Research Article

To the Question about the Development of Composition and Technology of Soft Medicinal Forms-Ointments for the Treatment of Periodontal Disease

Sergey Nikolaevich Povetkin[4]*, Khamzat Akhmudovich Khasarov[1], Denilbek Said-Abazovich Mazaev[1], Said Aligadzhievich Alishlalov[2], Fatima Vladimirovna Kozaeva[1], Zamza Zovmakanovna Khanbetirova[1] and khadizhat Isaevna Mezhidova[3]

[1]Department of Medicine, North Ossetian State University Named after KL Khetagurov, Vladikavkaz, Republic of North Ossetia, Russia; [2]Department of Medicine, Moscow State Medical and Dental University Named after AI Evdokimov, Moscow, Russia; [3]Departmentof Medicine, Chechen State University, Grozny, Chechen Republic, Russia; [4]Departmment of Medicine, North Caucasus Federal University, Stavropol, Russia

Corresponding author:
Sergey Nikolaevich Povetkin,
Departmment of Medicine,
North Caucasus Federal University,
Stavropol, Russia,
E-mail: ruslankalmykov777@yandex.ru

Abstract

In this article we present the results of the development of optimal parameters for the production of phytocomposition-complex alcohol extraction from medicinal plant raw materials Sophora Japanese fruit, marigold flowers and nettle leaves. On the basis of the obtained complex phytoproduct, as well as lysozyme, aqueous extraction of oak bark and sea buckthorn oil, the optimal composition and rational technology of obtaining ointment for the treatment of periodontal were developed.

Keywords: Periodontal disease; Ointment; Extraction

Introduction

To date, periodontal diseases occupy one of the leading places in the structure of dental diseases. This is due to the unfavorable socio-economic and environmental situation, irrational antibiotic, hormone and chemotherapy, inadequate and irrational nutrition, and as a result, the treatment of periodontal diseases becomes an urgent problem in dentistry. [1-5]

Periodontal lesions include inflammatory degenerative and neoplastic processes of various forms and clinical manifestations. Thus, according to WHO, severe periodontal diseases occur in 5%-25% of the adult population, moderate in 30%-45% of the adult population, and only 2%-8% of people have intact periodontal disease at the age of 35 years-45 years.

The prevalence of periodontal diseases at the age of 40 years, in general, is 94.3%. Periodontal diseases cause serious complications in the body as a whole and are one of the most complex pathologies in terms of therapy, during which there is often a need for complex treatment. [6-9]

Most medications used in the treatment of periodontal diseases contain broad-spectrum antibiotics, which contributes to the appearance of dysbiosis in the oral cavity. In this regard, it becomes necessary to create a drug with a minimal risk of side effects. [10-14]Therefore, the main goal of our work was to develop a rational composition of a soft dosage form-an ointment with bactericidal, anti-inflammatory and regenerating effects.

Materials and Methods

The study used such research methods as biopharmaceutical (diffusion into gelatin gel) [15-17] pharmaceutical and technological (study of thermal and colloidal stability of the ointment, [18-21] physico-chemical (quantitative determination of flavonoids in terms of rutoside) [22,23] and microbiological (study of specific activity-bactericidalaction). [24,25] Mathematical processing of the results was carried out using FORTRAN software. [26]

Results and Discussion

At the first stage of our research, a complex alcohol extraction was obtained from medicinal plant raw materials: Japanese sophora fruits, marigolds of flowers and nettle leaves On the basis of experimental studies, optimal extraction parameters were determined: Extractant-ethyl alcohol 50%, the degree of grinding of raw materials-2 mm, the ratio of raw materials:Extractant-1:10, extraction method-fractional maceration followed by evaporation of the extraction to half the volume.

Water extraction from the oak bark was obtained using the traditional technology of making decoctions, which was also subsequently evaporated to half the volume. Model samples of ointments, including, in addition to the obtained phytocompositions, lysozyme and sea buckthorn oil, were prepared according to the generally accepted technology. The compositions obtained using carbopol gel 1% and sodium alginate 6% did not withstand the quality assessment according to the indicators description: The gels were stratified, they were heterogeneous systems.

The results of a biopharmaceutical study on the choice of the optimal composition (gelling agents methylcellulose 6% and

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polyethylene oxide base 7:3) are shown in [Figure 1]. The studies were conducted in 4 repetitions.

It follows from the data in the figure that the staining zones of the model samples of ointment no. 1, 3, 5, 7 (methylcellulose) and no. 2, 4, 6, 8, (polyethylene oxide) are approximately the same, so the compositions under consideration are taken by us for further research.

The release of flavonoids from the studied compositions no. 7 and no. 8 was carried out by the Kruvchinsky equilibrium dialysis method, while cellophane of the Kuprofan brand was used as a semi-permeable membrane, ethyl alcohol 50% served as the dialysis medium. The system was additionally sealed, thermostatically controlled, and samples were taken at specified intervals. The quantitative content of flavonoids in the sample was determined spectrophotometrically in terms of rutoside.

The results of the experiment are shown in [Figure 2]

It can be seen from the figure data that composition no. 8 has the highest degree of flavonoid release-76%, which is 14%more than that of composition no. 7.

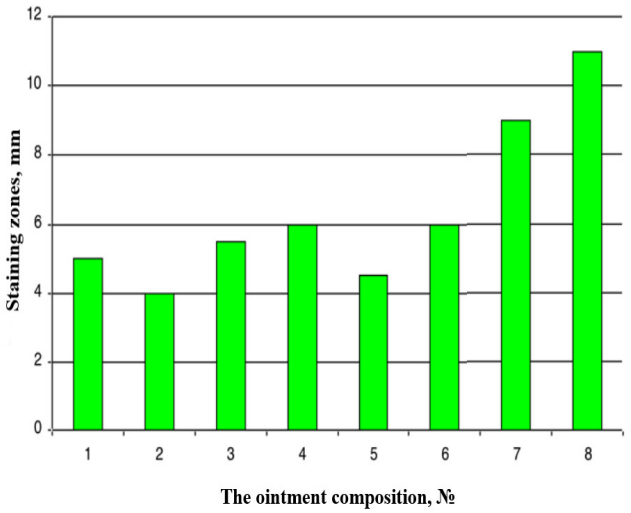

Figure 1: Release of flavonoids in 3% gelatin gel (iron III chloride reagent).

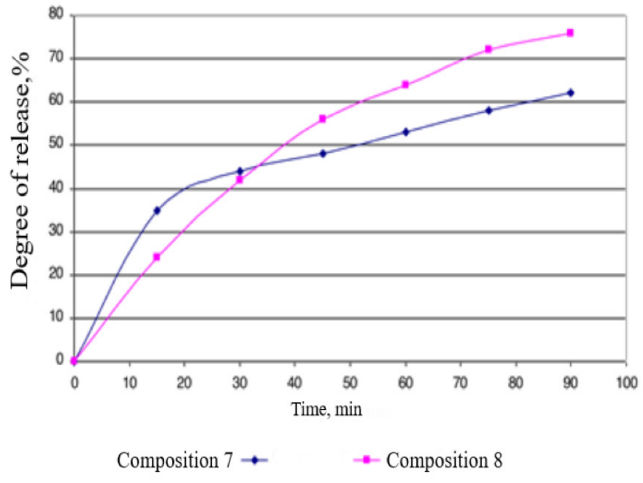

Figure 2: Results of a biopharmaceutical study by dialysis through a semipermeable membrane.

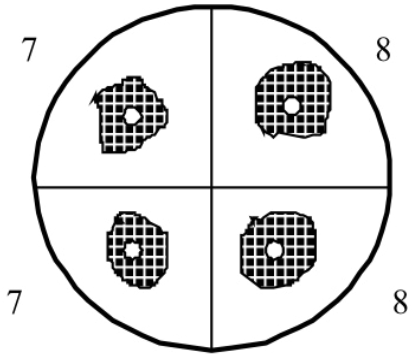

Figure 3: Microbial retention zones.

The optimal composition was also selected according to the delay zone the manifestation of bactericidal activity. The study was carried out by the "well" method on a nutrient medium impregnated with a culture obtained from the oral cavity of patients with periodontal diseases. The evaluation criterion was the growth inhibition zone around the "well", due to the ability of the ointment to suppress the growth of colonies of microorganisms by diffusion into the nutrient medium. The results of the experiment are shown in [Figure 3].

Note

No. 7-The diameter of the inhibition zone is 2.6

No. 7-The diameter of the inhibition zone is 2.8

No. 8-The diameter of the inhibition zone is 3.0

No. 8-The diameter of the inhibition zone is 3.2

It follows from the data in the figure that the greatest delay in the growth of microorganisms on the nutrient medium meat-peptone broth corresponds to composition no. 8.

When conducting research on the study of colloidal (centrifugation) and thermal (heating and freezing) therefore, the model composition no. 7 was stratified, became unusable. Therefore, the composition of ointment no. 8 is recognized by us as the optimal composition. [27]

Conclusion

Thus, on the basis of comprehensive experimental studies, we have proposed the optimal composition of an ointment based on phytocomponents (Japanese sophora fruits, flower marigolds, nettle leaves, oak bark, sea buckthorn fruits) and lysozyme. This composition of the ointment can be used for subsequent research on the development of domestic medicinal products for the treatment of periodontal disease.

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