

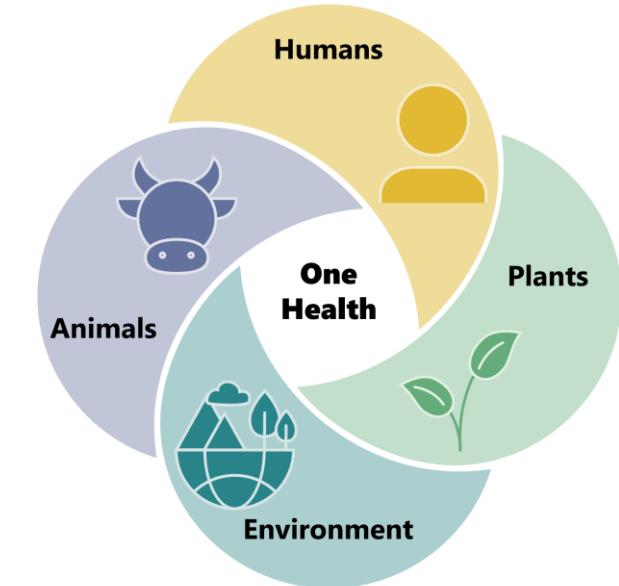
PFAS in paper and board

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Summary of PFAS Results of campaign A-019-25

“Suitability of paper and board products for food contact”



- Products
- Test strategy
- Analytes
- Method Description
- Results
- Discussion of results

Products/ samples:

Uncoated paper/ board articles



6 different pizza boxes (laminated corrugated cardboard)

6 different drinking straws (paper)

5 different paper bags for fast food (paper)

4 different muffin or backing cups (paper)

1 paper plate (coated board)

1 napkin (paper)

1 cardboard box (cardboard)

Test strategy

- Cold water extraction according to EN 645:
10 g small pieces of sample in water at 23 ± 2 °C, 24 h, 250 ml
Samples: napkins, straws, paper bags, paper plate, cardboard box, pizza box
- Hot water extraction according to EN 647:
10 g small pieces of sample in water at 80 ± 2 °C, 2 h, 250 ml
Samples: muffin or backing cups

Analytes

Perfluorobutanoic acid (PFBA), 3 samples

Perfluoropentanoic acid (PFPeA), 2 samples

Perfluorohexanoic acid (PFHxA), 15 samples

Perfluoroheptanoic acid (PFHpA), 6 samples

Perfluorooctanoic acid (PFOA), 15 samples

Perfluorononanoic acid (PFNA)

Perfluorodecanoic acid (PFDA)

Perfluoronundecanoic acid (PFUnDA)

Perfluorododecanoic acid (PFDoDA)

Perfluorotridecanoic acid (PFTrDA)

Perfluorobutanesulfonic acid (PFBS)

Perfluoropentanesulfonic acid (PFPeS)

Perfluorohexanesulfonic acid (sum of n-PFHxS and br-PFHxS)

Perfluoroheptanesulfonic acid (PFHpS)

Perfluorooctanesulfonic acid (sum of n-PFOS and calc.-PFOS), 2 samples

Perfluorononanesulfonic acid (PFNS)

Perfluorodecanesulfonic acid (PFDS)

Perfluoroundecanesulfonic acid (PFUnDS)

Perfluorododecanesulfonic acid (PFDoDS)

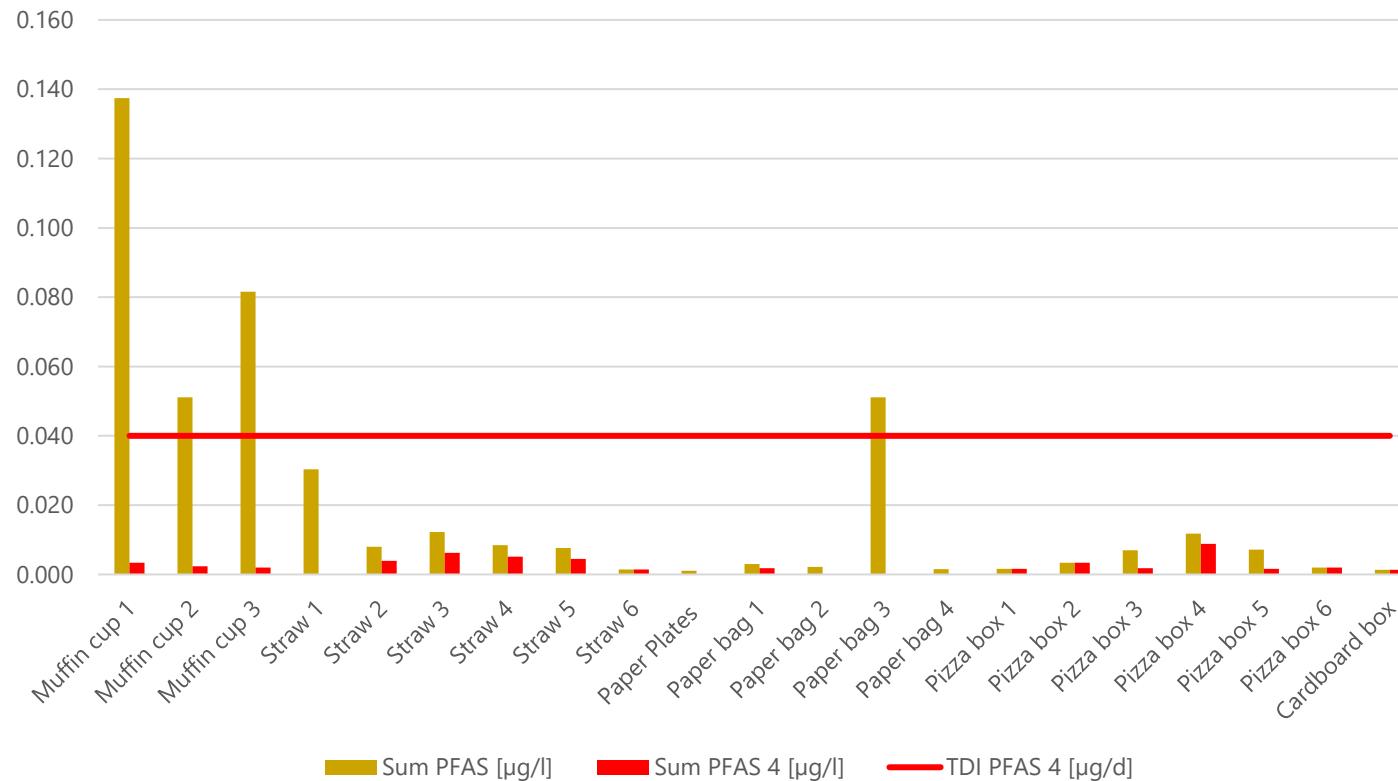
Perfluorotridecanesulfonic acid (PFTrDS)

Method Description

- DIN 38407-42:2011-03: German standard methods for the examination of water, waste water and sludge - Jointly determinable substances (group F) - Part 42: Determination of selected polyfluorinated compounds (PFC) in water - Method using high performance liquid chromatography and mass spectrometric detection (HPLC/MS-MS) after solid-liquid extraction
- Sample preparation: 50 ml of sample is spiked with internal standard, followed by solid-phase extraction (SPE) using SPE cartridges containing a weak anion exchange resin as the sorbent. The eluate is then concentrated to dryness using a vacuum centrifuge, dissolved in methanol, transferred to an LC vial, made up to a final volume of 1 ml with water, and mixed.
- The measurement is performed on our LC-MSMS system, an Agilent Infinity 1295 HPLC coupled to an ABSciex 6500+ mass spectrometer.
- LOD: 0,001 µg/L

Results

PFAS in paper/board samples



Results

- 3 (out of 24) samples with no detectable PFAS
(1 muffin cups, 1 napkins, 1 paper bag)
- **No critical results above group TWI sum of 4 PFAS** (PFOA, PFNA, PFHxS, PFOS) of 4,4 ng/kg BWw (0,04 µg/d, 60 kg BW)
- Highest quantities found:
 - Muffin cup 1: PFHxA: 0,100 µg/L
 - Muffin cup 2: PFHxA: 0,045 µg/L
 - Muffin cup 3: PFHxA: 0,066 µg/L
 - Paper bag 3: PFHxA: 0,032 µg/L

Discussion of results (1)

Assessment of short-chain PFASs (PFBA, PFBS, PFHxA)



EFSA Scientific Opinion doi: 10.2903/j.efsa.2020.6223:

"In humans, the estimated half-lives for short-chain PFASs (such as PFBA, PFBS and PFHxA) were found to range from a few days to approximately one month, whereas for compounds having a long perfluoroalkyl chain length (such as PFOA, PFNA, PFDA, PFHxS or PFOS), it can be several years."

End points for PFHxA:

ANSES: 20 µg/kg BWd (chronic toxicity reference value: TRV)

UBA: 6 µg/L (Trinkwasser-Leitwerte: TWLW)

Discussion of results (2)

How to proceed with results from hot/ cold water extracts?

Result in mg or $\mu\text{g}/\text{L}$: 10 g sample material extracted in 250 ml water

EDQM: no recalculation necessary, however detailed risk assessment based on additional knowledge of application is required

“Worst case” results: no findings – no further testing (solubility of contaminants needs to be considered)

Case 1: 1 straw per drink: 1 g/ 250 ml drink -> 10-fold overestimation (one drink/d)

Case 2: 1 muffin cup: 0,5 g/50 ml content -> 5 muffins/day: 20-fold overestimation

Findings need further clarification and testing (e.g. with food under realistic conditions) if compliance/ non-compliance needs to be demonstrated

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