

INCREASE OF THE LYMPH NODE FUNCTION AS A RESULT OF PHYTOSTIMULATION IN OLD AGE

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ABSTRACT — Age-related changes in mesenteric lymph node reflect the general process of ageing in the experiment. These changes of lymph node are associated with reduction of structural and functional compartments. There is a decrease in drainage and immune function of lymph nodes in the elderly and senile age. We have realized the idea to control the lymphatic system functions using phytotherapy. Phytotherapy provides improved drainage and immune functions of the lymph node by increasing the size of functional compartments, intensification of cellular proliferation. Phytotherapy has a structural-modifying effect, which is important for improving the non-specific resistance of the body at the late stage of ontogenesis.

KEYWORDS — lymph node, gerontology, phytotherapy .

INTRODUCTION

The most priority in medicine is the problem of providing an immune protection and increase in nonspecific resistance of an organism at elderly and senility age. Scientists did not study completely a phenomenon of lymphatic system as instrument of providing a drainage and detoxication of endoecological space at old age [1–4]. First of all, search of ways of control of functions of lymphatic system is necessary for counteraction to aging. It is possible to make it by means of lymphotropic technologies of preventive medicine if to consider the concept of the lymphatic region [1]. It is necessary to recognize as the most perspective direction of prevention of age changes lymphatic (lymphoid) systems. The idea of control of functions of lymphatic system is implemented in different preventive and therapeutic programs with use of non-drug methods of treatment. The greatest attention is deserved phytotherapy which is widely used in medicine. The lymphatic component of the mechanism of action of phytotherapy remains poorly studied [5]. There is an urgent need for scientific justification of expediency of phytotherapy for correction of age changes of lymphoid and lymphatic systems. The result



Olga Gorchakova, MD

has practical value for optimization of rehabilitation at a stage of late ontogenesis.

The purpose is studying influence of phytotherapy on structure and function of the lymph node which underwent age changes.

MATERIALS AND METHODS

The experiment is made on 160 white rats males of different age (3–5 months and 1.5–2 years) who conditionally divided into two groups of young and old animals. Old animals are an adequate model of age-induced immune deficiency. The experiment on animals was carried out according to the international rules and norms (European Communities Council Directives of 24 November 1986, 86/609/EEC) with the general anesthesia of painful manipulations.

All the animals received a standard briquetted forage at free access to water. The mesenteric lymph node is chosen as a research object. We used biologically active herbal remedy (phytocomposition) which contained *Hedysarum theinum* Krasnob., *Bergenia crassifolia* (L.) Fritsch., *Rhodiola rosea* L., *Vaccinium myrtillus* L., *Vaccinium vitisidaea* L.), *Ribes nigrum* L., *Rosa majalis* Herrm., *Thymus serpyllum* L. and dietary fibers. Phytocomposition is a source of bioflavonoids, microelements and other biologically active agents which have adaptogenic and lymphotropic effects [3, 4, 5]. Action mechanism of bioflavonoids and microelements are connected with activation and proliferation of immunocompetent cells [6, 7]. The daily dose of phytocomposition was 0.1–0.2 g/kg, and it was added to a standard forage by an animal of different age within one month.

We conducted a histologic research of mesenteric lymph nodes. Lymph nodes fixed in 10% neutral formalin. We adhered to the classical scheme of dehydration and embed in paraffin with preparation of histologic sections. Histological sections of lymph nodes painted hematoxylin and eosine, azury and eosine, Masson's trichromatic stain. The morphometric analysis of structural components of a lymph node was carried out by means of a morphometric grid [8].

Statistical data processing was performed with licensed statistical software package StatPlus Pro 2009, AnalystSoft Inc. Data were expressed as average arithmetic with definition of a standard (mean square) error. Belonging to normal distribution was defined when calculating criterion of Kolmogorov–Smirnov and the accompanying indicators. In work the correlation analysis with definition of a correlation coefficient of Brave–Pearson is used. A P value < 0.05 was considered statistically significant.

RESULTS

The structure of a lymph node changes with age. Comparative analysis showed age differences in a structure of a lymph node of old and young animals. There is an increase in the areas of the capsule (in 1.6 times), medullary cords (in 2.1 times) and reduction of subcapsular and medullary sinuses (in 1.3 and 1.8 times respectively), the cortical plateau (in 2.1 times), lymphoid follicles with the germinative center (in 1.4 times), by 12% of a paracortex for with age (Table 1). The direct dependence between saturation immunocompetent cells of structurally functional zones of a lymph node and type of an immune response takes place. The immune response is lowered as on humoral, and cellular type at old animals.

Phytocorrection causes positive changes of structural and functional zones of a lymph node of old animals (Table 1). Change of intranodal zones is followed by compaction of a lymph node after phytotherapy at old animals. There is an increase in size of a cortical and medullary ratio. Phytotherapy increases intensity of an immune response on humoral type as the area of B-dependent compartment of a lymph node changes (Table 1). Strengthening of a limfoproliferation after phytotherapy leads to formation of temporary lymphoid structures — lymphoid are called «tertiary lymphoid organs» [3, 9, 10]. The ectopia of lymphoid follicles is noted in a subcapsular zone and medullary substance of lymph nodes and outside lymph nodes after phytotherapy at old animals (Fig. 1).

DISCUSSION

First of all, it is connected with the structural and modifying effect of phytodrug when aging of a lymph node takes place. The phytotherapeutic effect consists in optimization of structure and function of a lymph node according to the principles a lymphosanitation, a lymphoprotection and a lymphostimulation [1–5, 11, 12]. One of effects of the strengthened cellular proliferation is formation of new lymphoid structures (lymphoid follicles). Neolymphoid aggregates are necessary for implementation of an adaptive immune response [9, 10, 13] that is important for neogenesis of lymph nodes [14–16]. Formation of lymphoid follicles is result of phytostimulation of an immune response [3, 13]. It is a fact in evidence increase drainage and immune functions of a lymph node as a result of phytotherapy of old animals [3, 5–7, 11]. Phytotherapy is means implementation of technology of recovery

Table 1. The area of structural and functional zones of a mesenteric lymph node of young and old animals and after intake of bioactive phytocomposition (BAP), %

Structures of lymph node	Young animals	Old animals	Old animals with intake of BAP
	1	2	3
Capsule	5.72±0.19	9.43±0.45*	9.04±0.48
Subcapsular sinus	4.57±0.17	3.38±0.27*	4.50±0.22°
Cortical plateau	7.74±0.31	3.78±0.24*	4.28±0.24°
Lymphoid follicle without the germinative center	4.18±0.17	3.32±0.22*	4.32±0.21°
Lymphoid follicle with the germinative center	5.69±0.19	3.03±0.26*	4.62±0.46°
Paracortex	16.02±0.56	14.29±0.54	12.28±1.11
Medullary cords	10.55±0.24	22.03±0.72*	16.63±1.62°
Medullary sinus	7.31±0.29	3.89±0.35*	5.61±0.61°

Note: level of the statistical importance of distinctions – * $P_{1,2} < 0.05$; ° $P_{2,3} < 0.05$. $n = 20$ – number of rats in each group

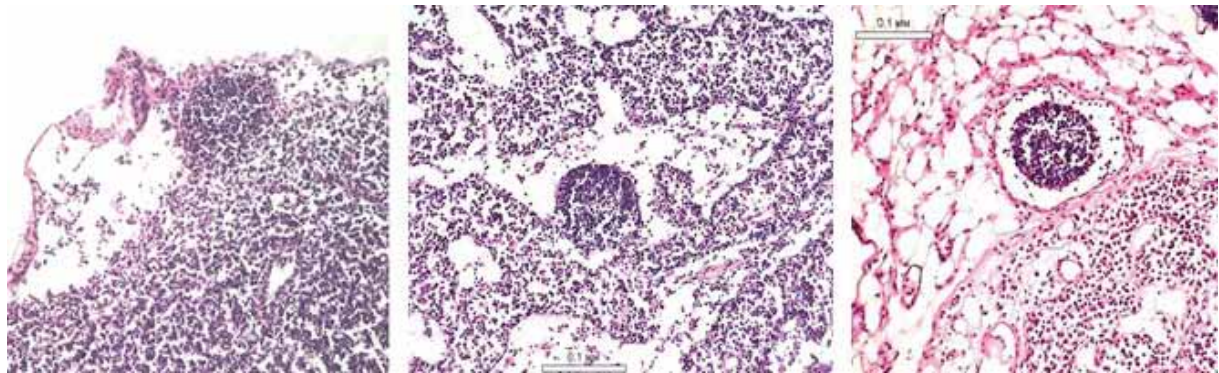


Fig. 1. Ectopia of lymphoid follicles in a mesenteric lymph node. Old animals. Phytotherapy. Hematoxylin and eosin stain. Magnification x240.

correction of the lymph node which underwent age changes that provides increase in nonspecific resistance of an organism.

CONCLUSION

Original herbal drug has the lymphotropic and structural modifying effect. Phytotherapy provides increase drainage and immune functions due to recovery of structure with increase in the size of compartments, strengthening of a lymphoid proliferation in a lymph node at a late stage of ontogenesis. It leads to increase in nonspecific resistance of an organism at elderly and senile age. The lymphotropic phytotechnology is positioned as a possibility of improvement of quality of life and maintaining health through optimization of structure and functions of a lymph node in relation to elderly and senile age.

REFERENCES

1. **BORODIN YU I.** Lymphatic system and aging. Fundamental researches 2011; 5: 11–15. (in Russian)
2. **KONENKOV VI, BORODIN YU I, LUBARSKY LS.** Lymphology. Novosibirsk: Publishing house "Manuscript", 2012; 1104 p. (in Russian)
3. **GORCHAKOVA OV, BORODIN YU I, GORCHAKOV VN.** Lymph nodes of different localization: aging and correction. Saarbrücken: Palmarium Academic Publishing, 2012; 350 p.
4. **LEVIN YUM.** Break in endoecological medicine. New level of medical thinking and effective therapy. M.: Shcherbinsky Printing House, 2006; 232p. (in Russian)
5. **GORCHAKOV VN, SARANCHINA EB, ANOKHINA ED.** Phytolymphonutriciology. Practical Phytotherapy 2002; 2: 6–9. (in Russian)
6. **LIU K, XIAO X, WANG J, ET AL.** Polyphenolic composition and antioxidant, antiproliferative, and antimicrobial activities of mushroom *Inonotus sanghuang*. LWT-food science and technology 2017; 82(1): 154–161.
7. **FU M, XU Y, CHEN Y, WU J, ET AL.** Evaluation of bioactive flavonoids and antioxidant activity in *Pericarpium Citri Reticulatae* (*Citrus reticulata* Chachi) during storage. Food chemistry 2017; 230(1): 649–656.
8. **AVTANDILOV GG.** Medical morphometry. M.: Medicine, 1990. (in Russian)
9. **MEBIUS RE.** Organogenesis of lymphoid tissues. Nat Rev Immunol 2003; 3(4): 292–303.
10. **ALOISI F, PUJOL-BORRELL R.** Lymphoid neogenesis in chronic inflammatory diseases. Nat Rev Immunol 2006; 6: 205–217.
11. **GORCHAKOVA OV, GORCHAKOV VN.** Structural and functional features of inguinal lymph nodes and a lymph flow when aging. Morphology 2013; 144: 4: 25–29. (in Russian)
12. **TOPOROVA SG.** Features of system of pericellular humoral transport when aging: overview of literature. Gerontology and Geriatrics 2003; 2: 90–94. (in Russian)
13. **MAYBORODIN IV, MAYBORODINA VI, POZDNYAKOVA SV, ET AL.** A dystopia of lymphoid follicles in lymph nodes after polychemotherapy as a possible indicator of their regeneration. Clinical oncology 2004; 2: 4–7. (in Russian)
14. **BENDE R, VAN MALDEGEM F, VAN NOESEL C.** Chronic inflammatory disease, lymphoid tissue neogenesis and extranodal marginal zone B-cell lymphomas. Haematologica 2009; 94: 8: 1109–1123.
15. **EGAWA G, KABASHIMA K.** Skin as a peripheral lymphoid organ: revisiting the concept of skin-associated lymphoid tissues. J Invest Dermatol 2011; 131(11): 2178–2185.
16. **FRANCESCA A. ET AL., 2006;** Francesca A, Ricardo P. Lymphoid neogenesis in chronic inflammatory diseases. Nature Reviews Immunol 2006; 6: 205–217.