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## LYMPHOKINETIC ACTIVITY OF THE COMPOSITION OF DIHYDROQUERCETIN AND ARABINO GALACTAN

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### SUMMARY

The study of the lymphokinetic activity of the composition of dihydroquercetin and arabinogalactan was carried out.

The experiments were performed on male Wistar rats. Lymphokinetic activity was determined by the rate of lymph outflow through the puncture of the lacteal cistern after intragastric administration of a composition of dihydroquercetin and arabinogalactan in a ratio of 1 : 5 (50 mg/kg + 250 mg/kg).

It has been established that the lymphokinetic activity of the composition of dihydroquercetin and arabinogalactan in the ratio of 1 : 5 exceeds the activity of its individual components.

**KEY WORDS:** lymph drainage, dihydroquercetin, arabinogalactan.

### Introduction

Dihydroquercetin (DHA) is an antioxidant of plant origin, found in the greatest amount in the butt of larch wood.

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Daurian (*Larix dahurica Turcz.*) [1]. It is known that dihydroquercetin has capillary protective, lymphokinetic, and other properties that make it promising for the development of a phleboprotective agent [1–3]. However, DHA has a low solubility in water (about 1 g/L), which probably limits its pharmacological activity [4].

In a recent study, it was found that the use of DHA in combination with plant polysaccharides increases its pharmacological effect, which is associated with an increase in solubility [5]. One of the polysaccharides used in this work is arabinogalactan (AG), also isolated from larch [6, 7].

The purpose of the study is to study the lymphokinetic activity of the composition of dihydroquercetin and arabinogalactan.

### Material and methods

We used DHA (98.6%) and AG (98.7%) isolated from Dahurian larch wood (*Larix dahurica Turcz.*), as well as compositions of DHA and AG in a ratio of 1 : 5. Substances for the study were provided by ZAO Ametis ".

Experiments on the study of the lymphokinetic activity of DHA, AG, and their compositions were performed on 28 male Wistar rats weighing 300–350 g.

Lymphokinetic activity was determined by the rate of lymph outflow ( $\bar{y}/(\text{kg min})$ ), released through a puncture of the lacteal cistern (*cisterna chyli*). One hour before the experiment, DHA at a dose of 50 mg, AG at a dose of 250 mg/kg, and DHA + AG (1 : 5) at a dose of 300 mg/kg (50 mg + 250 mg) were administered once intragastrically in purified water. Animals of the control group were injected with an equivolume amount of purified water. The time of lymph sampling was 10 min. The collected lymph was stabilized with heparin at a final concentration of 50 IU/mL [8].

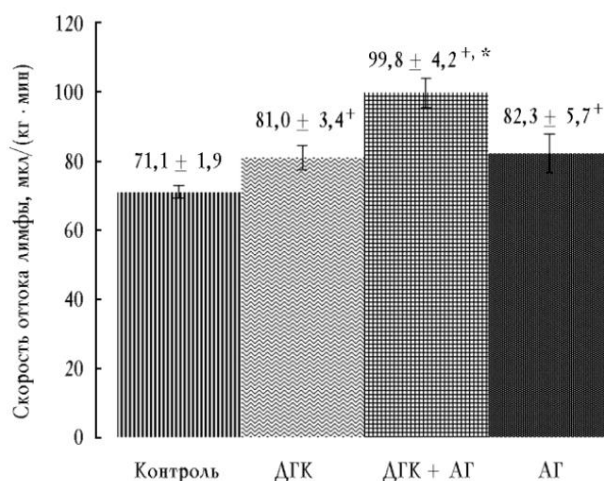
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Statistical processing of the results was carried out using the Statistica 6.0 software package. Dostoyanov et al. assessed the accuracy of the obtained results by the nonparametric Mann–Whitney U test. Data are presented as  $M \pm m$ , where  $M$  is the mean and  $m$  is the standard error of the mean.

## Results and discussion

The ability of a number of plant substances of a flavonoid nature (diosmin, rutin) to increase lymphatic drainage is widely known and is an important pharmacological property of drugs used in the prevention and treatment of chronic venous insufficiency. The course intake of phlebotonics increases the lymph outflow in the lower extremities, which leads to a decrease in the most severe form of edema, lymphedema [9].

In our study, the rate of lymph outflow in rats of the control group was  $71.1 \mu\text{l}/(\text{kg} \cdot \text{min})$  (picture). The data obtained are consistent with the results of measuring the rate of lymph outflow in other studies [10].



The rate of lymphatic drainage in rats after a single intragastric administration of dihydroquercetin, arabinogalactan and their composition in a ratio of 1 : 5: differences compared with the values in control animals ( $p < 0.05$ ); \* - statistically significant differences compared with the values in animals of the DHA group ( $p < 0.05$ )

In animals that were injected with DHA at a dose of 50 mg/kg, the rate of lymph outflow increased statistically significantly by 14% compared with the control. It is possible that the effect of DHA is similar to that of other antioxidants with lymphokinetic activity (mexidol, ketorolac). In the studies of R.Kh. Khafizyanova et al. it has been shown that such antioxidants are able to stimulate the flow from the interstitium into the lymphatic

a channel of metabolic products, initiating the process of lymph formation and lymph outflow [11].

Administration of AG at a dose of 250 mg/kg increased the rate of lymph outflow by 16% ( $p < 0.05$ ). Probably, such an effect of AG is associated with its ability to increase capillary permeability [12].

Administration of the DHA + AG complex (1 : 5) at a dose of 300 mg/kg caused an increase in the rate of lymph outflow by 40% as compared with the control values. Thus, the DHA + AG complex exhibits greater lymphokinetic activity compared to DHA and AG separately in the doses included in the complex. In addition, the data obtained confirm the phenomenon of an increase in the pharmacological properties of a medicinal substance when it is used in combination with AG [5, 13, 14].

## Conclusion

It has been established that the composition of dihydroquercetin and arabinogalactan in a ratio of 1 : 5 exhibits more pronounced lymphokinetic properties than its constituent components. The data obtained indicate the prospects for the development of a new phlebotropic drug based on the composition of dihydroquercetin and arabinoga-

lactan.

## Literature

1. Kolkhir V.K., Tyukavkina N.A., Bykov V.A. Dikvertin – a new antioxidant and capillary protective agent // *Khim.-farm. magazine* 1995. No. 9. S. 61–64.
2. Ivanov I.S., Sidekhenova A.V., Anishchenko A.M. and etc. Pharmacological activity of the composition based on dihydroquercetin and lipoic acid // *Bul. sib. medicine*. 2011. V. 10, No. 5. S. 43–47.
3. Pat. 2014841. Antioxidant, capillary-protective, anti-inflammatory and antihistamine in / Sokolov S.Ya., Tyukavkina N.A., Kolkhir V.K. and others. Registered in the state register of the Russian Federation on June 30, 1994.
4. *Taxifolin* from dahurian larch – application for the approval as novel food // Regulation (EC) no. 258/97 of the European parliament and of the council of 27 January 1997 concerning novel foods and novel food ingredients. 1997. 130 p.
5. Pat. Patent 2421215. Composition with increased pharmacological activity based on dihydroquercetin and plant polysaccharides (options) / Dushkin A.V., Meteleva E.S., Tikhonov V.P. and others. Registered in the state register of the Russian Federation on April 15, 2010.
6. Medvedeva E.N., Babkin V.A., Ostroukhova L.A. Arabinogalactan of larch: properties and prospects of use (review) // *Chemistry of vegetable raw materials*. 2003. No. 1. S. 27–37.
7. d'Adamo P. Larch arabinogalactan is a novel immune modulator // *J. Naturopath. Med*. 1996. No. 3. P. 32–39.
8. Kuznetsov A.V. A new way of taking lymph from animals

- // Bull. experimental biology and medicine. 1993. V. 116, No. 9. S. 329–331.
9. *Bogachev V.Yu.* Modern phleboprotectors // Consilium provisorum. 2004. V. 4, No. 1. S. 13–16.
10. *Cotonat A., Cotonat J.* Lymphagogue and pulsatile activities of Daflon 500 mg on canine thoracic lymph duct // Inter. Angiol. 1989. V. 8. Suppl. 4. P. 15–18.
11. *Khafizyanova R.Kh., Aleeva G.N., Mukhutdinov D.A.* The lymphotropic effect of dimphosphone, mexidol and ketorolac is realized by activating the activity of the lymphangion and enhancing lymph formation // Bul. experimental biology and medicine. 2007, vol. 143, no. 4, pp. 423–425.
12. *Kind LS, Macedo-Sobrinho B., Ako D.* Enhanced vascular permeability induced in mice by larch arabinogalactan // Immunology. 1970. No. 19. P. 799–807.
13. *Pat. Patent 2337710.* Water-soluble medicinal composition and method for its preparation / Dushkin A.V., Tolstikova T.G., Tolstikov G.A., Meteleva E.S. Registered in the state register of the Russian Federation on December 5, 2006.
14. *Tolstikova T.G., Khvostov M.V., Bryzgalov A.O.* Arabinogalactan, a plant polysaccharide as a new agent for pharmacon clathration, Doklady akademii nauk. 2010. V. 33, No. 5. S. 713–714.

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## INFLUENCE OF THE DIHYDROQUERCETIN AND ARABINOGALACTAN COMPOSITION ON LYMPH FLOW

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### ABSTRACT

**Purpose.** To evaluate lymphokinetic activity of the dihydroquercetin and arabinogalactan composition.

**material and methods.** The investigation was carried out on male Wistar rats. Lymphokinetic activity was determined by the rate of lymph outflow through the puncture of cisterna chili after intragastricall administration of the dihydroquercetin and arabinogalactan composition with a ratio of 1 : 5 (50 mg/kg + 250 mg/kg).

**results.** It was established that lymphokinetic activity of the dihydroquercetin and arabinogalactan composition with ratio 1 : 5 (50 mg/kg + 250 mg/kg) exceeds the activity of it's components.

**KEY WORDS:** lymph flow, dihydroquercetin, arabinogalactan.

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### References

1. Kolkhir VK, Tyukavkina NA, Bykov VA et al. *Khimiko Farmatsevticheskii Zhurnal*, 1995, no. 9, pp. 61–64 (in Russian)
2. Ivanov IS, Sidekhmenova AV, Anishchenko AM et al. *Bulletin of Siberian Medicine*, 2011, no. 5, pp. 43–47 (in Russian).

3. Patent 2014841. *Bulletin of Inventions*, 1994 (in Russian).
4. Taxifolin from dahurian larch – application for the approval as novel food. Regulation (EC) no 258/97 of the European parliament and of the council of 27 January 1997 concerning novel foods and novel food ingredients, 1997. 130 p.
5. Patent 2421215. *Bulletin of Inventions*, 2010 (in Russian).
6. Medvedeva EN, Babkin VA, Ostroukhova LA et al. *Chemistry of Plant Raw Material*, 2003, no. 1, pp. 27–37 (in Russian).
7. d'Adamo P. Larch arabinogalactan is a novel immune modulator. *J. Naturopath. Med.*, 1996, no. 3, pp. 32–39.
8. Kuznetsov AV *Bulletin of Experimental Biology and Medicine*, 1993, vol. 116, no. 9, pp. 329–331 (in Russian).
9. Bogachev V.Yu. *Consilium Provisorum*, 2004, vol. 4, no. one, pp. 13–16 (in Russian).
10. Cotonat A., Cotonat J. Lymphagogue and pulsatile activities of Dafilon 500 mg on canine thoracic lymph duct. *Inter. Angiol.*, 1989, vol. 8 suppl. 4, pp. 15–18.
11. Khafiz'yanova RH, Aleeva GN, Mukhutdinov DA *Bulletin of Experimental Biology and Medicine*, 2007, vol. 143, no. 4, pp. 423–425 (in Russian).
12. Kind LS, Macedo-Sobrinho B., Ako D. Enhanced vascular permeability induced in mice by larch arabinogalactan. *Immunology*, 1970, no. 19, pp. 799–807.
13. Patent 2337710. *Bulletin of Inventions*, 2006 (in Russian).
14. Tolstikova TG, Khvostov MV, Bryzgalov AO *Reports of the Academy of Sciences*, 2010, vol. 33, no. 5, pp. 713–714 (in Russian).

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