

Oral histology

Lec-13

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Oral mucous membrane(oral mucosa):

The oral mucosa is a barrier that separates the underlying tissues from their environment. It consists of two layers, the surface stratified squamous epithelium and the deeper connective tissue called lamina propria. The oral cavity has sometimes been described as a mirror that reflects the health of the individual. Changes indicative of disease are seen as alterations in the oral mucosa lining the mouth, which can reveal systemic conditions, such as diabetes or vitamin deficiency, or the local effects of chronic tobacco or alcohol use.

Functions of oral mucosa:

1. Protection: Barrier for mechanical trauma and microbiological insults.
2. Sensation: Temperature (heat and cold), touch, pain, taste buds, thirst; reflexes such as swallowing, etching, gagging and salivating
3. Secretion: Salivary secretion.
4. Thermal regulation: Important in dogs not in humans.

Types of the Oral Mucosa

According to function, oral mucosa divided into 3 types:

1-Masticatory Mucosa: is a part that is adapted to need friction produced by mastication, and this of keratinized or parakeratinized oral epith. like gingiva(free, attached and interdental) and hard palate. Its form about 25% of total mucosa.

2-Lining Mucosa: Form about 60% of total mucosa. Covers the floor of mouth, ventral (underside) tongue, alveolar mucosa, cheeks, lips and soft palate. Does not function in mastication and therefore has minimal attrition. Its non-keratinized epithelium; soft and pliable.

3-Specialized Mucosa: Form about 15% of total mucosa. Covers dorsal tongue and composed of cornified epithelial papillae. it's so called because it holds the taste buds.

Structure of Oral Mucosa

1. Overlying oral epithelium
2. Underlying connective tissue (lamina propria and submucosa)

In skin called epidermis and dermis

The oral epithelium is keratinized or parakeratinized or non-keratinized stratified squamous epithelium. Epithelial cell-cell contact is made through desmosomes. These are anchored intracellularly by tonofibrils.

The interface between epithelium and connective tissue is comprised of a structureless layer called basement membrane. This interface is irregular and is composed of downward projections of epithelium called rete ridges or rete pegs, and upward projection of connective tissue termed as connective tissue papillae. Junction between oral epithelium and lamina propria is more obvious than that between lamina propria and submucosa

Loose fat and glandular tissue with blood vessels and nerves seen underneath oral mucosa from underneath bone or muscle layer - this layer is termed *submucosa* – provides flexibility

In gingiva and hard palate, no submucosa is seen and the lamina propria is directly attached to the periosteum of the underlying bone which provides firm, inelastic attachment –this is called oral mucoperiosteum.

Basal cells interface with a membrane separating the epithelium and lamina propria.

The membrane is called basal lamina. Basal cells attached to basal lamina by hemidesmosomes.

Under electron microscope(*Figure.1*) this basal lamina appear as cell free zone about 1-4 micron width, stain positive with periodic acid Schiff method indicate it contain:

- 1- Mucopolysaccharides
- 2- fibronectin
- 3- type IV collagen
- 4- proteoglycan
- 5- glycoprotein
- 6- special anchoring fibrils.

This free zone appear composed of two laminae:

- 1- **lamina lucida:** this is a clear cell free zone , its toward epith.
- 2- **lamina densa:** this is dark zone toward c.t. , its filamentous and granular , contain fine collagen fibers called anchoring fibers.

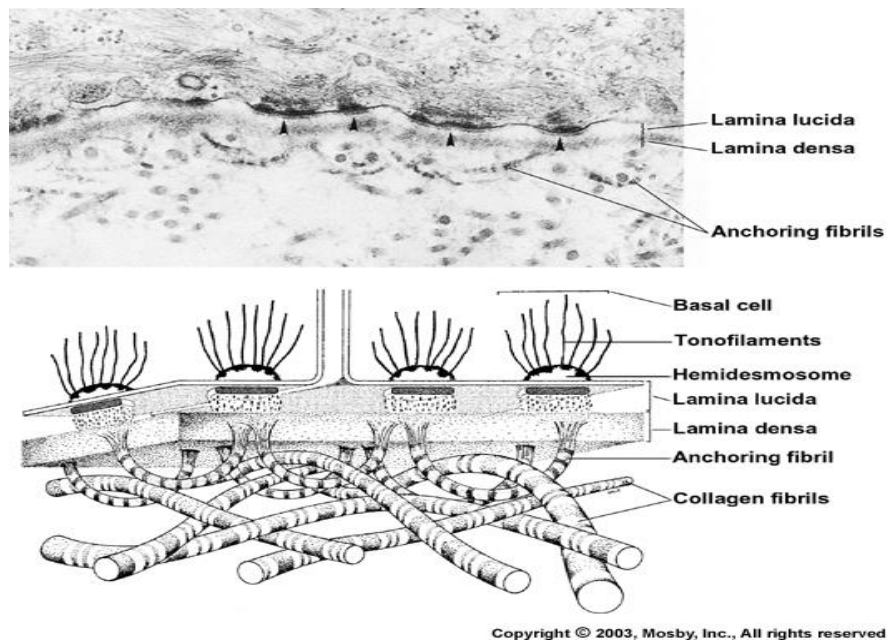


Figure.1 Basal lamina under electrone microscopic level

Characteristic features of cells of oral epithelium.:

- 1- The epith. composed of cells tightly link to each other by *desmosomes* and arranged in strata (layers), these cells are called *keratinocytes* and its about 90% of epithelium cells . The name of these cells not due to its ability to produce keratin but to its content

of tonofilaments (fibrous protein) and these keratinocytes are present in all types of oral epith

- 2- The other 10% of cells present in oral epithelium are non-keratinocyte cells which include melanocytes, Langerhans, Merkle's and lymphocyte cells.
- 3- The deeper layers (basal and supra basal) have the ability of active mitotic division and these cells replace the continuously degenerated surface cells and the process called cells *renewal* or cells *turnover*.

Types of oral epith.: (Figure-2)

A-Keratinized oral epith.(orthokeratinized):

1-basal cell layer (stratum basale):

Single cuboidal or short columnar cells layer attached to each other by *desmosomes* (a type of junction between the cells of the same embryonic origin). This layer is directly upon the basal lamina and attached to c.t. by *hemidesmosome* (a junction resemble desmosomes but between the cells of different embryonic origin).

Basal cell layer consist of 2 population of cells:-

- i))Serrated- heavily packed with tonofilaments which are adaptations for attachment.
- ii) Non-serrated – stem cells – slowly dividing cells which serve to protect genetic information of the tissue.

2-Spinous or prickle cell layer (stratum spinosum):

Cells are irregular, polyhedral or large oval in shape about 20-25 layers of cell. They joined together by intercellular bridges or processes which are desmosomes and tonofilaments. The intercellular spaces contain glycoprotein and fibronectin and these spaces are large in keratinized

epith. which made the desmosomes more prominent and given the cells prickles appearance. The basal cell layer and supra basal (2-3 cell layers from stratum spinosum just beyond the basal cell layer) are able to undergo mitotic division, so they are termed as *stratum germinativum layer*.

3-Granular cell layer (stratum granulosum):

2-3 layers of cell, flatter and wider , containing basophilic keratohylin granules(blue staining with H&E). The nuclei of this layer show signs of degeneration and pyknosis.

Odland bodies: they are membrane coating granules (keratinosomes), has internal lamellated granules present between granular cell layer and stratum corneum and between prickle cell layer and granular cell layer . Its function is produce a defense permeability barrier, and it present in all types of oral epith.

4-keratinized layer (stratum corneum):

Made up of keratinized and dehydrated squamous cells which are in layers. The cells are flatter than the cells of stratum granulosum , nuclei and cytoplasmic organelles disappeared , the layer is larger acidophilic amorphous layer , cells contain densely packed filaments developed from the tonofilaments.

B-Parakeratinized oral epith.:

It's similar to the keratinized in its layer except that the granular layer may be absent or not evident, the other differences in the stratum corneum ,the surface layer retain nuclei that are pyknotic and condensed.

C- Nonkeratinized epith.:

Consist of 4 layers, differs from the keratinized type primarily because they don't produce keratin. The layers are:

- 1- **Basal cell layer:** similar to that of keratinized epith.
- 2- **Prickle cell layer:** similar to that of keratinized except that the intercellular bridges or prickles are not obvious. For this reasons, some prefer to ovoid the term prickle cell layer for nonkeratinized epith.
- 3- **Intermediate cell layer:** Flatter than the prickle cells, contains incompletely formed granules, but there is no granular cell layer.
- 4- **Superficial cell layer:** Nucleated, with flat cells, ultimately desquamated and don't form keratin, therefore they don't stain with eosin (red in color) as do the surface of keratinized epith.

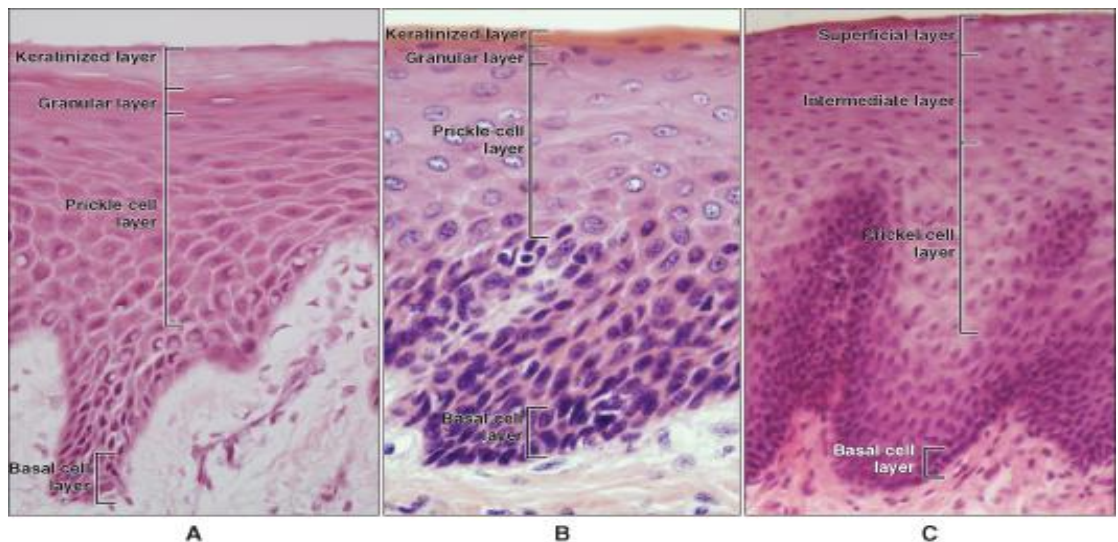


Figure.2: Types of oral epithelium(A: Keratinized epith, B: Parakeratinized epith., C:Nonkeratinized epith.)

Non-keratinocyte cells in oral epith.:

In oral epith. there are additional cells called non-keratinocyte cells, they are of different embryonic origin than that of keratinocytes and also doesn't contain the same number of desmosomes at tonofilament such as that present in keratinocytes. They constitute about 10% of epithelial cell population. These cells are:

- 1- **Melanocyte cells:** dendritic's cell present in the basal cell layer, its embryonic origin from neural crest cells. These cells store melanine in form of melanosomes which elaborate melanine pigment responsible for pigmentation of oral m. m.
- 2- **Merkle's cells:** non-dendritic cells present in basal cell layer, it's origin from neural crest cell, and act as tactile sensory cells.
- 3- **Langerhan's cells:** dendritic cells present in suprabasal layer, its origin from bone marrow, it's involved in immune response.
- 4- **Lymphocyte cells:** Its originate from hemopoietic stem cells and it present in any layer of oral epith. associated with inflammation.

Lamina properia:

Its C.T. of variable thickness that support the epith, Lamina properia may be directly attached to periosteum of alveolar bone or it may overly submucosa that contain minor salivary gland and large blood vessels. Lamina propria also contains various type of cells, blood vessels, nerves and fibers (collagen and elastic) embedded in an amorphous ground substance. Its divided into two parts:

A- Papillary part and B-Reticular part

A-Papillary part: is superficial zone of loose C.T. adjacent to epith. and surrounding the epith. ridges. Papillary projection have considerable variations in length and width and depth contain predominantly fine collagen fibers and blood vessels and network of sensory nerve ending. The papillary part of lamina properia help in 3 functions:.

1-Increasing surface contact between epith. and c.t. so it will strengthen attachment.

2-Allows greater proximity for passage of nutrition from b.v. and lymph vessels.

3-Serving for accurate sensation.

B-Reticular part:

Its denser C.T. contain coarse collagen fibers and are closely packed together besides large blood vessels and nerves, this reticular part is always present , while papillary part may be absent or very short as seen in alveolar mucosa.

Cells found in lamina propria

→Fibroblast →Histiocytes →Macrophages → Mast cell → Polymorph nuclear leucocytes →Lymphocytes →Plasma cells →Endothelial cells

Submucosa:

It's a C.T. of varying thickness and density . It attaches the mucosa to the underlying tissue, it contains the large b.v. , lymph v.and large nerves, in addition to mucous salivary glands, whose ducts penetrate the m.m. Also there is adipose tissue and lymph tissue. The oral mucosa is either loosely attached to the underlying tissue when contain submucosa and called *movable* like in alveolar mucosa, or its firmly attached to underlying tissue(without submucosa) and called *immovable* like in gingiva and hard palate when the oral mucosa attaches directly to the periosteum of underlying bone *mucoperiosteum*

General features of oral m.m.

1. Separated from the skin by vermillion zone of the lips which is more deeply colored than rest of the oral mucosa.
2. Factors affecting color of the oral mucosa:
 - a. Concentration and state of dilation of the blood vessels in underlying connective tissue.

- b. Thickness of the epithelium
- c. Degree of keratinization
- d. Amount of melanin pigmentation

Clinically, color of oral mucosa is very important. For example, inflamed oral tissues appear red rather than the normal pale pink

How is the oral mucosa different from skin?

1. Color
2. Moist surface
3. Absence of adnexal skin structures such as hair follicles, sweat glands and sebaceous glands (exception in Fordyce's spots)
4. Fordyce's spots: Sebaceous glands in oral cavity predominantly in upper lip, buccal mucosa and alveolar mucosa
5. Presence of minor salivary glands in oral mucosa
6. Texture of surface: Oral mucosa is smoother than the skin (few exceptions like dorsal tongue – due to papillae; hard palate – rugae; gingiva – stippling)
7. Firmness: Oral mucosa varies in its firmness. For example buccal mucosa and lips are loose and pliable whereas the gingiva and hard palate are firm so critical clinically while giving injections

Effect Of Aging On The Oral Mucosa

- Epithelial thinning
- Decreased keratinization
- Less prominent rete pegs
- Decreased cellular proliferation
- Loss of submucosal elastin and fat
- Increased fibrotic connective tissue with degenerative alteration in the collagen.