SALIVA: A MAGIC FLUID

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ABSTRACT
The most commonly used laboratory diagnostic procedures involve the analysis of the cellular and chemical constituents of blood. Other biologic fluids are also utilized for the diagnosis of disease, and saliva offers some distinctive advantage. Whole saliva can be collected non-invasively, and by individuals with limited training. No special equipment is needed for collection of the fluid. Diagnosis of disease via the analysis of saliva is potentially valuable for children and older adults, since collection of the fluid is associated with fewer compliance problems as compared with the collection of blood. Analysis of saliva may provide a cost-effective approach for the screening of large populations. For professionals, saliva collection is safer than blood tests, which can expose health care providers to HIV or hepatitis virus. In the present article, an attempt is made to study the pharmacological implications of Saliva along with its magical role in Human physiology.

Keywords: Saliva, Body Fluid, Drugs, Glands.

INTRODUCTION
Saliva has been used in diagnostics for more than two thousand years. Ancient doctors of traditional Chinese medicine have concluded that saliva and blood are ‘brothers’ in the body and they come from the same origin. The thickness and smell of saliva, as well as the patients’ gustatory sensation of their own saliva are all used as symptoms of certain disease state of the body. For example, over-secretion of saliva is linked to cold stimulation of the stomach or heartburn, and a sweet flavor of the saliva is correlated with spleen malfunctions. These theories are historical marks of some of the earliest applications of saliva in diagnostics and health surveillance. Analyses of the properties of saliva using biochemical and physiological methodologies can be traced back to at least over a century ago.

Literature Review: In 1898, Chittenden et al conducted their study of the influence of alcoholic drinks upon the measurement of total organic constituents, salts and chlorine in saliva [1]. In late 19th century, researchers learned that saliva had digestive power, mainly in the form of amylolysis and proteolysis. The amylolytic activity of saliva was known to come from the enzyme ptyalin, more commonly known as salivary amylase. Studies in the early 20th century had shown some evidence of the dietary effect on saliva. It was noticed that the amylolytic power of the saliva of dogs increased when a starchy diet was used.

On a meat diet, the amylolytic power was much less or entirely absent. These studies were also performed with human saliva and similar phenomenon was observed [2]. There had been a few pioneering efforts to explore the diagnostic value of saliva in certain diseases. Most of the early studies were aimed at understanding saliva and its components.

The intrinsic value of saliva as a potential indicator of systemic health was not realized until much later. In one of the earliest reports, it was observed that the salivary levels of thiocyanate ions could be used to differentiate smokers from non-smokers [3]. The study surveyed blood, saliva and urine and indicated saliva as the most sensitive among them.
Another interesting early report was focused on nitrate study. It was found that salivary nitrate levels parallel blood nitrate levels, which in turn were related to nitrate intake. This elicited much interest because nitrate was known to be converted by oral bacteria into nitrite which in turn could be converted to nitroamines in the stomach. Therefore, high levels of nitrate in the saliva might be linked to carcinoma of the digestive tract. The ease of collection and analyses of saliva had made it very attractive to researchers.

When potential links between saliva and disease were discovered, innumerable attempts were immediately taken to collect inorganic component changes of saliva in different disease states. Notably, it was established that changes in the concentrations of potassium and calcium in saliva could be used as a sensitive diagnostic marker for digitalis toxicity monitoring [4].

**Definition:** Syn: Spittle. Saliva is a clear, tasteless, odorless, slightly acidic viscid fluid consisting of the secretion from the parotid, sublingual, and submandibular salivary glands and mucous glands in the oral cavity. It serves to moisten the oral cavity to initiate the digestion of starch and to aid in the chewing and swallowing of food.

**Types of saliva**

1) Saliva can be considered as: Gland-specific saliva and Whole saliva.

Gland-specific saliva can be collected directly from individual salivary glands: parotid, submandibular, sublingual, and minor salivary glands. The collection and evaluation of the secretions from the individual salivary glands are primarily useful for the detection of gland-specific pathology, i.e., infection and obstruction. However, whole saliva is most frequently studied when salivary analysis is used for the evaluation of systemic disorders.

2) Saliva can be collected with or without stimulation. Stimulated saliva is collected by: masticatory action (i.e., from a subject chewing on paraffin) gustatory stimulation (i.e., application of citric acid on the subject's tongue).

Unstimulated salivary flow rate is affected by: degree of hydration (mostly) olfactory stimulation, exposure to light, body positioning, seasonal and diurnal factors.

**Collection of saliva**

Several methods are proposed to collect saliva. The best two ways to collect whole saliva are-

a) Draining method: saliva is allowed to drip off the lower lip.

b) Spitting method: the subject expectorates saliva into a test tube.

The inner circle is placed over the parotid duct and the lower tube is attached to a suction pump thus evacuating the outer space and causing the cannula to adhere firmly to the cheek. The saliva flows along the upper tube.

**Saliva; A diagnostic tool**

Saliva can reflect tissue levels of natural substances and a large variety of molecules introduced for therapeutic, dependency, or recreational purposes; emotional status; hormonal status; immunological status; neurological effects; and nutritional and metabolic influences.

A major drawback to using saliva as a diagnostic fluid is the fact that informative analytes (substances undergoing analysis) are generally present in lower amounts in saliva than in blood. Almost anything that can be measured in blood can be measured in saliva. Saliva has been reliably used to detect HIV 1 and 2 and viral hepatitis A, B, and C.

**Special considerations in HIV**

The diagnosis of infection with HIV based on specific antibody in saliva is equivalent to serum in accuracy. So applicable for both clinical use and epidemiological surveillance. Antibody to HIV in whole saliva of infected individuals, which was detected by ELISA and Western blot assay, correlated with serum antibody levels. As compared with serum, the sensitivity and specificity of antibody to HIV in saliva for detection of infection are between 95% and 100%. Salivary IgA levels to HIV decline as infected patients become symptomatic. It was suggested that detection of IgA antibody to HIV in saliva may, therefore, be a prognostic indicator for the progression of HIV infection.

Furthermore, viral transmission via saliva is unlikely, since infectious virus is rarely isolated from saliva [5,6]. Several salivary and oral fluid tests have been developed for HIV diagnosis. Orasure is a testing system that is commercially available in the United States and can be used for the diagnosis of HIV. The test (orasure) relies on the collection of an oral mucosal transudate (and therefore IgG antibody). IgG antibody to the virus is the predominant type of anti-HIV immunoglobulin. Different oral pathologic lesions, which are relatively common in HIV-infected individuals, do not appear to influence the results.

**Drug Monitoring**

Similar to other body fluids (i.e., serum, urine, and sweat), saliva has been proposed for the monitoring of systemic levels of drugs. A fundamental prerequisite for this diagnostic application of saliva is a definable relationship between the concentration of a therapeutic drug in blood (serum) and the concentration in saliva. For a drug to appear in saliva, drug molecules in serum must pass through the salivary glands. Therefore, the presence of a drug in saliva is influenced by:

a) Physicochemical characteristics of the drug molecule

b) Its interaction with the cells and tissues of the salivary glands

c) Extravascular drug metabolism.
Important determinants of drug availability in saliva are:

Molecular size, Lipid solubility, Degree of ionization of the drug molecule, Effect of salivary pH degree of protein binding of the drug.

**Diagnosis of Oral Disease with Relevance for Systemic Diseases**

The monitoring of gland-specific secretions is important for the differential diagnosis of diseases that may have an effect on specific salivary glands, like obstruction or infection. However, monitoring gland-specific saliva can be complicated and time-consuming. Evaluation of the quantity of whole saliva is simple and may provide information which has systemic relevance.

Quantitative alterations in saliva may be a result of medications, and the drugs associated are (At least 400 drugs). Reduced salivary flow may lead to oral problems like progressive dental caries, fungal infection, oral pain, and dysphagia. The reasons for such clinical findings should be thoroughly investigated, since they may be signs of an underlying systemic problem.

Qualitative changes in salivary composition can also provide diagnostic information concerning oral problems. Increased levels of albumin in whole saliva were detected in patients who received chemotherapy as treatment for cancer and subsequently developed stomatitis. However, no difference in albumin levels in parotid saliva was observed, which implied that the salivary albumin originated from the mucosal lesions as a result of loss of epithelial barrier function. This was further supported by the fact that salivary levels of another serum constituent, IgG, showed changes similar to those in albumin levels. The increase in the concentration of albumin in whole saliva was always detected prior to the clinical appearance of stomatitis, suggesting that albumin in whole saliva may be a marker and predictor of this complication.

Therefore, the monitoring of salivary albumin can assist in the identification of stomatitis at a pre-clinical stage and enable the chemotherapy dosage to be adjusted or treatment for the stomatitis to be initiated at an early stage. Furthermore, a significant negative correlation was found between normalized EGF (concentration of salivary EGF relative to total salivary protein concentration) and severity of mucositis in patients receiving radiation therapy to the head and neck. This negative correlation suggests that reduced salivary EGF levels may be important for the progression of radiation-induced mucositis. Furthermore, increased numbers of Streptococcus mutans and Lactobacilli in saliva were associated with increased caries prevalence and with the presence of root caries.

**CONCLUSION**

What will saliva bring us in the future? As research evidence accumulates, saliva-based diagnostics are being widely accepted by clinicians and patients. The non-invasive nature and ease of collection have made saliva the fluid of choice for not only diagnostic but also the more important health surveillance purposes. Research efforts are underway to reveal the connection of salivary changes in all aspects to systemic health status. Saliva has proven to be a discriminating element in forensic arenas, an effective indicator of acute diseases of salivary glands, and a promising probe for drug monitoring. With the advent of sensitive immunochemical assays, the compositional profile of human salivary secretions has been expanded considerably. Thus, the establishment of a range of "normal values" for a variety of "intrinsic" and "extrinsic" salivary components represented the initial step to use saliva as a diagnostic tool of oral health status. It is likely to see the increased utilization of saliva as a diagnostic fluid. As a result, dentists will have greater involvement in the identification and monitoring of certain non-oral disorders.

**REFERENCES**