

OCCURRENCE OF HALOGENATED FLAME RETARDANTS IN BELGIAN FOOD SAMPLES

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Target	Food c

PBDEs

BDE-28

BDE-49

BDE-47

BDE-100

BDE-99

BDE-153

BDE-138

BDE-183

BDE-209

compounds

HFRs

TBA

HBB

TBB

BTBPE

TBPH

syn-DP

anti-DP

Food categories – ID code – n. of samples

Liquid milk composite	LC; n=13
Dessert/sweet composite	DC; n=3
Cheese composite	CHC; n=22
Baby-food composite	BC; n=18
Oil/fat composite	OC-FAT; n=9
Fish composite	FC; n=51
Crustacean composite	CC; n=7
Mussel composite	MC; n=3
Egg composite	EGC; n=4
Grain composite	GRAC; n=7
Potato composite	POC; n=4
Other food composite	OTC; n=5
Vegetable composite	VEC; n=2
Meat composite	MEC; n=35

BDE-28

BDE-47

■ BDE-49

BDE-100

BDE-153

BDE-154

BDE-183

BDE-209

- ✓ Lack of data on the presence of brominated flame retardants (BFRs) in food → incorrect estimation of the health risks.
- EFSA indicated that it is not possible to perform an accurate risk assessment due to the lack of data on the occurrence in food and consequently on the exposure to BFRs via the diet.
- This project follows up the European Commission Recommendation 2014/118/EU¹ on the monitoring of BFRs in food.
- A simple two-step clean-up method, based on GC/ECNI-MS, for the determination of PBDEs and emerging halogenated flame retardants (EHFRs) in food was developed and validated².

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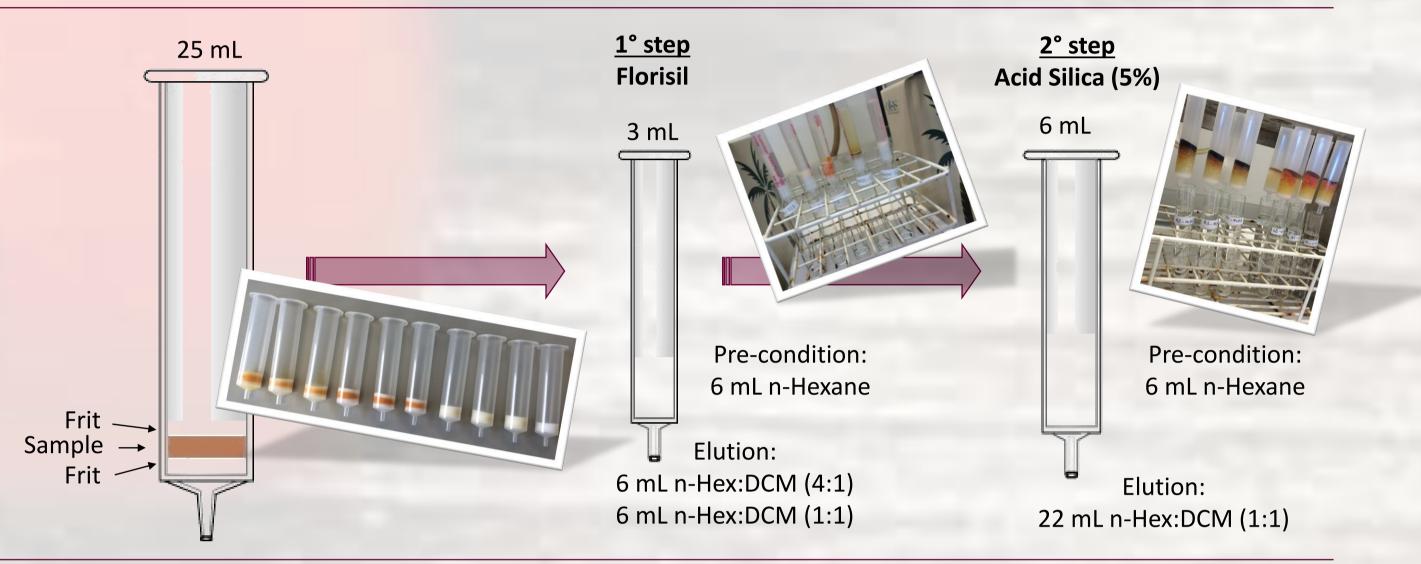
MATERIALS

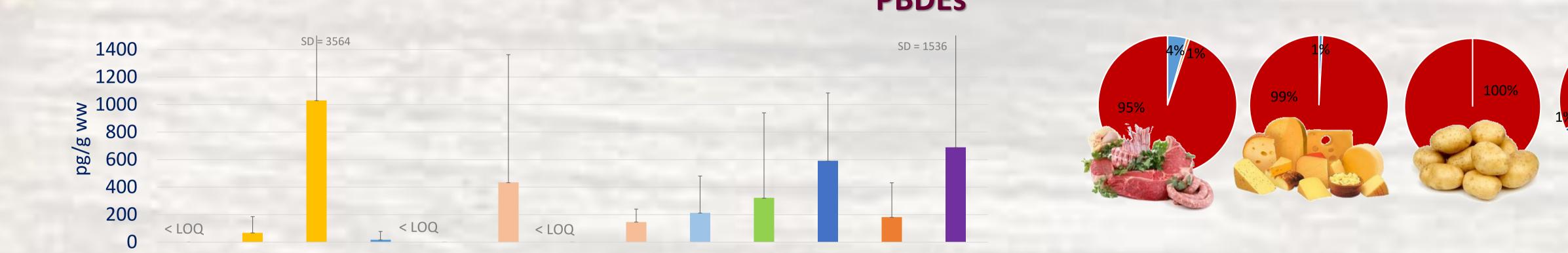
METHODS

183 composite food samples, belonging to 15 different food categories were analyzed in the frame of the project.



- Addition of Internal Standard (IS: BDE-103; BDE-128; ¹³C-BDE-209; ¹³C-TBB; ¹³C-TBP; ¹³C-anti-DP; ¹³C-syn-DP).
- ✓ Solid-liquid extraction with 5 mL acetonitrile:toluene (9:1, v/v).
- ✓ Clean-up performed on Florisil[®] and acidified silica (1 g, 5% H_2SO_4 w/w).
- ✓ Target analysis performed with a GC-ECNI/MS, operated in SIM.
- ✓ LOQs: 50 pg/g ww for TBA, 5 pg/g ww for PBDEs, 100 pg/g ww for BDE-209, 20 pg/g ww for HBB and DPs, 10 pg/g ww for BTBPE, 200 pg/g ww for TBB and TBPH.





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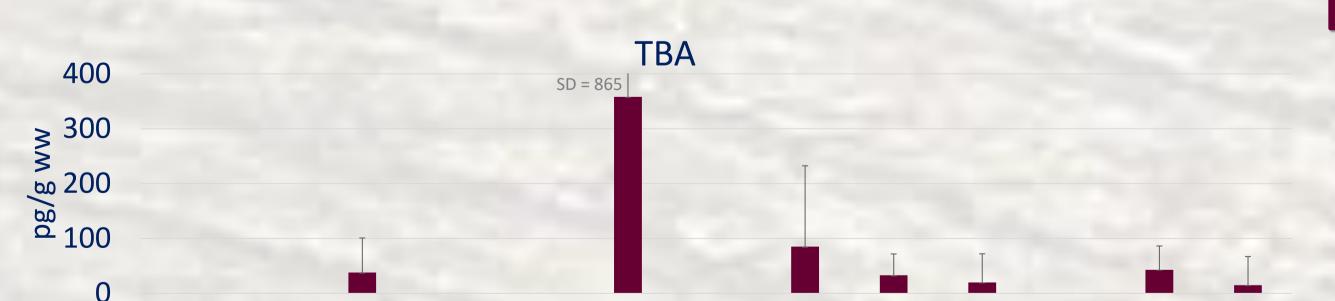
PBDEs

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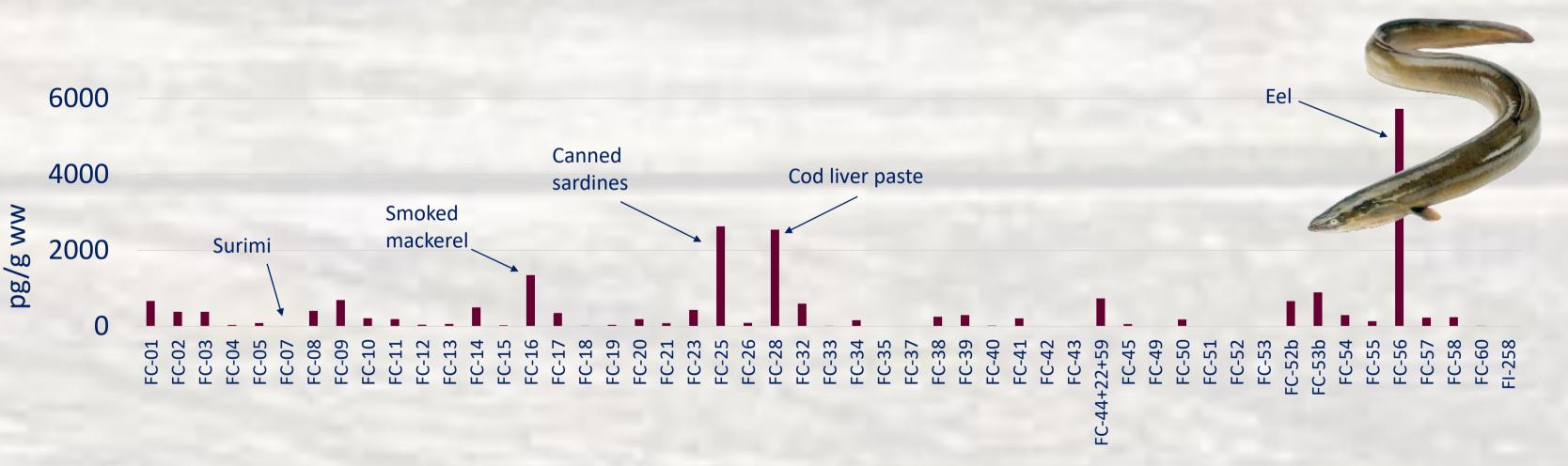
LB mean levels for \sum PBDEs from 17 ± 61 pg/g ww in BC to 1,029 ± 3,564 pg/g ww in CHC; $\sum PBDEs$ up to 16,888 pg/g ww (emmenthal).



✓ Mean distribution of PBDEs in the analyzed food categories: CHC (28 %) > MEC (19 %) > POC (16 %) > FC (12 %).



- MEC, CHC, POC: BDE-209 possible contamination during production chain, sample handling.
- ✓ FC: BDE-47 (41 %) > BDE-209 (32 %) > BDE-100 (12 %) > BDE-49 (7 %) > BDE-28 (4 %), BDE-154 (2 %), and BDE-153 and -183 (1 %).



PBDEs (pg/g ww) in FC: surimi = least contaminated seafood item (5 pg/g ww); eel = highest total PBDE concentration (5,727 pg/g ww); processed food = higher PBDE levels; PBDE levels in FC comparable with other studies worldwide.

EFRs

✓ TBA was the most frequently detected FR, in 50 % of the food categories: FC (60 %) and MC (14 %) > OTC-VEC (7 %) > CHC and EGC (6 %) > MEC and GRAC (3 %). TBA is naturally produced by algae, bacteria, fungi and sponges in the marine environment;^{3,4,5} TBA in CHC, OTC, EGC, GRAC, MEC activities related to the sample pre-analysis processing, industrial production.

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✓ Detection of **TBPH and DPs** was sporadic (< 5 % of the samples).

✓ HBB, TBB, BTBPE were < LOQ in all analyzed food items.

CONCLUSIONS

- PBDEs were the prevalent contaminants among the food categories (BDE-47 was the most frequently detected congener)
- ✓ TBA was mainly present in FC and MC categories, as expected due to its primary natural origin from the marine environment
- ✓ General low contamination of food with brominated flame retardants
- ✓ The measured concentrations will be used to estimate the dietary exposure to BFRs in the Belgian population.

ACKNOWLEDGEMENTS

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