Polychlorinated biphenyls do not affect prostate development

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Polychlorinated biphenyls (PCBs) are ubiquitous persistent organic pollutants present throughout the environment, foodstuffs, and human populations. Previous work by our group has shown that in-utero and lactational exposure to PCBs in mice causes changes to voiding physiology. However, whether prenatal PCB exposure acts on the developing prostate to reduce adult prostate lobe mass or voiding function is still unknown. Therefore, the goal of this study is to test the hypothesis that PCBs decrease prostate formation from the urogenital sinus (UGS) during early development.

Effects of PCBs on prostate bud formation were assessed using in vivo and in vitro models. For in vivo studies, female mice were dosed daily with an environmentally relevant mixture of PCBs at 0, 0.1, 1, and 6 mg/kg/day 2 weeks before scheduled matings and through gestation. The dam and the embryos were euthanized on embryonic day 18 (E18), and the UGS were dissected from male offspring. For in vitro studies, E14 UGSs from untreated mice were placed into cell culture dishes with androgen to induce prostate bud formation (5 alpha dihydrotestosterone (DHT, 10nM)) and a vehicle of 1 pM, 1nM, or 1µM PCB for 4 days. Both the E18 UGSs and E14 cultured explants were stained for prostatic buds using in situ hybridization to label NK-3 transcription factor locus 1 (Nkx 3.1) as an early prostate identifier. Stained prostatic buds were quantified by individuals blinded to treatment conditions, and statistics were performed using PRISM.

Gestational exposure to PCBs did not result in a change in the number of prostatic buds at E18 between any of the treatment groups. However, there was a noticeable dose response between the 0.1 and 6 m/kg/d groups, with the lower concentration leading to fewer prostatic buds than the higher concentration. Following the E18 study results, we expect no significant difference in the number of prostatic buds in the E14 UGS cultures between each PCB concentration group.

The changes seen in prostatic lobe mass in the young adult male mice are not due to PCBs inhibiting prostate bud formation during the embryonic development of the prostate. These data points indicate that post-developmental changes to the prostate do not likely arise from deficits in prenatal development but could occur during later stages of differentiation and maturation. Further study is required to understand the influence developmental PCB exposure has on adult prostate morphology and function.