Journal of Molecular and Genetic Medicine

Mishra, J Mol Genet Med 2017, 11:3
DOI: 10.4172/1747-0862.1000288

Mini Review Open Access

Saliva Biomarkers: The Unsung Hero of Diagnostics

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Abstract

With the advancement in technology, compositional analysis of saliva for diagnosis of various medical conditions has attracted the researchers over the last decade. Monitoring the salivary biomarkers help in early detection of diseases and increase the rate of success of the treatment. Sampling of saliva is safe, simple, cost effective and does not demand an expertise for collection. Therefore, saliva can be an important diagnostic armamentarium for mass screening for a specific disease or in remote areas. However, despite of various research, there are no definite guidelines regarding sensitivity and specificity of salivary diagnostic tools. Health care professionals must go hand in hand with government agencies to develop more research so that a general acceptance can be developed like that of traditional blood/urine analysis.

Keywords: Salivary biomarkers; Autonomic nervous system; Gingival tissues

Introduction

The oral cavity is a dynamic field consisting of multiple structures working in harmony. Saliva, a prime component of the oral cavity, aids in digestion of food through its endogenous enzymes, buffers the salivary pH and facilitates the ionic exchange between oral structures. Metabolites, electrolytes and other biomarkers are passively filtered into the saliva which are in harmony with the systemic and environmental conditions of an individual [1]. The potential of saliva as a biomarker fluid has been transformed by the development of highly sensitive proteomic analysis, which has identified over 2,000 proteins, approximately 25% to 30% of which are shared with blood (Table 1) [2]. Also, the ease of collection, easy storage, non-invasive sampling and possibility of repetition makes saliva an ideal fluid for the screening of diseases.

Literature Review

Saliva: The oral fluid

The normal salivary secretion is 1 to 1.5 liter per day for an adult. Each of the major salivary gland is regulated by autonomic nervous system. The serous portion of salivary gland is innervated by sympathetic system and mucous portion is innervated by both parasympathetic and sympathetic stimulation resulting in secretion of saliva. Parasympathetic stimulation leads to high flow of saliva with less quantity of organic and inorganic compounds. Sympathetic stimulation produces less quantity of protein-rich and potassium-rich saliva [3]. Intake of meal results in an increase of total proteins and of α-amylase in saliva [4].

However, the resultant salivary flow is also influenced by the age, oral hygiene, psychological conditions, nasal and visual stimulation, physical exercise. Thus, the saliva collected from the oral cavity is the complex mixture of secretary product of the three major and numerous minor salivary glands along with mucosal transudate [5], nasal secretion, cellular and food debris [6], oral microbes and various metabolites. The mode of entry of these constituents from the blood into the saliva is by passive intracellular diffusion and active transport or para-cellular routes by extra cellular ultrafiltration within the salivary glands or through gingival tissues [7].

Discussion

Can saliva be an alternative to blood for diagnostic procedures?

1. Collection of saliva is noninvasive procedure when compared to blood sampling.

2. The person collecting sample does not require specialized training.

3. Collection and storage of saliva is cost effective.

4. Saliva sampling can be used for screening large population and in remote areas.

5. Saliva does not clot so allows an ample amount of working time compared to blood.

6. Reduced risk of transmission/cross infection of diseases compared to blood.

7. Saliva sampling can easily be used in uncooperative children or in children with special needs.

However, there could be some limitations [8,9] as the salivary flow rate and the method of collection of a sample of saliva might cause variation in levels of bio markers present in it. The amount of salivary secretion is expected to vary for each person under different condition. Drugs, radiation therapy and chemo therapy administered during the treatment of cancer reduce the salivary gland function, and thus, the quality and quantity of saliva. Also, the proteolytic enzyme present in whole saliva may alter the stability of diagnostic biomarkers present in it.

Conclusion and Future potential

With the advancements in molecular diagnostics, days are not so far when our health status and sampling will be pain free and convenient. However, still the big challenge is to establish a standard, accurate and validated method to identify disease specific markers in saliva. Researchers are working to develop bio sensors capable of identifying salivary bio markers with high sensitivity and specificity [10]. This would be an incredible leap in health sector, reducing the diagnostic burden financially and creating new clinical opportunities of early diagnosis and prompt treatment.

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Received July 03, 2017; **Accepted** September 01, 2017; **Published** September 04, 2017

Citation: Mishra A (2017) Saliva Biomarkers: The Unsung Hero of Diagnostics. J Mol Genet Med 11: 288 doi:10.4172/1747-0862.1000288

Diseases	Salivary biomarkers
Autoimmune diseases	
Multiple sclerosis	Iga levels
Sjogren's syndrome	Alpha-amylase, Kallikrin
Sarcoidosis	Interleukin-2, Interleukin-6
Hereditary diseases	
Cystic fibrosis	Cathepsin-D, Sodium, potassium, chloride, calcium, magnesium, urea, uric acid and total protein.
Ectodermal dysplasia	Total protein
21-Hydroxylase deficiency	17-hydroxyprogesterone (17-OHP)
Infections	
Bacterial	*H. Pylori* DNA, Pneumococcal pneumonia C polysaccharide, anti-shiga toxin antibody, *Mycobacterium tuberculosis*, MUC5B and MUC7
Viral	HIV-1, HIV-2antibodies, Salivary proteins
Fungal	Candidiasis immunoglobulins, Hsp70 and calprotectin, histatins, mucins, basic proline rich proteins
Malignancy	
Head and Neck cancer	Mrna of specific proteins, p53 antibodies
Breast cancer	Elevated levels of tumor markers c-erbb-2 (erb) and cancer antigen 15-3 (CA15-3), Elevated salivary levels of CA125
Others	Lncrna, mirna, CCNI, EGFR, FGF19, FRS2 and GREB1, AGPAT1, B2M, BASP2, IER3 and IL1B, FGF2, PSA, Cortisol, LDH
Renal diseases	Cortisol, nitrite, uric acid, sodium, chloride, pH, amylase and lactoferrin
Psychological research	Salivary amylase, cortisol, substance p, lysozyme and secretory Iga.
Oral disorders	
Dental caries	*S. Mutans* and Lactobacillus counts, pH, Buffering capacity
Periodontal diseases	Aspartate aminotransferase, alkaline phosphatase, uric acid, albumin, Arp3, CAVI, IL-1Ra, PLS-2.
Bone tumor markers	Osteocalcin (OC) and Pyridinoline (PYD)
Occupational/Environmental disorders	
Acute stress	Lead (Pb) and cadmium (Cd) poisoning
Chronic stress	Saliva chromogranin A and alpha-amylase, increased levels of salivary cortisol and decreased level of salivary iga and Lysozyme.
Cardiovascular markers	Alpha amylase salivary activity, salivary lysozyme, salivary TC, TGL, HDLC and VLDLC

Table 1: Salivary biomarkers in various systemic diseases.

References

1. Podzimek S, Vondrackova L, Duskova J, Janatova T, Broukal Z (2016) Salivary markers for periodontal and general diseases. Dis Markers 2: 1-6.
2. Loo JA, Yan W, Ramachandran P, Wong DT (2010) Comparative human salivary and plasma proteomes. J Dental Res 89: 1016-1023.
3. Aps JKM, Martens LC (2005) Review: The physiology of saliva and transfer of drugs into saliva. Forensic Sci Int 150: 119-131.
4. Messenger B, Clifford MN, Morgan LM (2003) Glucose-dependent insulinotropic polypeptide and insulin-like immunoreactivity following sham-fed and swallowed meals. J Endocrinol 177: 407-412.
5. Humphrey SP, Williamson RT (2001) A review of saliva: Normal composition, flow, and function. J Prosthet Dent 85: 162-169.
6. De Almeida Pdel V, Grégio AM, Machado MA, De Lima AA, Azevedo LR (2008) Saliva composition and functions: A comprehensive review. J Contemp Dent Pract 9: 72-80.
7. Lee JM, Garon E, Wong DT (2009) Salivary diagnostics. Orthod Craniofac Res 12: 206-211.
8. Gupta DK, Singh V, Singh A, Dubey RK, Gupta GB (2011) Saliva- A noninvasive diagnostic tool for aging population. J Indian Acad Geriat 7: 177-181.
9. Lee Y, Wong DT (2009) Saliva: An emerging bio fluid for early detection of diseases. Am J Dent 22: 241-248.
10. Wei F, Patel P, Liao W, Chaudhry K, Zhang L, et al. (2009) Electrochemical sensor for multiplex biomarkers detection. Clin Cancer Res 15: 4446-4452.