

Impact of Bisphenol-A on urogenital tract morphology in developing mice

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Introduction

Found in everyday consumer plastics, Bisphenol-A (BPA) is a xenoestrogen that has shown positive correlations with the development of chronic urogenital-related illnesses in aging males. The large-scale exposure of BPA is especially concerning due the lacking research being done on the effect of BPA exposure on the urogenital tracts of infants and developing children. In this study, we sought to visualize the effects of early BPA exposure on the urogenital tract morphology and anatomy of developing mice utilizing 3D reconstruction software.

Hypothesis

We hypothesize that there is a difference in urogenital tract morphology in developing mice under various levels of BPA exposure.

Methods

- BioVis 3D reconstruction was performed on four experimental treatment groups of post-natal day 1 (PND1) mice: Control, 5 μg BPA/kg, 50 μg BPA/kg, and 500 μg BPA/kg.

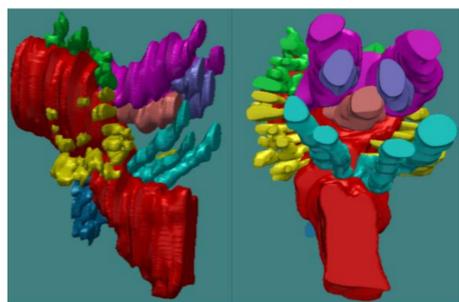


Figure 1. For each 3D reconstruction, eight morphological structures of the urogenital tract were reconstructed: Seminal Vesicles (Purple), Vas Deferens (Royal Blue), Urethra (Red), Anterior Pituitary Ducts (Light Blue), Ventral Pituitary Ducts (Dark Blue), Lateral Pituitary Ducts (Yellow), and Dorsal Pituitary Ducts (Green).

Results

- Preliminary volume data was taken from experimental groups of varying sample sizes: Control (n = 4), 5 μg BPA/kg (n = 6), 50 μg BPA/kg (n = 8), and 500 μg BPA/kg (n = 5).
- Initial trends can be visualized, but no conclusions can be drawn.
- Analysis was focused on the Anterior Pituitary duct, Ventral Pituitary ducts, Lateral Pituitary ducts, Dorsal Pituitary ducts, Urethra, and Seminal Vesicles.

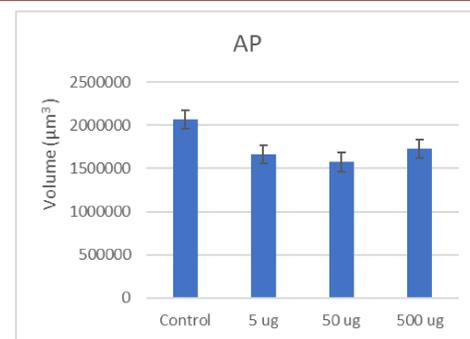


Figure 2. Average volumes of Anterior Pituitary (AP) ducts under the four experimental conditions. There is a statistically significant difference in AP volume between the control and BPA treated groups. However, this could be due to an outlier in the control having large control over the small sample size.

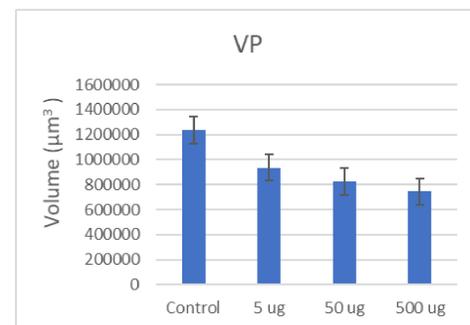


Figure 3. Average volumes of Ventral Pituitary (VP) ducts under the four experimental conditions. A preliminary downward trend can be observed as BPA concentration is increased.

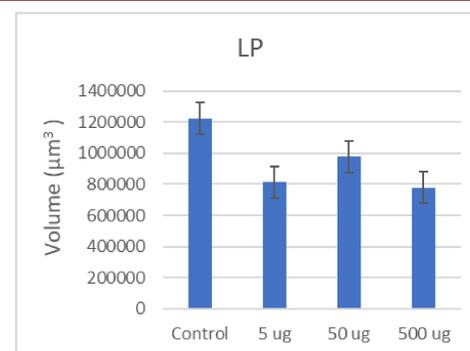


Figure 4. Average volumes of the Lateral Pituitary (LP) ducts under the four experimental conditions. No specific trend can be visualized from the current data.

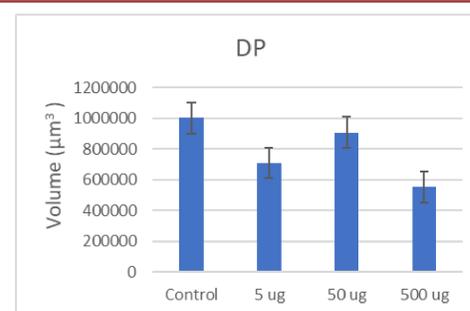


Figure 5. Average volumes of the Dorsal Pituitary (DP) ducts under the four experimental conditions. No specific trend can be visualized from the current data.

Results (cont.)

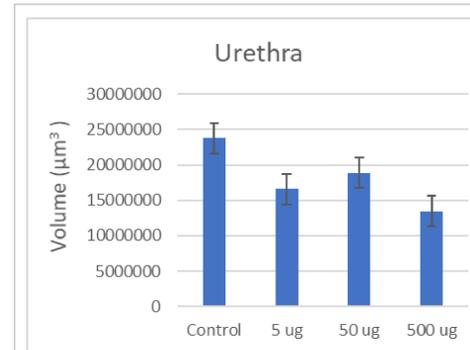


Figure 6. Average volume of the Urethra under the four experimental conditions. No specific trend can be visualized from the current data.

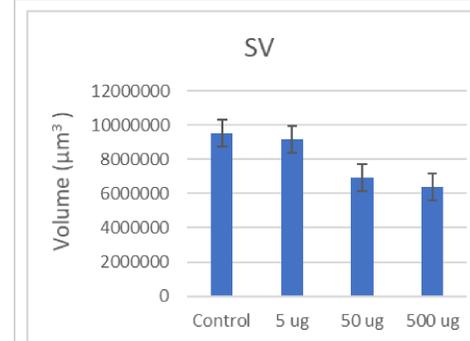


Figure 7. Average volumes of the Seminal Vesicles (SV) under the four experimental conditions. BPA levels appear to have decreasing effect on Seminal Vesicle volume at a BPA concentration between 5 and 50 μg BPA/kg.

Discussion

- Further volume analysis could provide data on BPA's affect on the amount of duct development during the earliest stages of growth in mice.
- Analysis of the morphological structures could provide valuable insight into how the developing prostate inserts itself into the urethra under varying exposures of BPA.
- Findings from this study will help the benign urological community in the future by providing the early morphological effects of BPA on the urogenital tract under normal and exposed conditions, which will give us better tools that aid in understanding the developmental origins of disease.

References

Uchtmann, et al., 2019. Fetal bisphenol A and ethinylestradiol exposure alters male rat urogenitaltract morphology at birth: Confirmation of prior low-dose findings in CLARITY-BPA. Reproductive Toxicology, 91.

Acknowledgements

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