



## Saliva: A Powerful Diagnostic Tool for Minimal Intervention Dentistry

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### ABSTRACT

Saliva plays a vital role in oral health as patients strive to maintain a healthy dentition throughout their lives. It is nature's primary defense mechanism for the oral environment, and is particularly important for protecting exposed tooth surfaces. While internal protection for dentin comes from odontoblasts and the dental pulp, the body's external protection for enamel comes from saliva.

The noninvasive nature of salivary testing has made it an effective alternative to blood and urine testing and home testing kits have made it possible for people to monitor their own health using this diagnostic medium. This paper presents what saliva can reveal about general and oral health as well as highlights the current use and potential clinical and research applications, of diagnostics based on oral fluids.

**Clinical significance:** Early detection always minimizes the need for more invasive treatment. It prevents oral health disease at an early stage and provides a good oral health in rejuvenated state. If you stick and follow regular professional care, prevention maintenance appointments, prevention counseling, good home care and oral hygiene, diet habits you will be free from oral health illness and you can experience the harmonious and rejuvenated state of good oral health.

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### INTRODUCTION

Saliva is kind of like a car wash—a constant cleaning mechanism—Diaz-Arnold.

Saliva is an integral part of oral health and many people do not actually realize the importance of saliva has in our mouth. The role of saliva is often underplayed due to lack of awareness. Saliva has many important functions and it is unfortunate that most people would only realize this when they have a chronic case of xerostomia or dry mouth, which

is often hard to manage as treatment available involves mainly palliative care rather than a cure.

### IMPORTANCE OF SALIVA

It is something you probably consider gross or disgusting, not beneficial. You probably do not even think about it much at all. But if it disappears, you will wish you had your saliva back.

Saliva performs a multiplicity of roles within the oral cavity, and like many things in life, its importance is usually not appreciated until it is absent. Impairment of salivary parameters is commonly not recognized by clinicians. Patients may present with a range of signs and symptoms, which may be due to an underlying deficit in saliva production at rest. Reductions in saliva production during eating are much more apparent in terms of symptoms, and this generally brings it more to the patient's attention. In contrast, deficits in the production of saliva at rest can easily pass unnoticed. In elderly patients and medically compromised patients, where the use of multiple medications is common, salivary dysfunction is frequently seen.<sup>1</sup>

The functions of saliva include the following:<sup>2,3</sup>

- Lubricating the oral tissues (for swallowing and speech)
- Assisting the special sense of taste
- Maintaining the health of the oral mucosa
- Assisting in digestion
- Dilution and clearing of material from the oral cavity.
- Buffering acids from dental plaque and from consumed foods and drinks, and preventing erosion caused by episodes of prolonged exposure to weak acids (e.g. wines and black cola soft drinks) or short-term exposure to strong acids (e.g. reflux and vomiting).
- Remineralization of enamel using calcium and phosphates.

- Antimicrobial and cleansing activity degrading bacterial cell walls and inhibiting growth.

## HOW CAN SALIVA AFFECT OUR ORAL HEALTH?

Saliva plays a critical role in the maintenance of oral and dental health.

From above, we have established the important functions of saliva. All these functions are part of our saliva's natural protective mechanism and if impaired, can cause oral health problems. There are two main aspects of saliva, the quantity and quality. When our salivary glands failed to produce adequate quantity of saliva, also known as hyposalivation, our mouths will become dry and unable to self-cleanse. And when our salivary glands failed to produce proper quality of saliva, our saliva will not be able to buffer acids effectively. These cause a whole strings of oral health problems, depending on the severity of the impairment. Common oral health problems arise from poor quantity and quality of saliva<sup>2</sup> include dental caries or tooth decay, halitosis or bad breath, and gingivitis or gum diseases.

Oral health is linked to our general health and in this case, lack of proper saliva can cause speech, chewing and swallowing difficulties. This is especially true in patients with dentures or plates that rely on saliva for retention and stability.

## CLINICAL SITUATIONS WHICH WARRANT TESTING PATIENT'S SALIVA?

### Diagnosing New Clinical Problems

When a patient arrives with new oral health problems, the saliva is tested to help determine the reason why the oral balance is now favoring demineralization. Once diagnosed a long-term solution can be found to correct or control these problems.

### Prior to Extensive Restorative Treatment

What has caused the loss of tooth structure in the first instance? Will the same problem or another currently undiagnosed oral balance problem compromise the success of any new restorative treatment?

### As Part of Risk Assessment for All Patients

Throughout their lives your patients will experience many changes in habits, lifestyle, diet and health status. All these changes can unknowingly impact on their oral balance (e.g. medication side effects can reduce saliva flow).

Risk assessment measures can identify the current oral balance situation before irreversible loss of tooth structure

has occurred. Periodic risk assessment should be regarded as routine for all dental patients.

## CLINICAL TESTING OF SALIVA

While the composition of saliva is complex, its properties in relation to defending the oral hard tissues can be assessed at the chairside in a relatively simple manner, using the GC Saliva Check Buffer kit.<sup>15</sup> During the same consultation, an assessment of dental plaque maturity and plaque fermentation can be made with the GC Saliva Check +pH test kit, in providing a comprehensive approach to patient assessment.

A widely used systematic method for assessing salivary parameters follows a sequence of checking the physical and chemical properties of saliva, which relate strongly to the risk of dental erosion and dental caries. The test sequence is divided into two parts, the first of which assesses the resting parameters, and the second, which assesses the stimulated parameters.

### Resting Saliva

The first phase of the test is done to assess the production of saliva at rest.

The second phase of the test is to examine the viscosity of the saliva at rest.

The third phase of the test is assessment of the pH of the saliva at rest. This is done by asking the patient to expectorate the remaining saliva in their mouth into the cup provided in the test kit.

### Stimulated Saliva

Having now assessed the patient's saliva at rest, the clinician can move on to examine the properties of the stimulated saliva. It is necessary to obtain a sufficiently large sample of stimulated saliva by having the patient chew a small piece of paraffin wax. The saliva, which is collected in the cup, is then used for the assessments.

The fifth test measures the pH of the stimulated saliva.

The sixth and final component of the testing program is the assessment of the buffering capacity of the stimulated saliva. This is done using a series of buffer test pads.

## CLINICAL APPLICATIONS OF SALIVA TESTING

The Saliva-Check buffer test kit can be used in a range of clinical situations. In patients who presenting with cervical dentinal hypersensitivity, one may see several areas, where there is cervical tooth loss from dental erosion may be seen. Such a patient may have a resting salivary pH of 5.6 that is near the critical threshold for demineralization, while the

stimulated pH at 7.6 is normal, as is their buffer capacity.<sup>4,5</sup> The hydration levels of such a patient should be very carefully checked.

Even in younger patients, saliva testing can give important information to assist their clinical management. In patients in their 20's who show an increase in their caries rate, such as a 25-year-old woman,<sup>6</sup> encircling lesions on the canines and premolar teeth signify an acidic salivary environment at rest. Salivary profiling may show a low resting salivary pH just above the critical threshold, and a lower than normal buffer capacity.<sup>7,8</sup>

Saliva testing helps to point the clinician in particular directions and away from others, and it provides a means of assessing changes over time as various factors in the patient's lifestyle are altered.

**SALIVA TESTING**

A simple in-office test (Fig. 1) is now available for evaluating how well saliva is protecting teeth. Saliva testing involves both the stimulated and unstimulated saliva. The functions and characteristics of these two forms of saliva are different. By evaluating both, the test results become very useful diagnostic and powerful communication tools.

The saliva test consists of five steps as follows:

- Step 1—resting saliva hydration
- Step 2—resting saliva viscosity
- Step 3—resting saliva pH



Fig. 1: Saliva-Check buffer kit

- Step 4—stimulated saliva quantity
- Step 5—stimulated saliva buffering capacity (quality).

The most important instruction prior to any visit, where a saliva diagnostic test is planned, is to instruct the patient not to smoke, consume food or drink, brush their teeth or use a mouthwash for at least 1 hour prior to the scheduled appointment time.

**TESTING RESTING (UNSTIMULATED) SALIVA**

**Visual Examination-Hydration**

Resting saliva is derived mainly from the submandibular glands and it can be measured by allowing a patient to drool saliva into a collection cup (typical resting flow rate is around 0.4 ml/min). However, a simpler technique is to visually assess salivary production from the small salivary glands in the lips. The lower lip glands can be seen easily by turning the lip over to expose the inner (wet) side.

Evert the lower lip, gently blot the labial mucosa with a small piece of gauze, and observe the mucosa under good light. Droplets of saliva will form at the orifices of the minor glands. If the time taken for this to occur is more than 60 seconds, the resting flow is below normal.

**Visual Examination-Viscosity**

Visually assess the resting viscosity (Fig. 2) healthy unstimulated saliva is clear in color and watery in consistency. If it looks stringy, frothy or bubbly, or is very sticky, then it may mean the content of water is low because the rate of production is low.

**Resting pH of Unstimulated Saliva**

Test the resting pH of unstimulated saliva, a low pH indicates the environment of the mouth is much more acidic than normal.<sup>10,11</sup> When this occurs, acid challenges result in demineralization and mineral loss at a level that the saliva cannot repair.

Instruct the patient to expectorate any pooled saliva into the collection cup. Take a pH test strip, place this into the sample of resting saliva for 10 seconds (Fig. 3), and then check the color of the strip. This should be compared with

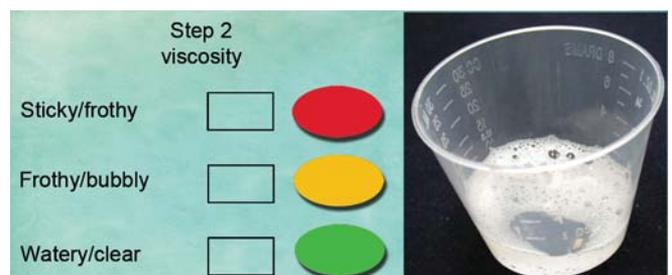


Fig. 2: Qualitative assessment of the viscosity of saliva

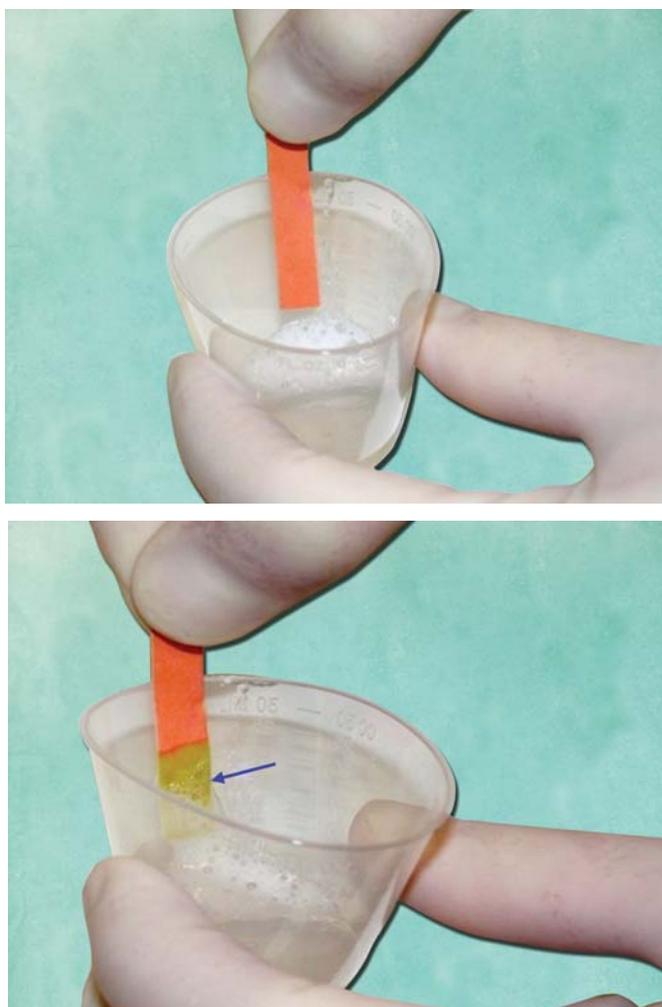


Fig. 3: pH strip test



Fig. 4: Saliva pH indicator (pH 5.0-8.0)

the testing chart (Fig. 4). Highly acidic resting saliva will be in the red section, pH 5.0 to 5.8. Moderately acidic saliva will be found in the yellow section, pH 6.0 to 6.6. Healthy saliva will be in the green section as shown above, pH 6.8 to 7.8.

**TESTING STIMULATED SALIVA**

**Stimulated Flow-Quantity**

Stimulated saliva comes mostly from the parotid gland, as a result of a variety of stimuli (masticatory stimulus, taste stimulus, esophageal stimulus).<sup>12</sup> Stimulated flow is important to help flush away acids from the diet, from dental plaque,<sup>13</sup> or from internal sources (such as gastric reflux). Testing the stimulated flow involves obtaining a saliva sample over a period of 5 minutes.

Instruct the patient to chew on the piece of wax (to stimulate salivary flow). After 30 seconds, expectorate into the spittoon. Continue chewing for a further 5 minutes, collecting the saliva into the collection cup at regular intervals (Fig. 5).

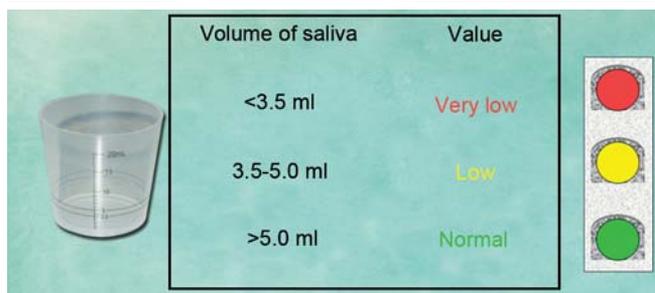


Fig. 5: Stimulated saliva flow rate

**Stimulated Flow-buffering Capacity (Quality)**

Testing the buffering capacity indicates the effectiveness of the saliva in neutralizing acids in the mouth, which may come from the diet, from dental plaque, or from internal sources (such as gastric reflux). Bicarbonate is the most important buffering system in saliva. While unstimulated saliva has very low levels of bicarbonate, stimulated saliva has levels of bicarbonate more than 60 times higher.<sup>14</sup> The GC Saliva-Check Buffer Test (Fig. 6) is designed to correlate with results obtained by titration techniques as specified in Ericsson’s method (1959).



Fig. 6: Buffer test strip

Remove a buffer test strip from the foil sealed package and place onto an absorbent tissue with the test side up. Using a pipette, draw sufficient saliva from the collection cup, and dispense one drop onto each of the test pads (Fig. 7). Immediately, turn the strip 90° to soak up any excess on the absorbent tissue. This will prevent excess saliva from swelling on the test pad and possibly affecting the accuracy of the test result.

The test pads will begin to change color immediately and after 2 minutes the final results will be available.

## CONCLUSION

Saliva is a promising option for diagnosing certain disorders and monitoring the pathologies or the dosage of medicines

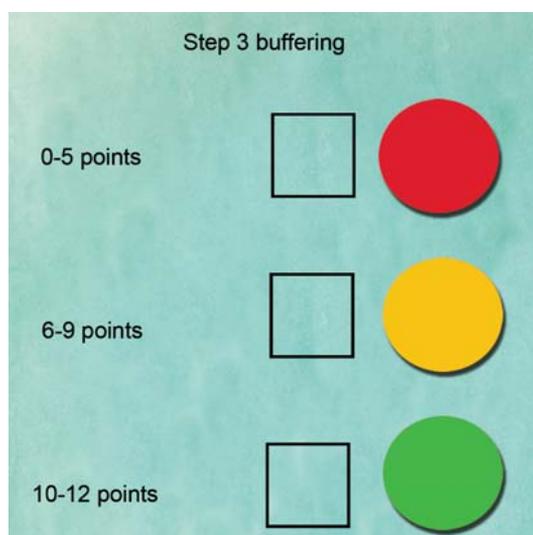
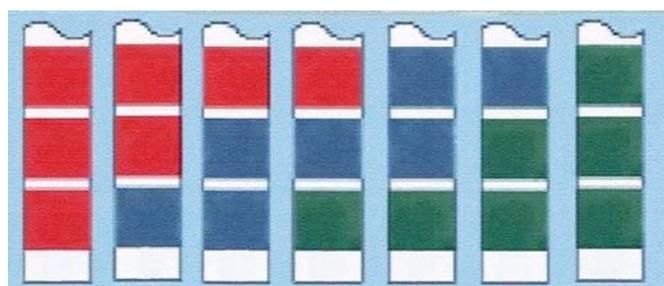


Fig. 7: Saliva buffer challenge test pads (color-coded)

or drugs. Its advantages as a diagnostic tool include its being easy to obtain and the positive correlation between many parameters in serum and saliva.

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