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Androgens are sex hormones involved in stimulation and regulation of development and maintenance of male sexual characteristics. Androgens also play a vital role in normal prostate growth and development, while under abnormal conditions they are also associated with prostate cancer. Androgen action is exerted through the androgen receptor (AR) that functions as a transcription factor, where binding of androgens leads to receptor activation and altered expression of androgen response genes. Testosterone and dihydrotestosterone are physiological ligands for human AR whereas zebrafish uses 11-ketotestosterone. The presence of environmental pollutants exhibiting androgenic or anti-androgenic activity can modulate AR function. This thesis is focused on the impact of environmental pollutants, in particular brominated flame retardants (BFRs), on human and zebrafish androgen receptor activity. The studied BFRs alter AR function as well as affect the expression of genes involved in amino acid transport, apoptosis, immune function, drug metabolism, DNA methylation, sex differentiation and steroidogenesis, and gonadal development. In vivo study further showed that the BFRs affect early development in zebrafish. Mutations in the human AR ligand binding domain (AR-LBD) associated with prostate cancer resulted in AR promiscuity and enhanced the activation potency of the BFRs in comparison to wildtype AR. The studies give an insight on identification of BFRs exhibiting endocrine disrupting functions as well as species difference in AR ligand preferences and risk assessment.