

RECYCLED CONTENT IN FOOD PACKAGING AND TOXIC CHEMICAL EXPOSURE




Adapted from: Birgit Geueke, Ksenia Groh, Jane Muncke, (2018) Food packaging and the Circular Economy: Overview of chemical safety aspect for commonly used materials, *Journal of Cleaner Production*, 193: 491-505
<https://doi.org/10.1016/j.jclepro.2018.05.005>

Using recycled packaging waste to create new food packaging increases the number and level of chemicals that can then migrate from the packaging into foods due to:

- contaminants in the original package
- degradation of the material during recycling
- accumulation of contaminants when materials are repeatedly recycled non-food grade materials that enter the recycling system

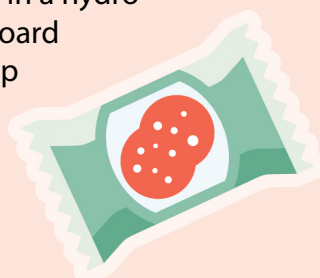
Contaminants in Recycled Plastic



Typical groups of contaminants that have been reported in recycled plastic include: flavor/aroma/odor compounds; oligomers, monomers, and derivatives; additives and their degradation products (such as UV absorbers, antioxidants, adipates, and phthalates); brominated flame retardants (in black plastic); and 2-Methoxynaphthalene, sulfuric compounds, and ethanol with fusel oil. Of particular concern are the **higher level of phthalates** in recycled plastic than the feedstock plastic, and the presence of brominated flame retardants in black plastic which is associated with the recycling of plastic derived from waste electronic equipment.

Multimaterial Multilayers

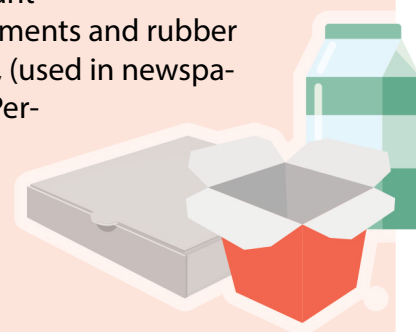
Generally, **multilayered packaging is not recycled back into food contact materials**. Beverage cartons usually comprised of about 75% paperboard, 20-21% plastic (usually polyethylene - PE) and up to 5% aluminum foil. In a hydro-pulping process, the paperboard breaks down into a fiber soup that can be separated from the plastic and aluminum. This paper is recycled but not into food



contact material. The PE is sent to incineration/energy recovery and aluminum recycled, but neither is used again in food contact materials. Pouches and tubes and bags are made of laminated multimaterial multilayers of plastic. Recycling for laminated materials is not widely available.

Contaminants in Paper and Board

More than 250 health-threatening chemicals were identified in recycled paperboard used for food packaging. Recycled pulp shows much higher levels of contaminants than non-recycled. Contaminants detected in recycled paperboard include: mineral oil (from print inks, adhesives, waxes, and processing aids), bisphenols (from thermal paper receipts, inks and glue), phthalates (from inks, lacquers, and adhesives), Diisopropyl naphthalenes (DIPN) (from carbonless copy paper), photoinitiators (UV-cured printing inks), inorganic elements (pains, pigments, recycling of non-food grade paper and board, processing aids, reaction products, various additives); 2-Phenylphenol (OPP) (an antimicrobial, fungicide, and disinfectant and raw material for pigments and rubber additives), Phenanthrene, (used in newspaper ink pigments), and Per- and Polyfluoroalkyl Substances (PFASs – used as moisture and grease-proof barrier).

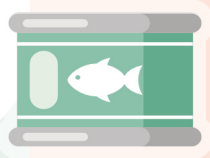


Contaminants in Metal and Glass

Aluminum cans. Repeated recycling may result in accumulated metals and metalloids. The addition of primary aluminum helps reduce the concentration of such impurities. Since most aluminum cans are coated, there isn't direct contact with the beverages and foodstuffs.



Steel cans. Usually made from tin-coated steel (i.e. tinplate) or electrolytic chromium coated steel (ECCS). Tinplate is usually lacquered with organic coatings as a barrier to the food, while ECCS requires an organic coating for corrosion resistance. **It is unknown whether the use of recycled steel has an impact on metal migration from cans into foodstuffs.**



Glass. Glass can be continuously recycled. During recycling, the **lead content of container glass may increase** but can be controlled by sorting out glass with high lead content such as crystal glass.



General Solutions

The safety of recycled packaging for food contact could be dramatically improved by **phasing out hazardous substances used in all materials entering the recycling stream**. However, even with such improved regulation, a period of 10-20 years would be required for these contaminants to reach insignificant levels.

Reuse and reduce need to be to play a bigger role in food delivery systems.

Rather than reducing through light-weighting via thinner, more complex materials (i.e. plastic laminates), reduction should be achieved by decreasing the packaging-to-volume ratio and eliminating excess layers of packaging. Food production and delivery systems should more seasonal and local in order to eliminate the need for packaging and chemicals that extend the shelf life of foods. Delivery systems should be re-designed using non-toxic reusable containers.

Potential Methods for Reducing Migration from Paperboard

Several techniques can be used to reduce, but do not eliminate, migration of contaminants. Reduction methods include: de-inking prior to recycling, using vegetable-based inks rather than mineral oil-based printing inks, using internal bags, applying non-toxic barrier layers on the inner surface of the package, or including non-toxic absorbents in the paperboard.

