BIOCORRECTION OF PROSTATIC MORPHOFUNCTIONAL DISORDERS IN ENVIRONMENTALLY INDUCED UROLITHIASIS: EXPERIMENTAL EVIDENCE AND THERAPEUTIC PROSPECTS

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Abstract. Urolithiasis is a common disorder of the urinary system associated with metabolic disturbances, oxidative stress, and inflammatory processes. Environmental factors may contribute to its development and progression, causing changes in renal function and systemic homeostasis. Although the kidneys are the primary organs affected by urolithiasis, associated metabolic and inflammatory disturbances may also influence other organs of the urogenital system, particularly the prostate gland. The aim of this study is to investigate morphofunctional changes in the prostate gland during experimental urolithiasis and evaluate the potential protective effects of biocorrection. Special attention is given to histological, morphometric, and biochemical parameters that may reflect tissue damage and recovery.

Keywords: prostate gland, urolithiasis, environmental stress, biocorrection, morphofunctional disorders, oxidative stress, morphometry, histology, antioxidant protection.

Introduction

The prostate gland is an important accessory organ of the male reproductive system, contributing to the production of prostatic secretions and maintaining reproductive function. Its normal structural organization depends on hormonal regulation, metabolic activity, adequate blood circulation, and the physiological condition of the urinary system.

Urolithiasis is characterized by the formation of mineral crystals and stones in the kidneys and urinary tract. Its development is associated with metabolic disorders, changes in urinary composition, dehydration, and environmental influences. Calcium oxalate crystals are among the most common components of kidney stones. Their accumulation may cause epithelial injury, inflammatory reactions, and disturbances in renal function.

Oxidative stress plays an important role in the pathogenesis of experimental urolithiasis. Excessive production of reactive oxygen species can damage cellular membranes, increase lipid peroxidation, and activate inflammatory pathways. These processes may contribute to systemic metabolic disturbances that could potentially affect prostate tissue morphology and function.

Biocorrection using biologically active substances with antioxidant and anti-inflammatory properties represents a promising approach to reducing oxidative damage and maintaining tissue integrity. Therefore, investigating the protective effects of biocorrection on the prostate gland during experimental urolithiasis is of considerable scientific interest.

Aim of the Study

The aim of this research is to investigate morphofunctional changes in the prostate gland during environmentally induced experimental urolithiasis and evaluate the potential effectiveness of biocorrection in preventing or reducing pathological tissue alterations.

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Materials and Methods

The proposed experimental study involves laboratory animals divided into three groups: a control group, an experimental group with induced urolithiasis, and a treatment group receiving a selected biocorrective agent.

Experimental urolithiasis is induced using an established laboratory protocol. Following the experimental period, prostate tissue samples are collected in accordance with laboratory animal ethics requirements and processed for histological examination.

Histological sections are stained with hematoxylin and eosin and examined using light microscopy. Morphometric analysis includes the measurement of glandular acini diameter, epithelial cell height, connective tissue stromal thickness, and the relative proportions of glandular and stromal components.

Biochemical assessment may include malondialdehyde (MDA) concentration and the activity of antioxidant enzymes such as superoxide dismutase (SOD) and catalase (CAT). These indicators help evaluate oxidative stress and the possible effects of biocorrection.

Results and Discussion

Experimental urolithiasis may be accompanied by systemic metabolic disturbances and increased oxidative stress, which could potentially influence the structural organization of the prostate gland. Under normal conditions, prostate tissue demonstrates an organized arrangement of glandular acini, preserved epithelial architecture, and balanced stromal components.

In pathological conditions, possible changes may include alterations in acinar diameter, epithelial cell height, and connective tissue organization. These morphological parameters are important indicators for evaluating tissue remodeling and potential functional disturbances.

Biocorrection with antioxidant and anti-inflammatory compounds may help reduce lipid peroxidation, support endogenous antioxidant defense, and preserve the structural integrity of prostate epithelial cells. Comparing the untreated experimental group with the treatment group may help establish the protective potential of the selected intervention.

Previous experimental research has demonstrated the involvement of oxidative stress and inflammatory mechanisms in ethylene glycol-induced nephrolithiasis. However, the direct effects of biocorrection on prostate gland morphology under these conditions remain insufficiently investigated, emphasizing the scientific relevance of this research.

Conclusion

The investigation of prostate morphofunctional disorders during environmentally induced urolithiasis is important for understanding the possible systemic consequences of renal pathology. Histological and morphometric assessment may reveal structural alterations in glandular and stromal components, while biochemical analysis can provide additional information about oxidative stress.

Biocorrection using antioxidant and anti-inflammatory approaches represents a promising experimental direction for protecting prostate tissue against potential pathological changes. Further experimental studies are necessary to establish the mechanisms of these effects and determine their therapeutic significance.

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