

Endocrine Disruptors in Seminal Fluid: Bisphenol A, Triclosan and Benzophenone-3

Marianna Krause, Hanne Frederiksen, Kristian Almstrup, Niels E. Skakkebaek, Anders Juul, and Anna-Maria Andersson

Department of Growth and Reproduction, Rigshospitalet, University of Copenhagen, Denmark

✉ marianna.krause@regionh.dk

Introduction

There is concern that unintended environmental exposures to numerous chemicals may have adverse endocrine effects on human reproduction (1). These include bisphenol A (BPA), benzophenone-3 (BP-3) and triclosan (TCS), all of which can be detected in serum and urine. Less is known about the concentrations of these chemicals in other body fluids. Here we present data, which show that these three chemicals also are present in the seminal fluid of young men.

Materials and method

From an ongoing study on male reproductive function in young men from the general population (2), we selected 29 men with high urinary excretion of BP-3, who were examined in 2007 and from whom urine, serum and seminal fluid were available for chemical analysis. Serum, urine and semen samples were collected within one hour. Samples were analyzed for BPA, BP-3 and TCS by Turbo-Flow-LC-MS/MS (3). Limits of detection (LOD) for BPA was 0.12 ng/ml in urine and 0.2 ng/ml in serum and seminal fluid and for BP-3 and TCS ≤ 0.1 ng/ml in all matrices.

Results

BPA, BP-3 and TCS were detected above LOD in 52%, 28% and 17% of the seminal fluid samples respectively. Median and range concentrations are given in table 1. Some subjects had very high levels in seminal fluid and the five men with the highest concentrations of TCS and BP-3 in serum also had the highest concentrations of TCS and BP-3 in seminal fluid (fig. 3). Concentrations of BP-3 and TCS in serum and in urine were significantly correlated with concentrations in seminal fluid (fig 2 and 3). There was no correlation between BPA concentrations in seminal fluid and BPA concentration in neither serum nor urine.

Conclusion

In this preliminary study BPA, TCS and BP-3 were detected in seminal fluid from young men from a general population. We do not know whether or not the seminal plasma content of BP-3, TCS and BPA originate from rete testis fluid, the epididymis, the prostate or the seminal vesicles. It remains to be seen whether the presence of these chemicals in seminal fluid is associated with effects on sperm cell function or the female reproductive tract.

Table 1. The range of BPA, BP-3 and TCS concentrations (ng/ml) detected in seminal fluid of young men from general population (2).

	n<LOD	median	p 75	p 95	max
BPA	14	< LOD	0.88	1.5	8.5
BP-3	21	< LOD	0.13	13.3	18.2
TCS	24	< LOD	< LOD	4.2	6.7

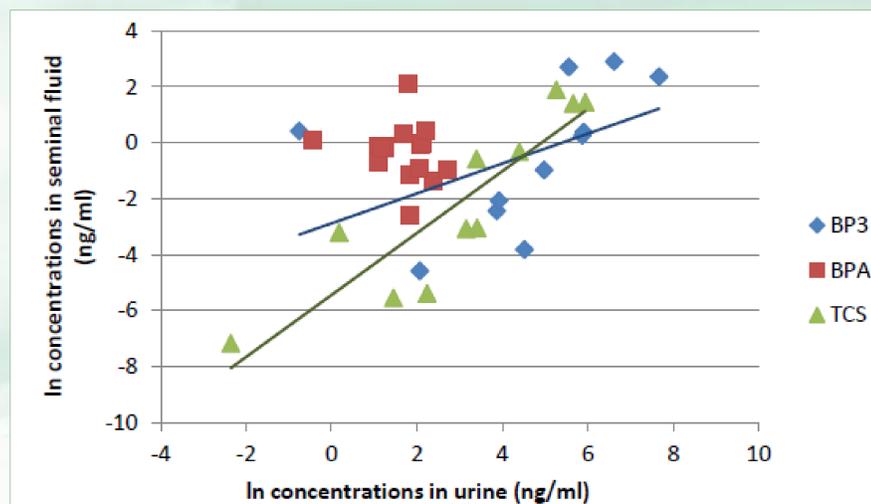


Fig. 2. Correlation between ln concentrations of BPA, BP-3 and TCS in urine and in seminal fluid.

BPA: $r = -0.197$; BP-3: $r = 0.627$; $p < 0.05$; TCS: $r = 0.936$; $p < 0.001$

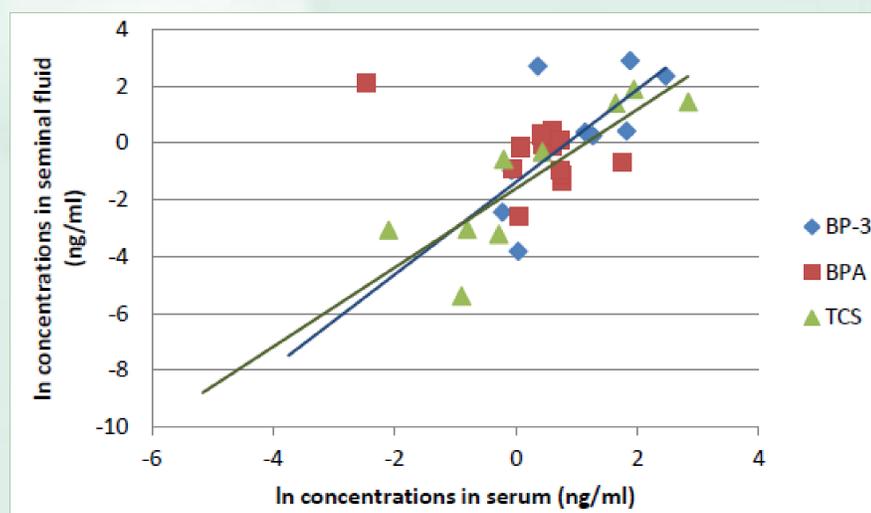


Fig. 3. Correlation between ln concentrations of BPA, BP-3 and TCS in serum and in seminal fluid.

BPA: $r = -0.203$; BP-3: $r = 0.733$; $p < 0.05$; TCS: $r = 0.900$; $p < 0.005$.

References

- (1) Zoeller RT, Brown TR, Doan LL, et al. Endocrine-disrupting chemicals and public health protection: a statement of principles from The Endocrine Society. *Endocrinology* 2012 Sep;153(9), 4097-4110.
- (2) Jorgensen N, Joensen UN, Jensen TK, et al. Human semen quality in the new millennium: a prospective cross-sectional population-based study of 4867 men. *BMJ Open* 2012;2(4).
- (3) Frederiksen H, Aksglaede L, Sorensen K, et al. Bisphenol A and other phenols in urine from Danish children and adolescents analyzed by isotope diluted TurboFlow-LC-MS/MS. *Int J Hyg Environ Health* 2013 <http://dx.doi.org/10.1016/j.ijheh.2013.01.007>