Acta Biomedica Scientia

e - ISSN - 2348 - 2168
Print ISSN - 2348 - 215X

www.mcmed.us/journal/abs

Review Article

ARTIFICIAL SALIVA - A REVIEW

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ABSTRACT

Due to the increase in life expectancy, new treatments have emerged which, although palliative; provide individuals with a better quality of life. Artificial saliva is a solution that contains substances that moisten a dry mouth, thus mimicking the role of saliva in lubricating the oral cavity and controlling the existing normal oral microbiota. The appropriate action of salivary substitutes requires the interaction between viscosity and film formation. The oral cavity provides a favourable environment for the presence of both substances in the saliva substitutes and human saliva. Of the salivary proteins, the mucins are the proteins primarily responsible for lubrication and film formation in human saliva.

Keywords :- Microbiota, Artificial saliva, Complex fluid.

Access this article online	
Home page: www.mcmed.us/journal/abs DOI: http://dx.doi.org/10.21276/abs.2019.6.1.3	**Quick Response code**

Received:25.11.18	**Revised**:12.12.18	**Accepted**:15.12.18

INTRODUCTION

Saliva is a complex fluid secreted by the major and minor salivary glands and the secretion is under the control of the autonomic nervous system. The three major salivary glands are parotid, sublingual and submandibular. Daily secretion of saliva in human is about 1.5 litres and its normal pH is slightly alkaline (7.4). Saliva contains organic and inorganic substances suspended in an aqueous medium. Besides glycoproteins, like mucin, it contains digestive enzymes like lipase, amylase etc. Other compounds, such as lactoferrins, cystatin, histatin, thiocyanate ion and immunoglobulins are also present. Presence of lipids, both neutral and polar, has also been reported. Saliva has several distinct functions namely cleansing, lubrication, mucosal integrity, buffering, remineralisation, digestion and antimicrobial action. Human saliva is an important physiological fluid that is essential for the maintenance of good oral health and of the entire human body; it is the place where digestion begins and thus contributes to the supply of those nutrients and health-promoting substances that are essential to the body but may also cause release of potential toxins.

DISCUSSION:

Human saliva –composition and secretion

Mucous glands[1] are the epithelial cell products that in evolutionary terms first appeared in Agnatha. They are found in the skin of fish, amphibians and mammals. In mammals these glands are located on the lips and, above all, in the mouth. The major salivary glands, i.e. parotid, submandibular and sublingual, are mainly responsible to produce saliva in the human oral cavity. Each of these produces a different type of saliva, differing in the content

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of ions and proteins. The parotid gland produces serous secretions, the submandibular-serous and mucous secretions, while the sublingual-mucous and serous secretions. The minor salivary glands (palatal, buccal, lingual, lip, molar, tonsil) involved in saliva production, together with secretions produced by the major glands, gingival crevicular fluid and microorganisms, epithelial cells, blood morphotic elements, serous exudate and food residues, generate ‘full saliva’ or ‘oral fluid’ . Depending on the state of stimulation of the glands, their share in saliva production is changed. Saliva is essential for protection of the mucosa as well as structures of the oral cavity and adjacent gastrointestinal epithelium.

Functions of saliva:

The saliva [2] washes away the food particles from oral mucosa synchronously by the muscle activity, moving debris from teeth and soft tissues progressively towards the back of the mouth and eventually swallowing occurs. Glycoproteins in saliva are responsible for the viscoelastic character of it giving a lubricative film, which enables free movement of oral tissues. The mucin and electrolytes in saliva maintains the oral mucosa in its hydrated state and thus providing mucosal integrity. The most prominent buffering agents in saliva are bicarbonate and phosphate ions and these agents protect the dentition from demineralization. Ions such as phosphate, calcium, and fluoride help for the remineralisation of teeth by promoting surface binding to the hydroxyapetite surface. Enzymes like amylase and lipase play their role in the digestion function. The antimicrobial action of saliva is due to the presence of lactoferrins, immunoglobulins and cystatin, histatin, thiocyanate ions. Thus these compounds altogether give saliva a complexity and also distinct rheological and interfacial properties, which accounts for its normal functioning.

Salivary hypofunction

Salivary gland [3] dysfunction can be due to functional or morphological disorders resulting in qualitative and quantitative changes of saliva. Hyposalivation, which is characterised by decreased salivary flow, and xerostomia, the subjective feeling of a dry mouth, may or may not be associated. Factors related to hyposalivation and xerostomia include aging, the presence of glandular or systemic diseases and the use of certain drugs (e.g., anticholinergics, anxiolytics, antihypertensives, diuretics, antihistamines and antireflux). In addition, it may be a side effect of head and neck radiotherapy. Xerostomia and hyposalivation can diminish quality of life by resulting in discomfort and pain when chewing, swallowing and talking. The decrease in salivary flow increases the risk of tooth decay and other oral fungal and/or bacterial infections, facilitating the emergence of opportunistic pathogens such as Candida albicans. The management of patients with salivary gland dysfunction requires enough stimulation of the residual gland function with sialogogues or, in severe cases, use of artificial saliva. The present saliva substitutes are intended to act as a replacement of the mucoadhesive, lubricative and protective function of the natural saliva. They are not used as substitutes for the digestive and enzymatic actions. The saliva substitutes must be as close as possible to the natural saliva in terms of composition as well as in biophysical properties. There have been very few studies on biophysical characterization of normal and artificial saliva. The development of effective salivary substitutes requires an understanding of the physiological and biological properties of human saliva, which depend primarily on the role of salivary proteins and glycoproteins.

CURRENT STATUS OF ARTIFICIAL SALIVA:
Composition and properties

Clinically, artificial saliva has served as a replacement modality for individuals exhibiting hyposalivation. For sale as an "over-the-counter" item, artificial saliva have traditionally been function-oriented or formulated to replenish particular function(s) of saliva such as lubrication, viscosity, tissue hydration, surface tension, and/or anti-microbial properties. Currently available products appear to be less than ideal, since their effects are of limited duration, and they may either have an unpleasant taste or irritate the mucosa. Traditionally, two approaches have been utilized for the treatment of dry mouth: "intrinsic" and "extrinsic". For example, intrinsic reagents have been used to maintain or augment hypofunctional glands and can include pilocarpine [3] and bromhexine [5,6]. An obvious disadvantage of this approach is the potential side-effects, and the actual formulation and regimen of these compounds are still under experimental study [4]. Currently, extrinsic saliva substitutes are divided into two groups based upon the presence or absence of natural mucins. Carboxymethylcellulose (CMC) is a common ingredient used to impart lubrication and viscosity. Sorbitol or xylitol is added to provide surface activity and act as a sweetener. However, the combination of carboxymethylcellulose and sorbitol results in a highly viscous mixture having a surface tension significantly higher than that of natural saliva. Consequently, animal mucins, usually derived from porcine gastric tissues and bovine submaxillary glands, have been added, with a concomitant decrease in carboxymethylcellulose content to reduce the viscosity/surface tension of artificial saliva. It has been suggested that the more physiological mucin-based saliva substitutes facilitate the emulsion of food, aid in swallowing, and allow the artificial saliva to distribute more evenly over the oral mucous membranes [7]. Salts are added to artificial saliva to mimic the electrolyte content of natural saliva, while calcium, phosphate, and fluoride ions are included to provide a remineralization potential. Interestingly, rehardening properties of artificial saliva appear to be dependent on an appropriate concentration [7] of carboxymethylcellulose, mucin, and sorbitol. Methyl phydroxybenzoate is commonly used as a preservative. However, this compound has an unpleasant taste and may irritate oral mucous membranes when its concentration increases due to evaporation of water from the artificial saliva.

CONCLUSION:

Future of artificial saliva

Goals:

1. Develop more selective artificial saliva for pellicles [8] *(Super salivary substances)*
2. Greater substantivity
3. Biocompatibility
4. Can be targeted to a precise location
5. Can be designed for a patient's needs

Requirements:

I. Structural characterization of relevant functional domains

2. Computer modeling to predict & design "better" domains

3. Peptide engineering to synthesize these domains

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Cite this article:
Narayanan S, Sabarigirinathan C, Vinayagavel K, Guguloth Amani, BalaSiddharth S, Srinidhi L, Scindia N, Arun Prasad G. Artificial Saliva - A Review. ***Acta Biomedica Scientia***, 2019;6(1):18-20. DOI: **http://dx.doi.org/10.21276/abs.2019.6.1.3**