

Key Chemicals of Concern in Food Packaging and Food Handling Equipment

EDF has identified chemicals in food packaging and food handling equipment where the potential health impacts from their migration into food raises serious concerns. These chemicals in virgin materials may also contaminate the recycling stream and undermine their recyclability or biodegradability. By ensuring food packaging is free of these chemicals, companies can improve consumer trust and enable a clean circular economy while minimizing the impact of regulations on their bottom line. In the tables below, we list key chemicals of concern in food packaging. For even more information about chemicals of concern in food packaging, take a look at the comprehensive and harmonized [Food Chemicals of Concern List](#). Taking action today helps to protect consumer health now and in the future.

Intentionally Added Ingredients

Chemical or class	CASRN	Health concerns	Citations from authoritative bodies	Role in packaging
Ortho-phthalates*	Various	Carcinogenicity, developmental toxicity, reproductive toxicity, endocrine disruption	California Prop 65 ; EU REACH Annex VI ; REACH Annex XVII ; REACH SVHC ; EU Priority ED ; CPSC	Primarily used in plastics including polyethylene (PE), polypropylene (PP), polystyrene (PS), and polylactic acid (PLA). Also used in paper, inks, adhesives, and epoxy.
PFAS (per- and poly-fluorinated alkyl substances)*	Various	Developmental toxicity, environmental persistence and bioaccumulation	<i>Varies</i>	
Long-chain (8 or more carbons)	Various	Systemic, reproductive and developmental toxicity; carcinogenicity, bioaccumulation	California Prop 65 ; EU REACH Annex VI ; REACH SVHC ; FDA ; ATSDR ; EPA Drinking Water ; Washington State	Many uses in packaging. Primarily known for use as a grease-proofing agent in paper. Directly used as processing aids in the production of plastic packaging. Also formed in the fluorination of PE and PP containers. Also used in inks and epoxy.
Short-chain (less than 8 carbons)	Various	Systemic, reproductive and developmental toxicity; persistence, highly mobile in water	EU REACH SVHC ; ATSDR (some chemicals); Washington State	
Perchlorate and related compounds	Various including 14797-73-0, 7791-07-3, 7601-89-0, 7790-98-9	Endocrine disruption, developmental toxicity	EU REACH Annex VI ; EPA Drinking Water	Anti-static agent used in plastic for dry food packaging and in food handling equipment.
Benzophenone	119-61-9	Carcinogenicity	California Prop 65 ; EU Priority ED ; IARC Group 2B ; FDA	Used in inks printed on paper and plastic packaging. Other uses include in paper and in certain plastics including PE, PP, acrylics, and polyvinylchloride (PVC).

Notes:

- **Ortho-phthalates:** FDA is currently reviewing petitions to revoke their uses. Maine banned sale of food packaging (printing materials, inks, pigments, adhesives, stabilizers, coatings, plasticizers, etc.) containing phthalates effective January 1, 2022. [Testing](#) of recycled plastics has revealed presence of phthalates.
- **PFAS:** FDA banned use of long-chain PFAS in 2016 but illegal uses may continue. In 2020 FDA [announced](#) that four chemical manufacturers were voluntarily phasing out 6:2 fluorotelomer alcohol, a short-chain PFAS, from certain paper packaging intended for food contact (i.e. greaseproof paper). In 2021, [EPA testing](#) revealed that certain PFAS (perfluoroalkyl carboxylic acids) can form and migrate from fluorinated polyethylene containers. PFAS may be migrating into food via fluorinated plastic containers not authorized by FDA for food contact use. The state of Washington, concerned that paper and cardboard food packaging treated with PFAS may be [contaminating composting](#) and paper recycling processes post-consumer, conducted a safer alternatives assessment and prohibited PFAS use in four food packaging categories effective early 2023. California, Connecticut, Maine, Minnesota, New York and Vermont also have banned PFAS use in certain food packaging. **Perchlorate:** Young children's exposure to perchlorate increased after FDA's [approval](#) of perchlorate for use as a food contact substance in 2005. Perchlorate exposure can pose a risk to a child's healthy development. In April 2019 FDA [reaffirmed](#) their decision to continue to allow the use of perchlorate in plastic packaging and processing equipment and denied requests for public hearings on the matter.
- **Benzophenone:** In Oct. 2018, FDA banned synthetic benzophenone from use as a flavor and in food packaging effective Oct. 2020.
- Starred (*) chemicals are also recommended for minimization or phase out in "[Food Packaging Product Stewardship Considerations](#)," a set of best practices released in 2018 by the [Food Safety Alliance for Packaging](#), a part of the Institute of Packaging Professionals, to reduce problematic chemicals in food packaging.

Residual Processing Aids

Chemical or class	CASRN	Health concerns	Citations from authoritative bodies	Role in packaging
Bisphenol A (BPA) and related compounds	Various	Endocrine disruption, developmental and reproductive toxicity	<i>Varies</i>	Used in the making of epoxy lining in metal cans, polycarbonate plastic, paper/board, melamine resins, adhesives, and inks.
BPA*	80-05-7	Endocrine disruption, developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC ; EU Priority ED	
Bisphenol B	77-40-7	Endocrine disruption, developmental toxicity	EU REACH SVHC ; EU Priority ED	
Bisphenol F	620-92-8	Endocrine disruption, reproductive toxicity	IPCP 2018 EDC report ; EU Priority ED	
Bisphenol S	80-09-1	Endocrine disruption, reproductive toxicity	IPCP 2018 EDC report	
Toluene*	108-88-3	Reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI	Solvent often used in inks, epoxy and adhesives. Used in paper and in certain plastics including polyethylene (PE), polyamide and nylon, acrylics, polyvinyl chloride (PVC) and polylactic acid (PLA).
Ethyl glycol (2-ethoxy ethanol)*	110-80-5	Reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC	Solvent often used in inks, epoxy, and adhesives as well as in paper.
Methyl glycol (2-methoxyethanol)*	109-86-4	Reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC	Solvent often used in inks, epoxy, and adhesives. Other uses include in paper, wood/cork, and glazes and enamels.
N-Methyl-2-pyrrolidone (NMP)	872-50-4	Reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH Annex XVII ; REACH SVHC	Solvent often used in inks, epoxy, and adhesives. Other uses include in paper, wood/cork and certain plastics like polystyrene, acrylics and PVC.

Notes:

- **Bisphenol compounds:** FDA banned BPA use in baby bottles and as a coating of infant formula packaging [based on abandoned uses](#). BPS became a common replacement to BPA in packaging, but [studies](#) demonstrate similar health concerns to BPA. In December 2021, the European Food Safety Authority released a draft opinion recommending a safe daily intake of BPA more than 5000 times lower than the average daily intake of BPA estimated by FDA. In January 2022, advocacy groups including EDF [petitioned](#) FDA to remove approvals of BPA use as a food additive.
- **NMP:** Banned by EPA in paint strippers sold for non-commercial use.
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Contaminants

Chemical or class	CASRN	Health concerns	Citations from authoritative bodies	Role in packaging
Heavy Metals	Various	Carcinogenicity, neurotoxicity	Varies	Varies
Lead and lead compounds*	7439-92-1 and others	Carcinogenicity, neurotoxicity, reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC ; IARC Group 2A ; FDA ; CONEG ; EPA Drinking Water ; NTP ROC ; EPA PBT	Contaminant in some plastics including polyethylene (PE), polypropylene (PP), polystyrene (PS), polyamide (PA) and nylon, metal, glass, ceramics and inks.
Arsenic and arsenic compounds	7440-38-2 and others	Carcinogenicity, neurotoxicity	California Prop 65 (inorganic arsenic) ; EU REACH Annex VI ; REACH SVHC (some forms) ; IARC Group 1 ; FDA (inorganic) ; EPA Drinking Water ; NTP ROC ; NIOSH OC	Contaminant in paper, wood/cork, glass, ceramics, metals, adhesives, and some plastics including PE and polyvinyl chloride (PVC).
Cadmium and cadmium compounds*	7440-43-9 and others	Carcinogenicity, neurotoxicity, mutagenicity, reproductive and developmental, toxicity, nephrotoxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC ; IARC Group 1 ; FDA ; CONEG ; EPA Drinking Water ; NTP ROC ; NIOSH OC	Contaminant in paper, metals, glass, ceramics, inks, adhesives, and plastics including PVC.
Chromium VI and compounds*	18540-29-9, 1333-82-0 and others	Carcinogenicity, neurotoxicity, mutagenicity, reproductive and developmental toxicity	California Prop 65 ; EU REACH Annex VI ; REACH SVHC (some forms) ; IARC Group 1 ; CONEG ; EPA Drinking Water ; NTP ROC ; NIOSH OC	Contaminant in paper, wood, metals, glass, ceramics, and plastics including PE, PP, PVC.
Mercury and mercury compounds*	7439-97-6 and others	Carcinogenicity, neurotoxicity, reproductive and developmental toxicity, nephrotoxicity	California Prop 65 ; EU REACH Annex VI ; IARC Group 3 ; FDA ; CONEG ; EPA PBT	Contaminant in glass, inks, metals, and plastics including PE, PP, PS, PA and nylon.

Notes:

- **Heavy metals:** 19 [states](#) have banned their intentional use and set a 100 ppm limit for total concentration of lead, cadmium, chromium and mercury in packaging and components. Heavy metals shown to cause harm at very low-level exposures can result in significant toxicity, and some can build up in the body. [FDA's Toxic Elements Working Group](#), whose mission in part is to develop a strategy to prioritize and modernize activities with respect to food/toxic element combinations, is focused on children's exposure. In 2020, FDA announced its [Closer to Zero](#) Action Plan for reducing exposure to toxic elements, particularly arsenic, lead, cadmium and mercury, from foods for babies and young children.
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