

Urinary levels of Bisphenol A, Triclosan and 4-Nonylphenol in a general Belgian population

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1. INTRODUCTION

Bisphenol A (BPA), triclosan (TCS) and 4-Nonylphenol (NP) are among endocrine disruptors which are widely used in daily products. BPA is mainly used to manufacture polycarbonate, while TCS is an antimicrobial and antifungal agent used in personal care, and n-NP is mainly present in detergent and cosmetic products. The aim of this work is to estimate the levels of BPA, TCS and NP in 131 urine samples collected from a non-occupationally exposed population aged from 1 to 75 years living in Liege (Belgium) and the surrounding areas, to estimate baseline values concentration in Belgium.

2. MATERIAL AND METHOD

POPULATION 65 men / 66 women
Grouped by age (± 11 subjects by class)

6 classes

0-6	7-11	12-19
20-39	40-59	> 60

(Average age: 29.5 years)

Residence
57% rural / 43% urban

Smoking habits
89% no smokers / 11% smokers

BMI

BMI < 18.5	18.5 ≤ BMI < 24.9	BMI ≥ 25	BMI ≥ 30
4.5 %	65.7 %	35.1 %	10.4 %

SAMPLE
First morning urine collected in polypropylene container

HYDROLYSIS
 β -glucuronidase and sulfatase

SOLID PHASE EXTRACTION
Oasis HLB 3cc, 60mg

LIQUID/LIQUID EXTRACTION / DERIVATIZATION
Hexane/PFBCI; KOH 2M

EVAPORATION

RECONSTITUTION IN ISOCTANE
Sample volume 3 ml
Internal standards : bisphenol A-d₁₀, triclosan-d₃, nonylphenol-d₉

GC/MS-MS setting-up GC 7890A Agilent
MS Triple Quad 7000A Agilent

GC

- Multimode injector, pulse splitters, Inj. vol.: 2 μ l
- Carrier gas : helium, 1.2 ml/min
- Column : HP-5MS (30m x 0.25mm; 0.25 μ m) Agilent

Oven Temperature Program

Initial temp.	Rate (°C/min)	Temp. (°C)	Hold Time (min)	Run Time (min)
Ramp	25	300	8	24.65

MS

- Negative CI (methane)
- MRM

Compound	IS	MRM1	Collision en. (V)	MRM2	Collision en. (V)
4-n-Nonylphenol	Nonylphenol-d ₉	413.9>419.9	0	413.9>350.1	7.5
Triclosan	Triclosan-d ₃	481.8>481.8	0	481.8>286.9	10
Bisphenol A	Bisphenol A-d ₁₀	616.0>358.1	15	616.0>242.6	3.5

3. RESULTS AND DISCUSSION

	Positive samples (%)	Geometric mean μ g/l (μ g/g creat)	2,5th μ g/l (μ g/g creat)	50 th μ g/l (μ g/g creat)	97,5th μ g/l (μ g/g creat)
BPA					
Male	98.46	2.70 (2.23)	0.73 (0.69)	2.66 (1.99)	16.25 (15.29)
Female	96.92	2.40 (2.90)	0.44 (0.55)	2.35 (2.53)	10.79 (17.38)
TCS					
Male	70.77	2.84 (2.35)	<LOQ (<LOQ)	2.49 (2.28)	465.76 (334.19)
Female	78.46	2.57 (3.06)	<LOQ (<LOQ)	1.89 (2.35)	57.36 (59.05)
NP					
Male/Female	0	<LOQ	<LOQ	<LOQ	<LOQ

(C. Pirard et al, Environ. Int. 2012, 48:78)

➤ BPA and TCS were positively detected in almost all samples (97.7% and 74.6% respectively).

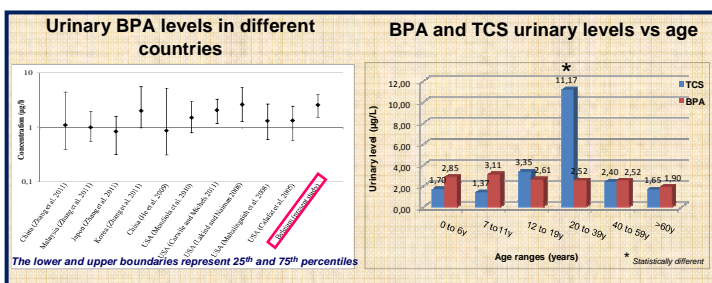
➤ NP was not detected in any samples of urine analyzed, confirming that urinary NP (free or conjugated) may not adequately assess nonylphenol exposure.

➤ Both BPA and TCS levels were not correlated with creatinine excretion, questioning the relevance of the creatinine adjustment in reporting these chemical levels.

➤ BPA levels in urine of people living in the same home and collected on the same time were fairly correlated, confirming that dietary intake would be the primary route of exposure. TCS urinary levels were not correlated with BPA levels.

➤ No statistical difference was found neither for BPA and TCS levels between male and female.

➤ TCS concentrations were significantly higher for people



4. CONCLUSION

We reported urinary levels of BPA, TCS and NP, in order to evaluate the baseline contamination of a general population in Belgium. Geometric mean concentration was determined for BPA at 2.55 μ g/l and for TCS at 2.70 μ g/l. No significant difference was observed between levels and gender for both BPA and TCS. When classified by age, the 20-39 year group showed the highest TCS levels, while all age groups seemed to be similarly exposed to bisphenol A.