pubmed/29950671

Additional report comparing exposure in mothers and children:

Gibson EA, Stapleton HM, Calero L, Holmes D, Burke K, Martinez R, Cortes B, Nematollahi A, Evans D, Anderson KA, Herbstman JB. Differential exposure to organophosphate flame retardants in mother-child pairs. Chemosphere. 2019 Mar;219:567-573. doi: 10.1016/j.chemosphere.2018.12.008. Epub 2018 Dec 4. https://www.ncbi.nlm.nih.gov/pubmed/?term=30553217
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