

Statistical approaches to compare levels of 9 endocrine disrupting chemicals in hair serum and urine

J. Claessens^{1,2}, C. Charlier^{1,2}, P. Dufour^{1,2}, C. Pirard^{1,2}

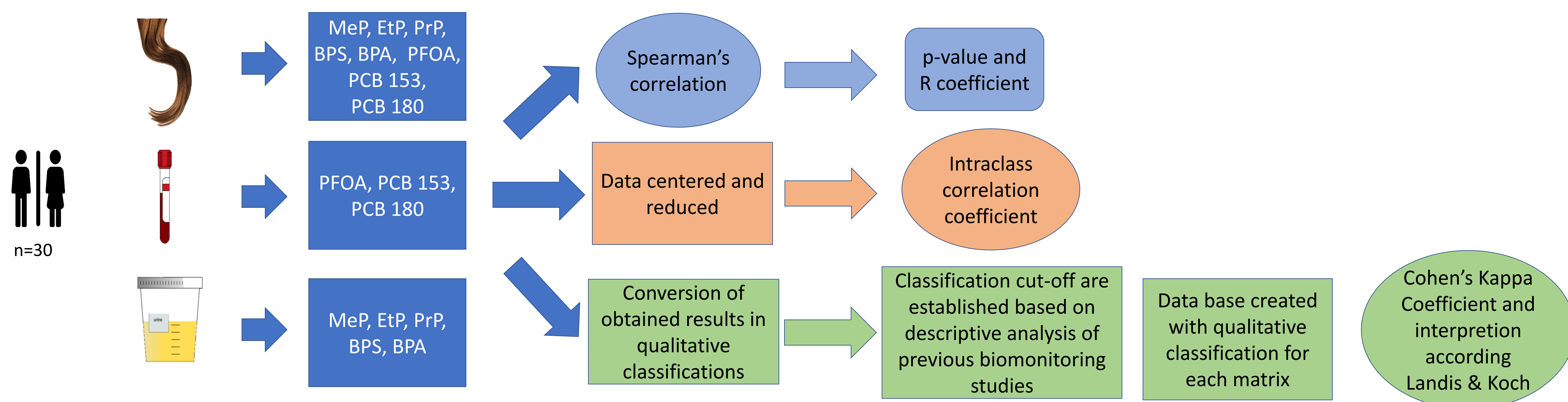
¹Department of clinical, forensic, environmental and industrial toxicology. University of Liege. CHU (B35) 4000 Liege Belgium

²Center For Interdisciplinary Research on Medicines (C.I.R.M). University of Liege. CHU (B35) 4000 Liege Belgium

Introduction

- Human biomonitoring of environmental pollutants (EP) is generally performed in blood or in urine. However concentration of non-persistent organic pollutants (nPOPs) in conventional matrix is subject to a high variability, leading to misclassification issues when assessing middle or long term exposure.
- Recently, hair has gained attention as an alternative matrix to assess exposure to EPs, supposing that the memory effect of hair could reduce the variability of contamination levels over different temporal windows.
- Correlations have been studied between concentrations observed in hair and in conventional matrix. But, to date, results observed in the literature use to be inconsistent and the reliability of using hair for biomonitoring remains uncertain.
- The aim was to investigate three different statistical approaches to assess comparability of results in hair and in conventional matrix for three persistent organic pollutants (PFOA, PCB 153 and 180) and five nPoPs (BPA, BPS, MeP, EtP, PrP).

Material and method



Results

Compounds	Spearman's correlation		Cohen's Kappa coefficient			ICC		
	R	P-value	K	CI lower limit	CI upper limit	Value	Upper CI	Lower CI
BPS	-0.15	0.44	-0.14	-0.42	0.14	0.02	-0.36	0.34
BPA	0.06	0.75	-0.10	-0.33	0.13	0.26	-0.37	0.40
MeP	0.31	0.09	0.35	0.08	0.63	-0.06	-0.42	0.31
EtP	0.59	<0.001	0.49	0.26	0.70	0.29	-0.08	0.59
PrP	0.38	<0.05	0.45	0.06	0.80	-0.05	-0.41	0.32
PFOA	0.17	0.36	0.11	-0.03	0.26	0.04	-0.34	0.40
PCB 153	0.09	0.69	0.04	-0.04	0.13	0.51	0.12	0.76
PCB 180	0.60	<0.05	0.62	0.344	0.89	0.85	0.68	0.93

- Only EtP, PrP, and PCB 180 showed significant Spearman's correlation coefficient.
- Interpretation of Cohen's kappa coefficient according to Landis & Koch classification:
 - Good agreement was observed for PCB 180 and moderate agreement for EtP and PrP.
 - Weak agreement for MeP, very weak agreement for PFOA and PCB 153 and no agreement for BPA and BPS.
- ICC: significant intraclass correlation coefficient were only highlighted for PCB 180 and 153.

Conclusion

- A comparison of contamination levels in hair and in serum or urine for 8 endocrine disruptors was performed using three different statistical methods.
- Results of Spearman's correlation and Cohen's Kappa Coefficient seems to be concordant with a reinforcement of the correlation coefficients and the agreement for the same compounds (namely PrP, EtP and PCB 180).
- ICC for PCB 180 is concordant with results of other statistical methods and ICC of PCB 153 was significant what is in opposite to the results of Spearman's correlation and Kappa. However for other compounds, ICC showed poor values.
- The absence of correlation for contamination level of PFOA and PCB 153 in the different matrix was not expected since there are both persistent organic pollutants. These results question the reliability of using hair to assess exclusively internal contamination.
- Using hair for biomonitoring of environmental pollutants is an interesting approach. However, future studies are needed to enquire influence of external factors on hair contamination and link between internal contamination and levels of pollutants in hair.