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THE STUDY OF THE INFLUENCE OF THE INFUSION FROM RUBUS CAESIUS LEAVES THE PERMEABILITY OF RATS' VASCULAR WALLS

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Abstract. *The article describes the results, achieved from the research on the influence of the infusion from Rubus caesius leaves on the penetrability of rats' vascular walls. It was found the capillary strengthening activity of infusion due to the presence of flavonoids quercetin, kaempferolandrutin. The results obtained comply with scientific data, substantiating the statistically-valid fact that the infusion from Rubus caesius leaves can decrease vascular penetrability under the "protein", "xylol" or "formalin" inflammations.*

Keywords: *Rubus caesius, the capillary strengthening activity, hemostatics, inflammation.*

The broadening range of hemostatics is motivated by various factors, such as: post-surgery complications, intake of different medicaments, disturbing the fusion of coagulation factors or stimulating fibrinolysis, the effect of radiotherapy and increased allergisation of population, resulted from practice of chemical therapy. One of the ways to solve this problem is to produce new hemostatics and remedies, strengthening capillaries without side effects. In this view, medicaments, based on herbal substances, are rather prospective, gaining more and more popularity in the market of drugs.

The Rubus caesius, well-known for its therapeutic qualities for a long time, was mentioned by Theophrastus, Avicenna and Dioscorides. To achieve therapeutic effect ancient healers used it as decoctions and infusions of berries, leaves and roots. The multifarious chemical composition of Rubus caesius leaves may predetermine its manifold application [1]. According to scientists, leaves of the Rubus caesius exert a hemostatic, astringent, sudorific, analgesic and anti-inflammatory effect, as well as show an antiseptic effect and accelerate digestion [2, 3].

Being substantial for hemostasis, a vascular wall is the first to react to injuries through reflex contraction, leading to deflation of blood flow to a traumatic area. Apart from that, this wall serves as a source of tissue thromboplastin and other thrombogenic factors. A vascular wall makes a biosynthesis of adrenaline, noradrenaline, lipoids, heparin and other physiologically active substances, participating in bleeding control [4].

The influence, exerted by herbal drugs on human organism through a group of biologically active substances and microelements, is manifold [5]. Consequently, it is a topical issue in modern pharmacology to seek and develop new hemostatics of a plant origin, which apart from being specifically hyperactive would be convenient and safe in application.

The purpose of our research was to investigate the influence of the infusion from the *Rubus caesius* on the permeability of rats' vascular walls.

Materials and Methods. The experiment was conducted on 12 WAG line rats (weight 180-200 g), kept on a standard vivarium diet. All experimental animals were raised in the vivarium in the Central research laboratory of the National Pharmaceutical University and standardized according to physiologic and biochemical criteria.

The experiment was conducted in vivo. Animals were divided into 2 groups, 6 animals in each of them: experiment and control. The experiment lasted 1 month. The infusion from *Rubus caesius* leaves was orally intragastrically administered to the animals from the experiment group on a daily basis (12ml/kg). Water, equivalent to the weight of the control animals, was given to the latter. As soon as the experiment came to an end, on the 30th day local inflammation was stimulated in the animals of both groups by the P.P. Golikov method with use of different phlogogenic substances, such as: egg albumin (protein), xylol, histamin and formalin [6].

The number of animals and their group distribution conformed to economical approach, bioethical rules and statistic requirements. Recalculation of human doses for the rats was conducted by Yu. R. Rybolovlev using the ratio of species sensitivity

[7]. A daily average dose for a patient makes 200 ml of the infusion, prepared in an amount of 1:10, assuming that $\text{ml/kg} = 2,9$.

Statistical calculations were performed by conventional methods [8].

The laboratory animals employed in the research were kept in the experimental biological clinic of the KhNMU under Storage, Care and Feeding Norms, conforming to the principles of the “European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes” (Strasbourg, 1986) [9] and the resolution of the First National Congress on Bioethics (Kyiv, 207) [10]. The experiments were carried out in the morning, because according to scientists this time of day shows the dependence of the main pharmacological parameters and pharmacological activity of the herbal product under study on circadian rhythms [11, 12].

Results and Discussion. The animals from the control group presented faster colouring of skin papules, produced by protein (1,8 min), slower colouring – by histamine (2,8 min) and formalin (3,4 min) and the slowest one – by xylol (4,2 min) (Table 1).

Table 1.

The capillary strengthening activity of the infusion from *Rubus caesius* leaves, with dose of 12 ml/kg (n = 6)

№gr.	Groups of animals	The duration of skin staining (in minutes) under the influence of phlogogenic agents			
		Egg albumin	xylol	histamin	formalin
1.	Control	1,80 ± 0,49	4,20 ± 0,73	2,80 ± 0,66	3,40 ± 0,29
2.	The infusion from <i>Rubus caesius</i> leaves	3,60 ± 0,68*	6,201 ± 0,58*	2,80 ± 0,37	6,80 ± 0,80*

Note: * - difference is statistically significant: versus control.

As compared to the control group, the infusion from *Rubus caesius* leaves with a dose of 12 ml/kg stabilized vascular walls when the level of their penetrability was raised by protein (twice), xylol (in 1,5 times) and formalin (twice). The results of the experiment show that the infusion from *Rubus caesius* leaves can reduce vascular penetrability under the protein, xylol and formalin inflammations (Table 1).

The obtained results attest to the fact that the infusion possesses a capillary strengthening effect and conforms to scientific data, showing the ability of such flavonoids as quercetine, kaempferol and rutin (contained in leaves of the *Rubus caesius*) to reduce the penetrability of walls in blood vessels (the so-called R-vitamin activity) [13].

The given method of studying the penetrability of rats' vascular walls being based on simulating local inflammation by phlogogenic substances, we can assume to a certain degree that the infusion from *Rubus caesius* leaves performs an anti-inflammatory activity. During inflammation, induced in rats by histamin, there was no positive effect on stabilization of the vascular wall after infiltration of the infusion from *Rubus caesius* leaves. This fact allows us to assume that the infusion has no anti-allergic properties.

Conclusions: 1. The infusion from leaves of the *Rubus caesius* produces a general strengthening effect on the permeability of blood vessel walls in rats.

2. Leaves of *Rubus caesius* are perspective raw materials for studying for the purpose of its application in phytotherapy.

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Резюме. Стаття представляє результати дослідження впливу настою листя ожини сизої на проникність стінок судин у щурів. Було встановлено, капіляррозміцнюючу дію настою, яка обумовлена наявністю флавоноїдів кверцетин, кемпферол, рутин. Отримані результати узгоджуються з даними літератури та підтверджують здатність настою листя ожини сизої статистично вірогідно знижувати судинну проникність при «білковому», «ксилоловому», «формаліновому» запаленнях.

Ключові слова: ожина сиза, капіляррозміцнююча активність, гемостатичні засоби, запалення.

Резюме. Стаття представляет результаты изучения влияния настоя листьев ежевики сизой на проницаемость стенок сосудов у крыс. Было установлено капилляроукрепляющее действие настоя, обусловленное наличием флавоноидов кверцетин, кемпферол, рутин. Полученные результаты согласуются с данными литературы и подтверждают способность настоя листьев ежевики сизой статистически достоверно снижать сосудистую проницаемость при «белковом», «ксилоловом», «формалиновом» воспалениях.

Ключевые слова: ежевика сизая, капилляроукрепляющая активность, гемостатические средства, воспаление.

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