Toxic TV Binge

An Investigation into Flame Retardants in Televisions

Safer Chemicals, Healthy Families

Mind the Store

TOXIC-FREE FUTURE

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Safer Chemicals, Healthy Families fights for strong chemical policy, works with retailers to phase out hazardous chemicals and transform the marketplace, and educates the public about ways to protect our families from toxic chemicals.
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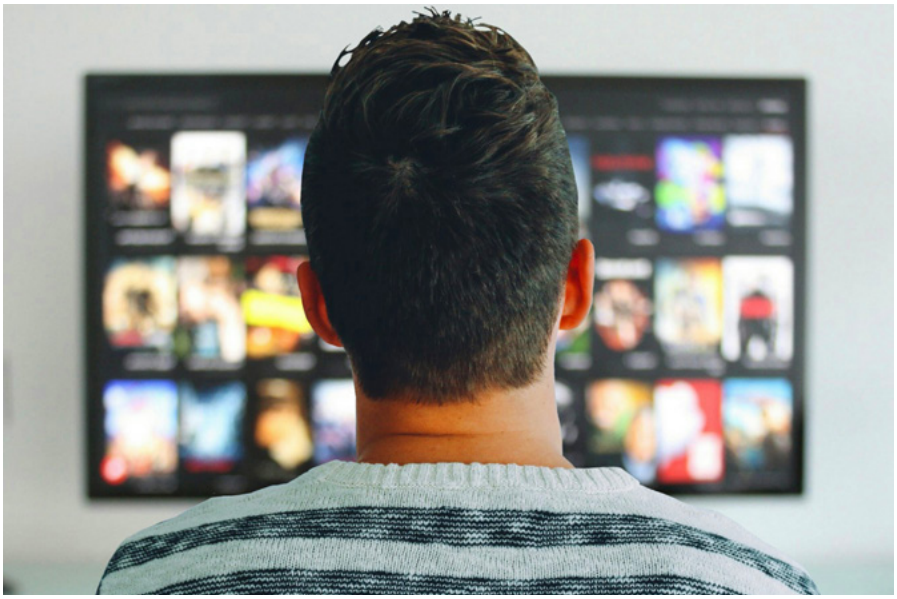
Executive Summary



For decades, television makers have been putting harmful chemicals into their products in the name of fire safety. Millions of pounds of toxic flame retardant chemicals are used in the plastic casings surrounding televisions sold at major retailers each year in the U.S. Flame retardants in TVs constitute a large and growing source of unregulated toxic pollution in our homes, workplaces and environment and pose serious health threats that are entirely preventable.

This new investigation of six leading Best Buy- and Amazon-brand televisions revealed retailers and suppliers are using outdated, hazardous chemicals to meet fire safety standards that can be met with safer alternatives or material changes.

In these televisions, made for the retailers as private-label products, we found the following in the plastic casings, also known as enclosures:

- Three Best Buy Insignia Roku TVs contained hazardous organohalogen flame retardants. All Best Buy Insignia TVs contained the banned flame retardant deca-BDE, outlawed in five states, including at its purchase location in Washington State; one TV contained deca-BDE at levels above Washington's enforcement limit.
- Three Toshiba (Hisense) Fire TVs, produced in partnership with Amazon, contained hazardous organohalogen flame retardants, including one closely related to the banned deca-BDE.[i]
- The televisions contained flame retardants at percentage levels by weight in the plastic, meaning the chemicals make up a significant portion of the product. These chemicals can migrate out of televisions and get into indoor air, household dust, and make their way into our bodies, posing risks to families and pets.

Organohalogen flame retardants such as those found in these TVs have been the subject of increasing government scrutiny around the world. Organohalogen flame retardants are persistent chemicals linked to a variety of health concerns, including thyroid disruption, cancer, and learning deficits. In 2017, the U.S. Consumer Product Safety Commission (CPSC) warned electronics manufacturers and retailers to "eliminate the use" of halogenated flame retardants in plastic casings:

> *"To protect consumers and children from the potential toxic effects of exposure to these chemicals, the Commission recommends that manufacturers of children's products, upholstered furniture sold for use in residences, mattresses (and mattress pads), and* ***plastic casings surrounding electronics*** *[emphasis added] refrain from intentionally adding non- polymeric, organohalogen flame retardants ("OFRs") to their products. Further, the Commission recommends that, before purchasing such products for resale, importers, distributors, and retailers obtain assurances from manufacturers that such products do not contain OFRs."*[1]

Manufacturers and retailers of these TVs are currently ignoring this CPSC safety warning, issued along with a CPSC vote to ban organohalogen flame retardants, which has not yet been fully implemented.

i The Chinese TV manufacturer Hisense purchased the Toshiba TV business in 2017.

Table 1:

			Halogenated Flame Retardants				Phosphorus Flame Retardants	
Retailer	Brand	Model	TTBP-TAZ (%)	2,4,6-TBP (%)	DBDPE (%)	Deca-BDE (%)	BAPP (%)	TPhP (%)
Best Buy	Insignia	Roku LED TV 24" 720P	7.4	0.15	0.95	0.06	0.03	ND
Best Buy	Insignia	Roku LED TV 43" 4KUltra HD	9.6	0.45	0.69	0.01	0.17	ND
Best Buy	Insignia	Roku LED TV 50" 4KUltra HD	12	0.28	0.56	0.13	0.49	0.004
Amazon	Toshiba (Hisense)	Firetv Edition 43" 4KUltra HD	3.7	0.12	0.93	ND	ND	ND
Amazon	Toshiba (Hisense)	Firetv Edition 50" 4KUltra HD	3.9	0.14	1.1	ND	ND	ND
Amazon	Toshiba (Hisense)	Firetv Edition 55" 4KUltra HD	3.5	0.14	1.0	ND	ND	ND

ND = not detected
Concentrations given as percent by weight.

Additional regulation on organohalogens is moving forward in Europe. TVs like those in this investigation will soon be unavailable in the European Union (EU), which in October 2019 passed a EU-wide ban on all organohalogen flame retardants in electronics casings that will take effect in 2021.

It is time for the U.S. to follow Europe and rapidly implement rules to ban organohalogen flame retardants and take steps to restrict other harmful flame retardants. In the meantime, manufacturers and large retailers like Hisense, Best Buy, and Amazon must heed the CPSC warning. These companies should quickly implement policies to eliminate organohalogen flame retardants and substitute them with safer alternatives or innovate with less flammable materials. Retailers have a moral responsibility and the power to "mind the store" and drive these toxic chemicals out of televisions and other electronics.

How We Tested TVs and What We Found

In 2017, we tested casings from twelve televisions from twelve different manufacturers and reported the results in our **TV Reality report**. We found that two-thirds of the TVs tested contained high concentrations of brominated flame retardants, part of the problematic class of organohalogen flame retardants.[2] These included deca-BDE, illegal in five states and the EU, and the chemicals introduced to replace it. Organohalogen flame retardants, which include brominated as well as chlorinated compounds, are persistent chemicals linked to a variety of health concerns, including thyroid disruption, cancer, and learning deficits.

In the U.S., manufacturers use flame retardants in televisions to voluntarily meet fire-safety standards established by UL (formerly known as Underwriters Laboratory, an independent standards development organization). These are based on standards developed by the International Electrotechnical Commission and do not specify that chemical flame retardants must be used.

Shortly after our previous testing, Amazon announced a partnership with Toshiba to produce the Fire TV: a "smart TV" with built-in Fire-TV capability. Major TV retailer Best Buy has a similar product with Roku capability integrated in the set, under its Insignia brand. To better understand the manufacturers' flame retardant choices in these TVs, we purchased six TVs in 2018 and commissioned flame retardant analysis in the plastic casings.

Insignia televisions were purchased from a Best Buy in the Seattle area, and Fire TVs were purchased from Amazon online. We removed small pieces of the plastic enclosure and sent them to Dr. Sicco Brandsma's lab at Vrije Universiteit Amsterdam. Plastics were screened using gas chromatography/mass spectrometry (GC/MS). Brominated flame retardants, including 2,4,6-tribromophenol (2,4,6-TBP), decabromodiphenyl ether (deca-BDE), decabromodiphenyl ethane (DBDPE), and 2,4,6-tris(2,4,6-tribromphenoxy)-1,3,5-triazine (TTBP-TAZ) were quantified using GC/MS; phosphate flame retardants, including resorcinol bis (diphenylphosphate) (RDP) and bisphenol A bis (diphenyl phosphate) (BPA-BDPP), were analyzed using liquid chromatography/mass spectrometry (LC/MS).

Our testing found the following (also shown in Table 1, page 4):

1. All Insignia Fire TVs, purchased at Best Buy, contained organohalogen flame retardants in the plastic housing as their primary flame retardants.

2. All Toshiba (Hisense) Fire TVs contained organohalogen flame retardants as their primary flame retardants.

3. The dominant flame retardant in all TVs was the organohalogen flame retardant TTBP-TAZ, found in U.S. TVs for the first time in our previous report. All six TVs also contained its contaminant and breakdown product 2,4,6-TBP as well as another organohalogen flame retardant, DBDPE. All of the TVs would be illegal for sale in Europe after 2021 under the new EU regulation.

4. All three Insignia TVs contained the banned flame retardant deca-BDE, and it was present at concentrations above Washington's enforcement limit (0.1%) in the Insignia Roku 50" TV.

   Five states—Washington, Maine, Maryland, Oregon, and Vermont—have banned the use of deca-BDE in electronics enclosures.

Thus, although our previous testing, along with government alternatives assessments, found that television casings can be made without organohalogen flame retardants, these companies have chosen to continue to use the worst class of chemicals for this purpose.[3,4]

Why Flame Retardant and Plastic Use in TVs is More of a Problem Than Ever

As described in our 2017 report *TV Reality*, flame retardants are mixed into plastic television casings and become pollutants in our homes when they escape the plastic they are mixed into and migrate into household dust or air.[2] Adults and children are then exposed to flame retardants through incidental ingestion of dust, such as through hand-to-mouth activity, and research has confirmed that this is an important exposure source.[5]

Several studies find that televisions are a source of exposure to flame retardants in the indoor environment. Research in the Boston area found that rooms with more consumer electronics products containing brominated flame retardants had higher levels of deca-BDE in dust, suggesting the electronics were the source.[6] In that study, high levels of the flame retardants in televisions were especially important as a source. A Toronto study found that electronics were the main source in rooms with the highest concentrations of flame retardants in dust.[7] A 2016 study using wipes of electronics found that the flame retardants detected in the wipes at the highest levels were also present in dust at higher levels.[8]

Experiments show that flame retardants move directly from electronics to house dust. Researchers conducted chamber experiments attempting to replicate in-home conditions and concluded that flame retardants contaminate dust through abrasion of plastic casings as well as migration directly to dust on the product surface.[9] Scientists have also examined house dust with electronic microscopes and found indications that small particles are abraded from casings to contaminate dust.[10] Finally, analysis of dust collecting in television cabinets detected

elevated levels of brominated flame retardants used in television casings as well as in circuit boards.[11]

Three of the brominated flame retardants found in these six televisions—DBDPE, TTBP-TAZ, and Deca-BDE—have been assessed using the **GreenScreen for Safer Chemicals** tool. In those assessments, all three received scores of Benchmark 1, indicating they are of high concern. The breakdown product 2,4,6-TBP has been assessed with the GreenScreen List Translator and by government agencies. It received a List Translator 1 score, indicating its hazard classifications meet one or more of the GreenScreen Benchmark-1 criteria and it would most likely be designated Benchmark 1 in a full GreenScreen assessment. Besides its association with TTBP-TAZ, 2,4,6-TBP is also intentionally produced and used as a flame retardant, intermediary in chemical production, and anti-fungal agent, with a production volume of 10-50 million pounds per year reported in 2006.[12] In a study of 102 placental tissues in North Carolina, it was found in every placenta at unexpectedly high levels, making up nearly half the total brominated flame retardant load.[13] It has also been found in the blood of adults including electronics dismantling workers and the blood of fetuses.[14,15] Laboratory tests have found it to be a potent endocrine disruptor, particularly for thyroid hormone. In placenta, differences in thyroid hormone levels were associated with exposure to 2,4,6-TBP, suggesting this compound alone or in combination may be affecting this critical hormone for development.[13]

The science is clear that using organohalogen flame retardants in TVs means people are unnecessarily exposed to hazardous chemicals in their homes. The result: toxic chemicals in our bodies and those of our children.

Hazardous After They Leave Our Homes

Recent research makes clear that the use of these toxic flame retardants is a major worker exposure and environmental problem as well.

The rising use and increasingly short lifespan of electronics has resulted in the generation globally of more than 44 million metric tons of e-waste yearly.[16] Plastics, including casings containing flame retardants, make up approximately 20% of e-waste, the fastest growing waste stream in the U.S.[17,18] As a result of this growth, the e-waste recycling industry has grown in higher income countries.[19] The vast majority of e-waste, including large volumes of plastic, continues to be dumped, traded, or improperly recycled.[16] Because of the presence of multiple toxic chemicals including flame retardants in e-waste, workers in this growing industry face health risks. E-waste recycling is known to release flame retardants and other chemicals into air and dust, and a number of health effects have been associated with informal e-waste recycling, such as in uncontrolled workshops, homes and yards.[20] These health effects include increases in miscarriage and stillbirth rates, premature birth, and reduced birthweight, as well as DNA damage and decreased lung function.[21]

Recently, researchers have begun to study formal e-waste recycling facilities more intensively. For example, Gravel et al. measured 40 flame retardants in air at six Canadian recycling facilities, using personal air samplers to assess exposure of 85 workers.[20] Workers in this study were exposed to an average of 26 different flame retardants. In dust and air samples collected at a Canadian e-waste recycling facility in 2016, the brominated flame retardant TTBP-TAZ was found in dust at levels two to three orders of magnitude higher than in U.S. residences.[22] TTBP-TAZ and its breakdown product, the hormone disruptor 2,4,6-TBP, were also detected in the air so workers are likely exposed through inhalation as well.

Increasingly, the recycling of the plastic from electronics is also causing a concern because of its contamination with toxic flame retardants. Brominated flame retardants have been found in kitchen utensils as well as a variety of toys and other plastic products, likely from recycled e-waste.[23,24,25]

Policy Developments: the Move Away from Organohalogen Flame Retardants

While manufacturers and retailers continue to use organohalogens, the worst class of flame retardants, policymakers are working to stop them. The last two years have seen an increase in regulatory activity to move manufacturers away from the most toxic flame retardants.

Europe: In October 2019, the EU adopted a ban on the use of all halogenated flame retardants, including the ones found in this study, in electronics displays.[26] This ban, adopted as part of the EU's Ecodesign Regulation, was driven by the desire to make plastic free of toxic flame retardants available for recycling. It applies to all electronic displays, including TVs, monitors, and digital signage displays, with size equal or greater than 100 cm^2, or 15.5 in^2. The new regulation goes into effect in 2021.

United States: In September 2017, the Consumer Safety Protection Commission (CPSC) voted to grant a petition to ban organohalogen flame retardants, in additive form, in electronics casings (and other product categories). To assist the CPSC in its process, the National Academy of Sciences released a report in 2019 acknowledging the limitations of the traditional one-chemical-at-a-time regulatory approach and recommended addressing groups of organohalogen flame retardants.[27]

Canada: In May 2019, the Government of Canada proposed a ban on the manufacture, import, use, sale, and marketing of DBDPE as well as products containing it.[28] Canada took this action based on its conclusion that "DBDPE is expected to contribute to the formation of persistent, bioaccumulative and inherently toxic transformation products, such as lower brominated diphenyl ethanes, in the environment." Canada has yet to address organohalogen flame retardants as a class.

Washington State: In May 2019, the Washington State Legislature passed the **Pollution Prevention for our Future Act**, which directs the state Department of Ecology to prioritize products containing toxic flame retardants and grants the agency authority to ban flame retardants or require disclosure of product content.

Policy Recommendations

To reduce exposure to toxic flame retardants due to their use in televisions, we recommend the following actions:

Federal, State, and Local Policymakers

1. State and local policies should restrict the use of the most hazardous flame retardants (including organohalogen flame retardants, or OFRs, and GreenScreen Benchmark 1 flame retardants) in television housings and require manufacturers to assess and adopt safer alternatives.
2. The U.S. Consumer Product Safety Commission (CPSC) should move rapidly to implement a U.S. ban on organohalogen flame retardants in electronics.
3. The U.S. Environmental Protection Agency (EPA) should finalize its proposed rule to quickly end the production, import, and all uses of deca-BDE, including prohibiting recycling of materials containing deca-BDE, as part of its expedited action program under Toxic Substances Control Act (TSCA).
4. States should require companies to disclose chemicals of high concern used in electronics, including televisions, giving consumers and policymakers information to better understand what chemicals are used in electronics and to take action.
5. State and local procurement policies for televisions should include requirements for the disclosure of flame retardants and avoidance of high-concern flame retardants. More specifically, state and local government purchases should make mandatory the optional criteria in the Electronic Product Assessment Tool (EPEAT) standard for reducing organohalogen content of external plastic casings.
6. States with laws banning the use of deca-BDE should take immediate enforcement actions to prevent companies from selling televisions containing the banned flame retardant.

Television Manufacturers

1. Design more sustainable products that do not result in toxic contamination of homes, people, workplaces and the environment.
2. Require suppliers to fully disclose the identities and quantities of all flame retardants used.
3. Adopt a Restricted Substance List (RSL) and Manufacturing Restricted Substance List (MRSL) to ban hazardous flame retardants, including organohalogens, and other flame retardants that are GreenScreen Benchmark 1 chemicals, starting with the enclosures of televisions. Publicly disclose the RSL and MRSL.
4. Set clear timelines for reducing and eliminating toxic chemicals in televisions.
5. Ensure substitutes are safer. Require suppliers to identify safer alternatives (specifically those receiving GreenScreen Benchmark 2 scores

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and higher) and promote innovation by using materials that do not require flame retardants (e.g. non-flammable materials instead of plastic enclosures).

6. Over time, expand the restriction of toxic flame retardants to other electronics the company manufactures.
7. Publicly report on progress each year.

Television Retailers

1. Only sell televisions that do not contain hazardous flame retardants. Adopt an RSL and MRSL to ban hazardous flame retardants, including organohalogen and other flame retardants that are GreenScreen Benchmark 1 chemicals, starting with the enclosures of televisions. Publicly disclose the RSL and MRSL.
2. Require suppliers to fully disclose the identities and quantities of all flame retardants used to retailers.
3. Set clear timelines for reducing and eliminating these toxic chemicals in both private label and brand name televisions sold at retail.
4. Ensure substitutes are safer. Require suppliers to identify safer alternatives (specifically those receiving GreenScreen Benchmark 2 scores and higher) and promote innovation by using materials that do not require flame retardants (e.g. non-flammable materials instead of plastic enclosures).
5. Over time expand the restriction of toxic flame retardants to other electronics sold at retail.
6. Publicly report on progress each year.

Consumers

1. Call and write to TV retailers and manufacturers and ask them whether they have policies to phase out and ban toxic flame retardants in TVs.
2. Call and write to state and federal representatives and demand a phaseout of toxic flame retardants in TVs.
3. Tell CPSC to quickly implement the ban on organohalogens in electronics.

Conclusions

The results of our testing of television casings shows that at least for these two companies, progress in use of safer materials has not kept up with advances in technology. By contrast, our previous research found that televisions can be made with less-toxic flame retardants, benefitting users at home, workers during manufacture and recycling, and the environment. These key companies are leaders in innovation in many ways, and can show leadership in ensuring their products are safe before, during, and after use.

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