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ANTI-INFLAMMATORY ACTIVITY OF GALIUM VERUM HERB INFUSION

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There was studied the anti-inflammatory activity of Galium verum herb infusion on the model of carrageenan edema of rats inflammation. In the conditions of long-term prophylactic administration, the infusion of the bedstraw has an inhibitory effect on the development of edema. The phlogolytic activity of Galium verum herb is associated with the presence of coffee acid. Coffee acid has the ability to remove active forms of oxygen and prevent a number of cellular biochemical reactions that ensures an inflammatory process.

Key words: Galium verum herb, anti-inflammatory activity.

Among the plants of Altai flora the plant genus Bedstraw (*Galium* L.) of madder family (Rubiaceae) is of considerable interest. For a long time, many of its species have been used in folk medicine as diuretic, anti-inflammatory and bactericidal agents for the treatment of gastro-intestinal tract and kidney diseases [1]. *Galium verum* contains anthracenederivative groups of alizarin in rootstocks and roots, the grass contains phenolcarbonic acids, flavonoids, coumarins, tanning agents, iridoids and steroidal saponins [2]. Consequently, topical is the search of new effective nontoxic drugs on the basis of plant sources for the treatment of inflammatory diseases of various etiology.

Objective: to study the influence of *Galium verum* herb infusion on the course acute inflammatory process in rats.

Materials and methods

The experiment were conducted on 20 outbred rats of both sexes weighing 200 – 220 g in accordance with the good laboratory practice (ПД3), the order of the Ministry of Health of the Russian federation # 708H from 23.08.2010, Guidance for pre-clinic drug studies conduction [3].

Anti-inflammatory activity was studied on the model of acute inflammation after the two-week intake of *Galium verum* herb infusion in the earlier specified optimal dose 1,5 ml.

The last infusion intake was made 1 hour before the phlogistic injection. Nimesulide in the dose of 10 mg/kg was used as a comparative drug.

Acute exudative inflammation was induced by subplantar intake of 0.1 ml of 1% carrageenan solution [3]. The measurement of size of the right hind limb was made by plethysmometer after the course of *Galium verum* herb infusion before intake and also after 60 (1 hour), 120 (2 hours) and 240 (4 hours) minutes after phlogistic injection. The rate of anti-inflammatory activity was counted according to the data of the average growth of animal limbs obtained as the result of three parallel measurements.

The drugs are considered effective, when their anti-inflammatory activity is over 39% [4].

The statistical processing of the obtained results was carried by means of calculation of sample mean (M) and error of mean (m) using the parametric Wilcoxon-Mann-Whitney test. By calculation the program Statistica 6.0. for Windows was used. The differences were considered significant at $p < 0,05$ [5].

Results and discussion

The development of aseptic inflammation caused by carrageenin includes several stages. In the first stage, (10-20 minutes) in response to the damaging effect of phlogogen, biogenic amines (serotonin and histamine) are released, activating the kallikrein-kinin system, which leads to the accumulation of kinins (1 – 2 hours). The latter facilitate the local release of hydrolytic enzymes of lysosomes, stimulating the formation of prostaglandins, being the intermediates of the late stage of inflammation developing by carrageenan edema in 3 hours. Thus, the maximum of prostaglandin E_2 concentration is registered in 12-24 hours. Further, the system of complement is included in this chain, functioning in complex with kinin system and blood coagulation system [6]. A number of authors often combine the mentioned late stages into one, and the carrageenan edema is considered as a two-stage process, the second stage of which is the result of release of prostaglandins, lysosomes, bradykinin and proteases [7].

In course of the experiment the intake of 1% carrageenan solution by control animals lead to quick and consistent edema development. In these conditions long-term preventive intake of *Galium verum* herb infusion weakened its development.

At the early stages of edema development, the maximum effect of inflammation suppression under the influence of comparative drug – nimesulide – constituted 47%, while the effect stayed consistently high during the whole period of observation.

Table 1

The influence of Galium verum herb infusion on the development of carrageenan inflammation in outbred white rats

Animal group	Dose, mg/kg, ml/kg	Number of animals	Average growth of limb mass ($X \pm m$), %	Suppression of edema at the peak of inflammation, %
Control	-	10	39,8 $\pm$ 4,3	-
Nimesulide	10	10	21,9 $\pm$ 5,1*	47
Galium verum herb infusion (1:10)	1,5	10	27,3 $\pm$ 6,8*	37

The effect of Galium verum herb infusion reached statistically significant results in one hour after the carrageenan injection, reaching maximum in 2 hours and weakened by the end of the experiment. In the period of maximum phlogolytic activity the Galium verum infusion suppressed the inflammation by 37%, which exceeds the anti-inflammatory activity in comparison with the control group by 1,5 times.

The study of the anti-inflammatory activity of Galium verum herb infusion is based on the current literature data on the phlogolytic activity of single polyphenols contained in the plant. The anti-inflammatory activity of the coffee acid contained in Galium verum infusion is connected with the ability to destroy reactive oxygen intermediates and prevent a number of cell biochemical reactions, ensuring the inflammatory process, which has a distinct protective effect on the capillary permeability [8].

Considering the stage nature of acute carrageenan edema and the registered maximum of activity during the period of energetic edema growth, the effectiveness of coffee acid can be explained by the interference in the trigger mechanisms of inflammatory process with the suppression of its vascular component in the alteration zone.

Conclusion

Consequently, the model of acute exudative inflammation allowed to reveal the influence of Galium verum herb infusion on one of the pathogenetic inflammation stages – stage of exudation, which opens the prospective for the complex study of Galium verum material.

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