STUDY OF ANTIBACTERIAL PROPERTIES OF A NEW DEVELOP DENTAL DRUG «DENTA ALOE»

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Abstract
The variety of clinical forms of stomatitis and a large number of etiological factors and pathogenetic chains of the development of inflammatory and dystrophic diseases in the oral mucosa actualize the problem of prevention and treatment of stomatitis for a practical solution. The multifactorial nature of the development of the disease, the chronization of the process, difficulties in achieving positive results of complex treatment, the emergence of resistant forms of microorganisms require the creation of new drugs for the local treatment of lesions of the oral mucosa. A promising direction is considered to be the development of medicines for the treatment of oral diseases based on medicinal plants, in particular Aloe arborescens mill. This article presents the results of studying the antimicrobial activity of the drug «Denta Aloe». This article discusses the characteristics of the sensitivity of microbes to the newly created drug «Denta Aloe» in vitro.

Keywords: stomatitis in children, microbiology, drug «Denta Aloe», Plant-based substances, microorganisms, oral mucosa, oral hygiene, sensitivity, wound healing, fungi.

INTRODUCTION

It is known that many drugs contain substances that can inhibit the growth of a number of microorganisms. The effectiveness of these substances is due to the content of a number of chemically complex and various active substances. Plant-based substances contain alkaloids, amino acids, antibiotics, vitamins, glycosides, tannins, organic acids, fats, trace elements, pigments, mucus, resins, volatile, essential oils, etc. [2,3,6,21].

They are able to influence the microbial, aseptic effect in the production of drugs. In this regard, the study of the medicinal properties of many plants of wild flora with antimicrobial properties has recently become relevant. A microbiological purity test is required to evaluate the quality of medicinal forms [7,8,1,2,23].

Before the analysis, it is recommended that the antimicrobial effect of the drug be determined under the conditions of the test in relation to the test of microorganisms specified in the general pharmacopeial articles for microbiological purity. For the quantitative determination of aerobic bacteria and fungi, the European Pharmacopoeia recommends: if a suitable method or combination of methods does not remove the inhibitory effect of the drug against a particular microorganism test, it can be assumed that the drug has an antimicrobial effect against this microorganism and there is little chance of contamination [1,8,10,20,22].

However, it is possible that the drug inhibits only the test microorganisms involved in the test in determining the antimicrobial activity, but does not show antimicrobial activity in relation to other microorganisms that are not used as the test microorganisms. In this case, the test is performed at the maximum dilution of the test subject, taking into account microbial growth and acceptable criteria.

Stomatitis is an inflammatory lesion of the oral mucosa, which is an urgent problem in modern dentistry. The mechanism for the occurrence of stomatitis has not yet been fully identified, but most likely this is a reaction of the immune system to irritants. Local factors, such as poor oral hygiene, are also considered the cause [2,11,14,17,24].

With this disease, oral mucosa becomes edematous, painful, and may be covered with white or yellow plaque. Hypersalivation is noted (increased salivation). There may be unpleasant breath noted. There are allergic, aphthous, vesicular, herpetic, catarrhal, traumatic, ulcerative varieties of stomatitis.

LITERATURE SURVEY.

Recurrent aphthous stomatitis is one of the most common diseases of the oral mucosa. Prevalence of recurrent aphthous stomatitis (RAS) greatly differs among different populations [Neville B.W., 2010, Yang S., 2017]. According to recent studies, it varies from 5 to 66%, with an average value of 20% [Momem-Behbahani, 2010].

Aphthous stomatitis refers to systemic pathology with a complex genesis, is characterized by a long course and resistance of therapy. Currently, there are many methods for treating lesions of the oral mucosa. The complex treatment includes topical drugs with analgesic and anti-inflammatory, antimicrobial and keratoplastic properties.

Multi-varieties of disease, development of chronic process, difficulty in achieving a positive outcome of complex treatment, the appearance of resistant microorganisms require the creation of new drugs for the local treatment of lesions of the oral mucosa. Diagnosis of stomatitis and determination of the cause are made based on history and physical examination: specific tests may be conducted in cases where stomatitis is likely a result of systemic disease or infection (eg. inflammatory bowel disease, celiac disease, nutritional deficiency, HIV infection, HSV infection). No cure exists for aphthous stomatitis and ulcers typically remit without drug therapy; topical anesthetics such as lidocaine provide relief. Stomatitis caused by specific infection may be treated with the appropriate antimicrobial (eg. nystatin or fluconazole for candidiasis; acyclovir for HSV). In cases associated with a systemic inflammatory or autoimmune disease, treatment of the underlying condition often results in...
According to recent data in the literature (Tsarev V.N., 2010; Y. Levinson, 2015) the sensitivity of microorganisms to chemicals is determined by two methods:

1. Disc - diffuse method, based on diffusion into agar using paper disks impregnated with chemicals.

2. The method of serial dilutions of chemicals in dense or liquid nutrient media with the introduction of microbes in them. Among these methods, disc - diffusion is the most common spread. Frequency of use of this method is related its benefits such as reliability of the testing process, low cost, flexibility, high reproduction of results in compliance with the testing conditions and preparing expenses materials [15,19,19].

For the setting this research method, we initially prepared fresh (18 hours) culture of microbes for test. After that, 1-2 ml of the test culture according to the turbidity standard of 1 × 10⁶ microbes were uniformly distributed by shaking the cup on the surface of the dried Müller Hinton culture medium in Petri dishes, and the excess was removed with a pipette in a disinfectant solution. At the same time, in certain penicillin vials, chemical preparations of certain concentrations (0.1-0.5 - 0.75 - 1.0%) were prepared to be tested. We used these concentrations of the drug to treat sick children.

After seeding, Petri dishes were dried at room temperature for 10-15 minutes, then prepared paper disks (like anti-biotic ones) were taken with sterile tweezers, soaked in prepared chemicals and applied at different distances from each other and 2 cm from the edge of the cup on the surface of the nutrient medium seeded with a certain culture (no more than 6 discs per cup), the plates were closed and placed in a thermostat at a temperature of 37 °C, incubated for 18-24 hours. At the end of the incubation period, the plates were removed from the thermostat and, to take into account the results obtained, the plates were placed on a dark matte surface and the diameter of the microbial growth inhibition zone around the disks was measured using a special ruler, including the diameter of the disks themselves with an accuracy of 1 mm.

**DISCUSSION**

The results of microbiological studies on the sensitivity of microbes to the drug "Denta Aloe" in various concentrations (0.1 - 0.5 - 0.75 - 1.0%) in vitro are presented in table No. 1.

The table shows that the drug "Denta Aloe" was quite high antibacterial activity in respect of microbes belonging to Gram-positive cocci, but also Menno all strains belong to the streptococci and staphylococci.

It is interesting to note that with an increase in the concentration of the «Denta Aloe» drug, the degree of antibacterial activity also increases. It is interesting to note that among all the studied cocci, the most sensitive were the strains: Staph. aureus and Str. salvarius, and the least sensitive of the strains is Str. mitis. It could be noted as well high antibacterial activity «Denta Aloe» to microbes pertinent camping fungi genus of Candida.

At the same time, the antibacterial activity of this drug to gram-negative microbes is not enough expressed. It should be noted that an increase in the concentration of the drug may not change the antibacterial effect.

Analyzing the obtained results, the differences in the antibacterial activity of the drug on relation to gram-positive and gram-negative microbes depend on the mechanism of action of this drug.

It is known that the human oral cavity is a unique system, which is explained by the habitat of more than 800 species of microbes in the areola, among which the leading role, both quantitatively and qualitatively, belongs to the gram-positive flora, namely to streptococci and staphylococci, at the same time. Gram-
Thus, based on the conducted microbiological studies in which the antibacterial activity of the Denta Aloe drug is evaluated, the following conclusions can be drawn:

1. According to statistical data, dysbiosis in the oral cavity is most often due to quantitative and qualitative violations of microbes such as streptococci, staphylococci and fungi of the genus Candida. On this basis, the drug «Denta Aloe» can be widely used for diseases of the oral mucosa.

2. Given the antibacterial activity of the drug «Denta Aloe» depending on the concentration of the drug, it is recommended in the treatment of children with diseases of the oral cavity, in a concentration of 1.0%.

### Table 1. Antibacterial activity of the drug «Denta Aloe» under conditions in vitro (M ± m) m.m.

| No. | Microbial groups      | Drug concentrations | 0,1% | 0,5% | 0,75% | 1,0% | R    |
|-----|-----------------------|---------------------|------|------|-------|------|------|
| 1   | Str. salivarius       | 12,0 ± 0,1          | 14,0 ± 0,3 | 18,0 ± 0,3 | 21,0 ± 0,4 |      |
| 2   | Str. mutans           | 15,0 ± 0,3          | 16,0 ± 0,4 | 21,0 ± 0,5 | 20,0 ± 0,5 |      |
| 3   | Str. Mitis            | 11,0 ± 0,2          | 14,0 ± 0,2 | 17,0 ± 0,3 | 19,0 ± 0,3 |      |
| 4   | St. aph. aureus       | 17,0 ± 0,3          | 18,0 ± 0,3 | 19,0 ± 0,4 | 20,0 ± 0,4 |      |
| 5   | Steptepidermids       | 10,0 ± 0,1          | 12,0 ± 0,2 | 14,0 ± 0,1 | 16,0 ± 0,1 |      |
| 6   | St.saprophiticus      | 14,0 ± 0,4          | 16,0 ± 0,3 | 18,0 ± 0,1 | 21,0 ± 0,4 |      |
| 7   | Esch. coli lp         | 10,0 ± 0,1          | 12,0 ± 0,1 | 13,0 ± 0,1 | 15,0 ± 0,2 |      |
| 8   | Esch. coli in         | 8,0 ± 0,1           | 12,0 ± 0,3 | 14,0 ± 0,2 | 15,0 ± 0,3 |      |
| 9   | Prot. vulgaris        | 13,0 ± 0,4          | 14,0 ± 0,3 | 16,0 ± 0,2 | 17,0 ± 0,2 |      |
| 10  | Klebsiella            | 10,0 ± 0,1          | 13,0 ± 0,3 | 14,0 ± 0,3 | 15,0 ± 0,3 |      |
| 11  | Pseudomonas           | 14,0 ± 0,4          | 15,0 ± 0,3 | 17,0 ± 0,3 | 18,0 ± 0,2 |      |
| 12  | Candida albicans      | 16,0 ± 0,3          | 17,0 ± 0,4 | 18,0 ± 0,3 | 20,0 ± 0,5 |      |

Note: units are given in mm of microbial growth inhibition zone.

A series of works to determine the antibacterial activity in studying the sensitivity of microbes living in the oral cavity to the Denta Aloe drug; the sensitivity of the microbe to the Denta Aloe drug was studied at a concentration of 0.1%, 0.5%, 0.75%, 1.0% (children’s dose).

### Table 2. Characterization of the sensitivity of microorganisms to the drug «Denta Aloe» (M ± m) m.m.

| No. | Microbial groups      | Drug concentrations | 1%   | 3%   | 5%   | 10%  | R  | TO |
|-----|-----------------------|---------------------|------|------|------|------|----|----|
| 1   | Str. Salivarius       | 14,0 ± 0,2          | 15,0 ± 0,1 | 19,0 ± 0,3 | 22,0 ± 0,5 |     |
| 2   | Str. Mutans           | 13,0 ± 0,2          | 17,0 ± 0,3 | 16,0 ± 0,2 | 21,0 ± 0,4 |     |
| 3   | Str. Mitis            | 12,0 ± 0,2          | 15,0 ± 0,2 | 18,0 ± 0,3 | 20,0 ± 0,4 |     |
| 4   | St. aph. aureus       | 18,0 ± 0,3          | 20,0 ± 0,3 | 19,0 ± 0,3 | 23,0 ± 0,4 |     |
| 5   | Steptepidermids       | 17,0 ± 0,3          | 19,0 ± 0,3 | 18,0 ± 0,1 | 21,0 ± 0,4 |     |
| 6   | St.saprophiticus      | 16,0 ± 0,4          | 14,0 ± 0,3 | 14,0 ± 0,2 | 18,0 ± 0,3 |     |
| 7   | Esch. coli lp         | 10,0 ± 0,1          | 11,0 ± 0,1 | 12,0 ± 0,1 | 12,0 ± 0,1 |     |
| 8   | Esch. coli in         | 13,0 ± 0,3          | 15,0 ± 0,3 | 12,0 ± 0,2 | 14,0 ± 0,3 |     |
| 9   | Prot. vulgaris        | 13,0 ± 0,2          | 14,0 ± 0,2 | 14,0 ± 0,3 | 14,0 ± 0,3 |     |
| 10  | Klebsiella            | 13,0 ± 0,3          | 12,0 ± 0,2 | 14,0 ± 0,3 | 14,0 ± 0,4 |     |
| 11  | Pseudomonas           | 8,0 ± 0,1           | 8,0 ± 0,1  | 14,0 ± 0,2 | 13,0 ± 0,2 |     |
| 12  | Candida albicans      | 15,0 ± 0,4          | 12,0 ± 0,3 | 18,0 ± 0,3 | 21,0 ± 0,5 |     |

Note: units are given in mm of microbial growth inhibition zone.

As can be seen from Table 1, investigated concentrations drug «Denta Aloe» possess antibacterial activity and can be widely applied in diseases of the oral mucosa in children.

### Recommendation

Investigated concentrations drug «Denta Aloe» possess antibacterial activity and can be widely applied in diseases of the oral mucosa.

«Denta Aloe» preparation in high concentrations has the same tendency as with small, that is, gram-positive microbes are sensitive to it, most often it is streptococci and staphylococci. With streptococcus red, Str. salivarius, and the least sensitive was the culture of Str. mitis. At the same time among staphylococci drug «Denta Aloe» had a significant antibacterial effect on the culture of St. aureus, and the culture of St. saprophiticus was the least sensitive.

Drug «Denta Aloe» has antibacterial effect on gram-negative flora, but this action is lower extent compared to gram-positive one, under the action of the drug on the gram-negative flora.

### CONCLUSION

Thus, based on the obtained microbiological data, it is possible to draw the following conclusions:
1. As can be seen in tables 1-2, the studied drug «Denta Aloe» exhibits antibacterial activity to all clinical strains of microorganisms.
2. With an increase in the concentration of the «Denta Aloe» drug, the degree of antibacterial activity also increases. It is interesting to note that among all the studied cocci, the most sensitive were the strains: Staph. aureus and Str. salivarius, and the least sensitive of the strains is Str. mitis. It should be noted as well and high antibacterial activity «Denta Aloe» to microbes belonging to the fungi of the genus Candida.
3. Disposes are often created in the oral cavity, due to quantitative and qualitative disorders of microbes such as streptococcus, staphylococcus and fungi of the genus Candida. On this base, the drug «Denta Aloe» can be widely used for diseases of the oral mucosa.
4. The drug «Denta Aloe» also had an antibacterial effect on gram-negative flora.
5. Drug «Denta Aloe» has a pronounced antibacterial activity to gram-positive coccal microbial flora in the oral cavity, and it is recommended for wide use in dentistry, both for children and for adults.

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AUTHORS CONTRIBUTIONS
All the authors have contributed equally

CONFLICT OF INTERESTS
Author(s) have no conflict of interest

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