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The study of prostate-protective effect of dry extract from reishi mushrooms on the model of testosterone-induced prostatic hyperplasia

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ABSTRACT

The aim of this work was to study the prostate-protective properties of dry extract from reishi mushrooms in testosterone-induced benign prostatic hyperplasia in rats.

Materials and methods. Simulated benign prostatic hyperplasia was reproduced by subcutaneous injection of testosterone propionate solution at a dose of 3 mg/kg to male rats for 21 days. The dry extract of reishi mushrooms was administered intragastrically to experimental animals daily at a dose of 100 mg/kg body weight simultaneously with subcutaneous injection of testosterone propionate for 3 weeks. The comparison drug «Prostatophyt" in a dilution of 1:10 at a dose of 1 ml/100 g of the animal's body weight was administered intragastrically according to the same scheme as the reishi extract. Prostate homogenate and rat blood serum were tested. The prostate-protective effect of the reishi mushroom extract was evaluated by the activity of acid and alkaline phosphatase, the content of TBA-active products and reduced glutathione. The phosphatase index was calculated, which is the ratio of

acid phosphatase to alkaline phosphatase (AP/ALP).

Results. Subcutaneous administration of testosterone propionate to male rats for 21 days probably leads to disruption of phosphatases activity, increase in TBA-active products and decrease in the content of reduced glutathione in blood serum and prostate homogenate of affected animals.

It was established that the dry extract from reishi mushrooms in the model of testosterone-induced benign prostatic hyperplasia in white rats inhibits the processes of lipid peroxidation and normalizes the antioxidant/prooxidant balance.

Conclusion. Dry extract from reishi mushrooms has a prostate-protective effect in conditions of testosterone-induced prostate adenoma due to its antioxidant properties, which are caused by the presence of biologically active substances in mushrooms, in particular polysaccharides, flavonoids, vitamin C and steroid compounds.

1. Introduction

Currently, the treatment of benign prostatic hyperplasia (BPH) remains an urgent problem. According to the latest data, 15-25% of men aged 50-65 suffer from this disease, which, causing lower urinary tract dysfunction (lower urinary tract symptoms), significantly reduces the quality of life[1, 2].

According to the recommendations of the European Association of Urologists in 2021, 6 groups of drugs can be used for the treatment of prostate adenoma: α1-adrenoblockers, 5α-reductase inhibitors, muscarinic receptor antagonists, phosphodiesterase type 5 inhibitors, vasopressin analogue and herbal preparations, including the extract of saw palmetto (Serenoa repens) were recognized as the most effective and well-studied[3, 4]. All the groups of drugs listed above have proven clinical effectiveness, are used to treat overactive bladder, lower urinary tract symptoms in BPH, but not all patients are helped by standard therapy. There are data confirming the prostate-protective effect of burdock root and leaf extracts[5, 6]. There is a development of side effects of medicines, especially of synthetic origin. Most herbal preparations are multicomponent, which increases the likelihood of an unpredictable allergic reaction[7, 8]. Therefore, the search for new effective and safe drugs for the treatment of BPH and chronic prostatitis is still ongoing.

The study of reishi mushrooms dry extract (RMDE), which, due to its rich chemical composition, can have a complex pharmacological effect[9, 10, 11] is promising in this direction. Since it is a drug of natural origin, it can be used for a long time without significant side effects, which is relevant in the therapy of prostate adenoma and CP.

The aim of our work was to experimentally study the prostate-protective properties of dry extract from reishi mushrooms in testosterone-induced benign prostatic hyperplasia in rats.

2. Material and methods

2.1. Material

The material of the experimental work was a dry extract from reishi mushrooms. The research was performed on white male rats weighing 200-250 g, which were kept on a standard diet of the vivarium of of I. Horbachevsky Ternopil National Medical University. All experiments were performed in accordance with good laboratory practice (GLP) and bioethics according to the "European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes"[12]. The conducted re-

search was approved by the Ethics Committee of I. Horbachevsky Ternopil National Medical University (excerpt from the protocol №72 from 06.01.2023).

2.2. Experimental induction of benign prostatic hyperplasia

Modeling of BPH in white male rats was carried out by injecting a solution of testosterone propionate at a dose of 3 mg/kg subcutaneously for 21 days. Reishi mushroom extract was administered intragastrically to the experimental animals daily at a dose of 100 mg/kg of the animal's body weight simultaneously with subcutaneous administration of testosterone propionate for 21 days. The dose of 100 mg/kg of animal body weight for RMDE was chosen based on our previous studies, which found it to be conditionally therapeutic for experimental carcinogenesis in rats[9, 13]. As a comparison drug for the prostate-protective action of RMDE, "Prostatophyt" (manufacturer - "Eim Scientific and Production Pharmaceutical Company" LLC, Kharkiv, Ukraine) was used in a 1:10 dilution at a dose of 1 ml/100 g of animal body weight, which was administered intragastrically according to the same scheme as the studied extract.

2.3. Experimental design

The design of the experimental work included seven groups of animals, 8 rats in each: Group 1– animals that were given the appropriate amount of purified water daily (for 3 weeks), control (C); Group 2 and 3 - animals that were subcutaneously injected with a solution of testosterone propionate, control pathology (CP), 15th and 22nd days of the experiment; Group 4 and 5 – rats, which were treated with a dry extract of reishi mushrooms simultaneously with subcutaneous injection of testosterone propionate, 15th and 22nd days of the experiment; Group 6 and 7 – animals that were treated with the reference drug "Prostatophyt" simultaneously with subcutaneous injection of testosterone propionate, 15th and 22nd days of the experiment.

On the 15th and 22nd day from the beginning of the study, animals were removed from the experiment by euthanasia using sodium thiopental. Prostate glands (PG) and seminal vesicles (SV) were isolated, and relative mass was determined. The homogenate of PG and blood serum of rats were also subjected to research, the relative weight of the prostate gland, seminal vesicles was isolated and determined.

2.4. Methods

The prostate-protective effect of RMDE was assessed by the activity of acid (AP)[14] and alkaline (ALP) phosphatase[15], the content of TBA-active products (TBA-AP)[16] and reduced glutathione (GSH) [16] in blood serum and homogenate of animal prostates. The phosphatase index was calculated, as the ratio of acid phosphatase to alkaline phosphatase (AP/ALP) and indirectly characterizes the degree of androgen saturation of the body[6].

2.5. Histopathological studies

The collection of material for histological and histochemical studies was carried out according to the generally accepted methodology[17]. Pieces of the rat's prostate gland were fixed in a 10 % formalin solution, while the duration of exposure did not exceed 1-2 days. Next, the pieces were dehydrated in alcohols of increasing concentration in an AT-4 machine for histological processing of tissues, and embedded in paraffin blocks. Sections with a thickness of 5-7 μm obtained on a sled microtome MC-2 were stained with hematoxylin and eosin. Slides were viewed under a light microscope at 100x and 200x magnification.

2.6. Statistical analysis

Statistical analysis of the data was performed using STATISTICA 13 (TIBCO Software Inc., 2018). Parametric and nonparametric methods of evaluation of the obtained data were used for statistical processing of the results. For all indices, the arithmetic mean of the sample (M) and the error of the arithmetic mean (m) were calculated. The reliability of the difference between the values between the

Table 1: Effect of reishi mushrooms extract on the relative weight of the reproductive system organs under conditions of simulated BPH (M±m; n=56)

Index/Group of animals	Relative weight of organs, g/100 g of body weight			
	Prostate gland		Seminal vesicles	
	15th day	22th day	15th day	22th day
C	0.31±0.02	0.31±0.02	0.48±0.03	0.48±0.03
CP	0.47±0.03*	0.55±0.06*	0,87±0,03*	1,08±0,05*
CP+RMDE	0.35±0.02**	0.37±0.02**	0,63±0,05**	0,57±0,04**
CP+Prostatophyt	0.34±0.02**	0.35±0.03**	0,55±0,02**	0,54±0,04**

Note. Here and in the following tables: ** – probable changes between the indicator of control and testosterone-affected animals; ** – probable changes between the indicator of testosterone-affected and treated animals; p<0,05.*

independent quantitative values was determined by the Mann-Whitney test. The difference between the values was considered probable at $p < 0.05$[18, 19].

3. Results

3.1. Effect of RMDE on the relative weight of the reproductive system organs, on serum biochemical indicators and biochemical indicators in rat prostate homogenate under the conditions of simulated BPH

Subcutaneous administration of testosterone propionate at a dose of 3 mg/kg for 21 days caused statistically significant changes in the relative mass of androgen-dependent organs compared to rats in the control group: an increase in PG – by 1.5 and 1.8 times and an increase in seminal vesicles – by 1.8 and 2.2 times on the 15th and 22nd days of the study, which indicates the development of BPH (Table 1).

The use of RMDE and the comparison drug for 21 days to correct the PG damage caused a statistically significant decrease in the relative weight of PG and SV in both terms of the study compared to CP group. RMDE and prostatophyte showed similar effectiveness, under their influence the relative mass of androgen-dependent organs approached the indicators of the control group.

The next stage of our research was to study the activities of acid and alkaline phosphatase in the blood serum and prostate homogenate of animals with simulated hyperplasia of the PG and after the use of RMDE and prostatophyte.

Acid phosphatase (AP) is a lysosomal enzyme found in almost all tissues of the body. Its highest concentration is in the prostate gland (prostatic fraction), then in the liver, spleen, erythrocytes (externally lysosomal localization), platelets, and bone marrow. That is why the blood serum analysis for the determination of acid phosphatase is used to detect prostate carcinoma in men. A high activity of AP in macrophages and osteoclasts is also noted. As for the activity of the enzyme in the prostate gland, it is not detected until puberty[3].

Alkaline phosphatase (ALP) is an enzyme that affects lipid metabolism and the process of calcium deposition in bone tissue. Under the influence of the enzyme, reactions related to the release and free movement of phosphorus in the blood are carried out, ALP catalyzes the separation of phosphoric acid from its organic compounds. LF is extremely common in the body. It is found in the intestinal mucosa, osteoblasts, walls of bile ducts of the liver, placenta, lactating mammary gland, prostate gland[6].

The development of inflammatory processes in the prostate under the influence of testosterone is evidenced by an increase in the activity of acid and alka-

Table 2: Effect of reishi mushrooms extract on serum biochemical indicators of rats under conditions of testosterone-induced hyperplasia of the PG, day 15 (M±m; n=56)

Index/Group of animals	C	CP	CP+RMDE	CP+Prostatophyt
AP, nmol/l*hour	6.70±0.38	12.84±0.63*	7.50±0.28**	7.18±0.36**
ALP, nmol/l*hour	10.45±0.36	18.05±0.55*	12.03±0.56**	11.21±0.39**
AP/ALP	0.64±0.02	0.72±0.05*	0.64±0.05	0.64±0.03
TBA-AP, μmol/l	2.06±0.11	3.37±0.16*	2.78±0.12**	2.55±0.14**
GSH, mmol/l	1.75±0.06	0.96±0.05*	1.54±0.03**	1.61±0.03**

Table 3: Effect of reishi mushrooms extract on serum biochemical indicators of rats under conditions of testosterone-induced hyperplasia of the PG, day 22 (M±m; n=56)

Index/Group of animals	C	CP	CP+RMDE	CP+Prostatophyt
AP, nmol/l*hour	6.70±0.38	19.07±0.66*	8.69±0.51**	7.70±0.32**
ALP, nmol/l*hour	10.45±0.36	25.27±1.10*	12.88±0.77**	11.45±0.35**
AP/ALP	0.64±0.02	0.76±0.03*	0.68±0.01**	0.67±0.02**
TBA-AP, μmol/l	2.06±0.11	4.55±0.24*	2.84±0.15**	2.30±0.10**
GSH, mmol/l	1.75±0.06	0.73±0.04*	1.39±0.09**	1.53±0.07**

line phosphatases in the blood serum of animals with simulated hyperplasia of the prostate gland. Thus, AP activity increased by 1.9 and 2.8 times, and ALP increased by 1.7 and 2.4 times relative to the control on the 15th and 22nd days of the experiment (Tables 2, 3).

In the CP group, the AP/ALP ratio in the blood serum increased by 1.2 times by the end of the experiment, which indicates an increase in the permeability of the membranes of the acini, which are the final branches of the ducts. Acini are surrounded by secretory cells in the prostate gland and stimulate the flow of prostate-specific enzyme into the blood [6].

Administration of the dry reishi mushroom extract to animals in parallel with testosterone propionate contributed to the normalization of phosphatases activity already on the 15th day of the experiment. By the end of the study, the activity of AP in the blood serum of rats under the influence of RMDE decreased by 2.2 times, the activity of ALP - by 2.0 times compared to the group of control pathology. The use of the reference drug also reduced the activity of AP and ALP by 2.5 times and 2.2 times, respectively, in affected animals on the 22nd day of the experiment. The use of RMDE and prostatophyte led to a probable decrease in the ratio of phosphatases (AP/ALP) on the 22nd day of the study compared to the control pathology group (Table 3).

When studying the activity of AP in the homogenate of the prostate of animals, it was established that under the influence of testosterone there was a probable decrease in the activity of the enzyme by 1.5 and 2.2 times compared to the control group on the 15th and 22nd days of the experiment. This indicates a violation of the functional state of the PG. ALP activity in the prostate homogenate of white rats increased by 1.6 and 1.9 times on the 15th and 22nd days of the study compared to the control (Tables 4, 5).

Table 4: Effect of reishi mushrooms extract on biochemical indicators in rat prostate homogenate under conditions of testosterone-induced prostate hyperplasia, day 15 (M±m; n=56)

Index/Group of animals	C	CP	CP+RMDE	CP+Prostatophyt
AP, nmol/kg*hour	20.20±0.34	13.83±0.46*	17.67±0.31**	18.69±0.35**
ALP, nmol/kg*hour	23.59±0.89	36.75±1.26*	26.25±1.16**	25.38±0.86**
AP/ALP	0.87±0.04	0.38±0.02*	0.68±0.04**	0.74±0.04**
TBA-AP, μmol/kg	13.44±0.82	22.41±1.12*	16.25±0.92**	15.26±0.60**
GSH, mmol/kg	1.26±0.06	0.77±0.03*	1.09±0.03**	1.16±0.03**

Table 5: Effect of reishi mushrooms extract on biochemical indicators in rat prostate homogenate under conditions of testosterone-induced prostate hyperplasia, day 22 (M±m; n=56)

Index/Group of animals	C	CP	CP+RMDE	CP+Prostatophyt
AP, nmol/kg*hour	20.20±0.34	9.10±0.37*	17.17±0.59**	18.98±0.27**
ALP, nmol/kg*hour	23.59±0.89	44.75±2.23*	28.97±1.01**	25.27±1.11**
AP/ALP	0.87±0.04	0.21±0.01*	0.60±0.03**	0.76±0.03**
TBA-AP, μmol/kg	13.44±0.82	27.96±0.97*	16.42±0.78**	14.58±0.62**
GSH, mmol/kg	1.26±0.06	0.55±0.05*	1.03±0.09**	1.17±0.05**

In the prostate homogenate of the affected animals, the AP/ALP ratio was also determined, which decreased by 4.1 times compared to the control by the end of the experiment.

After the use of RMDE, AP activity in rat prostate homogenate increased by 1.9 times, ALP activity decreased by 1.5 times on the 22nd day of the study compared to the control pathology group. Under the influence of the prostatophyte, the activity of AP in the examined tissue probably increased by 2.1 times by the end of the experiment, the activity of ALP decreased by 1.8 times compared to CP. Under the influence of RMDE and the reference drug, the AP/ALP ratio in the animal prostate homogenate increased by 2.9 and 3.7 times, respectively, relative to the affected rats on the 22nd day of the study. This testifies to the ability of the studied extract and prostatophyte to stabilize acinus membranes.

The development of hyperplasia of the prostate gland under the influence of testosterone was accompanied by an increase in the processes of free radical oxidation. Thus, in the blood serum of the affected animals, a probable increase in the content of TBA-AP was observed by 1.6 and 2.2 times on the 15th and 22nd days of the experiment, which, in turn, caused corresponding changes in the antioxidant system of rats - a decrease in the level of reduced glutathione (GSH) by 1.8 and 2.4 times (Tables 2, 3). The administration of RMDE and the reference drug in parallel with testosterone contributed to a probable decrease in the content of TBA-AP, and most significantly on the 22nd day of the study in the blood serum of rats by 1.6 and 2.0 times and an increase in the level of GSH by 1.9 and 2.1 times, respectively, relative to the group of affected animals.

The content of TBA-AP in the prostate homogenate

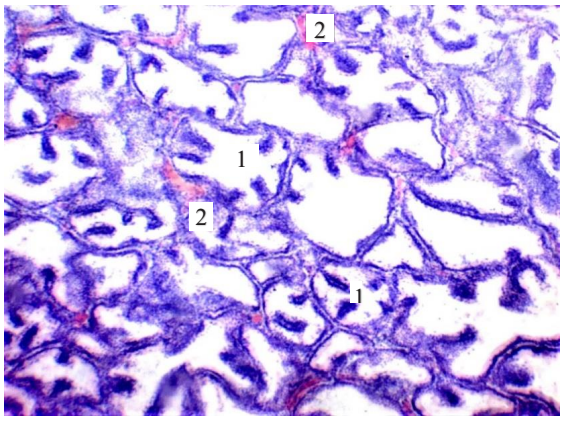

Photo 1: *Prostate gland of a control group rat. The glands are lined with prismatic epithelium and form numerous folds (1). Vessels full of blood (2). Staining with hematoxylin and eosin. ×100.*

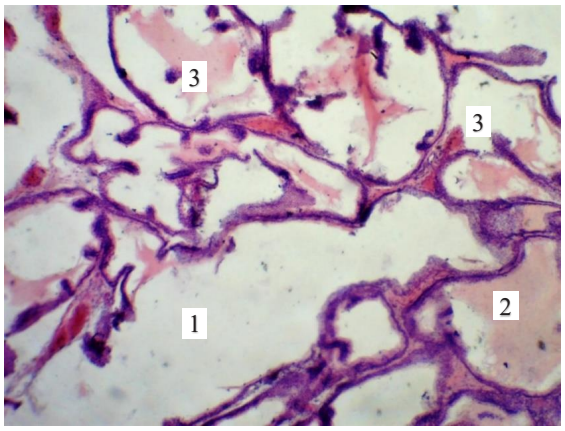

Photo 2: *Prostate gland of a rat with simulated BPH. Cystic transformation of the glands (1), flattening of the epithelial lining (2) and uneven distribution of the secretion (3). Staining with hematoxylin and eosin. ×200.*

of the group of animals with control pathology increased by 1.7 and 2.1 times, the content of GSH decreased by 1.6 and 2.3 times compared to the control on the 15th and 22nd days after the start of testosterone administration (tables 4, 5). The use of RMDE and prostatophyte probably reduced the content of TBA-AP in the prostate homogenate throughout the study, and most of all on the 22nd day of the experiment - by 1.7 and 1.9 times compared to CP. The content of GSH in the homogenate of the prostate of animals probably increased under the influence of the studied extract by 1.4 and 1.9 times, and under the influence of the comparison drug - by 1.5 and 2.1 times on the 15th and 22nd days of the experiment compared to the affected animals (Tables 4, 5).

3.2. Histopathology study

Histologically, the parenchymal component of the prostate gland of rats is represented by numerous alveolar-tubular glands. The basement membrane is lined with a layer of secretory cells - high prismatic epithelium, which together form folds protruding into the lumen of the glands. Peeled epitheliocytes are often found in the lumen of the glands, which is considered a normal process of cell removal. There are also characteristic morphological signs of high functional activity of the glands - the lumens are filled with a secret of various tinctorial properties. In addition to secretory cells, there are small basal cells with signs of mitotic activity.

The stroma of the gland is represented by connective tissue cords that depart from the capsule of the organ and smooth myocytes with a large number of blood microvessels. Venules, as a rule, are full-blooded (Photo 1).

Histological analysis of prostate tissues of affected animals revealed significantly different structural changes compared to the control group. First of all, they concerned the glandular component. The lumens of the glands are significantly expanded and deformed. The epithelium located on the basement membrane is represented by cubic or flattened cells. Nuclei reversion from the basal part of the cells to the apical part is often observed. A decrease in the number of basal cells is characteristic. At the same time, binucleated epitheliocytes appear. The number of folds, as well as the height of the preserved

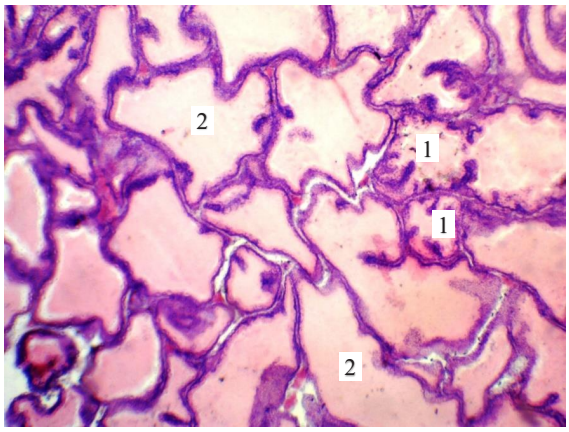

Photo 3: *Prostate gland of the rat after correction of BPH by prostatophyte. Some of the glands are identical to control glands (1), others - with signs of cystic transformation (2). The discharge is distributed evenly. Staining with hematoxylin and eosin. ×100.*

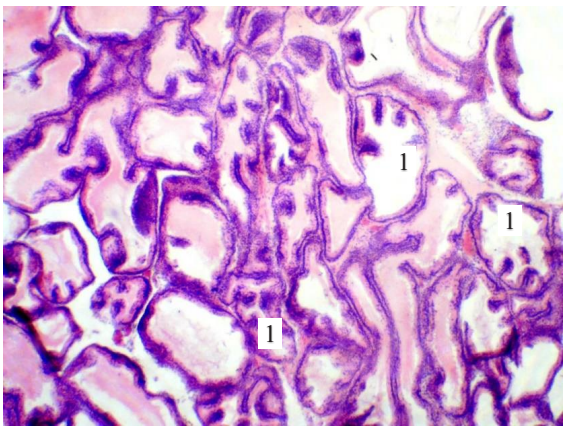

Photo 4: *Rat prostate after correction of BPH with reishi mushroom extract. Glands of tubular-alveolar structure with papillary folds inside (1). Staining with hematoxylin and eosin. ×100*.

ones, has been drastically reduced. The secretion is unevenly distributed, there are many lumens of the glands that do not contain secretion (Photo 2).

During the histological examination of the tissues of the prostate gland of animals that received the comparison drug, we observed a sufficiently clear positive dynamics. The parenchymal component in many areas was represented by alveolar-tubular glands similar to the control group. The secretory cells that cover the basement membrane have a high prismatic shape. Together with the underlying thin stroma, they form papilla-like growths in the lumen of the glands, the discharge of which is distributed evenly. Proliferative activity of basal cells was occasionally noted. The stroma is dominated by venous full blood of the microcirculatory channel. At the same time, often, next to the described changes, cells of various sizes typical for the prostate gland of affected animals were adjacent - deformed, cystic enlarged glands with flattened or cubical epithelium, which formed single short folds. The discharge is mostly evenly distributed (Photo 3).

Histological analysis of the tissues of the prostate gland of experimental animals, which were injected with RMDE, showed significant positive changes in the structure of the organ. The glandular component in most of the studied cases was similar to the control manifestations and was represented by typical glands of alveolar-tubular structure. A high prismatic, functionally active epithelium is located on the basal membrane, and folds and papilla-like outgrowths protrude into the lumen. The gaps are filled with a secret. However, a similar picture was not regularly observed everywhere. Changes typical for BPH with glandular ectasia, atrophied and partially exfoliated epithelium, and atrophied folds were also observed (Photo 4).

The intermediate tissue of the gland is almost evenly distributed between the glands and is represented by collagen fibers and smooth myocytes. The microcirculatory channel was characterized by full blood of its venous link.

4. Discussion

According to scientific research, up to 35% of patients with chronic prostatitis and up to 25% of patients with BPH receive drugs of natural origin. Thus, in many randomized placebo-controlled studies, the

high effectiveness of medicinal products containing biologically active substances of natural origin (extracts of sabal palm fruits, African plum bark, nettle roots, slangy grass, etc.) has been proven. These agents are able to reduce inflammatory processes and slow down the proliferation of PG tissues, normalize the level of androgens, exhibit angioprotective, antioxidant, antihypoxic effects, increase potency and libido[1, 3, 20].

Evaluation of the development of the simulated pathology of PG and the effectiveness of the reishi mushroom extract was carried out by biochemical parameters of blood serum and PG homogenate, changes in the mass of PG and SV. To confirm the results of the experiment, a histological examination of the prostate gland of rats with testosterone-induced BPH and after the use of RMDE and the reference drug was performed.

Administration of testosterone propionate to male rats for 3 weeks led to the development of the animals prostate gland pathology, which was indicated by a significant increase in the relative mass of PG and SV compared to the control.

Under the influence of RMDE, the normalization of the mass of the PG and SV was noted almost to the values of the control group, which indicates a decrease in proliferative processes, and therefore the restoration of the structural and functional state of the PG and androgen sensitivity in the organ, disturbed by testosterone-induced BPH in rats.

The course of the simulated pathology was characterized by a probable, relative to the values of the control group, an increase in the level of ALP and AP in blood serum. According to the literature, an increase in the activity of these enzymes, especially acid phosphatase, which is a prostate-specific enzyme, indicates an increase in proliferative processes and the development of hyperplasia of the organ[6]. In the prostate homogenate of animals of the CP group, a significant decrease in AP activity and an increase in ALP activity were observed relative to the control.

The introduction of testosterone into male rats leads to the activation of the processes of peroxidation, primarily lipoperoxidation. Lipid peroxidation (LPO) is a physiological process that ensures the normal functioning of cells. However, its deviation from the norm causes damage and death of cells[4, 9]. TBA-AP are the primary products of LPO, which in further transformations cause membrane destabilization, destruction and cell death[6]. Testosterone propionate caused a probable increase in the content of TBA-AP in blood serum and prostate homogenate of animals.

The main role in the neutralization of hydroperoxides, formed during the activation of free radical oxidation processes, is played by the system glutathione peroxidase - glutathione reductase - reduced glutathione. Restored glutathione participates in the protection of cells from oxidative stress and supports the functioning of the body's detoxification system[6]. Exposure of albino rats to testosterone resulted in a significant decrease in GSH in both tissues tested.

The results of our experimental work correlate with the data of other researchers, who highlight the important role of the antioxidant/prooxidant balance in the pathogenesis of chronic prostatitis[4, 6]. Activation of lipid peroxidation against the background of reduced antioxidant protection causes a violation of the permeability of biological membranes, leads to an increase in destructive and dystrophic processes in the prostate gland and causes cell death..

RMDE effectively affected the indicators of the oxidative status of rats under conditions of testosterone-induced BPH, minimizing the disruption of AP and ALP activities, reducing the content of TBA-active products, and increasing the content of reduced glutathione in blood serum and prostate homogenate of affected animals almost to the control level. This confirms the presence of antioxidant properties in reishi mushrooms. Prostatophyte also had a positive effect on the investigated biochemical indicators.

5. **Conclusions**

It was experimentally proven that the subcutaneous administration of testosterone propionate to white male rats at a dose of 3 mg/kg body weight of the animals for 21 days led to a violation of the

functional state of the prostate gland, which was characterized by an increase in the mass of prostate and seminal vesicles of the affected animals. Activation of LPO processes and imbalance in the antioxidant protection system were observed. The results of the conducted studies showed the pronounced effectiveness of the dry extract from reishi mushrooms, the introduction of which to male rats almost completely restored the balance in the peroxidation system/antioxidant system. In terms of effectiveness, the studied extract was close to the comparison drug «Prostatophyte».

The prostate-protective effect of reishi mushrooms extract is probably due to its antioxidant properties, which are associated with the presence of polysaccharides, flavonoids and steroid compounds in the chemical composition of the mushrooms.

Microscopic analysis of rat prostate tissues showed positive dynamics of the structural changes under the condition of exposure to reishi mushroom extract and prostatophyte. □

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