

Biomarkers in Saliva

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ABSTRACT

The components of saliva act as a "mirror of the body's health". Saliva contains biomarkers derived from serum, gingival crevicular fluid and mucosal transudate. Saliva helps individuals, researchers and health care professionals as a diagnostic tool. Since using saliva is safe, non-invasive, inexpensive, less time consuming it can also be used in community health programs. It helps to detect diseases and to improve the general health of the public. This review article gives details about salivary biomarkers and their role in diagnosis of systemic disorders.

Key words: Biomarkers, Saliva, Systemic disorders, Gingival crevicular fluid

INTRODUCTION

Saliva is mainly secreted by 3 major glands (parotid, submandibular and sublingual) and many other minor salivary glands, which provides the basic functions like lubrication and helps in taste, speech and digestion. The secretions from these glands is mixed with bronchial, nasal secretions, gingival crevicular fluid, blood constituents from bleeding gums, bacteria, virus, fungi, exfoliated epithelial cells and the food debris^{1, 2}.

It has been used as a diagnostic medium for several years now^{3, 4, 5}. Saliva contains biomarkers derived from serum, gingival crevicular fluid and mucosal transudate. Systemic and oral diseases produce markers that appear in saliva. Unstimulated saliva contains higher concentration of diagnostic biomarkers than stimulated saliva and is used commonly for the diagnostic purpose. It is because, stimulated saliva has low concentrated proteins^{6, 7} and variation in pH, due to the foreign

substances (citric acid) that are used to stimulate salivary secretion. Apart from diagnosing various diseases, drug abuse can also be detected through salivary samples under drug monitoring system⁸.

The advantages of using saliva as a diagnostic aid are, it is safe, non-invasive, cost effective, time saving and can be used in mass screening^{5, 9}. The salivary biomarkers and their role in diagnosis of various systemic disorders are briefed in this article.

DISCUSSION

Saliva is used as a diagnostic medium for diseases such as, Oncology (Oral Squamous Cell Carcinoma, Cervical Cancer and Breast Cancer), Cardiovascular Diseases, and Infectious

Diseases (Viral Diseases, Bacterial Infections, Fungal Infections), Endocrinology, Autoimmune Diseases (Sjogren's syndrome) and Psychiatry. Biomarkers are defined as cellular,

biochemical and molecular characteristics by which normal/abnormal processes can be recognized and/or monitored.

The biomarkers for various diseases are as listed below.

Oncology

Saliva would be ideal for screening pre-malignant and malignant neoplasms because of its anatomical proximity. The bio markers are p53 antibody which can be detected in oral squamous cell carcinoma¹⁰, high level of salivary kallikrein in oral malignant tumors¹¹⁻¹³ and Ca-125, a glycoprotein for ovarian cancer¹⁴.

Cardiovascular diseases

Cardio vascular diseases are the major cause for high mortality rate across the world. Salivary markers can be used for follow up after surgery. Determination of salivary amylase activity before and 6hrs after cardiovascular surgery shows more mortality in patients with low salivary amylase pre operatively.¹⁵

Infectious diseases

Viral diseases

Beta 2 micro globulin and soluble tumor necrosis factor are high in HIV patients.^{16, 17} Acute hepatitis A & B are diagnosed based on the level of IgM antibodies in saliva.¹⁸

Bacterial infections

Presence of helicobacter pylori in saliva is a sign of peptic ulcer^{19, 20}. Saliva can be used as a tool for the detection of dental plaque – induced diseases, i.e. dental caries and gingivitis^{21, 22}.

Fungal infections

Saliva can be used for the detection of oral candidiasis and salivary fungal counts²³.

Endocrinology

Hormone levels can be monitored with the aid of saliva. Estradiol, Estriol, Cortisol, Testosterone, Salivary Aldosterone, Salivary Progesterone are the hormones that can be accurately assessed from saliva. Diabetes mellitus affects rate of flow & composition of saliva. Salivary alterations include higher levels of IgA, salivary peroxidase, glucose content, potassium, salivary total protein & amylase²⁴.

Sjogren's syndrome

It is a chronic autoimmune disorder noted by salivary and lacrimal gland dysfunction along with rheumatoid arthritis. A raised concentration of NaCl, IgA, IgG, lactoferrin, inflammatory mediators such as PGE2, TXB2, interleukin-2 and interleukin-6^{25, 26, 27} are noted in the saliva of Sjogren's syndrome patient.

Psychiatry

Objective Outcome Measures can be deciphered with the help of saliva during psychiatry. The therapeutic responses in the treatment of anxiety can be measured with salivary MHPG- (3-methyl 4-hydroxyphenyl glycol).²⁸

Drug monitoring

Saliva can be used to detect and monitor drugs like cocaine, opioids, barbiturates, diazepam, cotinine, cannabinoids and ethanol.^{29, 30, 31, 32}

CONCLUSION

Although challenges remain ahead, the use of saliva - based oral fluid diagnostics appear promising for future application to diagnose diseases and to prognosticate treatment outcomes. More case controlled and longitudinal studies are needed in near future to validate these biomarkers and impregnate these into regular clinical practice, in a cost effective way for the benefit of mankind.

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