



## Xerostomia: Help Patients Cope, Have Hope

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### Abstract

Xerostomia is the term that describes a group of signs and symptoms associated with the experience of having a dry mouth. While occasional mouth dryness is normal and often situational, chronic dry mouth warrants further investigation. Xerostomia due to either hyposalivation or a perceived sensation of dryness can be relatively mild or lead to devastating consequences. Since it is encountered frequently by the dental profession, one must be familiar with its presentation, causes, and treatment options. Approximately 20% of the population experiences xerostomia to some degree, especially the elderly where medications are often the cause. Xerostomia is often found in health conditions such as depression, anxiety, diabetes, Alzheimer's, Parkinson's and Burning Mouth Syndrome. It may also occur in cancer patients receiving radiotherapy to the head and neck and in patients with Sjogren's Syndrome. It is common in those abusing illicit drugs and in young adult females with bulimia nervosa. Luckily, dental professionals can educate and direct patients on how best to cope with xerostomia. Treatment often begins with simple lifestyle changes and centers around meticulous oral care. When medications are the cause, drug substitutions and dosing schedules are altered. When xerostomia is severe, sialogogues like pilocarpine and cevimeline may be prescribed. Non-medical strategies include saliva stimulants and substitutes as well as non-traditional approaches that warrant further research. Included here are several case vignettes obtained from patient interviews conducted by the author with support from Rowpar Pharmaceuticals, Inc., makers of ClōSYS oral health care products. These products are widely known for alleviating oral mucositis and oral malodor. The purpose of the case study interviews was to examine the effect of these products on the reduction of symptoms of dry mouth. The review of relevant research, together with these case studies, offers insight and hope for those whose lives have been compromised by the devastating effects of xerostomia and for the dental professionals who treat them.

**Keywords:** Xerostomia, Dry Mouth, Sjogren's Syndrome, Hyposalivation, Burning Mouth Syndrome, Oral Hygiene

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Everyone experiences a dry mouth from time to time, whether the result of inadequate fluid intake or a bout of temporary mouth breathing that might accompany the common cold. It is not unusual for one's mouth to suddenly go dry when in fight or flight situations such as being unexpectedly called upon to give an answer or speak in front of an audience. Having an occasional dry mouth is simply a normal part of the human experience. When dry mouth becomes a chronic condition, however, there is always reason for concern.

### Recognizing Xerostomia

Xerostomia is the term used to describe a collection of signs and symptoms associated with the feeling of having a dry mouth. Interestingly, the terms xerostomia and dry mouth are used interchangeably whether the mouth dryness is associated with a physiological decrease in saliva or if no objective signs of hyposalivation can be detected<sup>[1]</sup>. In either case, chronic xerostomia places a heavy burden on the daily lives of its victims.

To fully comprehend the effects of xerostomia, it is important to review the basic function of saliva. Composed primarily of water, saliva also contains electrolytes, minerals, buffering agents, immunoglobulins and nitrogenous products<sup>[1]</sup>. Healthy individuals produce approximately 1.5 liters of saliva daily to provide the lubrication necessary to talk, eat, swallow, taste and digest food with comfort and ease<sup>[2]</sup>.

Saliva protects the oral mucosa from normal frictional movements and from potential injuries caused by trauma, burns, lesions and ulcers. At a pH between 6-7, saliva neutralizes acids that erode and demineralize the teeth while its immune components stave off bacteria, viruses and fungi. Saliva washes away food debris that would otherwise contribute to tooth decay and gum disease. It also initiates the digestive process and is the solvent that allows for the sensation of taste and, hence, the enjoyment of food<sup>[1,2]</sup>. A lack of adequate saliva impairs these vital functions creating serious challenges for those affected.

People with xerostomia exhibit signs and symptoms that range from mild oral discomfort to significant oral disease. Besides the subjective complaint of a dry mouth, these patients may also complain of a dry

or sore throat, difficulty speaking, eating, swallowing and tasting. They are also unable to tolerate spicy, acidic, dry and crunchy foods<sup>[3]</sup>. Additionally, xerostomic patients complain of cotton mouth, cracked lips, inflammation at the corners of their mouth (angular cheilitis), hoarseness, oral malodor, and difficulty wearing their dentures as well as a burning or tingling sensation that can affect any area of the oral cavity.<sup>4</sup> Almost all lament the need for increased water intake and subsequent trips to the bathroom throughout the day and night<sup>[2,4]</sup>.

A detailed case history and oral examination can quickly reveal evidence of xerostomia. The saliva may look stringy or frothy with little to no saliva collecting on the floor of the mouth. The tongue may appear dry and deeply fissured and may be devoid of its characteristic papillae.<sup>3</sup> Signs of periodontitis and gingivitis are often evident along with dental caries primarily effecting root, cervical and incisal/cuspal tips. Inspection commonly reveals a glossy oral mucosa, smooth gingival tissue, oral mucositis, candidiasis, and mucosal debris on the palate in the absence of dentures<sup>[3,5]</sup>.

### Causes of Xerostomia

Xerostomia is a common condition that warrants the attention of the dental community. It is prevalent in approximately 20% of the population with a higher incidence occurring in women and increasing with age for both sexes. While older individuals experience xerostomia more frequently, the condition is not a natural consequence of aging per se but rather the result of older individuals taking the most prescription medications.<sup>3,4</sup> While head and neck radiation and Sjogren's Syndrome constitute many cases of xerostomia encountered by dental professionals, the untoward effects of medications are the most frequent cause.<sup>1</sup>

As many as 70% of adults taking common prescription drugs such as antidepressants, diuretics, sedatives, opiates, antihistamines, anti-hypertensives and NSAIDs (like ibuprofen and naproxen) experience significant dry mouth.<sup>1,3</sup> Dry mouth is also a common side effect experienced by those taking medications to control acne, stop smoking and to decrease the symptoms of Parkinson's Disease.<sup>1</sup> Overall, more than 400 medications have been cited as potentially causing dry mouth<sup>5</sup> and addressing this issue with patients might well be a daily occurrence.

Illicit drug users, especially those abusing opiates, cannabis and methamphetamines, may experience hyposalivation that can negatively impact oral health.<sup>1,6</sup> Methamphetamines, for example, strongly activate the sympathetic nervous system resulting in xerostomia that predisposes to carious erosions. Along with dry mouth, methamphetamine users, which number 35 million worldwide, experience jaw clenching, severe grinding and TMJ pain that have led to the common term "meth mouth."<sup>6</sup> Due to a rise in the drug's popularity, dental professionals may be called upon to help treat and prevent meth mouth in addicted patients while encouraging users to seek long-term drug rehabilitation<sup>[6]</sup>.

Xerostomia may occur in cancer patients receiving radiotherapy to the head and neck. In addition to oral mucositis, trouble swallowing, hoarseness and localized skin burns, damage to the salivary glands can be a disturbing side effect of treatment, often occurring within the first week and reducing salivary flow in nearly half of patients. After 7 weeks of treatment, salivary flow may be reduced by as much as 20% and will frequently continue to diminish over time. This may lead to chronic and irreversible hyposalivation and a lifelong sentence of xerostomia<sup>[7]</sup>.

Xerostomia is a significant symptom in patients with Sjogren's Syndrome, an inflammatory, autoimmune disease that effects numerous bodily systems. While gastrointestinal, respiratory and

renal organs are among those targeted, Sjogren's seems to have a predilection for the salivary and lacrimal glands. Due to a hypervigilant immune response, lymphocytes infiltrate and destroy these secretory glands leading to Sjogren's characteristic dry mouth and dry eyes<sup>[7]</sup>.

Although the etiology of Sjogren's Syndrome is unknown, it is thought to arise from a complex interplay of genetic, environmental and hormonal influences and is most commonly seen in middle-aged women. One explanation is that a decline in sex hormones at menopause removes estrogen's protective effect on the exocrine glands.<sup>7</sup> The resultant xerostomia adversely effects oral health, creating a challenge for dental professionals working diligently to reduce their patients' symptoms and minimize complications.

Xerostomia may present itself in 2/3 of patients suffering with a serious medical condition known as Burning Mouth Syndrome, or BMS. BMS is a chronic pain disorder that effects 1.3 million Americans, particularly peri- and post-menopausal women. A disease of unknown etiology, it is characterized by a painful burning sensation in the mouth that often effects the tongue and is associated with abnormal taste sensation (dysgeusia) and xerostomia, with or without a measurable decrease in saliva. BMS was previously thought to be primarily a psychiatric illness, but nutritional deficiencies and dryness of mucous membranes due to estrogen decline have been implicated<sup>[8]</sup>.

Several other health conditions can cause dry mouth including anxiety, depression, uncontrolled diabetes, mouth breathing, snoring, stroke and Alzheimer's disease. Noteworthy is the perception of dry mouth in stroke and Alzheimer's patients despite a lack of measurable decrease in saliva flow.<sup>4</sup> Additional systemic diseases associated with xerostomia include hypertension, Hepatitis C, rheumatoid arthritis, systemic lupus erythematosus, hypothyroidism and eating disorders<sup>[4,5,9]</sup>.

Xerostomia is a symptom seen in patients with bulimia nervosa, a complex eating disorder characterized by episodes of uncontrollable eating followed by vomiting ("binging/purging") to maintain ideal body weight. Often affecting women in late adolescence and early adulthood, its prevalence in high schools and on college campuses is staggering. One study reported 4.2 new cases of bulimia for every 100 female college freshmen<sup>[10]</sup>.

The most frequent and alarming finding among bulimic patients by dental clinicians is severe, pathological erosion of tooth enamel. In bulimia, the perpetual presence of gastric contents in the oral cavity lowers salivary pH, rendering it corrosive to teeth. Also, damage to the parotid glands leads to xerostomia that further escalates tooth decay. Besides restoring eroded teeth and referring these patients for medical/psychological treatment, dental professionals can impact patient prognosis by taking time to explain the devastating toll bulimia

### Treatment Options

Treatment of xerostomia usually begins with simple lifestyle strategies. An initial treatment plan may include increasing hydration, limiting mouth breathing, using a humidifier at night and avoiding aggravating substances such as tobacco, alcohol and caffeine.<sup>3</sup> Nutritional recommendations may include replacing dry, sticky, sugary, and spicy foods with hydrating, nutrient-dense foods like soups, stews and salads. Watermelon, celery and cucumbers are suggested for their ample water content and citrus fruits for their ability to stimulate saliva flow and deter bacterial growth. Recommended beverages include aloe vera juice to soothe oral tissues, coconut water to improve hydration and ginger tea to refresh the breath and activate saliva<sup>[11]</sup>.

When xerostomia is the result of pharmacological treatment, alternative medications should be considered. When drug substitutions are not possible, a trial of dosage reduction may be initiated.<sup>1,3</sup> Patients experiencing xerostomia from anticholinergic

medications (i.e. anti-depressants, diuretics, anti-hypertensives, anti-histamines, anti-anxiolytics, NSAIDs, etc.), can take medication during the day instead of at night to reduce having to wake up repeatedly to sip water. Patients can also try taking their medication in divided doses to minimize dry mouth symptoms.<sup>1,5</sup> Since xerostomia is more likely to occur in individuals taking 4 or more prescription drugs,<sup>5</sup> it might be advisable for patients to work with healthcare practitioners to optimize health and possibly reduce reliance on medications.

Sialogogues, FDA-approved drugs that stimulate salivary secretion, may be used in the treatment of more advanced cases of xerostomia. Two such medications, pilocarpine (Salagen®) and cevimeline (Evxac®), are indicated when dry mouth symptoms are moderate to severe and the individual's salivary glands have retained some functional tissue. While symptomatic relief is often obtained, these medications may produce side effects such as sweating, urinary frequency and skin flushing as well as nausea, diarrhea, hypotension, persistent hiccups and visual problems. Pilocarpine and cevimeline must be used cautiously in individuals with asthma, chronic obstructive pulmonary disease (COPD) and cardiovascular disease and is contraindicated in those with narrow-angle glaucoma <sup>[2,3,5,7]</sup>.

Several non-medical treatment strategies exist for patients with xerostomia. These include saliva stimulants and substitutes such as mucin-containing lozenges, xylitol-sweetened chewing gum, glycerin-containing lubricants, alcohol-free mouthwashes, fluoride toothpastes and oral sprays.<sup>5,7</sup> Additionally, intraoral electro-stimulating devices and traditional acupuncture treatments have both shown promise in stimulating saliva flow in some patients although further research is needed to confirm their efficacy<sup>[3]</sup>.

Treatment of xerostomia requires meticulous oral hygiene to minimize complications such as dental caries, candidiasis and periodontal disease. Frequent dental checkups, vigilant tooth-brushing, flossing, hydro-flossing, tongue-scraping and mouth rinsing are recommended.<sup>1-4</sup> Oil pulling, an ancient Ayurvedic practice, is becoming part of an oral care regime for many. It consists of vigorously swishing and pulling coconut, sesame or olive oil through the teeth for several minutes before expectorating to remove toxins and improve oral and systemic health. Despite its growing use, it is not intended to replace time-tested treatments, and further scientific studies are needed to determine its specific benefits and limitations<sup>[2]</sup>.

Rowpar Pharmaceuticals, Inc., makers of ClōSYS oral care products, conducted a survey of customers who had used ClōSYS as part of their treatment for xerostomia. ClōSYS oral rinses, oral sprays and toothpastes all share a common ingredient, stabilized chlorine dioxide. The ClōSYS Unflavored Oral Rinse and the Gentle Mint Oral Rinse were the first such products to receive the American Dental Association (ADA) Seal for reduction of oral malodor. The ClōSYS Sulfate-Free Anti-Cavity Toothpaste and the ClōSYS Silver Oral, both of which contain a patented combination of stabilized chlorine dioxide and sodium fluoride, have been awarded the ADA Seal for the treatment of dental caries. Following Rowpar's survey, this author conducted interviews with respondents to ascertain the effectiveness of ClōSYS products in relieving their symptoms of xerostomia. The following case vignettes reflect the largely favorable responses received from existing product users.

### Patients Speak

**S. K., a 36-year-old male,** had been using ClōSYS oral health care products ever since his dental hygienist recommended them in 2008 for his plaque and gingivitis. Along with some additional flossing and the use of a water pic, the products helped ameliorate his dental issues. A few years later, Mr. K. began experiencing episodes of dry mouth

which he believed to be both caused and exacerbated by emotional stress. Remembering his success with ClōSYS, he began again to use the ClōSYS toothpaste and mint-flavored oral mouth rinse twice a day. He also used the mouth spray just before going in to meetings and delivering presentations. That was six years ago, and while he still experiences work-related stress, he explains, "I am no longer having dry mouth issues."

**V.T., a 61-year-old female,** began using ClōSYS Silver unflavored mouth rinse in 2017 when her dental hygienist discovered gingivitis during a routine cleaning. Besides using the mouth rinse twice daily, Valerie put the rinse into her water pic every other day to "really get into those deep pockets." While working at reducing her gingivitis, Valerie noticed that the ClōSYS products were also alleviating her dry mouth and keeping her breath fresher. Valerie had been suffering from chronic dry mouth as a side effect of taking Prozac and Dulera, both necessary prescription medications. She never thought she would find relief from the discomfort of dry mouth. Valerie assures, "I will be using these products for a long time to come."

**G.P., a 65-year-old nurse and lab technician,** suffered with dry mouth for many years until she implemented a healing protocol developed by a Dr. Ellie, D.D.S. The 4-minute protocol requires specific oral health care products to be used sequentially twice daily. The first product listed is ClōSYS unflavored mouth rinse. According to Gloria, "I had dry mouth for years due to stress and anxiety; wearing a mouth guard made it much worse. Dr. Ellie's protocol has been a game-changer for me. ClōSYS mouth rinse is a crucial part of that protocol, and I would never substitute any other product for it."

**J.H. is a dental hygienist** who has a great deal to say about ClōSYS oral health care products and dry mouth. Jennifer has been using ClōSYS products personally and professionally for 17 years. In her experience, "Dry mouth lowers the oral pH, creating an acidic environment that fosters the development of dental caries. ClōSYS products neutralize that acidity, allowing for moisture to be maintained." This is particularly helpful to Jennifer's many patients who suffer from dry mouth as a result of taking medications for their heart, allergies, anxiety and depression. While Jennifer has long been advocating the use of ClōSYS products, it was not until her 10 year-old-son developed oral issues that she realized just how effective these products could be. As a 4th grader, Jennifer's son was plagued with allergies that caused thick mucus and a chronic post-nasal drip. A mouth breather both by day and night, the boy's constantly dry mouth caused his breath to become quite bad. His morning breath made it impossible to sit across from him at the breakfast table. Jennifer soon got him using the ClōSYS toothpaste and mint-flavored rinse twice a day, and his problems resolved in short order. According to Jennifer, "Using ClōSYS has been life-changing for my son."

**S.M., a 63-year-old female, suffers from Sjogren's Syndrome.** Sherry's mouth was so dry that not only was eating a cracker unfathomable, but the tip of her tongue was often cracked and sore. "Having cottonmouth is embarrassing," reveals Sherry. "My mouth would get so dry that it would froth, and I constantly had thrush on my tongue and in my mouth." Thankfully, Sherry's dental hygienist told her about ClōSYS and gave her some samples. She had tried everything else to no avail. "The results have been life changing for me. My mouth is not as dry, and it keeps the thrush at bay. My tongue doesn't crack anymore!" Also, of critical importance to Sherry is that she no longer requires copious amounts of water to ward off dry mouth. "Since I've been using the ClōSYS mouth rinse and toothpaste, I'm not running to the bathroom all the time," exudes Sherry.



Sherry explained that when the mouth is devoid of saliva, bacteria proliferate and eat away at tooth enamel. "I used to have great teeth, but Sjogren's caused the edges near the gums to turn yellow and brown." While many Sjogren's patients lose teeth, Sherry feels that ClōSYS has spared her that hardship. "The longer you use it, the better your mouth gets, but you have to keep using it," instructs Sherry. Due to Sherry's success, she has become one of the company's staunchest advocates. "I told my endocrinologist and I post about ClōSYS on the Sjogren's Support blog. I am grateful, and I tell people all the time."

**B.B. is a 65-year-old registered dental hygienist (RDH)** who began using ClōSYS prophylactically when she learned she would be undergoing chemotherapy for an aggressive tumor. A friend of Becky's was diagnosed with the same type of breast cancer and had suffered horribly from xerostomia, mucositis and thrush due to chemotherapy. Desperate to avoid those troubling side effects, Becky used ClōSYS toothpaste and oral rinse daily. "Aside from a few sores on my palate, I was fine. I ate spicy food and raspberries, and my dry mouth was mild. I was very impressed," declares Becky.

While Becky remains enthusiastic about ClōSYS both personally and professionally, she laments that oncologists are largely unaware of it. "The usual recommendation for oral mucositis is salt water and sucking on ice chips, and few realize it helps with dry mouth." Becky believes that doctors, dentists and RDH's need to be educated about the benefits of ClōSYS oral health products. "We need to do some lunch-and-learns. We need to get the word out!"

**F.S., an 80-year-old swimmer and lifelong athlete,** was diagnosed in 2012 with a deep neck tumor that required intensive chemotherapy and radiation. Although grateful to be alive, Frank explains that the side effects of his cancer treatments are still with him today. "They had to focus the radiation beam at my throat, frying my salivary glands. That gave me dry mouth and allowed bacteria to grow and destroy my teeth." Luckily, Frank's dental hygienist told him, "You must get ClōSYS!"

According to Frank, "I am at big-time risk for tooth decay, and my mouth is entirely too sensitive for anything with mint. That is why ClōSYS is so important to me. I can use the unflavored rinse 4-10 times/day and not worry about chemicals or inflaming my mouth."

Frank also loves the mouth spray. When he awakens in the middle of the night with his mouth parched, the spray provides instant relief. "This allows me to get right back to sleep." Frank is sure that the popularity of ClōSYS will continue to grow as the word gets out. "I trust in it, I believe in it. I am such a big fan!"

### Parched No More

Xerostomia is a potentially debilitating condition that affects approximately 1/5 of the US population. It stems from a variety of medications, systemic and autoimmune diseases, head and neck radiotherapy, neurological and eating disorders and drug addiction. Whether scientifically quantifiable or a perceived sensation, xerostomia can have adverse effects on daily living, dental health and quality of life.

While there are no standard treatment guidelines for xerostomia and no apparent cure, there are many treatment options available to alleviate its symptoms. These range from lifestyle modifications aimed at limiting substances and behaviors that dry the mouth to medications reserved for the most serious of cases. Sialogogues such as pilocarpine and cevimeline provide relief but often provoke challenging side effects. Over-the-counter remedies include saliva substitutes and oral lubricants, select toothpastes, alcohol-free mouth

rinses, and gels and oral sprays, all providing variable results.

Oral hygiene remains the cornerstone of preventing complications of xerostomia. The dental professional can be a vital resource by providing education about the condition, instruction regarding home care, and by using their authority in a positive, impactful and supportive way whenever possible. Lastly, the case vignettes demonstrate how dental professionals can impact their patients' lives by introducing them to safe, effective products that restore comfort and confidence. According to one grateful patient, "Dry mouth is the killer of your teeth and your social life. ClōSYS has helped me keep both." Thankfully, this patient, and many others, are parched no more.

While few would dispute the need for conscientious oral care in addressing xerostomia, a 2011 Cochrane Review found insufficient evidence to support the use of gum, lozenges, gels, rinses, toothpaste and sprays in relieving symptoms of dry mouth.<sup>5,7</sup> This review of related research and case studies of individuals experiencing xerostomia suggests that further research is warranted.

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