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# THE EFFECT OF MILK THISTLE ON INGUINAL LYMPH NODES IN RHEUMATOID ARTHRITIS IN RATS

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**Abstract.** The effect of milk thistle (*Silybum marianum*) extract on the morphology and morphometry of inguinal lymph nodes in white rats with experimental rheumatoid arthritis was investigated. In arthritis, follicular destruction, sinus dilation, plasmacytic infiltration, and structural disorganization were observed. Biocorrection with milk thistle extract promoted restoration of lymph node architecture, activation of lymphocyte proliferation, reduction of inflammation, and normalization of microcirculation. Morphometric parameters — including lymph node diameter, thickness of cortical and paracortical zones, number and size of follicles, percentage of germinal centers, area of the medullary zone, and stromal volume — demonstrated significant improvement. Milk thistle proved to be an effective natural biocorrector supporting immune activity and reducing morphostructural alterations in rheumatoid arthritis.
**Keywords:** milk thistle, *Silybum marianum*, rheumatoid arthritis, lymph nodes, morphology, morphometry, biocorrection.

**Introduction.** Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disease characterized by joint destruction and systemic inflammation, leading to functional impairment and reduced quality of life [1]. Current therapeutic approaches are limited by adverse effects and are not always sufficiently effective, which stimulates the search for natural compounds with anti-inflammatory and immunomodulatory properties [2].

One of the promising medicinal plants is milk thistle (*Silybum marianum*), widely used in both traditional and evidence-based medicine due to its biologically active components [3]. The main active compounds — flavolignans, including silymarin, silibinin, silydianin, and silychristin — possess antioxidant, anti-inflammatory, and immunomodulatory activities [4]. Experimental studies have demonstrated that milk thistle extracts reduce the levels of pro-inflammatory cytokines, regulate the Th1/Th2 cytokine balance, and stimulate lymphocyte proliferation, making them promising agents for adjunct therapy in inflammatory diseases [5]. Review studies confirm that silymarin slows pathological processes in autoimmune diseases, reduces oxidative stress, and supports systemic immunity [6]. Clinical investigations have shown that silymarin administration in patients with active RA decreases symptom severity, improves functional status, and reduces inflammatory activity [7].

However, the mechanisms of milk thistle action under conditions of chronic inflammation and systemic immune dysregulation remain insufficiently studied [8]. In particular, its effects on lymph nodes and lymphoid tissue, which play a key role in immune responses, have been poorly investigated [9]. Considering the importance of lymphatic structures in regulating

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immune reactions and the development of autoimmune processes, the present study aims to evaluate the potential of milk thistle as a natural biocorrector for restoring the morphology and morphometry of inguinal lymph nodes in white rats with experimental rheumatoid arthritis [10].

**Aim of the study.** To investigate the effect of milk thistle extract on the morphological and morphometric structure of inguinal lymph nodes in white rats with experimental rheumatoid arthritis and to determine its effectiveness as a natural biocorrector in reducing inflammatory processes and restoring the immune activity of lymphoid tissue.

**Materials and Methods.** The study was conducted at the research laboratory of the Center for Scientific and Experimental Biomedicine of the Bukhara State Medical Institute. White hybrid rats aged 18 months and weighing 250–290 g were selected for the experiment. All animals were maintained under identical vivarium conditions: relative humidity 50–60%, temperature 19–22 °C, and a light regime of 12 hours light and 12 hours darkness. Vivarium facilities were cleaned daily in accordance with sanitary and hygienic standards.

At the completion of the experiment, animal carcasses were processed according to established regulations, disinfected with a 20% chlorinated lime solution, and buried. The animals received a standard vivarium diet throughout the study period.

Rats of the correction group (n = 23) were maintained on a standard diet and subjected to experimental induction of rheumatoid arthritis. The model was established by a single subcutaneous injection of 0.1 ml of Freund's adjuvant at the base of the tail. During the first three days after injection, local edema and hyperalgesia were observed, while signs of inflammation in the distal joints appeared on days 7–10.

At the end of the experiment, all animals were decapitated in the morning under fasting conditions. Inguinal lymph nodes were isolated, macroscopically measured, and fixed for morphological and morphometric analysis. The obtained samples were stained with hematoxylin–eosin and Van Gieson methods and examined microscopically. All morphological parameters were statistically processed and scientifically documented.

**Results.** In the experimental model of rheumatoid arthritis in white rats, pronounced morphological changes were observed in the inguinal lymph nodes. In control animals with rheumatoid arthritis, destructive processes were detected in lymphoreticular elements, dilation of medullary sinuses, marked plasmacytic infiltration, hemodynamic disturbances, and stromal disorganization. The follicles had irregular shapes with blurred boundaries, and the number of germinal centers was significantly reduced. Signs of edema, impaired microcirculation, and accumulation of inflammatory cells were observed in the parenchyma.

After biocorrection with milk thistle extract, significant positive changes in the morphological structure of the lymph nodes were observed. The follicles regained their normal shape and clear boundaries, and their number increased to 16 ± 0.26 per section. The percentage of germinal centers reached 32.1 ± 0.45%, indicating restoration of lymphocyte proliferation. The medullary sinuses became narrowed and structurally organized, while plasmacytic and histiocytic stromal infiltration markedly decreased. The lymph node capsule became thinner and more uniform, blood vessels restored their integrity, and signs of stasis and perivascular infiltration were reduced.

Morphometric parameters also improved: the total diameter of the lymph nodes increased to 2.62 ± 0.055 mm; cortical zone thickness reached 431.55 ± 7.87 µm, and paracortical zone thickness was 327.1 ± 5.36 µm. The mean follicular diameter reached 188.05 ± 3.09 µm, the relative area of the medullary zone was 28.05 ± 0.41%, and stromal volume accounted for 20.1

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± 0.34%. These findings indicate restoration of lymphoid tissue structure, improvement of trophic supply and microcirculation, as well as a reduction in inflammatory activity.
In 3- and 12-month-old rats subjected to biocorrection, persistence of the positive effect was observed: lymph node architecture remained stable, and indicators of lymphocyte proliferation and follicular integrity remained high, suggesting a long-term immunomodulatory effect of milk thistle extract.
**Conclusions.** Milk thistle extract demonstrates pronounced immunoprotective and anti-inflammatory effects in experimental rheumatoid arthritis. It promotes restoration of the morphostructure of inguinal lymph nodes, activates regenerative and reparative processes in lymphoid tissue, normalizes microcirculation, and enhances immune activity. The obtained data confirm the effectiveness of milk thistle as a natural biocorrector for reducing morphostructural disorders of the lymphoid system and supporting immune function in rheumatoid arthritis.
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