

# EFFECTS OF IN UTERO EXPOSURE TO PFOA AND PFOS ON HUMAN SEMEN QUALITY AND HORMONE PROFILE

Anne Vested, Aarhus University Hospital, Denmark  
Cecilia Hoest Ramlau-Hansen, University of Aarhus, Denmark  
Sjurdur Frodi Olsen, Statens Serum Institut, Denmark  
Jens Peter Bonde, Bispebjerg Hospital of Copenhagen University, Denmark  
Susanne Lund Kristensen, Aarhus University Hospital, Denmark  
Thorhallur Ingi Halldorsson, University of Iceland, Iceland  
Georg Becher, Norwegian Institute of Public Health, Norway  
Line Smaastuen Haug, Norwegian Institute of Public Health, Norway  
Emil Hagen Ernst, University of Aarhus, Denmark  
Gunnar Toft, Aarhus University Hospital, Denmark

**Background and Aims:** Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are man-made compounds found globally in humans. They are suspected to act as endocrine disrupters and since they are able to cross the placental barrier, in utero exposure is inevitable. The aim was to investigate whether in utero exposure to PFOA and PFOS is negatively associated with adult semen quality and hormone profile.

**Methods:** We recruited 169 sons (median age 20 years) who were offspring from a Danish pregnancy cohort in Aarhus. The sons' semen samples were analysed for sperm concentration, total count, motility, volume, and morphology, and blood samples were assessed for reproductive hormone profile. Maternal blood samples from pregnancy week 30 were analysed for levels of PFOA and PFOS as a measure of prenatal exposure. Median (range) PFOA was 3.7 (1.3 - 16.6) ng/mL and median (range) PFOS was 21.4 (7.5 - 54.3) ng/mL. Based on tertiles of exposure, the sons were divided into three groups according to maternal PFOA and PFOS serum levels, and multiple regression analysis was used to evaluate possible associations.

**Results:** Higher in utero exposure to PFOA was associated with lower sperm concentration, total count, and percentage of progressive spermatozoa and higher levels of luteinizing hormone (LH) and follicle stimulating hormone (FSH). Trends on continuous PFOA were statistically significant for sperm concentration ( $p=0.03$ ), total count ( $p=0.02$ ), LH ( $p=0.02$ ), and FSH ( $p=0.01$ ). For progressive spermatozoa there was a statistically significant overall association ( $p=0.03$ ).

There were no associations between in utero exposure to PFOS and any of the traditional semen parameters or any of the reproductive hormones.

**Conclusions:** The results indicate that in utero exposure to PFOA negatively affects adult human male semen quality and hormone profile. The results concord with earlier studies on adult exposure and emphasises the necessity of further research on this issue.