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| FSQM L # 25-26. COMMON CONTAMINANTS OF PLASTIC FOOD PACKAGING MATERIALS |
| Charlotte Wagner (October 9, 2012)  |
| [**https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/plastics/common-contaminants**](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/plastics/common-contaminants) **(22-04-2020)** |
| * [Biocides](https://www.foodpackagingforum.org/food-packaging-health/biocides-and-food-contact-materials)
* [Biomonitoring](https://www.foodpackagingforum.org/food-packaging-health/biomonitoring)
* [Bioplastics](https://www.foodpackagingforum.org/food-packaging-health/bioplastics)
* [Bisphenol A](https://www.foodpackagingforum.org/food-packaging-health/bisphenol-a)
* [Bisphenol S](https://www.foodpackagingforum.org/food-packaging-health/bisphenol-s)
* [Can coatings](https://www.foodpackagingforum.org/food-packaging-health/can-coatings)
* [Chemical Risk Assessment](https://www.foodpackagingforum.org/food-packaging-health/chemical-risk-assessment)
* [Chronic disease](https://www.foodpackagingforum.org/food-packaging-health/chronic-disease)
* [Developmental exposures](https://www.foodpackagingforum.org/food-packaging-health/developmental-exposures)
* [Endocrine disruptors](https://www.foodpackagingforum.org/food-packaging-health/endocrine-disruptors)
* [Epigenetics](https://www.foodpackagingforum.org/food-packaging-health/epigenetics)
* [EU Parliament Report on FCMs](https://www.foodpackagingforum.org/food-packaging-health/eu-parliament-report-on-fcms)
* [FACET exposure tool](https://www.foodpackagingforum.org/food-packaging-health/facet-exposure-tool)
 | [Food Packaging Materials](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials)* + [Ceramics](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/ceramics)
	+ [Glass](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/glass)
	+ [Metal](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/metal)
	+ [Paper and board](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/paper-and-board)
	+ [Plastics](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/plastics)
	+ [Printing inks](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/printing-inks)
	+ [Wax](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/wax)
	+ [Wood](https://www.foodpackagingforum.org/food-packaging-health/food-packaging-materials/wood)
	+ [Melamine](https://www.foodpackagingforum.org/food-packaging-health/melamine)
	+ [Micro plastics](https://www.foodpackagingforum.org/food-packaging-health/microplastics)
 | * [Migration](https://www.foodpackagingforum.org/food-packaging-health/migration)
* [Migration modeling](https://www.foodpackagingforum.org/food-packaging-health/migration-modeling)
* [Mineral oil hydrocarbons](https://www.foodpackagingforum.org/food-packaging-health/mineral-oil-hydrocarbons)
* [Mixture Toxicity](https://www.foodpackagingforum.org/food-packaging-health/mixture-toxicity)
* [Nanomaterials](https://www.foodpackagingforum.org/food-packaging-health/nanomaterials)
* [Non-intentionally added substances (NIAS)](https://www.foodpackagingforum.org/food-packaging-health/non-intentionally-added-substances-nias)
* [Per- and polyfluoroalkyl substances (PFASs)](https://www.foodpackagingforum.org/food-packaging-health/per-and-polyfluoroalkyl-substances-pfass)
* [Phthalates](https://www.foodpackagingforum.org/food-packaging-health/phthalates)
* [Plastic recycling](https://www.foodpackagingforum.org/food-packaging-health/plastic-recycling)
* [Regulation on Food Packaging](https://www.foodpackagingforum.org/food-packaging-health/regulation-on-food-packaging)
* [Silicones](https://www.foodpackagingforum.org/food-packaging-health/silicones)
* [Threshold of Toxicological Concern](https://www.foodpackagingforum.org/food-packaging-health/threshold-of-toxicological-concern)
* [UV filters in food packaging](https://www.foodpackagingforum.org/food-packaging-health/uv-filters-in-food-packaging)
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| **PLASTICS AS FOOD PACKAGING** |
| **Plastic Foil** | **PET** (polyethylene terephthalate) | * **Formaldehyde** [1]
* Acetaldehyde [1]
* Antimony [2]
* UV Stabilizers [3]
* Polybrominated Dimethylesters (PBDE) [4]
 | **Joghurt cup lids** |
| **PE** | * Polyolefin oligomeric saturated hydrocarbons (POSH) [5]
* **Nonylphenol** [6]
 | **Freezer bags**, frozen  poultry and ham bags, prepackaged fresh produce, food storage containers [7, 8] |
| **PVC** | * **Vinyl chloride** [9]
* Organo tins [10]
* Adipates [11]
* Plasticiser [11, 12]
* nonylphenol [13]
 | **Shrink foil**, shrink foil prepackaged meat, cheese, fruit and vegetables [8] |
| **HDPE** | * **Antimony** [4]
* Polybrominated Dimethylesters (PBDE) [11]
 | Milk, **dairy products** [8] |
| Cellulose | * Triacetin [14]
 | Meat packaging [8] |
| **Plastic Bottle** | **PET** (polyethylene terephthalate) | * Formaldehyde [1]
* Acetaldehyde [1]
* Antimony [4, 15]
* UV Stabilizers [3]
* Adipates [[16](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Plastic.docx#_ENREF_16)]
* Phthalates [16]
* Polybrominated Dimethylesters (PBDE) [4]
 | Soft drinks, CSD\*\* (single use) [8] |
| **PC (polycarbonate)** | * **Bisphenol A** [14, 17]
* Antimony [4]
* Polybrominated dimethylethers (PBDE) [2, 4]
* 4-nonylphenol [17]
 | Repeated use water bottles, **baby feeding bottles** [14] |
| **PVC (polyvinylchloride)** | * **Vinyl chloride** [9]
* Plasticiser [12]
* Organo tins [10]
* Nonylphenol [4, 18, 19]
 | **Water and soft drink bottles** (single use)[14] |
| **Plastic Trays and Inserts** | **PVC** (polyvinylchloride) | * Vinyl chloride [9]
* Plasticiser [12]
* **Organo tins** [10]
* Plasticiser [11, 12]
* Nonylphenol [18, 19],
 | **Chocolate box**  inserts, food trays, biscuit tins[14] |
| **PS (polystyrene)** | * **Styrene** [20] (found for cups)
* Styrene trimers [21]
* Polybrominated dimethylesters (PBDE) [4]
 | Yoghurt, dairy product, honey**, syrup and ice cream**, marmalade and jam tubs and containers;trays for prepackaged meat and fruit[14] |
| **Plastic Trays *(Oven Proof)*** | **PET (polyethylene terephthalate)** | * Formaldehyde [1, 15]
* **Acetaldehyde** [1, 15]
* Antimony [4]
* UV Stabilizers [3]
 | oven proof or **microwavable** food |
| **Plastic Cups** | **PP (polypropylene)** | * Polyolefin oligomeric saturated hydrocarbons (POSH) [5]
* Erucamide, oleamide [7]
* Antioxidants [7]
* **Phthalates** [7]
 |  |
| **PS (Polystyrene)** | * Styrene [20]
* Styrene trimers [21]
* **Polybrominated dimethylesters** PBDE [4]
 | **Vending** cups [14] |
| **Plastic Pouches** | Aluminium | * Aluminium [8]
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| **PP (polypropylene)** | * Polyolefin oligomeric saturated hydrocarbons (POSH) [5]
* **Erucamide**, oleamide [7]
* Antioxidants [7]
 | Crisps, **biscuits**, snack foods, sugar, grains and vegetables[14] |
| **PET** | * Formaldehyde [1, 15]
* Acetaldehyde [1, 15]
* Antimony [15]
* **UV Stabilizers** [3]
 | **Boil in the bag food** [8] |
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| [**Glass**](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Glass) | **Glass Container** Coated Metal Closure | * Phthalates [[1-3](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Glass/Glass#_ENREF_1)]
* Epoxidised soy bean oil (ESBO) [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Glass/Glass#_ENREF_1), [2](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Glass/Glass#_ENREF_2)]
* **Lead** [[4](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Glass/Glass#_ENREF_4)]
 | **Glass bottles**, yoghurt jars, vegetable and fruit jars |
| **Ceramics** | **Glazed Ceramic** | * Heavy metals (**Lead and Cadmium**) [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Ceramics/Ceramics#_ENREF_1)]
 | **Kitchen Ware** |
| **Metal** | **Steel Coated** with tin (tinplate)Coated tin, steel or **Aluminum** | * **Tin** [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_1)]
* Iron [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_1)]
* Bisphenol A diglycidyl ether (BADGE) [[2](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_2)]
* **Bisphenol A** [[3](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_3)]
* **Fungicide** [[4](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_4)]
* **Aluminium** [[5](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_5)]
* Tin [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_1)]
* Iron [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_1)]
 | White fruit cans [[1](https://www.foodpackagingforum.org/Food-Packaging-Health/Food-Packaging-Materials/Metal/Metal#_ENREF_1)]**Soft drink** and beer cans, fish and pâté cans [1, 6] |
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| **FOOD PACKAGING - PAPER**  |
| **Food Packaging** | **Food Contact Material\*** | **Typical Migrants** | **Typical uses** |
| **Paper** | **Paper** (recycled and/or printed) | * Printing **inks** (including benzophenones) [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_1)]
* **Mineral oils** [[2](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_2)]
* Anthraquinone [[3](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_3)]
 | **Dry food packaging** such as flower, sugar [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_1)] |
|  | **PE (polyethylene) coating** | * **Polyolefin oligomeric saturated hydrocarbons** (POSH) [[4](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_4)]
 |  |
|  | **Non-stick coating** | * **Perfluorinated** compounds [[5](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_5), [6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_6)]
 |  |
| **Carton Board** | Carton (recycled and/or printed) | * Printing inks (including benzophenones)  [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_1)]
* Mineral oils [[2](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_2)]
* **Phthalates** [[7](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_7)]
* Anthraquinone[[3](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_3)]
 | Rice cartons, muesli and cereal cartons, **infant formula** [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_1)] |
|  | **PE (polyethylene)** | * **Polyolefin oligomeric saturated hydrocarbons (POSH)** [[4](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_4)]
* UV stabiliser [[8](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_8)]
 | **Beverage cartons**, frozen food cartons, baby formula [[9](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_9)] |
|  | **Aluminium** | * **Aluminium** [[10](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_10)]
 | **Snacks**, cough drops |
|  | **PP (polypropylene)** | * Polyolefin oligomeric saturated hydrocarbons (POSH) [[4](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_4)]
* Erucamide, **oleamide** [[9](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_9)]
* Antioxidants (BHT) [[9](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_9),[11](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_11)]
* Benzophenone [[12](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_12)]
 | **Bag in box** [[9](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Paper.docx#_ENREF_9)] |

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| **PRINTING INK**  |
| **Substance name** | **CAS** | **Application** | **Regulation** | **Health Effect** |
| 4,4’‐bis (dimethylamino)-benzophenone | 90-94-8 | Printing ink for paper and board [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_1)] | Not regulated in the EU, not registered with OECD | *No studies on health effects available* |
| 4,4’‐bis(diethylamino)‐benzophenone (DEAB) | 90-93-7 | Printing ink for paper and board [[1](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_1)] | Not regulated in the EU, not registered with OECD, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | *No studies on health effects available* |
| **Dibutyl phthalate** | 84-74-2 | **Plasticizer in ink** for PE [[2](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_2)] | Authorized as an additive in the EU SML = **0.3mg/kg-d**, registered with [OECD](http://webnet.oecd.org/hpv/UI/SIDS_Details.aspx?Key=7ee4033e-caa6-41d3-b6b5-9a069b98e217&idx=0) | **Reproductive toxicant (embryotoxicity and impaired fertility** (see [assessment](http://webnet.oecd.org/hpv/UI/handler.axd?id=2596b98b-5b94-4766-a3ac-40b52d191172)), undifferentiated gonads in frogs [[3](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_3)], reproductive tract malformations in rats and rabbits [[4](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_4)]) |
| **Dicyclohexyl phthalate** | 84-61-7 | **Plasticizer in ink for PE** [[2](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_2)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B) | **Endocrine disruptor**, centribular cell hypertrophy in rat [[5](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_5)] |
| **Triphenylphosphate** | 115-86-6 | **Printing ink for paper and board** [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, registered with OECD, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | **Low acute toxicity** (see [OECD report](http://webnet.oecd.org/hpv/UI/handler.axd?id=84ec12e5-b201-4f75-bfcc-c240e529787c)) |
| **Di(2-ethylhexyl)phthalate (DEHP**) | 117-81-7 | **Plasticizer** in ink for PE [[2](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_2)] | EPA LOAEL 19mg/kg-d, SML =**1.5mg/kg-d**, group 00032 SML =60mg/kg-d, only to be used in repeated use articles in contact with non-fatty food and concentrations below 0.1%, OECD registered | Light skin and eye irritation, hepatoxin, **kidney toxin**, testicular toxicity (see [OECD report](http://webnet.oecd.org/hpv/UI/handler.axd?id=5738b7ae-0aa3-4fd2-8929-f4959d7df59c)), testicular toxicity [[7](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_7)], male reproductive tract malformations in rats and rabbits [[4](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_4)], reduced fertility ([EFSA Opinion](http://www.efsa.europa.eu/fr/scdocs/doc/243.pdf)) |
| 4-methyl-benzophenone | 134-84-9 | Printing ink for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not authorized by EU or FDA, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | *No studies on health effects available* |
| **Benzophenone** | 119-61-9 | **Photosensitizer** in printing inks [[8](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_8), [9](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_9)] | Approved as a food additive (9.1) (legislation: (EU) No 10/2011 (SML = 0.6 mg/kg), registered with OECD,  [FDA approved](https://www.fda.gov/food/ingredientspackaginglabeling/foodadditivesingredients/ucm091048.htm) as food additive, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | Classified as a 2B **carcinogen** by IARC ([Monograph](http://monographs.iarc.fr/ENG/Monographs/vol101/mono101-007.pdf)), Hepatoxin in two generations study in rats, estrogenic potency (see [EFSA report](http://www.efsa.europa.eu/de/scdocs/doc/243r.pdf)), estrogenic and androgenic activity in hormone responsive reporter assay [[10](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_10)] |
| Methyl 2-benzoylbenzoate | 606-28-0 | Printing ink for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B (currently under reevaluation)) | *No studies on health effects available* |
| **1-Hydroxycyclohexyl phenyl ketone** | 947-19-3 | **Printing ink** for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, registered with OECD, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | **Cytotoxic** [[11](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_11)] |
| 4-Phenylbenzophenone | 2128-93-0 | Printing ink for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B (currently under reevaluation)) | *No studies on health effects available* |
| 2-Isopropylthioxanthone (2-ITX) | 5495-84-1 | Photoinitiator in printing inks on drinking cartons [[12](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_12)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B | *No studies on health effects available* |
| Ethyl 4-dimethylaminobenzoate | 10287-53-3 | Printing ink for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B (currently under reevaluation)) | *No studies on health effects available* |
| **2-ethylhexyl-4-dimethylaminobenzoate** | 21245-02-3 | Printing **ink** for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not authorized by EU or FDA, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B (currently under reevaluation)) | Antagonist effect in Yeast two hybrid assay EC50 (+S9d)and in MDA-kb2 **cell transcriptional**-activation assay [[13](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_13), [14](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_14)] |
| **2,2-Dimethoxy-2-phenylacetophenone** | 24650-42-8 | Printing **ink** for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B) | Binds with rat **estrogen receptors** [[15](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_15)] |
| 4-(4-Methylphenylthio)benzophenone | 83846-85-9 | Printing ink for paper and board [[6](file:///C%3A%5CUsers%5CCharlotte%20Wagner%5CDocuments%5CWork%5CWebpage%5CFood%20Packaging%20Table%20Printing%20inks.docx#_ENREF_6)] | Not regulated in the EU, authorized in Switzerland ([Swiss ordinance 817.023.21](https://www.blv.admin.ch/dam/blv/en/dokumente/gebrauchsgegenstaende/rechts-und-vollzugsgrundlagen/anhang-6-sr-bedarfsgegenstaende.pdf.download.pdf/130401%20Annex%206_en.pdf), Section B) | *No studies on health effects available* |

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| **Threshold values defined by different research groups and regulatory agencies during the development of the TTC and ToR concepts.** |
| **Approach** | **Threshold groups** | **Threshold values** | **Reference** |
| General ToR | **All chemicals** | **0.1 ppm in the diet** | Frawley, 1969 [1] |
| ToR | **Non-carcinogens** | **1.5 ug/person/day** | US FDA [5, 6] |
| Decision tree approach | Cramer class ICramer class IICramer class III | **1800 ug /person/day****540 ug/person/day****90 ug/person/day** | Munro, 1996 [8] |
| ToR, tiered approach | Level 1Level 2Level 3 | **1.5 ug/person/day****15 ug/person/day****30-45 ug/person/day** | Cheeseman, 1999 [9] |
| TTC | Cramer classes I-IIIOrganophosphates and CarbamatesGenotoxic compounds | **according to [8]****18 ug/person/day****0.15ug/person/day** | Kroes, 2004 [10] |
| TTC | **Cramer classes I-III****Organophosphates and Carbamates****Structural alerts for Genotoxicity** | according to [8]according to [10]according to [10] | Scientific Opinion EFSA, 2012 [12] |
| **Adjusted for Body Weight** | **Cramer class I****Cramer class II****Cramer class III****Organophosphates and Carbamates****Structural alerts for Genotoxicity** | **30 ug/kg bw/day****9.0 ug/kg bw/day****1.5 ug/kg bw/day****0.3 ug/kg bw/day****0.0025 ug/kg bw/day** | Scientific Opinion EFSA, 2012 [12] |
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**Threshold Classes and corresponding threshold values**

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| --- | --- | --- |
| **Classification** | **TTC (µg/person/d)** | **Reference** |
| Cramer class I | **1800** | Munro 1996 [2]\* |
| Cramer class II | **540** | Munro 1996 [2]\* |
| Cramer class III | **90** | Munro 1996 [2]\* |
| Organophosphates and carbamates | **18** | Kroes 2004 [5]\* |
| Carcinogens | **1.5** | TOR rule, Rulis [1]\*\* |
| Genotoxic substances (without aflatoxin-like, azoxy- or N-nitroso compounds) | **0.15** | Kroes 2004[5]\*\* |



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