Work Plan Implementation:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) in Carpets, Rugs, Indoor Upholstered Furniture, and their Care and Treatment Products

NOVEMBER 15, 2016

SAFER CONSUMER PRODUCTS

Department of Toxic Substances Control

CalEPA California Environmental Protection Agency

Introduction

The Department of Toxic Substances Control's (DTSC) Safer Consumer Products (SCP) Regulations specify the process and criteria by which DTSC evaluates consumer products for possible designation as Priority Products. Every three years, DTSC issues a Priority Product Work Plan, which "... identifies and describes the product categories that [DTSC] will evaluate ..." over the next three years. DTSC's current Work Plan includes seven product categories and lists the five policy priorities that informed their selection.

Since issuing the Work Plan, DTSC has conducted a review of the product categories and has identified specific subcategories, chemicals, and chemical classes that align with our policy priorities. This document is one of three that summarizes the findings of the research on a specific topic. It describes our preliminary findings and concerns around the topic and identifies data gaps we seek to fill and specific questions we hope our stakeholders can answer. This document signals the beginning of an ongoing dialogue with interested stakeholders from all sectors (manufacturers, NGOs, governments, and academia). We believe the dialogue will ultimately inform our selection of future Priority Products.

Background

The class of perfluoroalkyl and polyfluoroalkyl substances* (PFASs) contains more than 3,000 man-made chemicals with at least one fully fluorinated carbon atom.[1-3] All PFASs are Candidate Chemicals for the DTSC's Safer Consumer Products program (SCP), because the entire class was added by Biomonitoring California to its list of Priority Chemicals[4] for measuring in the bodily fluids of Californians. PFASs have a variety of applications, such as water-, oil-, soil- and stain-repellents. They are found in all of the SCP 2015-2017 Work Plan product categories: beauty, personal care and hygiene products, building products, household and office furniture and furnishings, cleaning products, clothing, fishing and angling equipment; and office consumable products. Out of these six product categories, DTSC has identified carpets, rugs, indoor upholstered furniture, and their associated care and treatment products, as the largest potential sources of significant and widespread PFAS exposures.

DTSC's literature review of PFASs found evidence for (1) hazard characteristics (high persistence, bioaccumulation, potential toxicity) and (2) potential for widespread exposures for humans and other living organisms. DTSC is requesting additional information from stakeholders about the environmental and health hazards of PFASs, as well as the use of PFASs in carpets, rugs, indoor upholstered furniture, and their care and treatment products.

Hazard Traits of PFASs

The best-defined hazard trait of this chemical class is its high environmental persistence.[5] PFASs that do break down in the environment and in living organisms convert to other PFASs that persist indefinitely and may be even more harmful.[6,7] Unlike other persistent organic pollutants, PFASs accumulate in protein-rich organs rather than in fat.[8]

Most of the publicly-available research to date is limited to a few longer-chain† PFASs, such as perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS). Longer-chain PFASs are known to accumulate and persist in living organisms, including humans.[9] They have been linked to acute and chronic toxicity in aquatic life, such as microorganisms, algae, plants, invertebrates, amphibians, fish, and birds.[10,11] PFAS toxicity is less well characterized in terrestrial species, despite reports of their presence in a wide range of organisms.[12-14] In humans, potential adverse health effects from chronic longer-chain PFAS exposure include increased serum cholesterol,[15,16] thyroid disease,[17-19] liver[20] and kidney[21] damage, immune system disruption,[22-24] pregnancy-induced hypertension,[25] and kidney and testicular cancers.[26]

Under a voluntary agreement with the U.S. EPA, major PFASs manufacturers phased out the production and emission of longer-chain PFASs and precursors in 2015.[27] As a result, biomonitoring studies have found decreasing levels of longer-chain PFASs in human tissues.[28] Most replacements are also PFASs,

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* "Perfluoro" means that all carbons in the molecule are fully fluorinated, while "polyfluoro" refers to molecules containing a mix of fully-, partially-, and non-fluorinated carbons.

† Longer-chain PFASs include perfluoroalkyl carboxylates and sulfonates with six or more fluorinated carbons, and their precursors.

including fluorinated ethers and short-chain PFASs.[29] Fluorinated ethers were thought to degrade in the environment, but recent studies have cast doubt on that assumption.[30,31] Shorter-chain PFASs are marketed as less toxic compared to the long-chains, mainly because they bioaccumulate less and are more readily eliminated from living organisms. However, they are equally persistent and more mobile in the environment than the chemicals they are replacing, and also show potential for toxicity.[32]

Potential Exposures to PFASs

PFASs are found globally in the aquatic[33,34] and terrestrial environment,[35] indoor dust,[36] drinking water sources,[37] food,[38] wildlife,[39] and humans,[40,41] including the milk and serum of breastfeeding women.[42,43]

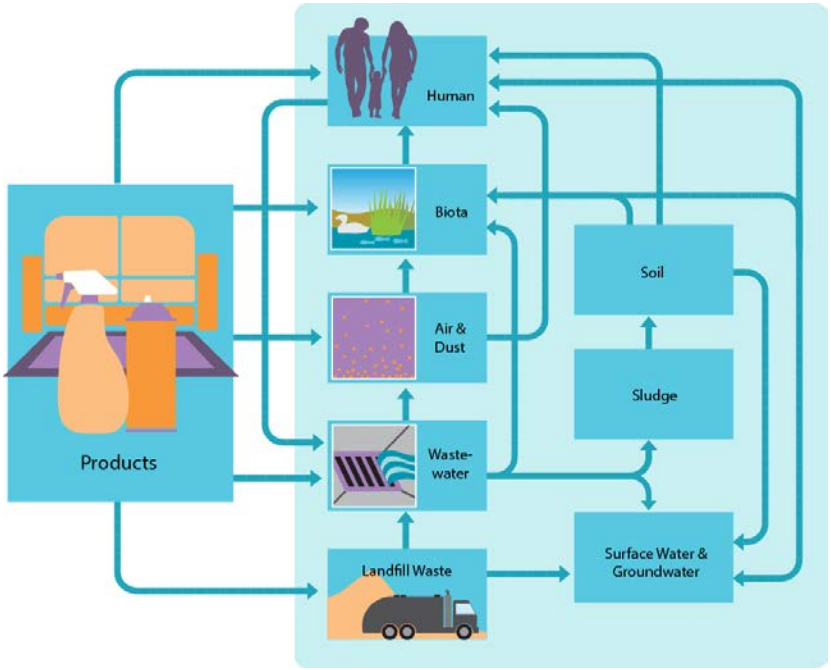

Figure 1: Potential routes of exposure to PFASs from consumer products.

Exposure begins early in a person's life, since mothers transfer PFASs to their babies via the placenta and breastfeeding.[44-48] Young children may experience higher exposure levels than adults due to greater dust ingestion rates[49] and hand-to-mouth transfer from PFASs-treated consumer products.[50] Industrial workers, carpet installers, carpet cleaners and workers in furniture, furnishings, outdoor clothing, and carpet stores may also experience above average PFASs exposure levels.[51,52] For the general population, PFASs exposure occurs mainly via contaminated food and drinking water,[53-55] yet questions remain regarding how PFASs enter the environment and food and water supplies.

A large percentage of the PFASs produced worldwide are used to treat carpets and other home textiles to confer stain-, soil-, oil- or water-resistance.[56-58] During normal use, treated carpets, rugs, indoor upholstered furniture and other consumer products release PFASs into indoor air and dust.[59,60] An estimated 50% of the PFAS treatment may be lost from carpets due to walking and vacuuming over a typical nine-year product lifespan.[61] People ingest or inhale the contaminated house dust,[62,63] and inhale volatile PFASs.[64] They can also be exposed to large amounts of PFASs when using after-market carpet and upholstery cleaning and treatment products.[65,66]

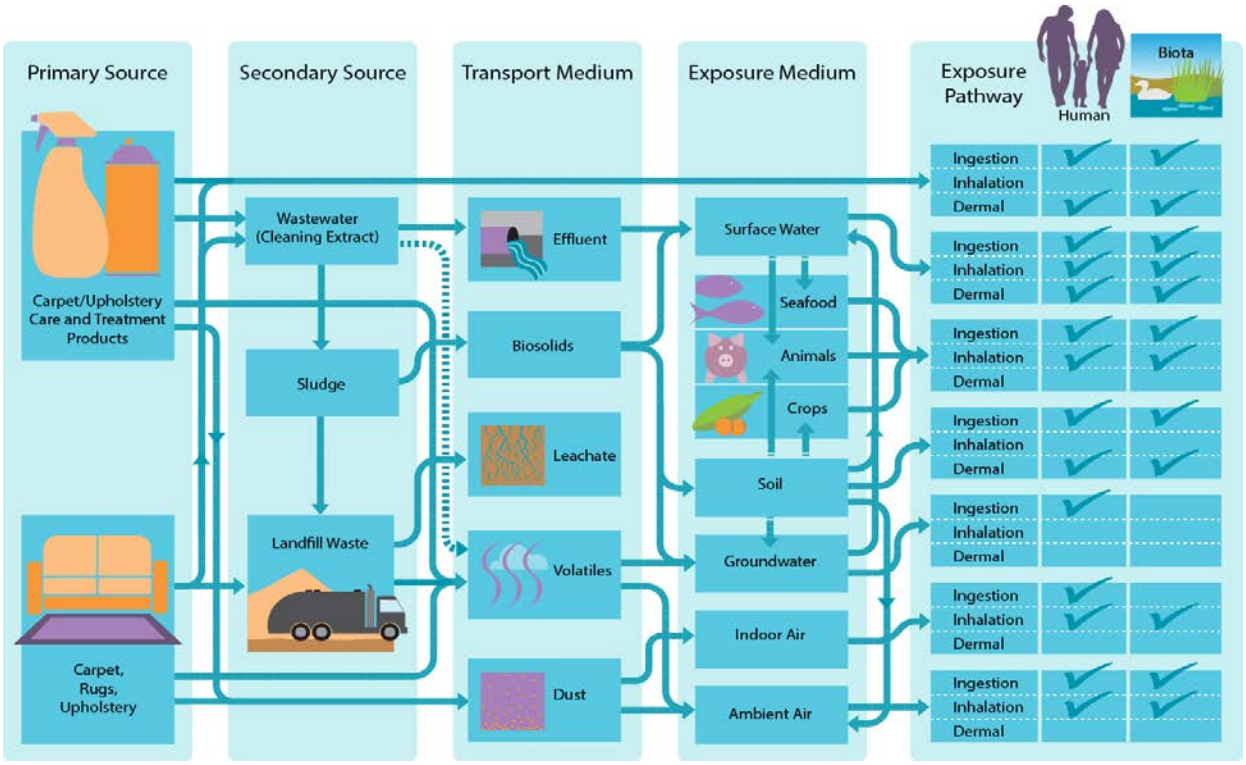

Figure 2: Exposure pathways to PFASs used in carpets, rugs, indoor upholstered furniture, and their care and treatment products.

DTSC seeks further information to help elucidate to what extent the manufacturing, use, and disposal of PFASs-treated carpets, rugs and indoor upholstered furniture contribute to the PFASs contamination of human food, drinking water, or aquatic and terrestrial ecosystems. Available information suggests that current disposal practices for carpet manufacturing and installation waste, unused and used carpeting, and other PFASs-treated consumer products that end up in landfills may release PFASs into the environment. Studies of landfills have detected PFASs in leachates[67-71] and gaseous emissions,[72-74] Additionally, wastewater treatment plants (WWTPs) collecting landfill leachates, surface runoff, and residential and commercial wastewater, cannot effectively remove PFASs.[75,76] As a result, when wastewater effluent is discharged into surface waters, PFASs are released into the environment, contaminating aquatic ecosystems and drinking water sources.[77-79] Sewage sludge also contains PFASs, thus the application of biosolids on soil can lead to the contamination of terrestrial ecosystems, drinking water, and food supplies.[80-84]

Next Steps

SCP is asking stakeholders to address the questions posted on our online information management system, CalSAFER, by December 30, 2016. This will help the Department determine whether carpets, rugs, indoor upholstered furniture and their care and treatment products contribute to human and ecological exposures to PFASs and whether such exposures have the potential for significant and widespread adverse impacts. We will also host a public workshop on Tuesday, January 31, 2017, in the CalEPA Headquarters Building, Sacramento. Please monitor our Priority Products Work Plan webpage for updates on this topic.

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