Bisphenol A in recycled paper and thermal paper used in food contact

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Summary

A significant contamination of food with Bisphenol A (BPA) can happen, if food comes into direct contact with thermal paper (contains 1 to 2% BPA). Amounts up to 60% of the TDI of 3 mg/60 kg body weight/d were detected in one slice of sausage (20 g). Also an indirect food contamination (up to 4% of the TDI) may be possible when food is touched by fingers, that have been in intensive moistly contact with a thermal paper receipt. So the consumer can contaminate the food indirectly and without knowledge of it. Food packagings of recycled card board contains BPA in amounts in range of 6 – 12 mg/kg. No migration into the investigated food samples has been detected (LOD: < 1 µg/kg), during storage of up to 9 months. The amount of BPA in kitchen tissues of recycled fiber was determined between 4 - 17 mg/kg (corresponds 2.5 – 8.6 µg/dm²). A migration of 0.2 – 6.5 µg/sdm food was detected in cucumber and sausage, which was stored for 24 h on a wet kitchen tissue but this transfer is far below the TDI (3 mg/60kg KG/d).

Thermal paper

1 to 2 % Bisphenol A is used in thermal paper as additive for the colour developer on the thermo-sensitive coating of the paper. If consumers or sellers touch a receipt, an indirect food contamination is possible by touching a receipt and then food.

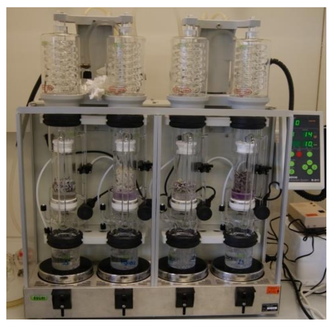
Thermal paper enters the paper recycling system after use. It is indentified as the main source of BPA in the recycling process.

Recycling products

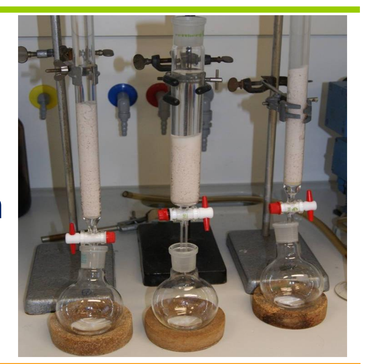
BPA is passing the recycling process. The recycled fibers are used to produce food packagings (carton) or kitchen tissues, respectively. Their BPA content ranges between 4 and 17 mg BPA/kg carton or tissue, respectively.

Sample preparation and chromatography:

Analysing paper and board:
- 4 g paper pieces 0,5 x 0,5 cm
- soxhlet extraction with methanol
- dilution 1:1 with bidestilled water
- RP-HPLC-FLD $\lambda_{ex/em}$: 275 / 305 nm
- Limit of detection (LOD): 270 µg/kg paper



Analysing food:
according to Petersen, 2003 [1]
- homogenization with kieselgur
- lipid-lipoid-separation with diethyl ether in glass columns
- RP-HPLC-FLD $\lambda_{ex/em}$: 275 / 305 nm
- Limit of detection (LOD): 1 µg/kg food



Direct contact

If food comes in direct contact with a thermal paper, because of careless storage of the receipts, the food will be contaminated.

Experimental:

1 slice sausage (20 g) + thermal paper with thermal sensitive side in direct contact to the sausage stored for 12 h in the fridge

Migration of 1,8 mg BPA in 1 slice sausage
≙ 60 % TDI
(TDI: 3 mg/60 kg body wight/d)

Recycled card board

BPA could be detected with a content between 6 and 12 mg BPA/kg card board. If food will be stored in this card board boxes, BPA might be able to migrate via gas phase or set off.

Experimental:

Storage of dry food in direct contact with recycled card board for 9 months.
The total amount in the card board box before storage was analysed with 8,3 mg BPA/kg card board.

Stored food: oak flakes, rice, pasta, breadcrumbs, grits and chocolate cookies

No detectable migration into the food
Limit of detection:
< 1 µg/kg food

Can Bisphenol A migrate into foodstuff?

Indirect contact

If a seller or a consumer touch a receipt and afterwards food will be touched, it is possible that food will be contaminated indirectly with BPA.

Experimental:

A thermal paper was touched with dry, wet and fatty gloves and than a slice of sausage (20 g) was touched. The sausage was analysed.

fatty < dry < wet
4,1 µg < 21 µg < 138 µg / slice sausage
≙ up to 4 % of the TDI

Tissue paper

kitchen tissues can be produced of recycling fibers and containing also 4 – 17 mg BPA/kg kitchen tissue (2,5 – 8,6 µg/sdm) (fig.1).

Experimental:

Storage of sausage and cucumber for 20 min up to 24 h on a dry or wet kitchen tissue.

BPA-transfer:
wet > dry kitchen tissue
6,5 > 0,2 µg/dm² sausage
≙ 0.2 % TDI

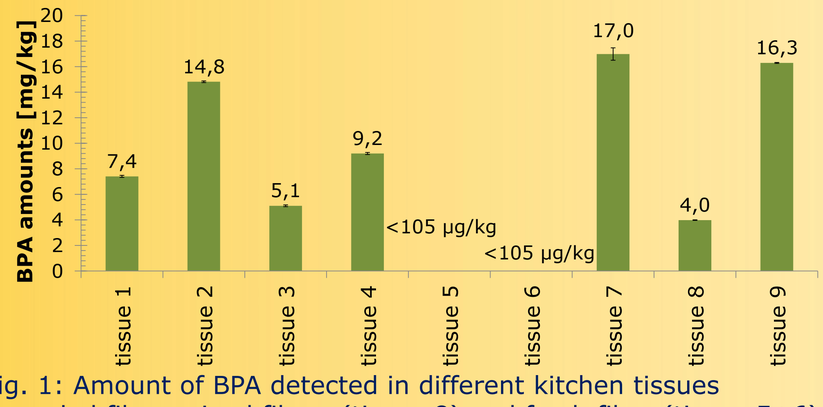


Fig. 1: Amount of BPA detected in different kitchen tissues (recycled fiber, mixed fibers (tissue 8) and fresh fiber (tissue 5+6)

Acknowledgment and Literature:
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[1]: Petersen, 2003, Bisphenol A-Diglycidylether: Vorkommen, Ersatzstoffe und Reaktionen mit Lebensmittelbestandteilen, dissertation, University Hamburg