



# UREMIC STOMATITIS: PATHOGENESIS, DIAGNOSIS, AND MODERN TREATMENT APPROACHES

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## Abstract

Uremic stomatitis is one of the serious pathologies that occurs in patients with chronic renal failure (CRF), which develops as a result of the effect of uremic toxins on the oral mucosa. Against the background of CRF, metabolic disorders occur in the body, as a result of which toxic substances have a negative effect on the skin, mucous membranes and internal organs. This article analyzes in detail the mechanisms of pathogenesis, clinical manifestations and stages of uremic stomatitis. Diagnostic methods, including laboratory and instrumental examinations, methods for assessing the state of humoral and cellular immunity, are also considered. Information is provided on modern treatment methods, in particular, drug therapy, physiotherapeutic procedures and innovative approaches. The results of the study are of significant scientific and practical importance in the development of strategies for early detection and effective treatment of uremic stomatitis.

**Keywords:** Uremic stomatitis, chronic renal failure, hemodialysis, uremic toxins, immune response, inflammation, oral mucosa, diagnostics, treatment methods, clinical signs, physiotherapy, dental diseases.

## INTRODUCTION

**Uremic stomatitis** is an inflammatory process that occurs in the oral cavity as a result of severe renal dysfunction, which occurs mainly in patients with chronic renal failure (CRF) and hemodialysis. Against the background of CRF, metabolic and immunological changes occur in the body, which leads to the accumulation of uremic toxins and their negative effects on various tissues, including the oral mucosa.

Studies have shown that factors such as an increase in toxic metabolites in the blood as a result of uremia, damage to the oral mucosa, weakened immunity, decreased salivation, and disruption of the microbiocenosis play an important role in the development of uremic stomatitis. In some patients, uremic stomatitis occurs in a mild form, while in others it occurs with severe necrotic inflammation, accompanied by acute pain, erosive and ulcerative lesions in the oral cavity.

Currently, research into the pathogenesis of uremic stomatitis is ongoing. Some scientists argue that uremic toxins alter the immune response of the mucosa and activate inflammatory mediators. Other studies have noted that disruption of the microbiota and increased bacterial colonization are the main factors in the development of uremic stomatitis.





This article analyzes the mechanisms of development, clinical picture, diagnosis and modern treatment approaches of uremic stomatitis. Recommendations are also given for the prevention of the disease and increasing the effectiveness of dental care.

### **Pathogenesis of uremic stomatitis**

Uremic stomatitis is a complex disease that develops as a result of serious metabolic disorders in the body, the basis of which is the effect of uremic toxins on the cells of the oral mucosa. This disease is observed in the late stages of chronic renal failure (CRF) and in patients on hemodialysis.

### **Effects of uremic toxins**

Against the background of SBY, nitrogenous metabolites (creatinine, urea, guanidine compounds) accumulate in the body, which have a toxic effect on the epithelial cells of the oral mucosa. This leads to the following changes:

- Necrosis and dystrophy of epithelial cells - the mucous membrane becomes thinner and its protective function is impaired.
  - Mitochondrial dysfunction is a condition in which cells experience energy deficiency, increased reactive oxygen species (ROS), and oxidative stress develop.
  - Activation of cytokines – inflammatory mediators such as IL-6, TNF-  $\alpha$  , and IL-1 $\beta$  increase , causing an inflammatory process in the mucosa.
- the oral cavity and decreased saliva production

In patients with SBY, functional disorders of the salivary glands are observed, which leads to the development of xerostomia (dry mouth). Decreased protective function of saliva:

- Changes in the oral microflora - pathogenic bacteria (Staphylococcus aureus, Candida albicans) multiply and damage the mucous membrane.
- Local immune suppression - a decrease in the levels of lysozyme, lactoferrin, and secretory IgA - increases the risk of infection.
- The sensitivity of tooth enamel and mucous membranes increases due to salt deposition and mineral imbalance - calcium and phosphorus metabolism disorders.

### **Inflammation and immune response changes**

Uremic stomatitis is also associated with impaired immune response. Imbalance of humoral and cellular immunity activates the following mechanisms:

- Hyperactivity of macrophages and neutrophils increases the inflammatory process.
- Insufficient B-lymphocyte response weakens defense against infections.
- Decreased activity of cytotoxic T-cells and NK-cells leads to prolonged wound healing.

### **Hypoxia and circulatory disorders**

Against the background of SBY, anemia and hemodynamic changes are observed in the body. This leads to a decrease in oxygen supply to the oral mucosa and dental tissues:

- Impaired capillary blood circulation – slows down the recovery of the mucous membrane.
- Hypoxia disrupts regeneration processes - inflammation lasts longer and severe ulcerative lesions form.





The pathogenesis of uremic stomatitis is a multifactorial and complex process, in which uremic toxins, immunosuppression, changes in microbiocenosis, and circulatory disorders play a key role. Taking these mechanisms into account, it is important to develop effective diagnostic and treatment strategies.

### **Clinical picture and diagnosis of uremic stomatitis**

#### **Clinical Landscape**

manifested by varying degrees of mucosal damage . The severity of the disease depends on the course of renal failure, the general condition of the patient, and the activity of the immune system.

#### **Forms of Uremic Stomatitis**

##### **Erythematous form**

- Redness and significant dryness of the oral mucosa .
- The patient complains of an unpleasant taste , burning , itching , and pain .
- Salivary secretion is reduced, and sometimes sticky saliva is formed.

##### **Erosive-Ulcerative Form**

- Superficial erosions and ulcers form in the oral cavity .
- The pain is severe and causes discomfort during eating and speaking.
- tissue may be visible around the wounds .

##### **Pseudomembranous Form**

- White, inflamed fibrinous plaques appear on the mucous membrane .
- When removing these coatings, bleeding or exposure of erosive surfaces is observed.
- is often caused by *Candida albicans* or other secondary infections.

##### **Hemorrhagic Form**

- Small hemorrhages and hematomas are observed on the mucous membrane .
- This form is usually associated with anemia and develops as a result of a deficiency of platelets in the blood.
- Patients complain of bleeding, swelling, and tenderness of the mucous membrane in the oral cavity.

#### **Main Symptoms**

- mouth (xerostomia) – develops as a result of decreased secretory activity of the salivary glands.
- Halitosis (bad breath) – Caused by the interaction of uremic toxins with the oral microflora.
- Taste changes – Some patients complain of a decreased sense of taste or a metallic taste .
- Changes in the mucous membrane of the tongue – The surface of the tongue becomes dry, red or whitish, and sometimes cracks appear.
- Necrotic processes – Mucosal tissue may become necrotic, especially in severe cases.





### **Diagnostic Methods**

Clinical, laboratory, and instrumental examination methods are used to diagnose uremic stomatitis.

#### **Clinical diagnosis**

The doctor determines the stage of the disease by collecting the patient's medical history.

- Complaints: dryness in the mouth, bitterness, pain, bleeding.
- Visual examination: color of the mucous membrane, degree of damage, presence of erosion or ulcers.
- saliva quantity and characteristics : decreased saliva production or changes in its composition.

### **Laboratory diagnostics**

#### **Blood test**

- Creatinine and urea are important for determining the level of SBY.
- Electrolytes (Na, K, Ca, P) – Assessment of mineral metabolism disorders.
- Glucose and albumin levels – Determining the overall metabolic status of the body.

#### **Saliva analysis**

- pH changes and mineral content are determined.
- Lysozyme, lactoferrin, and immunoglobulin A (IgA) levels are assessed.

### **Bacteriological and mycological examination**

- Candida albicans , Staphylococcus aureus , Streptococcus spp. to determine
- Bacteriological culture to determine antibiotic sensitivity.

### **Instrumental diagnostics**

#### **Microscopic and histological examination**

- epithelial tissues .
- necrotic and inflammatory processes in the mucous membrane .

#### **Doppler sonography**

- oral circulatory disorders and hemodynamic changes.

### **Biopsy**

○ For differential diagnosis (for example, to rule out malignant transformation).  
is a disease that can be clinically severe , and its diagnosis is carried out using clinical, laboratory and instrumental methods . Correct diagnosis and determination of the form of the disease are important in choosing an effective treatment strategy.

### **Treatment of uremic stomatitis: modern approaches**

Effective treatment of uremic stomatitis requires a comprehensive approach. The general condition of the patient, the degree of renal failure and the inflammatory processes in the oral cavity are taken into account. Treatment is carried out in the following main directions:





1. Etiological therapy – Control of the underlying disease (chronic renal failure – SBY).
2. Pathogenetic therapy – Reducing the effects of uremic toxins.
3. Symptomatic therapy – Reducing pain , treating inflammation, and preventing infection.

#### Etiological therapy

the main cause of uremic stomatitis is kidney failure , the first step in treatment includes nephrological care:

#### Hemodialysis and peritoneal dialysis

- Reducing the accumulation of toxins in the body by lowering urea and creatinine levels .
- Strict adherence to the dialysis regimen can help relieve stomatitis symptoms
- Erythropoietin, iron supplements, and vitamin D to achieve optimal dialysis is used .

#### Kidney transplant

- The only radical solution in SBY's final phase .
- Immunosuppressive therapy after transplantation can cause some forms of stomatitis, so regular dental follow-up is necessary.

#### Pathogenetic therapy

In this direction, methods are used to reduce the negative effects of uremic toxins on the mucous membrane and improve the immunological status.

#### Hydrating the oral cavity and combating xerostomia

- saliva production :
  - Parasympathomimetics such as pilocarpine or cevimeline.
  - Chewing gums and xylitol tablets that stimulate salivation.
- To ensure humidity:
  - Artificial saliva preparations (Carbomer-based sprays).
  - Drink plenty of fluids.

#### Anti-inflammatory therapy

- **Antiseptic washes:**
  - Chlorhexidine 0.12% solution (2-3 times a day).
  - Miramistin spray.
  - Rinsing with furatsilin solution.
- **Local anti-inflammatory drugs:**
  - Kamistad gel (lidocaine + chamomile extract) - reduces pain and has an anti-inflammatory effect.
  - Metrogil Denta (metronidazole + chlorhexidine) – reduces infection.





### Immunity support

- Vitamin-mineral complexes (vitamins A, C, D, E).
- Omega-3 fatty acids have an anti-inflammatory effect.

### Symptomatic therapy

The following guidelines are used to relieve symptoms associated with uremic stomatitis :

Analgesic therapy ( pain relief)

- Local anesthetic gels with 2% lidocaine solution .
- Benzydamine (Tantum Verde) in the form of a spray or solution .
- For patients with severe pain , NSAIDs (Ketorol, Nimesulide) are prescribed for a short period of time.

### Antifungal therapy (for Candida- related conditions)

- Nystatin solution or tablets .
- Fluconazole (50-100 mg per day) – has a systemic effect.
- Clotrimazole lozenges – for topical use .

### Antibiotic therapy (if accompanied by secondary infections)

- In purulent or necrotic forms, Amoxicillin + Clavulanate or Metronidazole is recommended.
- Modern innovative approaches

### PRP therapy (platelet-rich plasma)

- Autologous plasma injections to accelerate mucosal healing and reduce inflammation.
- Many studies have confirmed that PRP therapy has a positive effect on inflammatory processes in the oral cavity .

### Photodynamic therapy (PDT)

- Destruction of bacteria by laser irradiation after treatment with methylene blue or photosensitizers.
- Ozone therapy – Ozone treatment is an effective method against bacterial and viral infections.

Probiotic therapy

- Probiotics such as Lactobacillus reuteri and Bifidobacterium longum are used to support the natural microflora of saliva .

An integrated approach is important in the treatment of uremic stomatitis . The correct selection of etiological, pathogenetic and symptomatic therapy methods helps to control the disease. Modern innovative methods allow to significantly improve the quality of life of patients.

### Conclusion:

Uremic stomatitis is a complex and painful pathology associated with chronic renal failure (CRF) , which develops as a result of the action of uremic toxins accumulated in the body in excessive quantities on the oral mucosa. This condition significantly affects the quality of life of patients and requires a special approach.







For effective treatment of the disease, complex therapy is necessary, which includes the following main areas: etiological treatment (control of SBY and optimization of the dialysis regimen), pathogenetic treatment (reducing the effect of uremic toxins on the mucosa), and symptomatic therapy (reducing pain, preventing infections, and improving the condition of the oral cavity).

In recent years, modern innovative methods, including PRP therapy, photodynamic therapy, and probiotics, have shown effective results in the fight against stomatitis. These new technologies help accelerate the healing process of the mucous membrane, reduce inflammation, and improve the overall oral health of patients.

Regular dental check-ups, adherence to hygiene rules, attention to diet, and improving the quality of dialysis are important for the prevention of uremic stomatitis. Patients' timely consultation with a dentist and nephrologist and adherence to doctor's recommendations play a decisive role in improving their quality of life.

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