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The Exposure to Endocrine Disruptors during Pregnancy and Relation to Steroid Hormones

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Abstract : Endocrine disruptors (EDs) are substances leaching from various industrial products, which are able to interfere with the endocrine system. Their harmful effects on human health are generally well-known, and exposure during fetal development may have lasting effects. Fetal exposure and transplacental transport of bisphenol A (BPA) have been recently studied; however, less is known about alternatives such as bisphenol S (BPS), bisphenol F (BPF) and bisphenol AF (BPAF), which have started to appear in consumer products. The human organism is usually exposed to the mixture of EDs, out of which parabens are otherwise known to transfer placenta. The usage of many cosmetic, pharmaceutical and consumer products during the pregnancy that may contain parabens and bisphenols has led to the need for investigation. The aim of the study was to investigate the transplacental transport of BPA, its alternatives, and parabens, and to study their relation to fetal steroidogenesis. BPA, BPS, BPF, BPAF, methylparaben, ethylparaben, propylparaben, butylparaben, benzylparaben and 15 steroids including estrogens, corticoids, androgens and immunomodulatory ones were determined in 27 maternal (37th week of gestation) and cord plasma samples using liquid chromatography - tandem mass spectrometry methods. The statistical evaluation of the results showed significantly higher levels of BPA ($p=0.0455$) in cord plasma compared to maternal plasma. The results from multiple regression models investigated that in cord plasma, methylparaben, propylparaben and the sum of all measured parabens were inversely associated with testosterone levels. To our best knowledge, this study is the first attempt to determine the levels of alternative bisphenols in the maternal and cord blood, and also the first study reporting the simultaneous detection of bisphenols, parabens, and steroids in these biological fluids. Our study confirmed the transplacental transport of BPA, with likely accumulation in the fetal compartment. The negative association of cord blood parabens and testosterone levels highlights their possible risks, especially for the development of male fetuses. Acknowledgements: This work was supported by the project MH CR 17-30528 A from the Czech Health Research Council, MH CZ - DRO (Institute of Endocrinology - EÚ, 00023761) and by the MEYS CR (OP RDE, Excellent research - ENDO.CZ).

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