

HISTOLOGICAL REMODELING OF THE THYMUS UNDER STRESS-INDUCED SECONDARY IMMUNODEFICIENCY

Azimova Dilara Alijon qizi

Asian International University.

diloraxanum1993@gmail.com

<https://doi.org/10.5281/zenodo.17449826>

Relevance

The increasing prevalence of psychosocial stressors, malnutrition, and environmental factors has significantly contributed to the development of secondary immunodeficiency worldwide.

The thymus, as the central organ of T-lymphocyte maturation, is one of the most stress-sensitive structures. Understanding thymic morphological damage under stress is crucial for early diagnosis, prevention, and development of therapeutic strategies in clinical immunology and pathomorphology.

Objective

To investigate stress-induced histological and cellular changes in the thymus based on experimental models simulating secondary immunodeficiency.

Materials and Methods

Experimental stress conditions were modeled in rats using immobilization, cold exposure (4–6 °C), corticosteroid injections, and sleep deprivation over 14–30 days. After euthanasia, thymic samples were collected and analyzed with:

- Hematoxylin–eosin staining,
- PAS reaction,
- Van Gieson method,
- Immunohistochemistry (CD3, CD4, CD8, caspase-3),
- Light and electron microscopy.

Morphometric measurements were used to quantify cortical and medullary alterations.

Results

- Significant degenerative and apoptotic processes were revealed:
- Massive lymphocyte apoptosis and necrosis in the cortical layer;
- Medullary lymphocyte depletion;
- Vacuolization, wrinkling, and shrinkage of Hassall's corpuscles;
- Stromal disintegration and perivascular edema;
- Microcirculatory disorders such as congestion, hemorrhage, and stasis;
- Fatty infiltration and diffuse thymic atrophy.

The main pathogenic mechanism was linked to glucocorticoid-induced caspase-mediated apoptosis of thymocytes. Structural reduction of lymphoid reserves can predispose to infection and autoimmunity.

References

1. Sapolsky R. (2018). Stress and Immunosuppression in Mammals. Journal of Neuroimmunology.
2. Petrova L. (2021). Morphological Changes of the Thymus Under Stress. Morphology Journal.
3. Glaser R., Kiecolt-Glaser J. (2019). Experimental Stress Models in Rats. Brain Behav Immun.