



Oral Health Care for Cancer Patients

Determining and Managing Salivary Gland Function in Cancer Patients: A Fact Sheet for Dental Professionals

Susan Zunt, DDS, MS

Background¹

Symptoms include dryness, burning sensation on the tongue, fissures on the tongue, atrophy of dorsal tongue surface, increased thirst, candidiasis, and increased dental caries and demineralization.

Salivary gland hypofunction is caused by both chemotherapy and/or radiation therapy and it also is a side effect of many common medications.

About 40% of patients receiving chemotherapy report dry mouth. It usually resolves itself within a year after treatment stops. More than 90% of patients who receive head and neck radiation have long-term dry mouth when the parotid gland is directly irradiated. Unfortunately, decreased salivary flow can be an irreversible problem in the case of head and neck radiation.

Decreased salivary flow can result in impaired lubrication of oral tissues leading to: (1) difficulty in speaking and/or swallowing, (2) decreased buffering capacity of saliva which increases risk for dental caries, (3) oral flora becoming more pathogenic, (4) dental plaque levels accumulating due to a patient's impaired oral hygiene, (5) demineralization of teeth occurs as well as tooth decay, (6) and possibly accelerated periodontal disease.

Pre-existing conditions and salivary hypofunction¹

Decreased salivary flow is in part affected by: diabetes, hypothyroidism, rheumatoid arthritis or other immune mediated diseases, chemotherapies and/or head and neck radiation.

A dental examination with a determination of salivary gland function prior to beginning cancer therapies is an important first step. Dental care may also be needed more frequently during cancer treatment.

Salivary Flow Rates^{2,3,4}

A person's average daily saliva flow rate should be between 0.5—1.5 liters per day. General guidelines for salivary flow rates are:

	Normal	Abnormal
Unstimulated	0.3 mL/min	≤ 0.1-0.2 mL/min
Stimulated	1-2 mL/min	≤ 0.5 mL/min
Unstimulated (Indiana University School of Dentistry Standards)	≥ 0.2 mL/min	< 0.2 mL/min
Stimulated (Indiana University School of Dentistry Standards)	≥ 1.0 mL/min	≤ 0.7 mL/min

Measurement of Unstimulated Salivary Flow Using a Modified Schirmer Test⁵

Recommended Modified Schirmer test strip:
Schirmer test strips Eagle Vision (1-800-222-7584)

Measurement (mm/ 3m)	Diagnosis	Recommendations
≤25	Dry mouth	<ol style="list-style-type: none"> Adequate water: 64 oz. non-caffeinate and non-alcoholic beverages Oral hygiene instruction: brushing 2x daily, sodium lauryl sulfate-fluoride free toothpaste; floss daily Chlorhexidine if active carious lesions Topical fluoride: 1.1% sodium fluoride gel at bedtime Secretagogues (with functional tissue): e.g., pilocarpine 5 mg 3-4x daily and cevimeline, 30 mg 3x daily; OTC, e.g., OraMoist, 3-4x daily; Re-evaluations every 6 mo <p>Note: Referral for blood test (e.g., oral medicine or oral surgery) for Alc, T4 and TSH, SS-A, SS-B, ANA and Rheumatoid factor (e.g., hypothyroidism, Sjogren's)</p>

Sialometry: Measuring Salivary Gland Hypofunction^{6,7,8}

Calibrated paper

- Modified Schirmer Test (MST)
- Normal unstimulated saliva flow rate is 31 mm/3 minutes
- ≤ 25 mm/3 minutes indicates severe hypofunction (dry mouth)

Volumetric Testing

- Unstimulated whole saliva averages for adults at 3-4 mL/5 minutes
- Stimulated whole saliva average adult rate is 12-14 mL/5 minutes
- ≤ 0.1 -0.2 mL/minute indicates hypofunction

Gravimetric Testing

- 1 gram of saliva = 1 milliliter of saliva
- ≤ 0.1 -0.2 g/minute or ≤ 0.2 mL/minute indicates hypofunction

If unstimulated flow rate is low, measure stimulated salivary flow rate

- Measuring stimulated salivary flow rate identifies the saliva rate of functional salivary gland tissue at a rate of > 0.1 -0.2 mL per minute
- To stimulate saliva flow have the patient chew paraffin wax for one minute (45 chews/min)
- The suggested saliva collection time is 5 minutes after one minute of pre-stimulation.
- Stimulated saliva flow rate in adult females is 8.6 mL/min and 10.1 mL/5 min in adult males⁹
- Using a test dose of a secretagogue may identify responders that may be candidates for secretagogue therapy (e.g., Salagen [pilocarpine], 5 mg for 30 min or Evoxac [cevimeline], 30 mg for 90 min¹⁰)
- Nonresponders are more likely to have irreversible salivary gland damage. Nonresponders can be referred to an oral surgeon for a diagnostic labial salivary gland biopsy.

Salivary pH

- To test pH use pH test strips under the tongue (Colormetric paper strips from Carolina Biologicals [pH 5-10], www.carolina.com)
- Normal salivary pH is between 7.0-7.5
- Salivary pH decreases with decreased salivary flow
- Low pH contributes to mucosal discomfort

Brand Name	pH ¹¹
Classic Coke	2.62
Diet Coke	2.62
Gatorade	2.97
White wine	3.0-3.6
Red wine	3.1-3.7
Regular 7UP	3.2
Tea, herbal	3.2
Crystal Lite lemonade	3.25
Diet 7UP	3.54
Beer	3.7-4.1
A&W Root Beer	4.4
Coffee	5.0
Tea, black	5.7-7.2
Milk	6.4-6.8
Water (Tap)	7.0

References

1. Zunt SL. Cancer Therapies May Decrease Saliva and Increase Oral health Problems: Reasons, Symptoms and Solutions. <http://www.ohccp.org>.
2. Sreebny LM, Valdini A. Xerostomia. Part I: Relationship to other oral symptoms and salivary gland hypofunction. *Oral Surg Oral Med Oral Pathol* 66:451-458, 1988.
3. Navazesh M, Christensen C, Brightman V. Clinical criteria for the diagnosis of salivary gland hypofunction. *J Dent Res* 71: 1363-1969, 1992.
4. Wang SL, Zhao ZT, Li J, Zhu XZ, Dong H, and Zhang YG. Investigation of the clinical value of total saliva flow rates. *Archives of Oral Biology* 43:39-43, 1998.
5. Zunt. SL. Xerostomia: Clinical Evaluation and Treatment, *Practical Hygiene* 14(6): 17-20, 2005.
6. Koneke M, Maki Y, Takaesu Y. The measurements of salivary flow rates of dry eye patients. *J Dent Res* 80:617, 2001.
7. Woo S, Wai Y. The modified Schirmer test as a screening instrument to measure saliva wetness. *J Dent Res* 1995; 74 (special issue); 546 (abstr #1162).
8. Zunt SL, Lee L, Woo S-B. Identification of salivary gland hypofunction in the management of oral mucosal disease. Abstract. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 94(2): 210, 2002.
9. Larmas M. Saliva and dental caries: diagnostic tests for normal dental practice. *Int Dent J* 42(4): 199-208.
10. Rosas J, Ramos-Casals M, Ena J, Garcia-Carrasco M, Verdu J, Cervera R, Font J, Caballero O, Ingelmo M, Pascual E. Usefulness of basal and pilocarpine-stimulated salivary flow in primary Sjögren's syndrome. Correlation with clinical, immunological and histologic features. *Rheumatology* 41:670-5, 2002.
11. Baker K. Univ. Iowa. <http://vm.cfsan.fda.gov/~comm/lacfp-hs.html>.