Association between endocrine disruptor contamination and thyroid hormone homeostasis in Belgian type 1 diabetic children.

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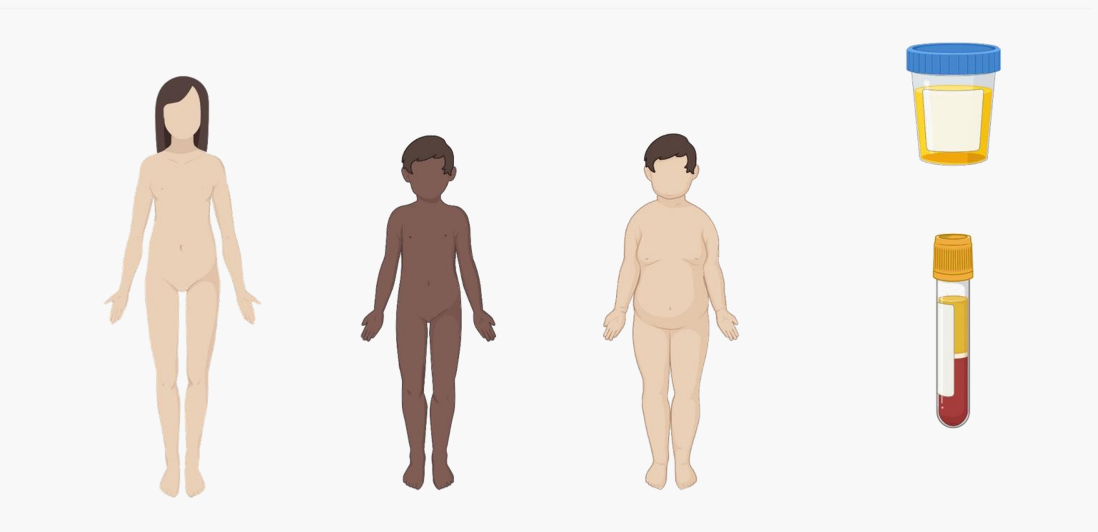
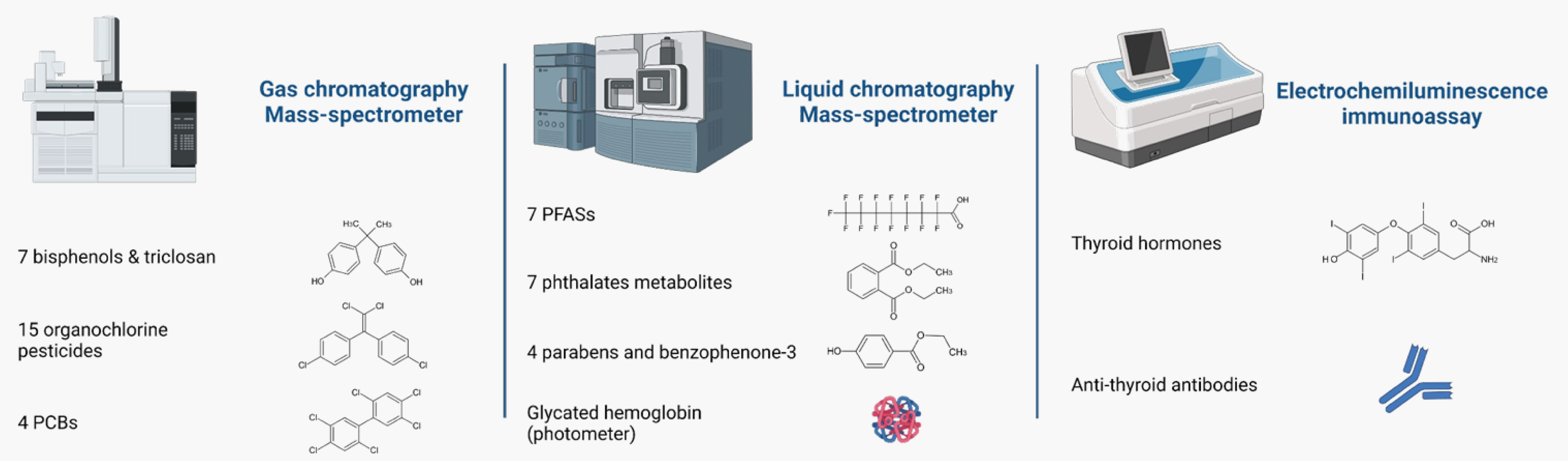
Introduction

Nowadays, the environmental impact of human activities is the focus of much attention, in the scientific community but also, more and more, among the general public. Among the environmental issues, the impact of pollutants (the so-called "endocrine disruptors") on endocrine health of humans but also animals is studied since decades. Every year, the weight of evidence grows so that it becomes difficult to deny that the growing quantity of synthetic chemicals contaminating the environment and the living organisms is an important public health concern. Nevertheless, more studies are required to undoubtedly establish the relation between pollutant exposure and the rising incidence of endocrine pathologies such as diabetes or thyroid impairments. In the present study, we explored the associations between the contamination by several chemicals measured in the serum and the urine of type 1 diabetic children and some thyroid and glucose homeostasis biological parameters.

Materials and methods



Serum and urine samples were collected from 54 children and teens with type 1 diabetes.
Age range: 3-18 years, median = 14 years.
Thirty-three boys and 21 girls, 20 were overweight.

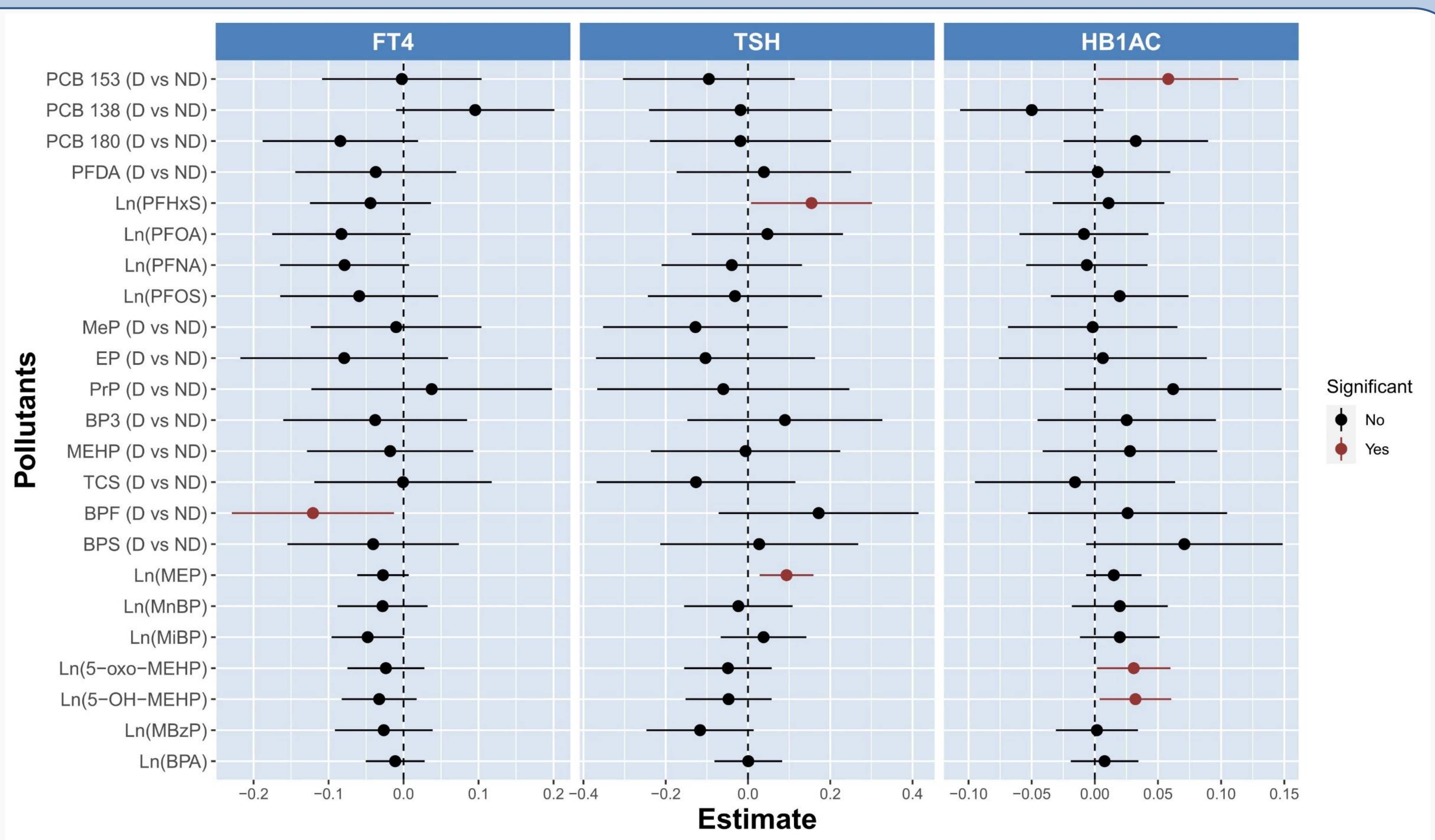


Pollutant and biological parameter analysis

Results

Compounds	DF (%)	Median (ng/mL)	Mean (ng/mL)	Range (ng/mL)
Serum				
PCBs				
PCB 138	61.1%	0.38	0.40	<LOQ - 1.22
PCB 153	55.6%	0.08	0.11	<LOQ - 0.41
PCB 180	55.8%	0.06	0.07	<LOQ - 0.27
OCP				
HCB	9.3%	<LOQ	<LOQ	<LOQ – 0.11
b-HCH	9.3%	<LOQ	<LOQ	<LOQ - 0.08
4,4'-DDE	1.9%	<LOQ	<LOQ	<LOQ - 0.18
PFASs				
PFHxS	100.0%	0.42	0.71	0.15 - 12.8
PFOS	96.2%	1.51	1.77	<LOQ - 5.66
PFOA	100.0%	1.08	1.35	0.30 - 4.76
PFNA	98.1%	0.36	0.44	<LOQ - 1.51
PFDA	53.8%	0.16	0.19	<LOQ - 0.88
Urine				
Phthalate metabolites				
MEP	100.0%	20.2	77.9	1.21 - 818
MnBP	100.0%	13.6	21.7	3.01 - 193
MiBP	97.9%	9.87	16.5	<LOQ - 93.4
MBzP	81.3%	1.65	3.74	<LOQ - 46.7
MEHP	65.2%	1.12	6.70	<LOQ - 212
5-OH-MEHP	97.9%	5.72	13.5	<LOQ - 303
5-oxo-MEHP	95.8%	4.32	9.34	<LOQ - 187
Parabens				
MeP	37.0%	<LOQ	44.7	<LOQ - 625
EP	25.6%	<LOQ	7.64	<LOQ - 291
PrP	22.9%	<LOQ	2.63	<LOQ - 26.8
Bisphenols				
BPF	69.8%	0.17	0.38	<LOQ - 2.50
BPA	80.4%	1.16	3.07	<LOQ - 53.8
BPS	65.1%	0.18	0.55	<LOQ - 6.97
Miscellaneous				
BP3	61.0%	0.90	9.61	<LOQ – 264
TCS	45.7%	<LOQ	1.33	<LOQ - 26.3

Detection frequencies (DF), median concentrations, mean concentrations and ranges measured for pollutants



Associations between TSH, fT4 and HB1AC and pollutant contaminations in multivariate linear regression models. Models for FT4 and TSH were adjusted for age, sex and presence of anti-thyroid antibodies while model for HB1AC was adjusted for age, sex and overweight status. When DF was <70%, pollutant contamination was dichotomized (detected vs non detected) and continuous concentrations log-transformed was used for pollutants with DF >70%.

Conclusion

Our results highlighted several significant associations between pollutants concentrations measured in urine or serum and levels of TSH, free thyroxine and glycated hemoglobin and therefore suggest that these environmental pollutants could interfere with the thyroid and glucose homeostasis in type 1 diabetic children. Nevertheless, given the transversal character of the present study, inverse causation cannot be excluded. Therefore these observations should be confirmed by larger scale and longitudinal studies.