

USE OF SYLVINITE FACILITIES IN THE COMPREHENSIVE TREATMENT OF  
INFLAMMATORY PERIODONTAL DISEASES

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**Abstract**

**Objective:** To hygienically and clinically evaluate the use of sylvinite facilities in the comprehensive treatment of inflammatory diseases of periodontal tissues.

**Materials and Methods:** The study was conducted in a room equipped with two sylvinite devices. Hygienic methods were used to assess the microclimate, radiation background, aeroionization, and aerosol environment. Forty-nine patients aged 20–25 years with a diagnosis of chronic generalized catarrhal gingivitis were examined, including 24 patients who underwent treatment in the salt facility. External examination and assessment of the objective periodontal status were carried out using hygienic and periodontal indices.

**Results:** Sylvinite facilities contributed to the formation of a special internal environment with a combination of therapeutic factors: a favorable aeroionization background, a stable concentration of multi-component salt aerosol, and a stable microclimate. The inclusion of sylvinite therapy in the treatment of patients with chronic catarrhal gingivitis had a positive effect on the condition of periodontal tissues and normalized local oral immunity parameters.

**Conclusions:** The study results demonstrate the prospects of using sylvinite facilities in the comprehensive treatment of inflammatory periodontal diseases.

**Keywords:** sylvinite facilities, sylvinite therapy, chronic generalized catarrhal gingivitis

**Introduction**

Currently, a physiotherapeutic method based on the physical properties of natural sylvinite from the Verkhnekamsk deposit has gained wide application [3], used to treat patients in pulmonology, otorhinolaryngology, cardiology, neurology, dermatology, and obstetric practice [2, 6, 9, 10]. The internal environment created in sylvinite facilities exerts anti-inflammatory, immunomodulatory, and hyposensitizing effects on the human body, improves microcirculation in tissues, normalizes morphological blood parameters, water-electrolyte balance, and reduces edema [3, 4]. These properties allowed researchers to explore the possibilities of applying sylvinite therapy in dental practice.

In the structure of dental pathology among the adult population of the Perm region, inflammatory periodontal diseases, predominantly gingivitis in young people, occupy the first place [5]. Currently, the generally accepted approach to therapy of inflammatory periodontal diseases involves comprehensive treatment, including the elimination of local damaging factors, use of various therapeutic, orthopedic, and surgical methods, and treatment of concomitant systemic diseases. Numerous methods and tools have been proposed for treating and preventing periodontal diseases [1, 7, 12]. However, clinical studies have shown the insufficient effectiveness of traditional therapy [11]. In particular, the use of antibacterial drugs leads to the formation of resistant bacterial strains, disruption of oral microbiocenosis, and decreased immunity. Such complications are minimized when using physiotherapeutic methods, including mineral therapy [1, 8].



**Objective:** To hygienically and clinically evaluate the use of sylvinitic facilities in the comprehensive treatment of inflammatory periodontal diseases.

## Materials and Methods

The study was conducted in a specialized room of 23.6 m<sup>2</sup> equipped with devices containing sylvinitic blocks with a total reactive surface area of 5 m<sup>2</sup>, salt filters with air ducts, and wooden plates filled with mineral fragments. Forty-nine patients aged 20–25 years with chronic generalized catarrhal gingivitis provided informed consent for participation in the physiologic-clinical study. The observation group consisted of 24 patients who, along with oral sanitation, underwent a 17-day salt therapy course. The control group (25 patients) received only oral sanitation.

Physical parameters of the salt room were studied using standard hygienic methods. Microclimate parameters were measured with the CENTER 311 device (1,632 measurements). Radiation background was assessed using the RD 1503 radioactivity indicator (408 measurements). The main factors affecting the human body in the sylvinitic facility are natural aeroionization and the natural salt aerosol. The aeroionization environment was assessed using a compact MAC-01 aeroion counter, considering the unipolarity coefficient (Ku) (1,632 measurements), calculated as the ratio of light positive ions to light negative ions. The internal environment was considered favorable at  $Ku < 1$ . Salt aerosol concentration in the air was measured using the "AEROCON" device (816 measurements), focusing on high-dispersion aerosol fractions with particle sizes up to 0.5  $\mu\text{m}$ . All hygienic factors were measured daily during the therapy session (beginning, middle, and end).

Dental indices (OHI(S), CPITN, PMA, SBI) were used to assess oral hygiene, periodontal tissue status, and gingival bleeding. Local oral immunity was assessed by measuring lysozyme, cytokines, and immunoglobulin levels in mixed saliva. Secretory IgA was measured using radial immunodiffusion in agar gel according to Mancini. Cytokine profiles were determined using solid-phase enzyme-linked immunosorbent assay; lysozyme enzymatic activity was measured by diffusion in agar. Data were processed and analyzed using statistical methods with Microsoft Excel and Statistica. Student's t-test was used to evaluate the significance of differences.

## Results and Discussion

Microclimate parameters of the salt facility: air temperature  $23.18 \pm 0.28^\circ\text{C}$ , relative humidity  $44.39 \pm 1.12\%$ , temperature of surrounding surfaces  $22.1 \pm 0.35^\circ\text{C}$ , air velocity  $0.01 \pm 0.001$  m/s. Air temperature slightly decreased during treatment and rose during sessions from  $22.48 \pm 0.35^\circ\text{C}$  (start) to  $24.36 \pm 0.26^\circ\text{C}$  (end). All microclimate parameters remained within hygienic standards. Radiation background was  $0.18 \pm 0.0027$   $\mu\text{Sv/h}$ , within permissible limits.

The number of light negative ions before therapy was  $802.33 \pm 62.69$  ions/cm<sup>3</sup> and positive ions  $509.33 \pm 37.17$  ions/cm<sup>3</sup>. Ku was  $0.63 \pm 0.001$ , indicating favorable aeroionization. Mid-session, negative and positive ions decreased significantly ( $423.66 \pm 20.06$  and  $381.15 \pm 30.35$  ions/cm<sup>3</sup>, respectively), Ku increased to  $0.9 \pm 0.001$ . At the end of the session, negative ions decreased by 62.6% to  $308.33 \pm 18.09$  ions/cm<sup>3</sup>; positive ions slightly increased ( $p > 0.05$ ), Ku exceeded one ( $1.3 \pm 0.002$ ).

Aeroionization with negative ions reduces nervous excitability, normalizes sleep, provides analgesia, and increases overall tone. Clinically, electrolyte balance, tissue respiration, hematopoiesis, and oxygen utilization improved. Sylvinitic aerosol, consisting of fine multi-component salt particles ( $< 0.5$   $\mu\text{m}$ ) with  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ , exerts sanogenic, mucolytic,



bronchodrainage, anti-inflammatory, desensitizing, and immunomodulatory effects, enhancing overall body defense.

Baseline dental health: caries prevalence 88.9%, DMFT index  $4.56 \pm 0.36$  (60.61% filled, 7.74% missing). OHI-S averaged  $2.4 \pm 0.1$ , indicating poor hygiene. Periodontal examination revealed gingival bleeding and inflammation; PMA index in the main group was  $28.3 \pm 0.1\%$ , in the control group  $26.5 \pm 0.1\%$ . CPITN showed sextants with dental calculus, index  $2.7 \pm 0.12$  (main) and  $2.6 \pm 0.12$  (control). No significant differences were found between groups ( $p > 0.05$ ). All patients required professional oral hygiene and training.

After combined treatment, the main group showed improved hygiene: OHI-S decreased to  $1.1 \pm 0.2$ . In the control group, immunological parameters in mixed saliva before sanitation were: IL-4 –  $34.89 \pm 4.4$  pg/L; IL-8 –  $52.23 \pm 3.48$  pg/L; SIgA –  $0.45 \pm 0.024$  g/L; lysozyme –  $261.5 \pm 5.6$  µg/mg. Traditional treatment significantly reduced only the pro-inflammatory cytokine IL-8 (to  $44.86 \pm 2.84$  pg/L); other local immunity factors showed no significant changes.

### Conclusions

Patients treated in sylvinite facilities are exposed to a combination of therapeutic factors: optimal microclimate, slightly elevated radiation creating air ionization dominated by light negative ions, and high concentrations of fine multi-component salt aerosol. Sylvinite therapy positively affected periodontal tissue condition and normalized local oral immunity. The results demonstrate the potential of using sylvinite facilities in comprehensive treatment of inflammatory periodontal diseases.

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