LIPS
These are two fleshy folds that circumscribe the mouth and closes the cavity.
At the sides they unite to form the oral commisures

5 LAYERS

1. *Skin* – made of keratinized epith. That contains hair follicles and sebaceous glands
2. *Superficial Fascia* – contains some fats
3. *Orbicularis Oris muscle* – serves as sphincter of the mouth
4. *Submucous tissue* – contains vessels, mucous labial glands and labial branches of facial artery
5. *Mucous membrane* – innermost layer
A sagittal section showing the major components forming the boundaries of the oral cavity

**Superior Boundary of the Oral Cavity**
- Hard palate
- Soft palate

**Anterior and Lateral Boundary of the Oral Cavity**
- Labium, or lip
- Cheek
- Body of the tongue

**Posterior Boundary of the Oral Cavity**
- Uvula
- Palatine tonsil
- Root of the tongue
- Lingual tonsil

**Inferior Boundary of the Oral Cavity**
The geniohyoid and mylohyoid muscles supporting the floor of the mouth
THE ORAL CAVITY IS CONVENIENTLY DIVIDED BY THE ARCH FORMED BY THE TEETH AND GUMS INTO:

1. **Oral Vestibule**
   - lies between the gums and the teeth.

2. **Oral Cavity Proper**
   - lies behind and within the arch of teeth.
The Vestibule (Oral Vestibule)

It is a slit-like space between the cheeks and the gums.
It communicates with the exterior through the oral fissure.
It communicates with the oral cavity proper behind the 3rd molar tooth on each side only when the jaws are closed.
It is limited by the reflection of mucous membrane from lips and cheek onto the gums superiorly and inferiorly.
It is connected to the upper and lower lips by two Frenulums (upper and lower respectively).

The lateral wall of the vestibule is formed by the cheek.
- The cheek is composed of Buccinator muscle, covered laterally by the skin & medially by the mucous membrane.

A small papilla on the mucosa opposite the upper 2nd molar tooth marks the opening of the duct of the parotid gland.
Vestibular Boundaries

1. Anteriorly by the lips,
2. Laterally by the cheeks,
3. Superiorly by the Mucolabial and Mucobuccal sulcuses formed by the mucosal folds
4. Posteriorly and medially by the teeth and gums.
Oral cavity proper

- It is the cavity interior to the alveolar margins of the maxillae and the mandible when the mouth is closed.
  - **Anterior and lateral:** It is bounded by the teeth and gums.
  - **Posterior:** Limited by the opening into the pharynx (The Oro-Pharyngeal Isthmus)
  - **The Roof** is formed by the hard palate anteriorly and the soft palate posteriorly
  - **The Floor** is formed by the mylohyoid muscle.
  - The anterior 2/3rd of the tongue lies on the floor.
Oral Cavity, Posterior boundaries

The Oro-Pharyngeal isthmus: Is the junction of mouth and pharynx.

Is bounded:

- By the soft palate and the palatoglossal folds superior
- By the dorsum of the tongue inferior
The roof of the mouth Palate

- The skeleton of the hard palate
  - The palatine processes of the maxilla and the horizontal processes of the palatine bones.

- The **Greater palatine foramen** carry the greater palatine artery and nerve.
- The **lesser palatine foramen** carry the lesser palatine artery and nerve.
The Roof of the mouth -

- Its oral surface is covered by mucusous membrane lined by **STRATIFIED SQUAMOUS EPITHELIUM** divided into two parts
  - Anteriorly is the *hard palate* which forms the partition between the nasal and the oral cavities.
  - Posteriorly *soft palate* which is attached to the posterior border of the hard palate and projects posteriorly into the pharynx, separating its oral and nasal parts.
  - (Soft palate is highly mobile and its movement important in preventing food and drink entering the nasopharynx and nose during the act of swallowing).
The Median PALATINE RAPHE made the mucosa ends anteriorely at small elevation called THE INCISIVE PAPILLA that Overlying THE INCISSIVE FOSSA (Where the nasopalatine nerve emerges into the hard palate through this fossa)
The presence of transverse corrugation called palatine rugae, antero-lateral (fatty) zone, and postero-lateral (glandular) zone.

Maxillary Tuberosity

Located Behind the last molar tooth
STRUCTURE OF ORAL MUCOSA

The oral mucosa is a **Stratified Squamous Epith.**

Oral epithelium Underlying connective tissue (Lamina Propria and sub mucosa)

The interface between epithelium and connective tissue is basement membrane

This interface is irregular and is composed of downward projections of epithelium called **Rete Ridges**, and upward projection of connective tissue termed as connective tissue **Papillae**
FUNCTIONAL CLASSIFICATION OF ORAL MUCOSA

Keratinized areas
- Masticatory mucosa
  - hard palate & gingiva
  - vermilion border

Nonkeratinized areas
- Lining or reflecting mucosa
  - lip, cheek, alveolar mucosa, vestibular fornix, mouth floor, soft palate, ventrum of tongue

Specialized mucosa
- dorsum of tongue
KERATINIZED AREAS

MASTICATORY MUCOSA

1. Hard palate
2. Gingiva

- Both are distinguished from one another by color and palpation.
- The hard palate is light pink while soft palate is red.
- The hard palate is firm and less movable than soft palate because the mucous membrane of hard palate is tightly fixed to underlying periosteum.
Keratinized epithelium

Stratum cornium

Stratum granulanium

Stratum spinosum

Stratum Basalne
**Stratum Basale  —  Stratum Spinosum**

- Single cuboidal or columnar Basal cell layer
- Adjacent to lamina propria
- The only layer where mitosis occurs
- Are all stem cells?
- Least differentiated cells
- Non-keratinocytes cell present

- Several cells thick
- Round or Ovoid cells (Prickel)
- Larger and more mature than those of stratum basale
- Contain
  - Tonofilaments
  - Phospholipid granules (Odland bodies) in the upper part of stratum spinosum
  - Increased desmosomes (shrinkage during preparation gives the spiny appearance)
Stratum Granulosum — Stratum Corneum

- Cells of further increase in maturation
- Cells larger and flatter
- Contain
  - Tonofilaments & tonofibrils that occupy the cytoplasm
  - Keratohyline granules are present

- In keratinized epithelium
  - Highly mature epithelial cells (squamous)
  - All cellular organelles and nucleus are lost
    (ORTHOKERATINIZATION)
  - In gingiva, nuclei may be retained
    (PARAKERATINIZATION)
  - Cells are packed with Keratin
- Keratin consist of
  - Tonofilaments surrounded by Filaggrin (matrix protein)
- Desmosomes are weak to allow for shedding (DESQUAMATION)
Types of keratinized epithelium

- In keratinized epith., as the cells of granular layer reach the junction with keratinized layer, a sudden changes occur.
  
- These changes are:
  1. All the organelles with the nuclei and keratohyaline granules disappear.
  2. The cells dehydrated.
  3. The keratinized layer become packed with filaments, flattened, assume the form of hexagonal disks (squamous).

- This pattern of maturation is termed ORTHO-KERATINIZATION.
In masticatory mucosa, PARAKERATINIZATION may occur characterized with:

1. Incomplete removal of organelles from the cells of granular layer.
2. The nuclei remain (shrunken or Pyknotic).
3. Remnants of other organelles may present in the squamous cell layer.
Types of oral epithelium

ORTHOKERATINISED

PARAKERATINISED

NON KERATINISED
KERATINOCYTES

keratinocytes consists of 2 functional populations

- Progenitor population – performing epithelial proliferation
- Maturing population – performing epithelial maturation
Keratins (previously also called cytokeratins) are filament forming proteins of epithelial cells and are essential for normal tissue structure and function.

- Forms the cytoskeleton of all the epithelial cells, along with microfilaments & microtubules.

- Provide mechanical linkage & distribute force over wide area

Based on distribution
- Soft keratin
- Hard keratin

Cytokeratins in oral epithelium
The Nonkeratinized squamous epithelium

Lines the greatest surface area of the oral mucosa, and includes the buccal and labial mucosae, the alveolar and vestibular mucosae, soft palate, tonsillar pillars, floor of the mouth, and ventral and lateral surfaces of the tongue.
FUNCTION OF STRATIFIED SQUAMOUS EPITHELIUM

Stratified squamous epithelium, non-keratinized
Layers of Non-Keratinized Surface Epithelium

**Stratum Basale**
Cuboidal or columnar cells containing separate tonofilaments and other cell organelles and it is the Site of most cell divisions

**Stratum Intermedium**
Slightly increase in cell size as well as accumulation of glycogen in cells of the surface layer
On rare occasion, keratohyalin granules can be seen

**Superficial cell layer:**
The cells appear more flattened.
Accumulation of glycogen.
The cells contain dispersed tonofilament.
The nuclei and some keratohyaline granules remain visible.
Diminished in number of other cell organelles.
No signs of keratinization.
- **Stratum corneum or superficiale** - In non-keratinized epithelium
  - No Keratin
  - Tonofilaments are less and under-developed
  - lack keratohyline granules
  - this layer is less distinct

**Stratum intermedium**
No granular layer
Superficial layer contain plump nucleus
Not stain intensely with eosin
<table>
<thead>
<tr>
<th>Shape</th>
<th>1- Pigment cell (Melanocyte, blast)</th>
<th>2- Langerhan’s cell</th>
<th>3- Merkel’s cell</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small body with long slender and branched process present in the I.C.S of epith. contain melanin granules (melanosomes)</td>
<td>Similar in shape. Contain granules (langerhan’s granules) (Bir-beck granules)</td>
<td>They do not have long processes. Contain small membrane bounded granules</td>
</tr>
<tr>
<td>Location</td>
<td>Basal and parabasal layers</td>
<td>High level cell and may be found at lower levels.</td>
<td>Basally in epithelium</td>
</tr>
<tr>
<td>Stain by H&amp;E</td>
<td>Not stained so called (Clear dentritic cell)</td>
<td>Not stained so called (Clear dentritic cell)</td>
<td>Not stained so called (Clear but not dentritic cell)</td>
</tr>
<tr>
<td>Special stain</td>
<td>DOPA reaction (for tyrosinase enzyme)</td>
<td>Gold chloride</td>
<td>PAS +ve</td>
</tr>
</tbody>
</table>
The BASEMENT MEMBRANE

- Interface between connective tissue and epithelium appears thick and it includes reticular fibres.
- 1-4 micrometre wide and cell free.
- Ultra structurally, basement membrane is called *Basal Lamina*.
- Basal lamina is made up of clear zone called *Lamina Lucida* just below the epithelial cells.
- A dark zone beyond lamina lucida adjacent to the connective tissue is called *Lamina Densa*.

### Components of basal complex

- **Lamina lucida:**
  - Bullous pemphigoid antigen
  - Laminin
- **Lamina densa (45 nm thick):**
  - Type IV collagen in chicken wire configuration
- **Anchoring fibrils (50 nm thick):**
  - Type VII collagen
- **Collagen of connective tissue:**
  - Type I
  - Type III
• **Basal Lamina:**
  - Thick
  - Contains closely packed bundles of collagen fibers
  - Collagen fibers follow a regular course between anchoring point enabling the mucosa to resist heavy loading.

• **Lamina propria**
  • Superficial papillary layer (associated with epithelial RETE RIDGES) Collagen fibers are thin and loosely arranged.
  • Deeper reticular layer: netlike arrangement of dense collagen fibers (nothing to do with reticulin fibers)

• Papillary layer has thin and loose collagen fibers with many capillary loops

• Reticular layer has collagen fibers arranged in thick bundles that are parallel to surface
The submucosa

- The submucosa consists of connective tissue of varying thickness and density. It attaches the mucous membrane to the underlying structures.

- Glands, blood vessels, nerves, lymph vessels and adipose tissue are present in this layer.

- It is in the submucosa that larger arteries divide into smaller branches which then enter the lamina propria.
The submoucous layer varies in thickness from one region to another and is absent in some areas. This variation in the submucous layer produces 3 zones:

1. **IN THE GINGIVAL REGION AND PALATINE RAPHE:**
   - Absent of sub-mucuous layer, the mucosa is pink and tightly adherent to the bone.

2. **BETWEEN THE RAPHE AND THE GINGIVAL REGION ON EACH SIDE:**
   - Is an intermediate zone in which the submucous is relatively well developed.

3. **ANTERIOR TO THE INTERMEDIATE ZONE:**
   - The space between the lamina propria and the periosteum fill with adipose tissue and the muocus membrane.
     - It is thick and pale.
Specialized Lining mucosa

- Covers the under surface of tongue, floor of mouth, inside of lips & cheeks, alveolar processes and soft palate.
- Occupies 60% of the oral cavity
- **The Epithelium:**
  - Usually thin but Thicker than that of masticatory mucosa in cheeks.
  - Non-keratinized in under surface of tongue, floor of mouth, cheeks, alveolar process and soft palate.
  - Orthokeratinized in vermilion zone and parakeratinized in intermediate zone of lips.
The FLOOR OF THE MOUTH.
The floor of the mouth is a small horseshoe-shaped region situated beneath the movable part of the tongue and above the muscular diaphragm formed by the mylohyoid muscles and above this diaphragm is the genohyoid muscle.
The Floor of the Mouth

- Covered with mucous membrane
- In the midline, a mucosal fold, the frenulum, connects the tongue to the floor of the mouth
- On each side of frenulum a small papilla has the opening of the duct of the submandibular gland
- A rounded ridge extending backward & laterally from the papilla is produced by the sublingual gland

Characteristics:

1. Anterior 2/3 of the tongue,
2. Lingual frenulum,
3. Lingual vein,
4. Sublingual caruncle,
5. Sublingual folds
6. Fimbriated fold
The inferior surface of the tongue is covered with a thin transparent mucous membrane through which one can see the underlying veins.

A sublingual caruncle (papilla) - opening of the submandibular duct.

1- frenulum,  
2- lingual vein,  
dashed-circle- sublingual gland.  
Arrow- Wharton's duct opening,
Lingual frenulum
(The inferior surface of the tongue is connected to the floor of the mouth by a midline fold called the frenulum of the tongue. The frenulum allows the anterior part of the tongue to move freely.)

Sublingual fold
(passes lateraly and backwards from the papilla and overlies the sublingual gland)

Papillae (openings of submandibular duct)

Each sublingual compartment contains submandibular gland and ducts, lingual and hypoglossal nerve and the sublingual vessels.
Mylohyoid.

- ORIGIN - Mylohyoid line of the mandible.
- INSERTION – Median fibrous raphe and adjacent part of hyoid body.
- **Action:** elevates and draw forwards the hyoid bone and depress the mandible.

Geniohyoid.

- ORIGIN - Inferior mental spines of mandible.
- INSERTION - Body of the hyoid bone.
BLOOD SUPPLY

Mouth is supplied by branches from

- Facial Artery
- Inferior Alveolar Artery
- Maxillary Artery
- Infraorbital Artery
- Postero superior alveolar arteries