REVIEW ARTICLE

Defence Mechanism Of Oral Cavity – Mini Review

Arya N¹, Bansal R², Anand N³, Saxena S⁴

¹PG Student, ²Reader, ³Head of Department, ⁴Reader, Seema Dental College & Hospital Rishikesh.

ABSTRACT: Humans are subject to various infections, some are mild, others severe. Although infections often are self limiting, many require the attention of the clinician who first must make a diagnosis and then prescribe treatment. In establishing the presence of an infection, interaction occurs among three factors: the host, environment and the organism. In a state of homeostasis, a balance exists among these three. Disease occurs when an imbalance exists. Host defense mechanism are the major factor in determining the outcome of an infection, the environment and the microbe play an important but usually secondary roles. There are numerous defense mechanisms present in our body especially in the oral cavity. These include role of epithelium, saliva, tongue, lymphoid organ and gag reflex. Control and prevention of infections can be done by a thorough understanding of the defense mechanisms.

Keywords: Infections, Defense mechanisms, Oral mucosa, Saliva

INTRODUCTION

The oral cavity is an important anatomical location with a role in many physiologic processes such as digestion, speech and respiration¹. Oral cavity acts as mirror of health or disease, a sentinel or early warning. As the gateway to the body, a constant barrage of invaders like bacteria and fungi challenges the oral cavity². The surface of oral cavity is continuous anteriorly with the skin of the lip through vermillion border and posteriorly with the mucosa of the pharynx. The structure of oral mucosa is divided into three types namely (masticatory, lining and specialized) mucosa which lines the oral cavity³. The cells lining the oral cavity consist of stratified squamous epithelium which provides a physical barrier against invasion of microbes⁴.

ROLE OF EPITHELIUM

The stratified squamous epithelium provides a physical barrier to the oral micro-organisms by different ways: 1) The microbial colonization of the oral mucosa is limited by continuous exfoliation of epithelial squames⁵. 2) Odland bodies or membrane coating granules which form in spinous and granular cell layers, discharge their content into intercellular space, contributes to the formation of the permeability barrier³. 3) Thickness of the squamous epithelia restricts the entry of pathogens from the outer mucosal surface⁴. 4) The keratin layer allows the mucosa to become dry without injury to the deeper epithelial layers. Dryness limits the growth of bacterial population on the skin surface. 5) Epidermal cells mainly keratinocytes and to a lesser extent melanocytes and Langerhans cells, release many regulatory proteins i.e cytokines which help in the local defense by enhancement of phagocytic
functions. 6) Epidermal cells also produces proteins such as interleukins, transforming growth factor, basic fibroblast growth factor, platelet derived growth factors and activating factors like IL-1α, IL-1β, IL-6 and IL-8. Numerous antimicrobial peptides have been identified in oral cavity which includes α-defensins, β-defensins, calprotectin, adrenomedullin, histatins and cathelicidin. Beta defensins are universally expressed in epithelial cells, active against broad range of microbes including gram positive and gram negative bacteria. Its mechanism of action lies in the fact that it targets the bacterial cell wall leading to the formation of multimeric pores hence cell death. Histatins are affective against bacteria protected by oral biofilm such as dental plaque bacteria. Another important antimicrobial peptides are bacteriocins, kill a narrow range of bacterial strains, active against gram positive bacteria because these organisms possess abundant membrane anionic lipids. Two classes of bacteriocins exists class I and class II. Class I bacteriocins exhibit broader spectrum of activity, form unstable pores according to wedgelike model and Class II exhibit narrow spectrum of activity, form spores of carpet models. Calprotectin a heterodimer of anionic peptides expressed in cells involved in immune function such as neutrophils, monocytes, macrophages and epithelial cells may act via chelation of zinc or other divalent ions essential for the usual microbial functioning Thus act as an antimicrobial agent. Human Cathelicidin is a cationic antimicrobial peptide, expressed by epithelial cells lining the oral cavity, active against both gram positive and gram negative bacteria including periopathogens P. gingivalis and A. actinomycetemcomitans. Its exact mechanism of action is not clear, some members overlap the bacterial cell membrane in a carpet like manner and dissolve it by micelles formation. Histatins, cationic histidine rich peptides offer many functions like maintenance of tooth integrity, antibacterial effects and antifungal
ROLE OF SALIVARY FACTORS

Saliva is secreted by three pairs of major salivary glands i.e parotid, submandibular and sublingual glands. It keeps the environment of the oral cavity stable by flushing the microorganisms from mucosal and tooth surfaces and by containing numerous antimicrobial, and antifungal components which play a major role in oral defense mechanism.

PRESENTATION OF THE MAIN FUNCTION OF SALIVA IN RELATION TO ITS CONSTITUENTS

Secretions from saliva contain lysozyme, lactoferrin and other substances that are microbicidal in nature. Lysozyme small protein present in body fluids hydrolyses the β-1,4 glycosidic bonds between the N-acetylmuramic acid and N-acetyl-D-glucosamine of bacterial cell wall peptidoglycan, active against the gram positive and gram negative bacteria. Lactoferrin is an iron binding cationic glycoprotein, active against bacteria and fungi. It is known as scavenger of Fe³⁺ ions, depriving microorganisms of iron that is essential for their growth. Cystatins are cysteine protease inhibitors, shown to inhibit bacterial growth of specifically P. gingivalis. Proline rich proteins (PRPs) are highly phosphorylated proteins, of two types acidic and basic proline rich proteins. Acidic PRPs bind bacteria while the basic PRPs bind fungi eg; Candida albicans that indicate their role in the clearance towards the stomach. Salivary mucins are the proteins present on the cell surface involved in the protection of epithelial surfaces. MUC5b and MUC7 are the most important subtypes. MUC7 have high affinity for microorganisms, also entrap and agglutinate bacteria and fungi. Statherin a tyrosine glutatmine phosphoprotein inhibits the adsorption of high molecular weight proteins on
to the tooth surface inhibiting the adsorption of high molecular weight glycoproteins binding bacteria eg streptococcus mutans$^{19}$.

**ROLE OF TONGUE**

Large part of the oral cavity is made up by the tongue. The tongue acts as a barrier protecting the deeper tissues from mechanical damage. It also prevents the entry of micro-organisms. It can reach all parts of the oral cavity by virtue of its movement, removing food debris from the gums, vestibule, floor of the mouth. Thus it helps in maintenance of oral hygiene$^{20}$.

**ROLE OF LYMPHOID ORGAN**

The simplest lymphoid organs are tonsils, named according to their location i.e palatine tonsils, lingual tonsils, pharyngeal tonsils and tubal tonsils. These four tonsils form a ring known as Waldeyers ring. The ring acts as a first line of defense against microbes that enters the body via the nasal and oral routes. The clusters of lymphoid follicles known as peyer’s patches located in the wall of small intestine and also in the wall of the appendix. The peyer’s patches, appendix and tonsils, are part of the collection of small lymphoid tissues known as mucosa associated lymphatic tissue (MALT). The MALT protects the respiratory tracts from the foreign matter entering the cavities$^{21}$.

**ROLE OF GAG REFLEX**

Gag reflex is described as protective mechanism that prevents the entry of any fluids or substances in the upper respiratory tract. It is a normal, healthy defense mechanism, its function is to prevent foreign bodies from entering the trachea by altering the shape of the pharynx and its various openings to eject out foreign bodies$^{22}$.

**CONCLUSION**
The oral cavity is well equipped to counter attack any adverse condition that may harm the oral tissues. Right from its superficial epithelial layer to the inner most connective tissue there is a line of defense that acts in harmony with other oral structures to maintain homeostasis to revert imbalance that would otherwise shift equilibrium to diseased state. This brief overview has attempted to show how the various anatomical regions in the mouth have specialized immune systems designed to maintain oral health. A better understanding of oral immune mechanisms should lead to improved control or prevention of bacterial and fungal infections.

REFERENCES