

## Chemical Classes of Concern:

### 3. Brominated, Chlorinated, and Phosphate-Containing Flame Retardants

#### What Are They and How Are They Used?

Flame retardants are chemicals added to products to delay or prevent ignition and the spread of fire. They are used in levels of about 1% to 30% of the weight of foam or plastic found in products such as furniture, baby products, electronics, building insulation, and wire and cable.<sup>1-4</sup>

#### Which Flame Retardants Are Of Concern?

Many flame retardants are organohalogens (compounds in which carbon is bonded to bromine or chlorine). All 22 chemicals globally banned as Persistent Organic Pollutants under the Stockholm Convention are organohalogens and three of them are brominated flame retardants.<sup>5</sup> There has been a history of unfortunate substitutions of one harmful flame retardant for another. Brominated tris was used in children's sleepwear in the 1970s until it was banned as a mutagen<sup>6</sup>; it was then replaced by a known carcinogen, chlorinated tris<sup>7</sup>. Similarly, PentaBDE was used in furniture and baby product foam until it was banned as a Persistent Organic Pollutant (POP), after which it was also replaced with chlorinated tris. Some replacements for organohalogen flame retardants include phosphate-based flame retardants that are also chemicals of concern.<sup>8</sup>

#### Why Are They A Concern?

Flame retardant chemicals known to be harmful can be found at pound levels in a typical home.<sup>2,3</sup> Organohalogen flame retardants are often toxic, lipophilic (fat-loving), and/or resistant to degradation, leading to their persistence and bioaccumulation in our bodies and the environment. Many flame retardants are semi-volatile and continuously migrate out of products and into dust, humans and animals.<sup>9-11</sup> Biomonitoring studies find organohalogen flame retardants in the blood and body tissues of nearly all Americans tested, with the highest levels in young children.<sup>12-14</sup> US citizens have much higher levels of these chemicals in their house dust and body fluids than Europeans, where most flammability standards do not lead to the use of flame retardants in consumer products.<sup>11,15</sup>

Organohalogen flame retardants have been found to cause adverse reproductive,<sup>16,17</sup> genotoxic, immunotoxic,<sup>18,19</sup> neurotoxic,<sup>20,21</sup> and/or carcinogenic outcomes in animal studies.<sup>22</sup> In humans they are associated with reduced IQ (similar to lead poisoning),<sup>23</sup> fertility,<sup>24</sup> birth defects, and hormonal changes.<sup>25,26</sup> Many are similar in structure or even identical to banned chemicals such as DDT, Mirex, and PCBs.

When consumer products containing halogenated flame retardants ignite, the chemicals can produce the toxic gases that cause most fire deaths and injuries.<sup>27</sup> Dioxins and furans, which are persistent and cancer-causing, are produced when consumer products containing organohalogen flame retardants are incinerated.

#### Do We Need Them?

Surprisingly, flame retardants, as used to meet current standards for furniture and baby products, do not increase overall fire safety.<sup>28</sup> While they may delay ignition a few seconds, they will eventually burn and can produce the toxic gases that cause most fire injuries and deaths.<sup>29</sup> Preventing ignition with fire safe cigarettes, candles, lighters, and other strategies is less expensive, more effective, and healthier than adding flame retardants to many of the products in our homes.

Recent policy actions are taking such other factors into consideration. For example, the updated California Furniture Flammability Standard (TB117-2013),<sup>30</sup> which will be implemented in January 2014 is based on a smolder test for fabric, which is where the majority of fires begin. The new standard does

not lead to the use of flame retardants, so it will now be possible to have increased fire safety without harmful chemicals. A recently signed California Assembly Bill (AB-127)<sup>31</sup> calls for a review of insulation flammability standards for buildings. This law is expected to reduce the use of harmful flame retardants in building insulation where they do not provide a fire safety benefit.

Instead of moving from one toxic flame retardant to the next, the challenge for flame retardant manufacturers is to develop more benign alternatives through materials innovation and green chemistry.

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