ANALYSIS OF MORPHOLOGICAL AND MORPHOMETRIC RESULTS OF THE PROSTATE GLAND IN 3-, 6-, AND 9-MONTH-OLD OUTBRED WHITE RATS WITH INDUCED PULMONARY FIBROSIS

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Background. Pulmonary fibrosis is a chronic lung disease that may have systemic effects, including on distant organs such as the prostate gland. This study investigates the morphological and morphometric changes in the prostate gland of outbred white rats with experimentally induced pulmonary fibrosis across different age groups (3, 6, and 9 months) to elucidate potential fibrotic influences on prostate histology.

Methods. Pulmonary fibrosis was induced in outbred white male rats using a standard model. Prostate glands were harvested at 3, 6, and 9 months post-induction. Histological sections were stained with hematoxylin-eosin and Van Gieson's method for morphological analysis. Morphometric parameters, including epithelial surface area, stroma surface area, alveolar-like cavity surface area, epithelial cell height and width, and number of binucleated epithelial cells, were quantified using image analysis software. Data were compared to age-matched controls, with statistical significance assessed via Student's t-test ($P<0.05$ and $P<0.01$).

Results. Microscopic examination revealed uneven thickening of the prostate capsule, with pronounced venous congestion and increased blood volume in subcapsular vessels, particularly veins. Vessel walls were slightly thickened, with signs of stasis including closely packed erythrocytes and slowed blood flow. Stromal edema was evident, accompanied by a relative increase in leukocytes distributed around vessels and throughout the stroma. Connective tissue components, including cellular and fibrous elements, were augmented, with elevated collagen fibers in the basal layer beneath epithelial cells, around vessels, and within the stroma, as confirmed by Van Gieson's staining.

Epithelial cells in the basal layer were predominantly simple cuboidal. There was a slight reduction in glandular height, with decreased vacuolar secretions in the apical cytoplasm of epithelial cells. Glandular folds appeared flattened, and excretory ducts were compressed, leading to accumulation of prostatic fluid (stasis) and occasional

small concretions in acini. These changes were observed across all prostate lobes, most prominently in the dorsal lobe, and were consistent in 6- and 9-month-old rats.

Morphometric analysis showed the following for the 3-month group: epithelial surface area 1523.11 ± 26.117 μm² (**P<0.01** vs. control), stroma surface area 1712.16 ± 37.612 μm², alveolar-like cavity surface area 11334.27 ± 192.117 μm² (**P<0.01**), epithelial height 17.62 ± 0.31 μm, epithelial width 13.95 ± 0.31 μm, and binucleated epithelial cells 0.82 ± 0.14 (*P<0.05*).

For the 6-month group: epithelial surface area 1587.21 ± 23.686 μm², stroma surface area 1926.54 ± 31.806 μm² (*P<0.05*), alveolar-like cavity surface area 11786.43 ± 243.702 μm², epithelial height 18.08 ± 1 μm (**P<0.01**), epithelial width 14.25 ± 0.51 μm, and binucleated epithelial cells 0.93 ± 0.09.

For the 9-month group: epithelial surface area 1792.33 ± 30.773 μm², stroma surface area 1836.21 ± 22.507 μm² (**P<0.01**), alveolar-like cavity surface area 11801.21 ± 208.748 μm², epithelial height 17.85 ± 0.88 μm (*P<0.05*), epithelial width 14.06 ± 0.28 μm, and binucleated epithelial cells 0.97 ± 0.11.

Conclusion: Induced pulmonary fibrosis leads to morphological alterations in the rat prostate gland, including vascular congestion, stromal edema, increased connective tissue, and epithelial changes, with age-dependent morphometric variations. These findings suggest systemic fibrotic effects on prostate microstructure, warranting further investigation into underlying mechanisms for potential clinical implications in fibrotic diseases.

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