Anatomical and physiological characters of the oral mucosa. Oral mucosa diseases etiology and classification.

Author: PhD Roman Ion

INTRODUCTION

- The oral cavity is in many respects a very interesting part of the human body .
- Many different kind of tissue from the hardest teeth to the softest, the salivary glands are found therein.

Oral mucous membrane

- The moist lining of the oral cavity that is in continuation with the exterior surface of skin on one end and esophagus on the other end is called the **oral mucosa** or **oral mucous membrane**

Function of oral mucousa

1. It is **protective** mechanically against both compressive and shearing forces.
2. It provides **a barrier** to microorganisms , toxins and various antigens.
3. It has a role in **immunological defence**, both humoral and cell- mediated.

4. Minor glands within the oral mucosa provide **lubrication** and **buffering** as well as secretion of some antibodies.
5. The mucosa is richly innervated, providing input for **touch, proprioception, pain** and **taste**.
6. **Reflexes** such as gagging, retching and salivating are initiated by receptors in the oral mucosa.

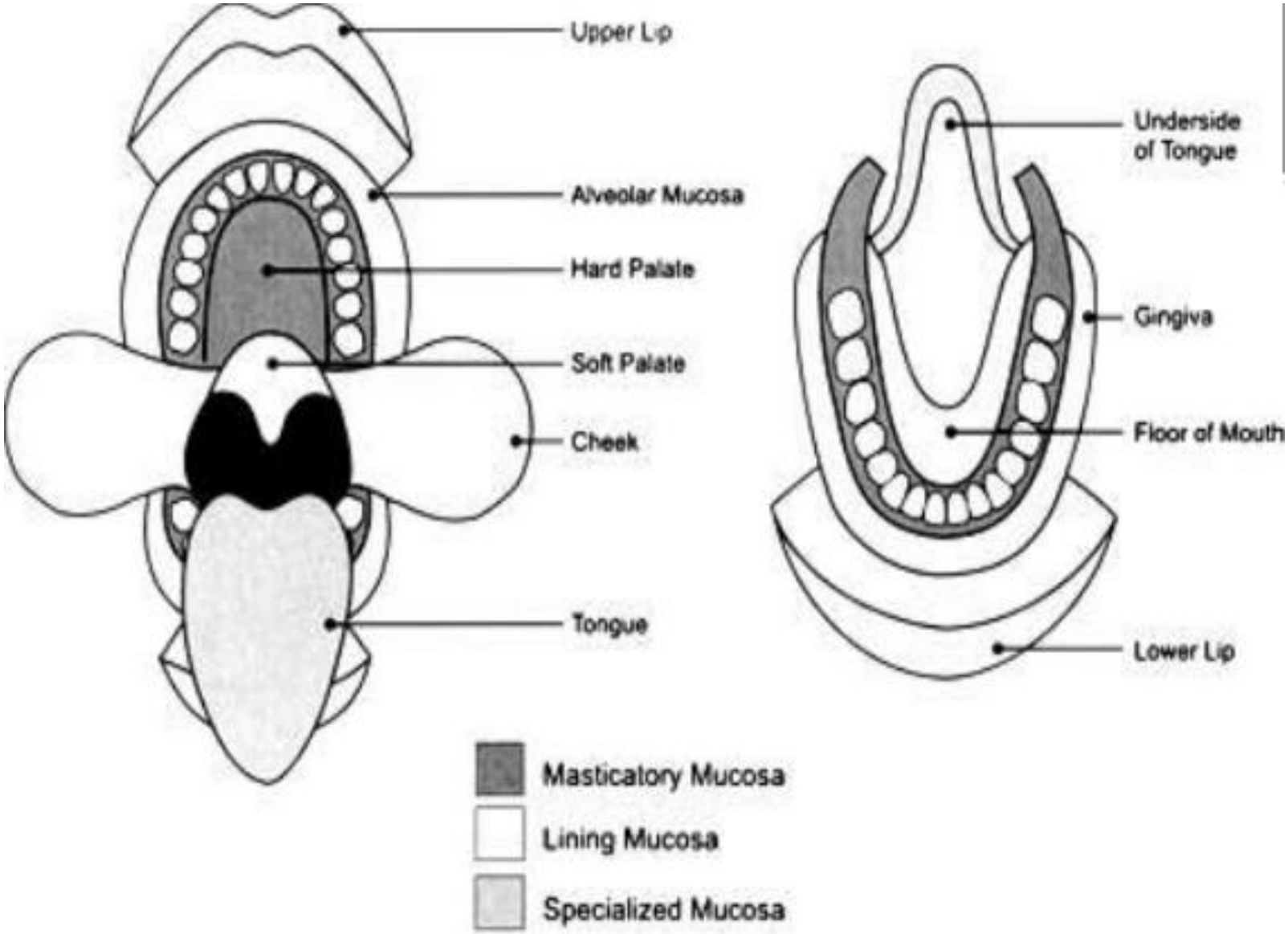
Function of oral mucosa

Ten Cate's Oral Mucosa, Nanci, Elsevier, 2013

- Protection
- Sensation
- Secretion
- **Thermal regulation**

Main parts of oral mucosa

- The oral cavity consists of **2 parts**: outer vestibule (bounded by **lips** and **cheek**) oral cavity proper (separated by alveolus bearing **teeth** and **gingiva**).
- Superiorly: **hard and soft palate**
- Inferiorly: **floor of mouth, base of tongue**
- Posteriorly: **tonsils**


Upper Lip
Alveolar Mucosa
Hard Palate
Soft Palate
Cheek
Tongue
Underside of Tongue
Gingiva
Floor of Mouth
Lower Lip
Masticatory Mucosa
Lining Mucosa
Specialized Mucosa

Classification of oral mucosa

Based upon primary function served

1. Masticatory Mucosa (25%)
2. Lining Mucosa (Covers 60% of total area)
3. Specialised Mucosa (15%)

Based upon keratinisation

1. Keratinised
   - Orthokeratinized
   - Parakeratinized

2. Non-keratinised

Based upon Location

1. Buccal Mucosa.
2. Lingual Mucosa.
3. Palatal Mucosa.
4. Labial Mucosa.
5. Alveolar Mucosa

Classification

Chandra (1 January 2004). *Textbook of Dental and Oral Histology and Embryology with MCQs*

- Oral mucosa can be divided into three main categories based on function and histology:

1. Masticatory mucosa (25%), keratinized stratified squamous epithelium, found on the dorsum of the tongue, hard palate and attached gingiva.

2. Lining mucosa (60%), nonkeratinized stratified squamous epithelium, found almost everywhere else in the oral cavity, including the:

a. **Buccal mucosa** refers to the inside lining of the cheeks and floor of the mouth and is part of the lining mucosa

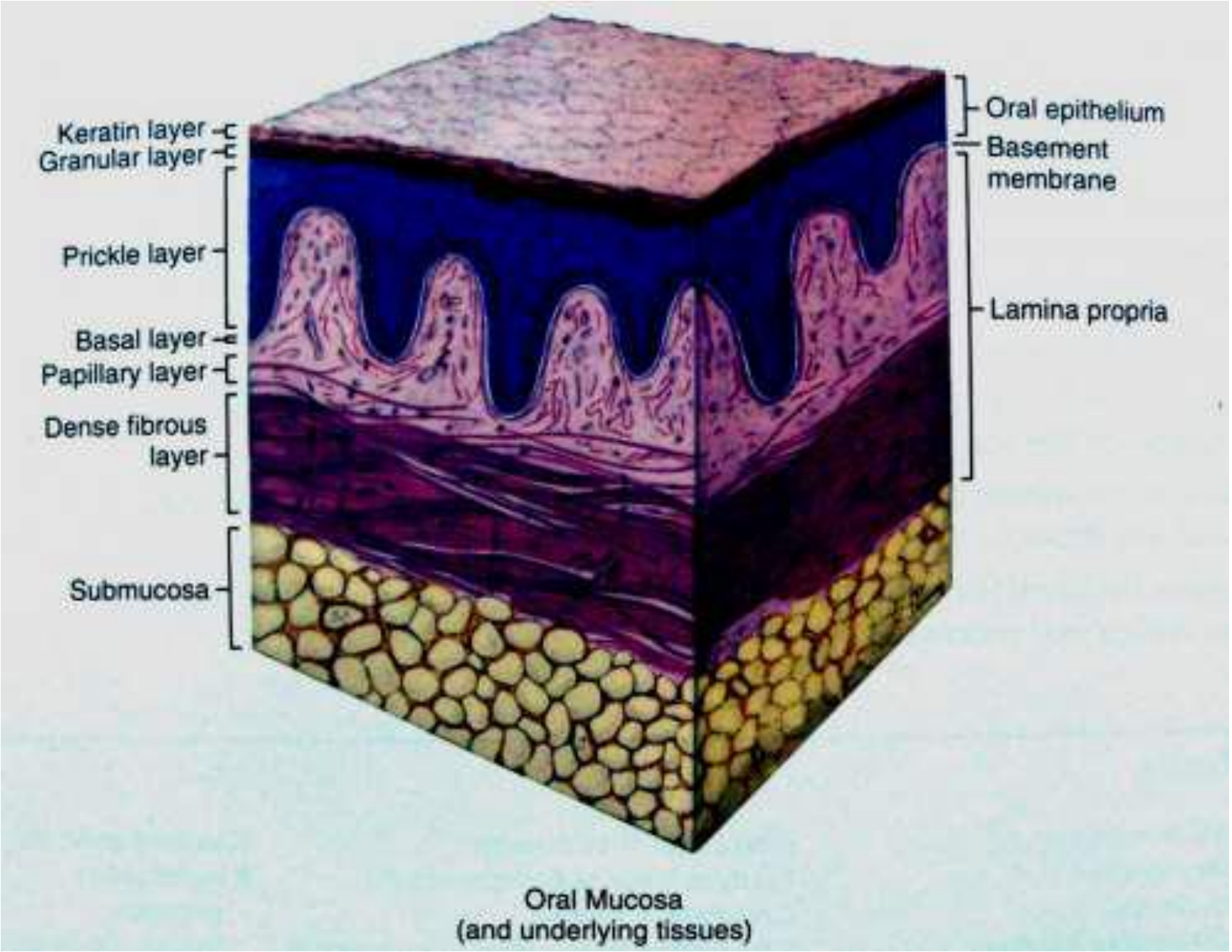
b. **Labial mucosa** refers to the inside lining of the lips and is part of the lining mucosa.

c. **Alveolar mucosa** refers to the lining between the buccal and labial mucosae. It is a brighter red, smooth and shiny with many blood vessels, and is not connected to underlying tissue by rete pegs

3. Specialized mucosa (15%), specifically in the regions of the taste buds on lingual papillae on the dorsal surface of the tongue that contains nerve endings for general sensory reception and taste perception

Structure of Oral Mucosa

- Epithelium
- Lamina Propria.
- Submucosa



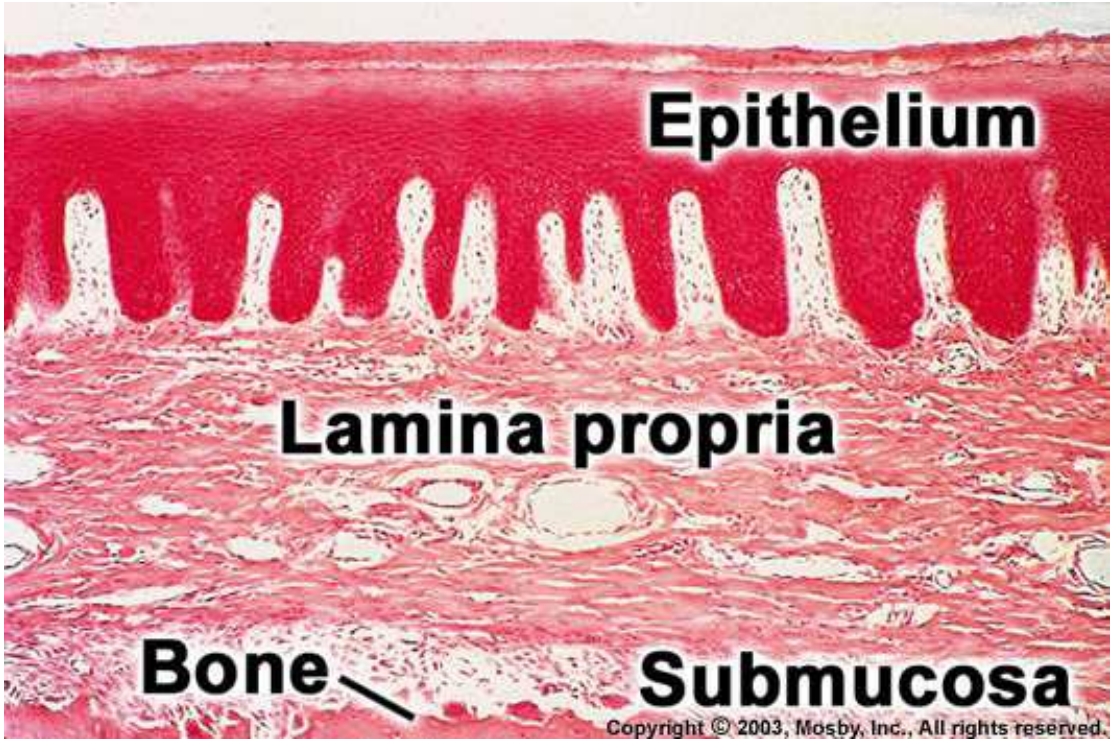
Oral Mucosa
(and underlying tissues)

Epithelium

- Epithelium of the oral mucosa is stratified squamous
- It may be

1.Keratinized

2.Non keratinized epithelium



Keratinized layer

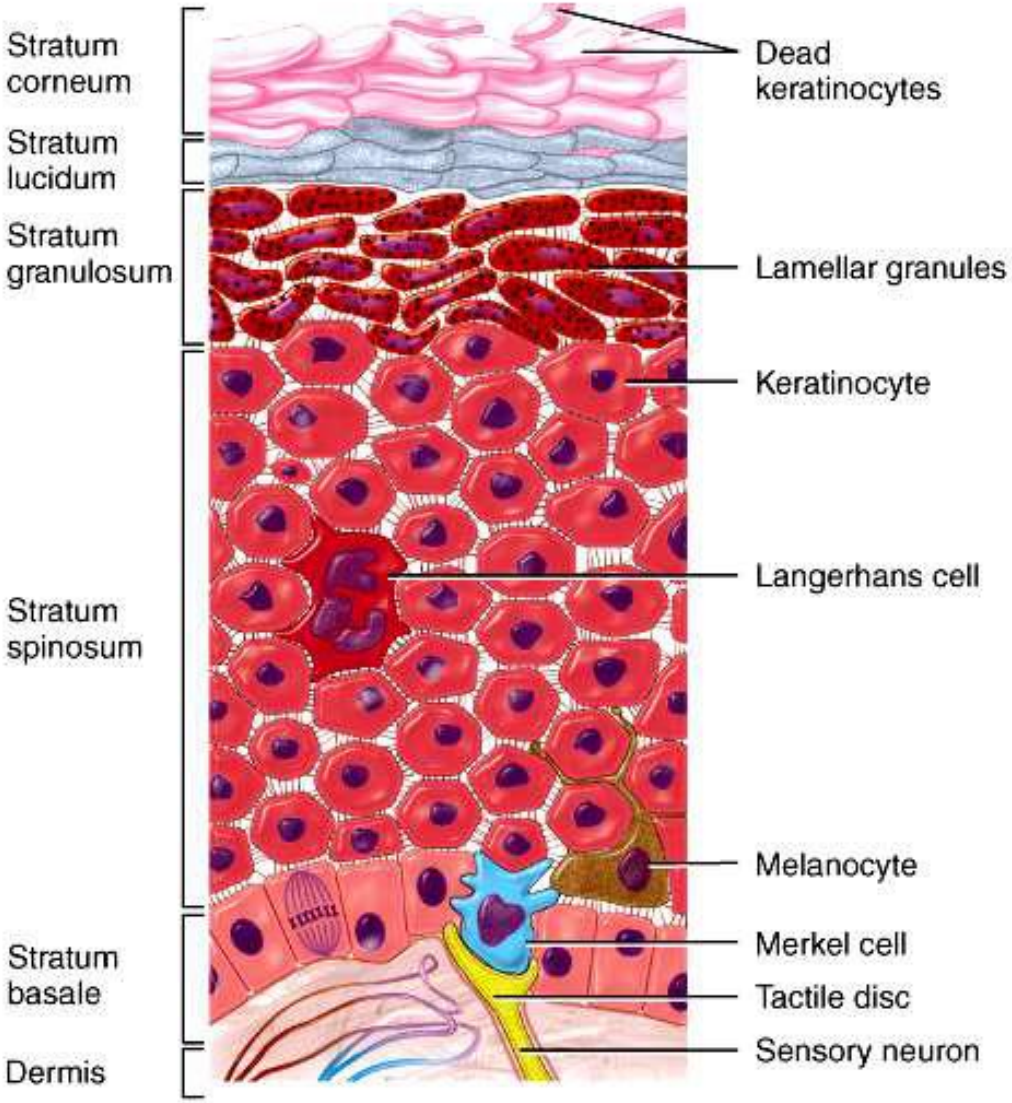
- Ortho keratinized
- Para keratinized

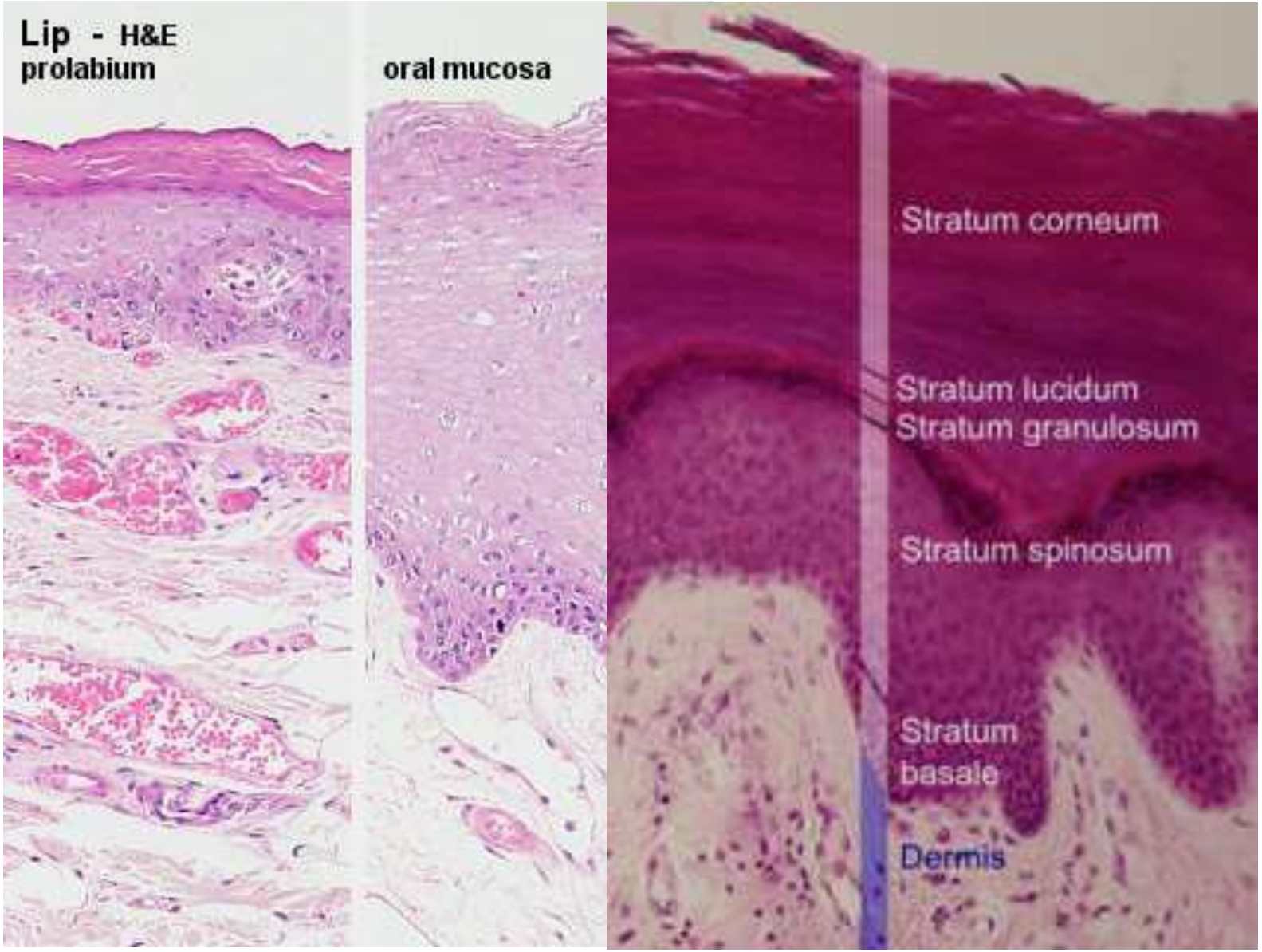
keratinisation and nonkeratinization

Keratinisation:

Inflexible, tough, resistant to abrasion and tightly bound to lamina propria. The mucosal surface results from formation of a surface layer of keratin and process of maturation is called keratinisation or cornification.

Shows 4 stratae:Stratum basale, Stratum spinosum, Stratum granulosum, Stratum corneum.


Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Dermis
Dead keratinocytes
Lamellar granules
Keratinocyte
Langerhans cell
Melanocyte
Merkel cell
Tactile disc
Sensory neuron


Lip - H&E
prolabium
oral mucosa
Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Dermis

Keratinised Epithelium (Electron Microscopy)

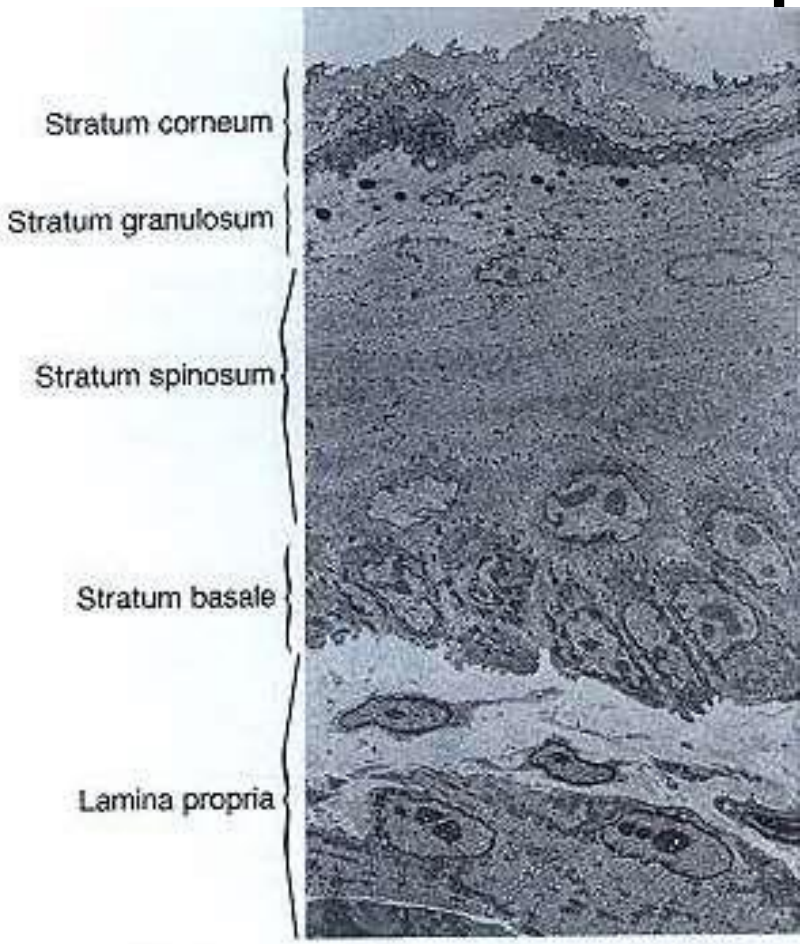
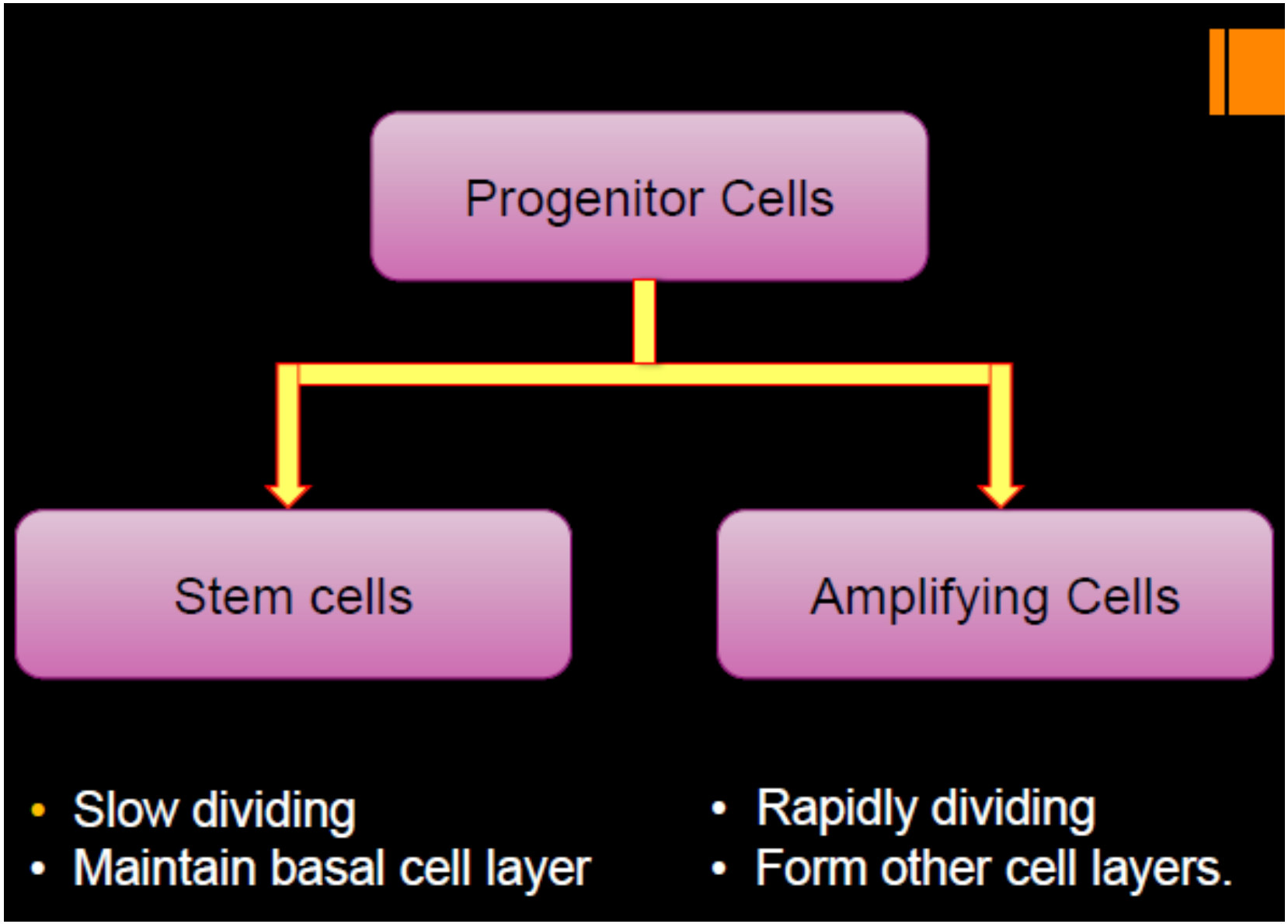


Fig. 14.2 Electron micrograph of keratinized oral mucosa.

Oral epithelium

- Consists of two populations of cells:
- Progenitor population
- Maturing population

- Progenitor cells function is to divide and provide new cells.
- Maturing cells continually undergo a process of differentiation or maturation to form a protective layer


Progenitor Cells
Stem cells
Amplifying Cells
• Slow dividing
• Maintain basal cell layer
• Rapidly dividing
• Form other cell layers.

Non – keratinized epithelium

- Nonkeratinized epithelial cells in the superfacial layers do not have keratin filaments in the cytoplasm

Difference

- **Keratinized**
- Layers - basal, spinosum, granular, cornified layer.
- Produce a cornified surface layer.
- Prickly appearance.

Nonkeratinized

Layers basal, intermediate, surface layer.

Do not produce a cornified surface layer.

Intercellular spaces not obvious-no prickly appearance

Lamina Propria

Two Layers

- Papillary layer

Close to epithelial ridges.
Arranged loosely.

- Reticular layer

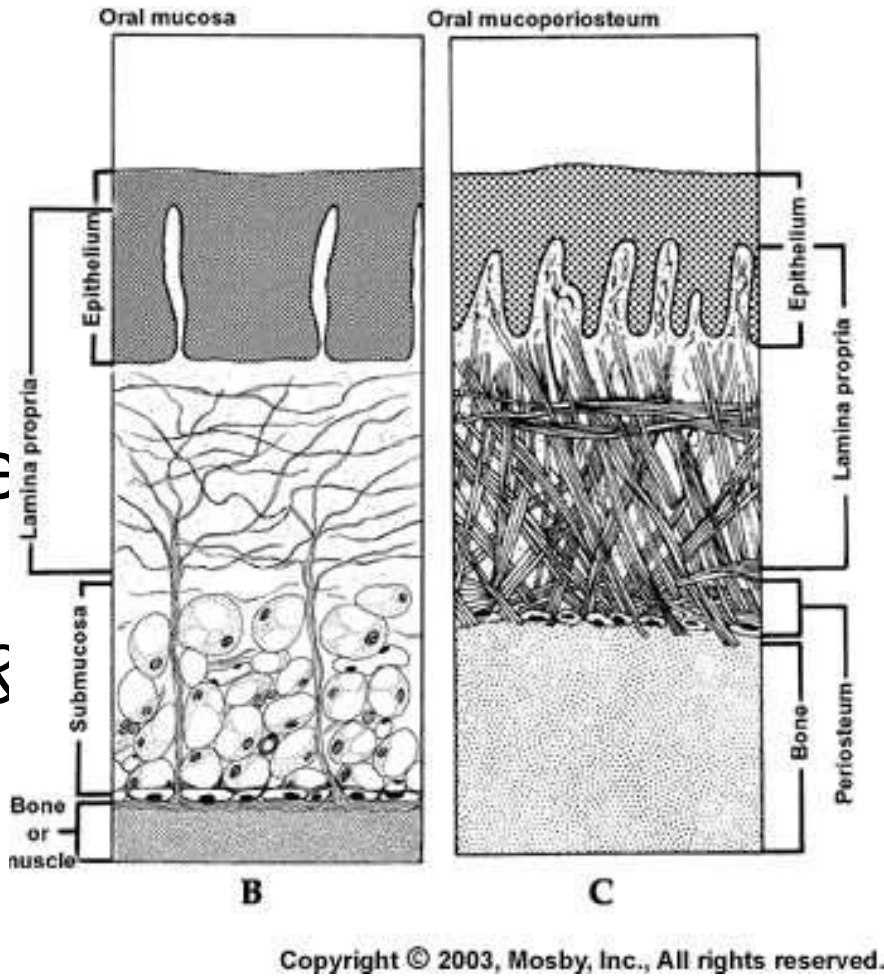
Parallel to epithelium.
Fibers are very thick.

Cells found in lamina propria

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

Submucosa

- It attaches the mucous membrane to the underlying structures – muscle or bone
- loose or a firm attachme and consists of glands, blood vessels, nerves, & adipose tissues.
- connective tissue of various thickness



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Lining mucosa

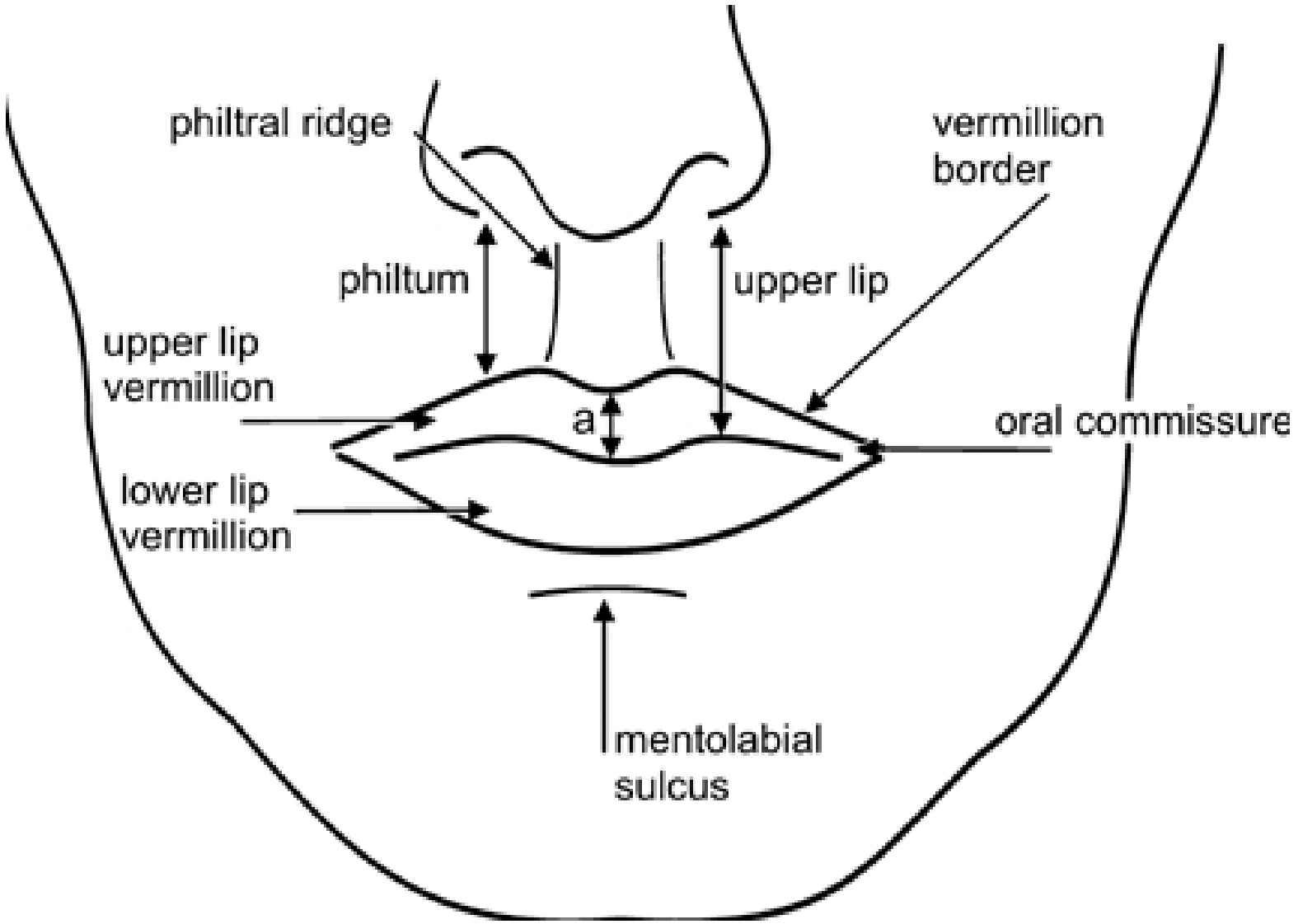
- Covers the floor of mouth, ventral (underside) tongue, alveolar mucosa, cheeks, lips and soft palate.

Lips, covered by lining mucosa

- Lip has skin on outer surface and labial mucosa on inner surface
- Between these tissues lie vermillion/red/transition zone
- Lips have striated muscle that are part of muscles of facial expression
- Minor mucous salivary glands in submucosa beneath oral mucosa
- Skin on outer surface is similar to skin elsewhere with a keratinised layer of epithelium on a bed of connective tissue

Vermilion zone, Junction between the skin and mucous membrane of the lip

- Lacks appendages of skin
- Occasional sebaceous glands at corner of mouth
- Requires constant moistening to prevent drying
- Epithelium: keratinised but thin and translucent
- CT papillae of lamina propria long, narrow; has capillary loops. Hence the red colour


philtral ridge
vermillion
border
philtum
upper lip
upper lip
vermillion
a
oral commissure
lower lip
vermillion
mentolabial
sulcus

Labial mucosa and cheek

- Inner surface of lip
- Covered by relatively thick non keratinised epithelium
- Wide lamina propria
- Short irregular papillae
- Submucosa with minor salivary glands Dense CT strands bind mucosa to underlying orbicular is ores
- Sebaceous glands may be present in cheek as Fordyces spots

Labial mucosa

cheek

Masticatory mucosa

- Covers areas like **hard palate and gingiva** which are exposed to compressive and shear forces and to abrasion during mastication of food.
- Epithelium: moderately thick, frequently orthokeratinised though areas of parakeratinisation may be seen

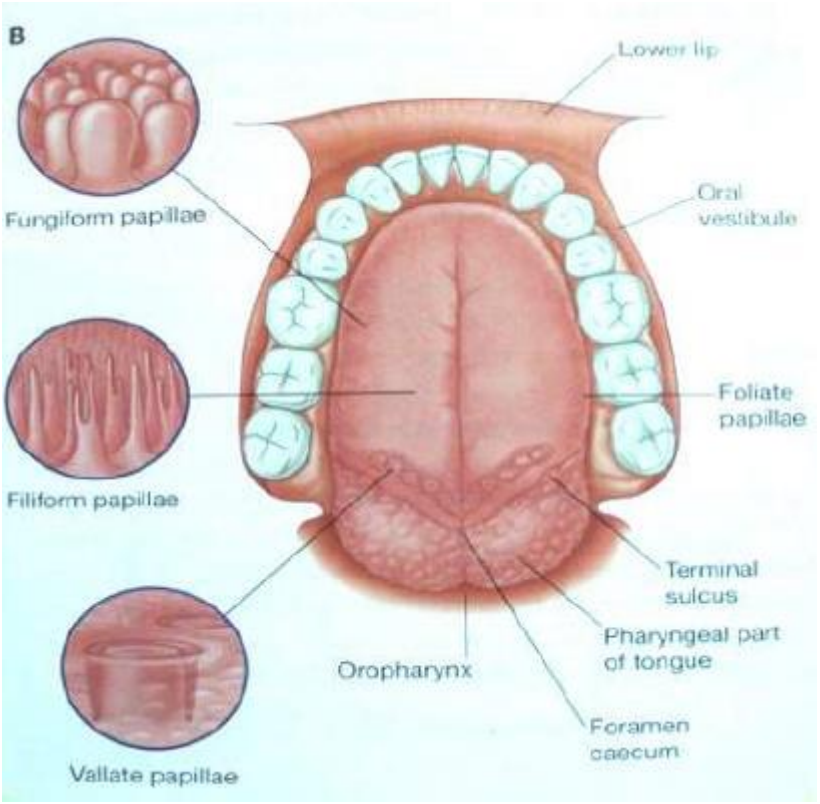
- Junction between epithelium and lamina propria: convoluted with numerous elongated papillae
- Lamina propria: thick, contains dense network of collagen fibres as large closely packed bundles enabling mucosa to resist heavy loading.

Mucosa of the Tongue – Specialised mucosa

- Anatomical division
- It is divided into two parts by a V-shaped groove known as sulcus terminalis.
- Anterior 2/3rd or papillary portion or body of the tongue contains lingual papillae.
- Posterior 1/3rd is lymphatic portion or base of the tongue contains lingual tonsil.

The different papillae found on the dorsal surface of the tongue are:

- Filliform papillae
- Fungiform papillae
- Circumvallate papillae
- Foliate papillae

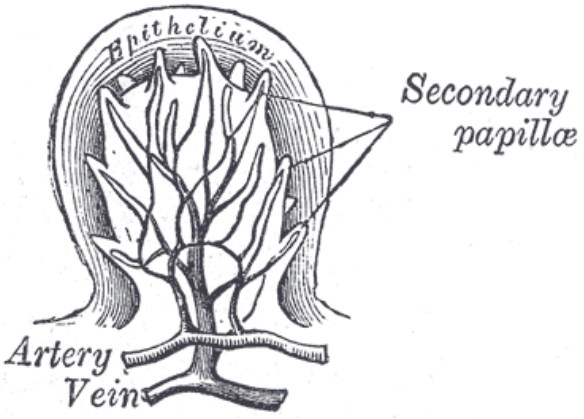


Filliform papillae

- Pointed extensions of the keratinized epithelial cells
- Most numerous papillae of the tongue
- Not associated with taste buds

Fungiform papillae

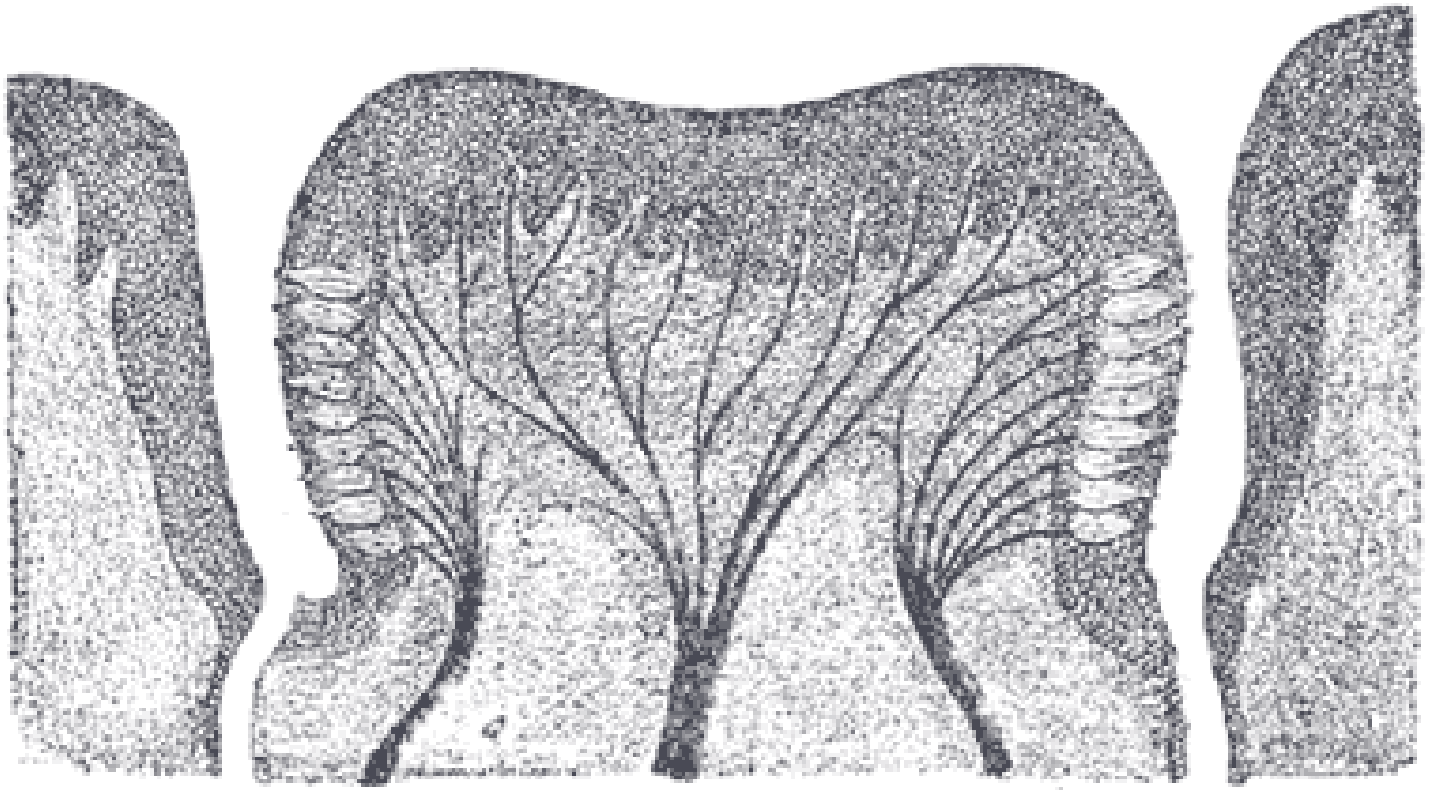
- Fewer than the filliform papillae and are scattered over the dorsal surface of the tongue
- Rounded elevations above the surface of the tongue
- Have taste buds on their superior surfaces
- Not keratinized

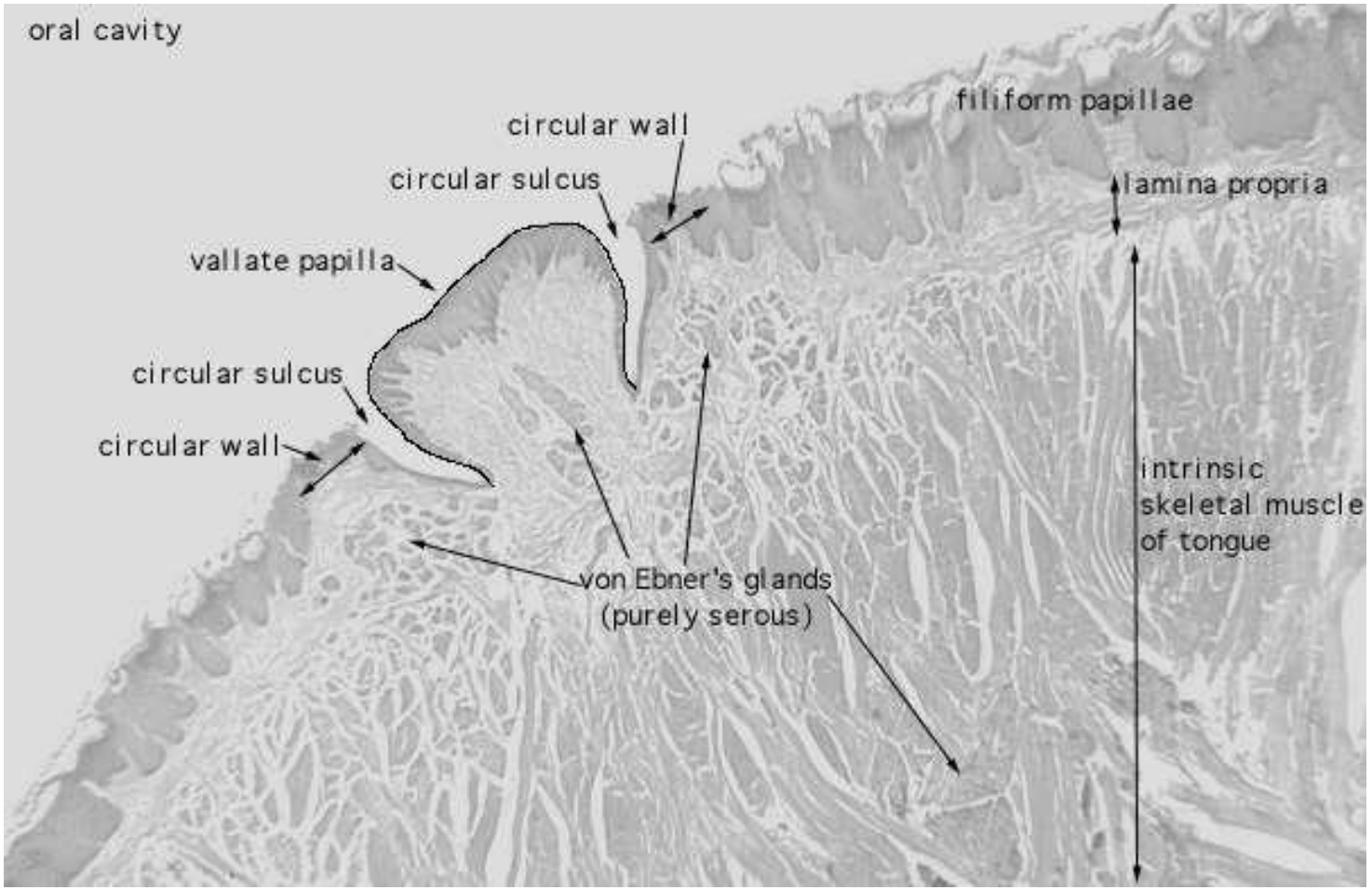


Circumvallate papillae

- Located at the junction of the anterior two thirds (body) and posterior one thirds (base) of the tongue
- There are eight to twelve in number
- Lined with taste buds and also openings of serous glands
- The secretion from the serous glands washes away food for renewal of taste

Circumvallate papillae

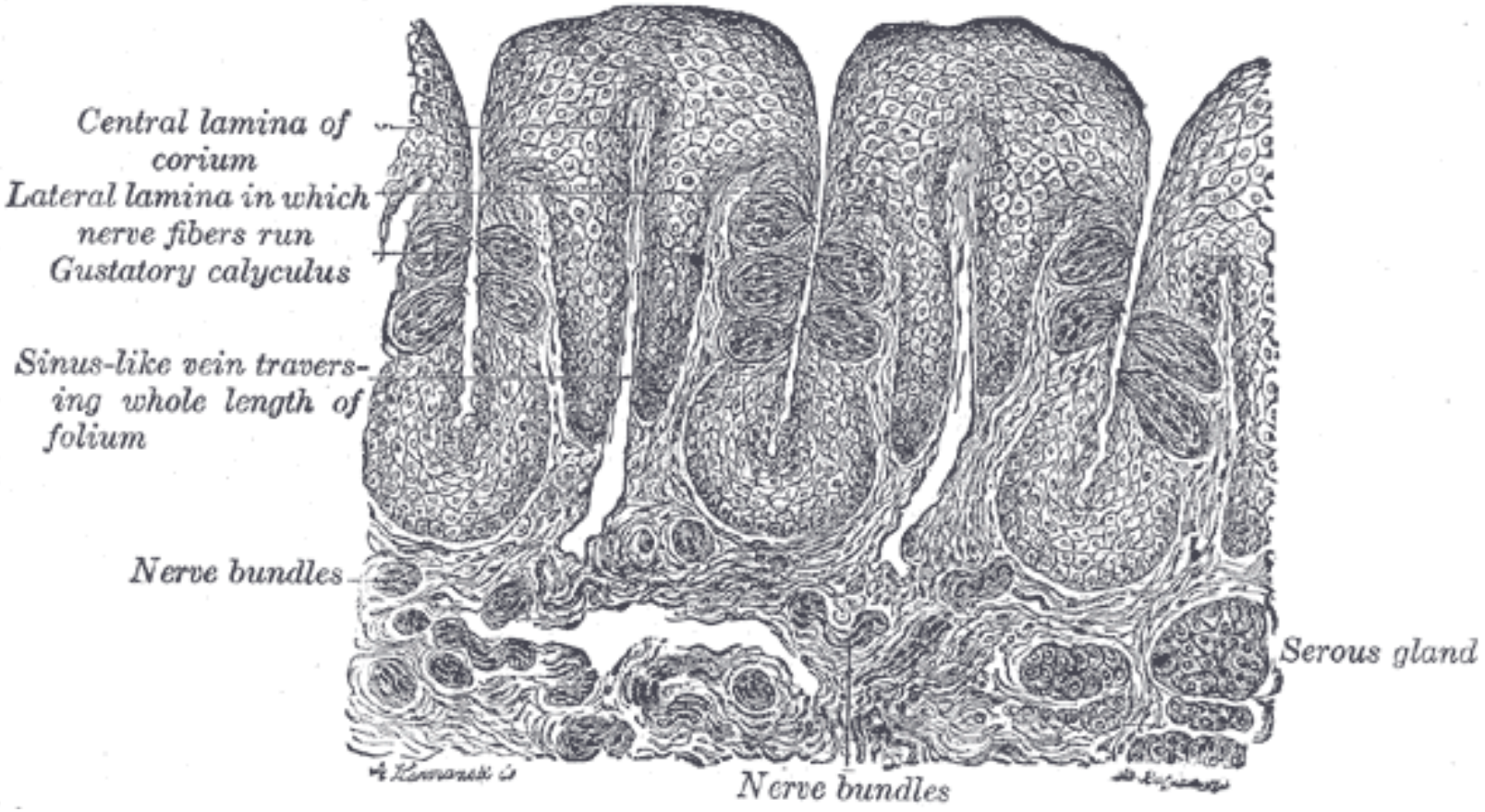



oral cavity
filiform papillae
circular wall
circular sulcus
lamina propria
vallate papilla
circular sulcus
circular wall
intrinsic
skeletal muscle
of tongue
von Ebner's glands
(purely serous)

Foliate papillae

- Located in the furrows along the posterior sides of the tongue
- Lined with taste buds
- Not prominent in human beings

Foliate papillae

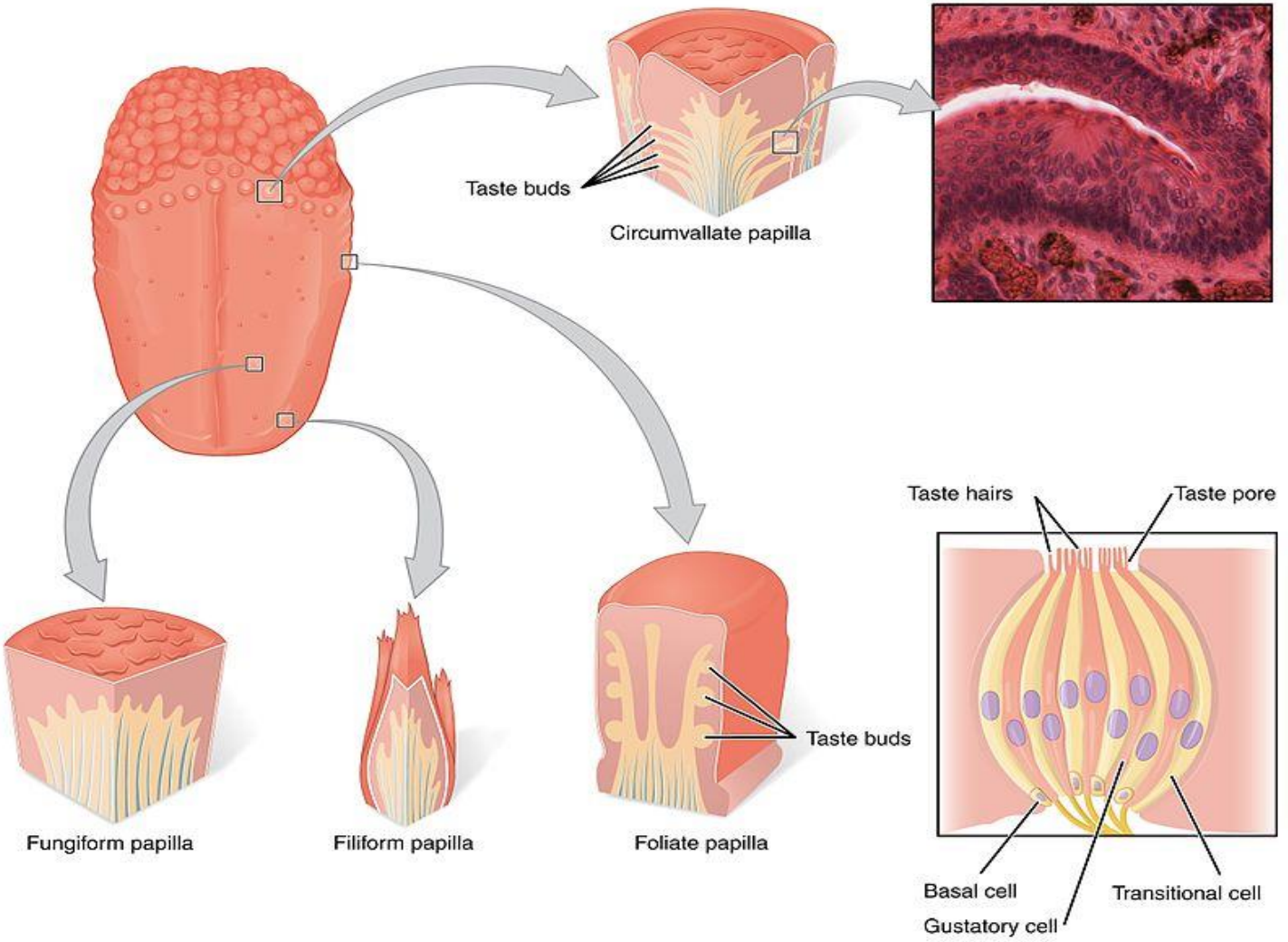


Taste bud

Shier, David (2016). *Hole's Human Anatomy and Physiology*.

- **Taste buds** contain the taste receptor cells, which are also known as gustatory cells. The taste receptors are located around the small structures known as papillae found on the upper surface of the tongue, soft palate, upper esophagus, the cheek, and epiglottis.

Taste buds are small structures present within the papillae of the tongue

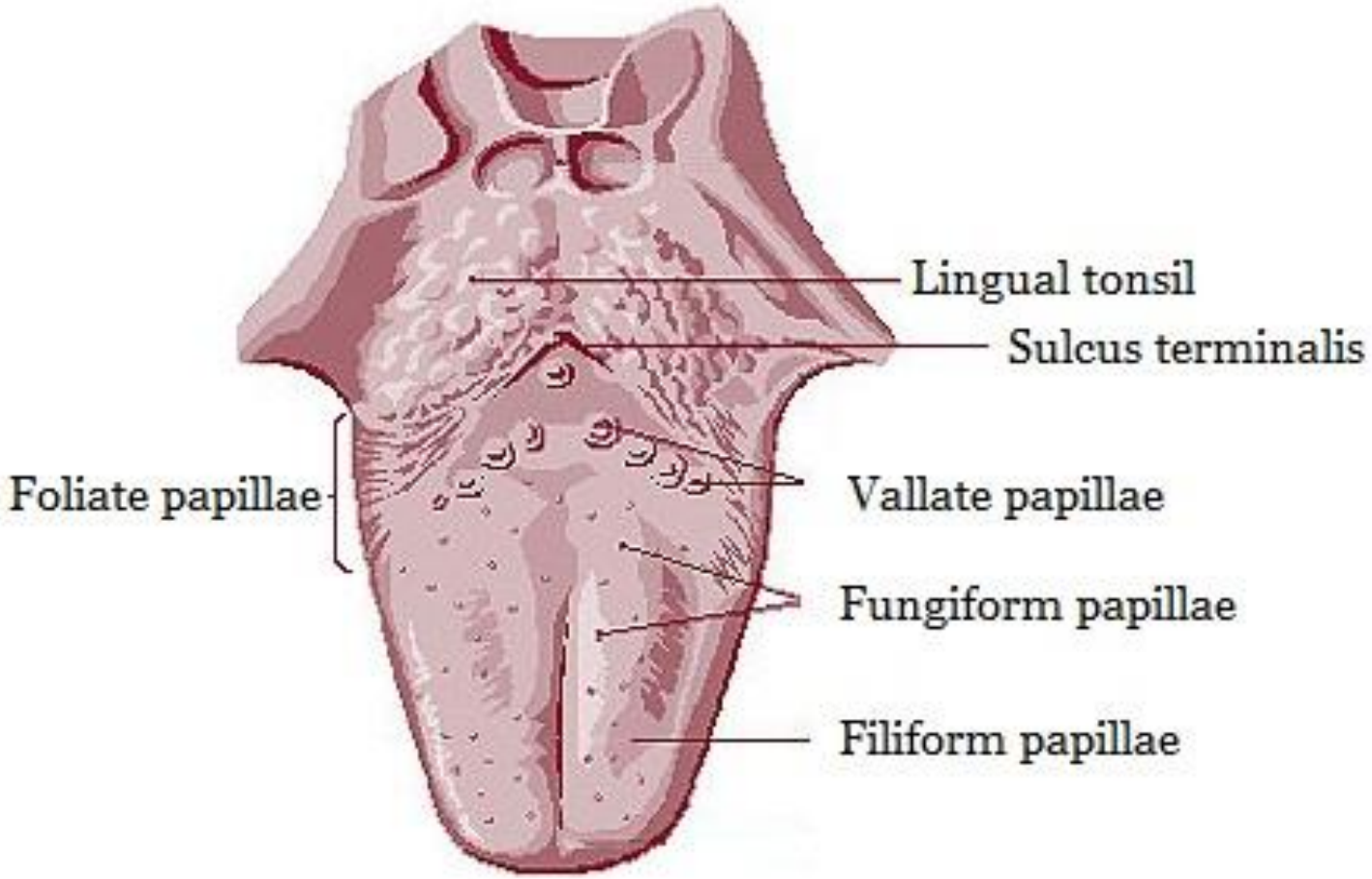


Function

Susan Standring (editor in chief)] (2008). "Chapter 33: NECK AND UPPER AERODIGESTIVE TRACT". *Gray's anatomy : the anatomical basis of clinical practice*

- Lingual papillae, particularly filiform papillae, are thought to increase the surface area of the tongue and to increase the area of contact and friction between the tongue and food.This may increase the tongue's ability to manipulate a bolus of food, and also to position food between the teeth during mastication (chewing) and swallowing.

Lingual papillae localization



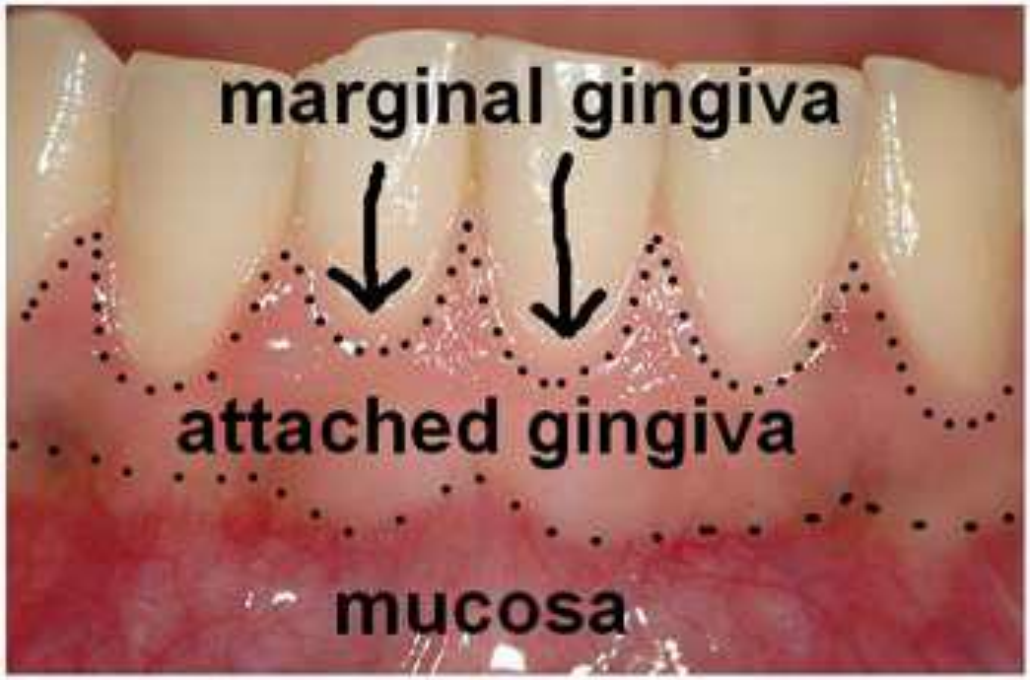
Hard Palate

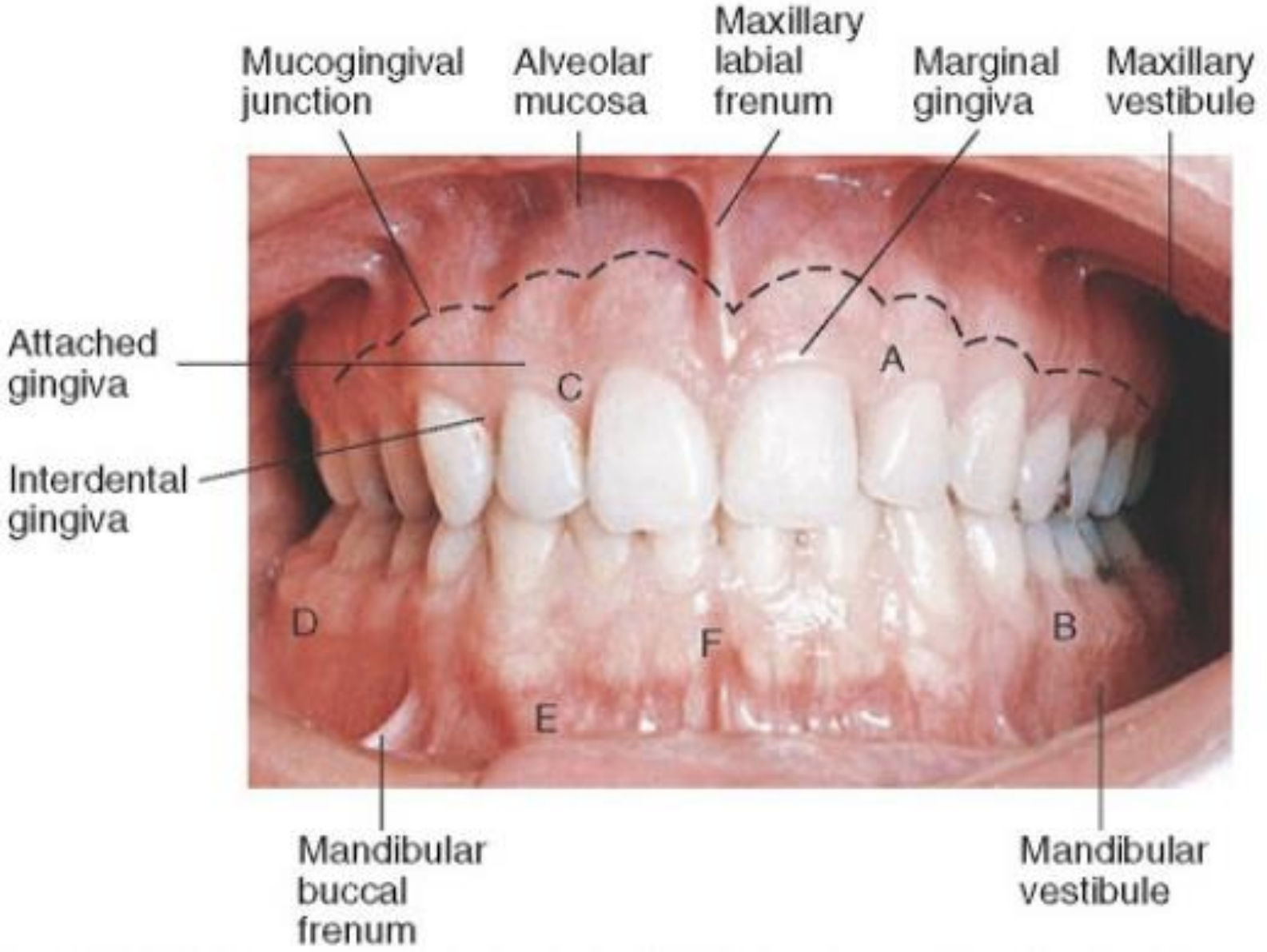
- Covered by masticatory mucosa lateral regions of the posterior part contains palatine glands

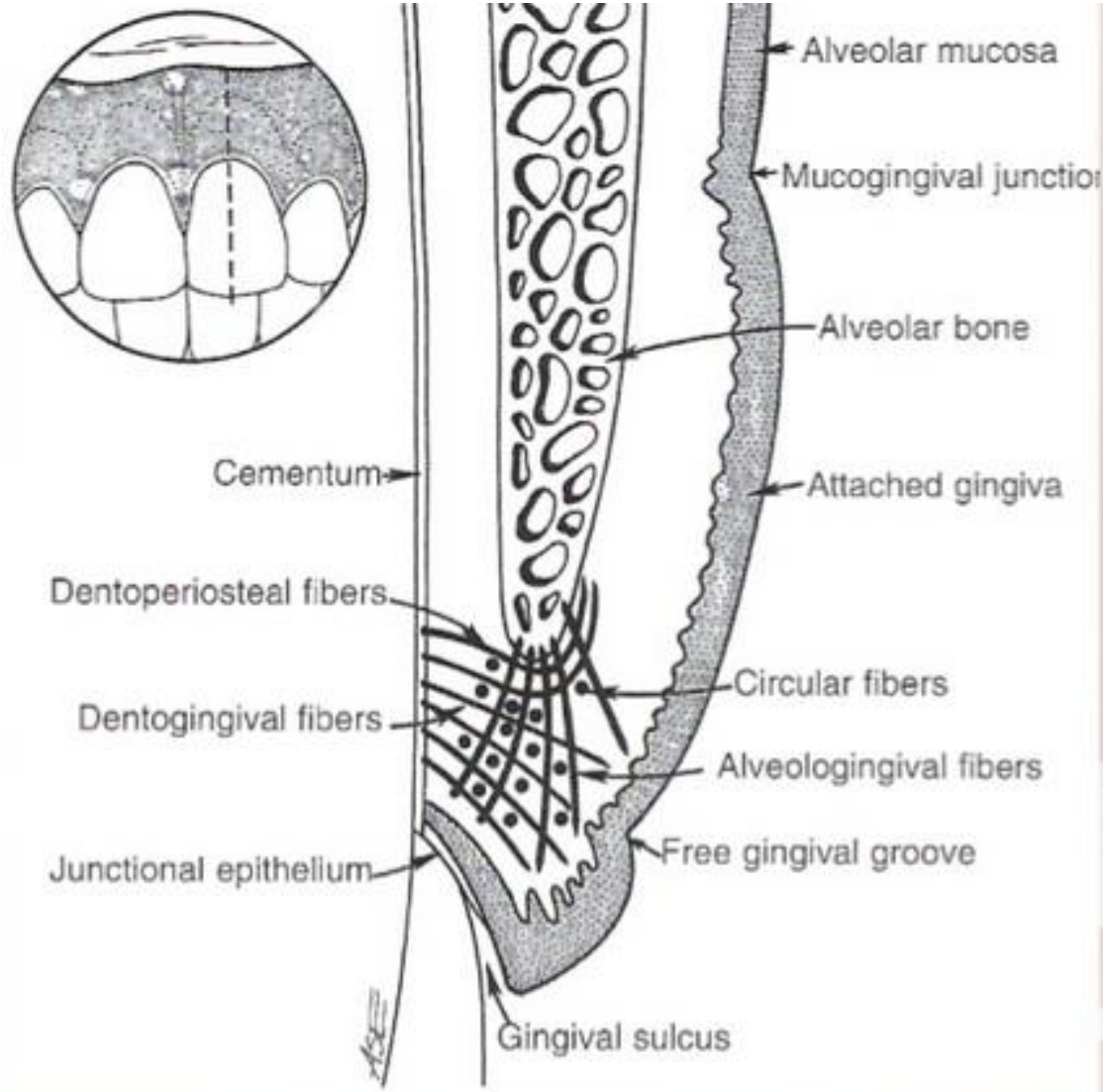
Gingiva

- Covers the alveolar process of jaws and surrounds the cervical portion of teeth.
- It develops from the union of oral epithelium and reduced enamel epithelium

- Gingiva can be classified as
- Free gingiva,
- Attached gingiva and
- Interdental papilla




Mucogingival junction
Alveolar mucosa
Maxillary labial frenum
Marginal gingiva
Maxillary vestibule
Attached gingiva
Interdental gingiva
A
B
C
D
E
F
Mandibular buccal frenum
Mandibular vestibule



Histology of gingiva

Oral Manifestations of Systemic Diseases at eMedicine

- The oral cavity has sometimes been described as a **mirror** that reflects the health of the individual.

Mak, Karen (2009). "Scarless healing of oral mucosa is characterized by faster resolution of inflammation and control of myofibroblast action compared to skin wounds in the red Duroc pig model". *Journal of Dermatological Science*.

- The oral mucosa tends to heal faster and with less scar formation compared to the skin.

oral lesions

PRIMARY LESION:

- Macule, Plaques, Papule, Patch
- Nodule, Tumor
- Vesicle, Bulla, Pustule
- Petechia, Ecchymosis

SECONDARY LESION

- Erosion,
- Ulcer,
- Scar,
- Infiltration.

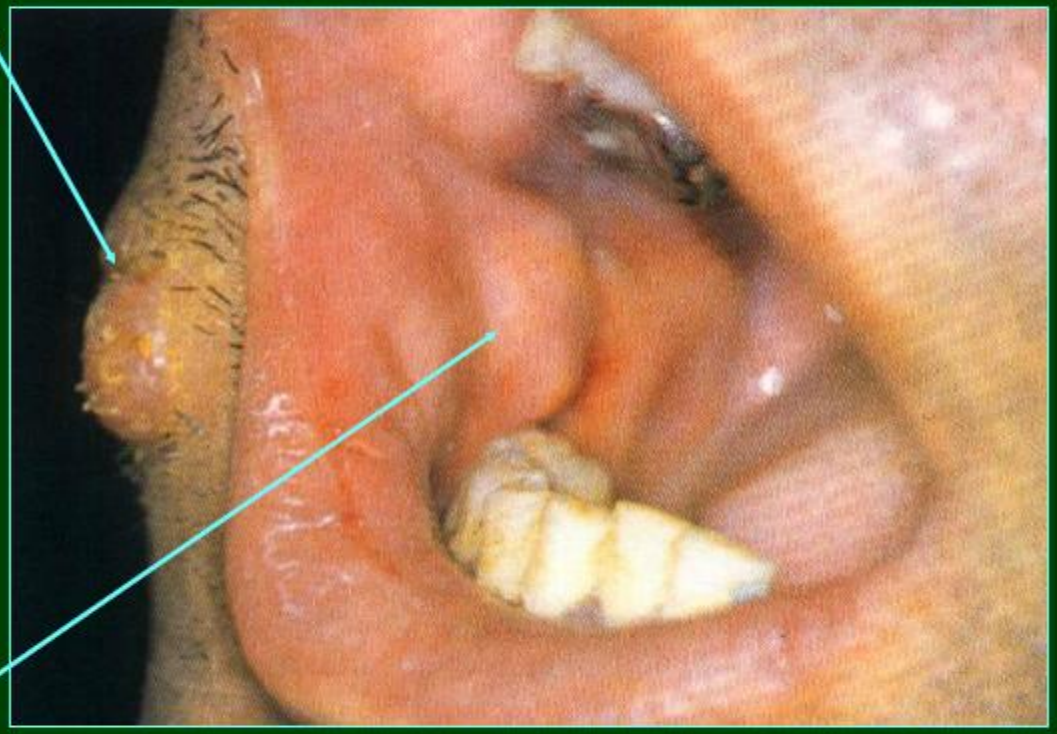
Macule: Sharply circumscribed discoloration (flat) up to 1 cm in diameter

Patch: Sharply circumscribed discoloration (flat) more than 1 cm in diameter

Papule: Well circumscribed, solid, flat-topped raised lesion up to 1 cm in diameter

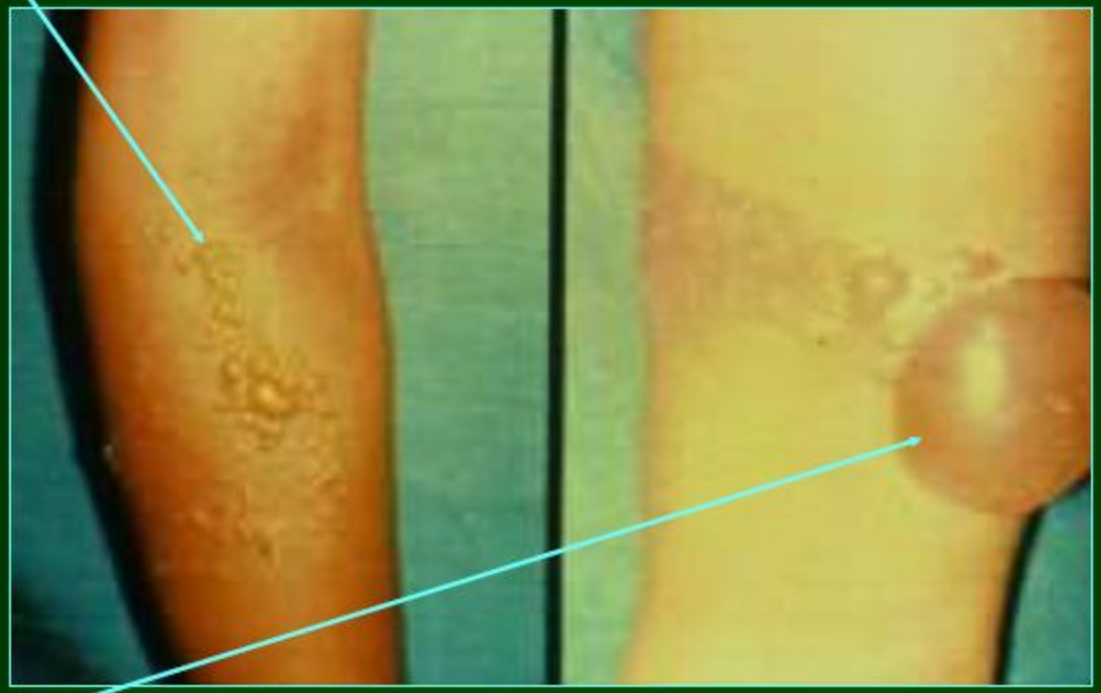
Plaque: Well circumscribed solid raised lesion more than 1 cm in diameter

Nodule: Well circumscribed solid, rounded projection up to 1 cm in diameter



Tumor: Well circumscribed solid, rounded projection more than 1 cm in diameter

Vesicle: Sharply circumscribed serous fluid-filled elevation up to 1 cm in diameter



Bulla: Sharply circumscribed serous fluid-filled elevation more than 1 cm in diameter

Vesicle: Sharply circumscribed serous fluid-filled elevation up to 1 cm in diameter

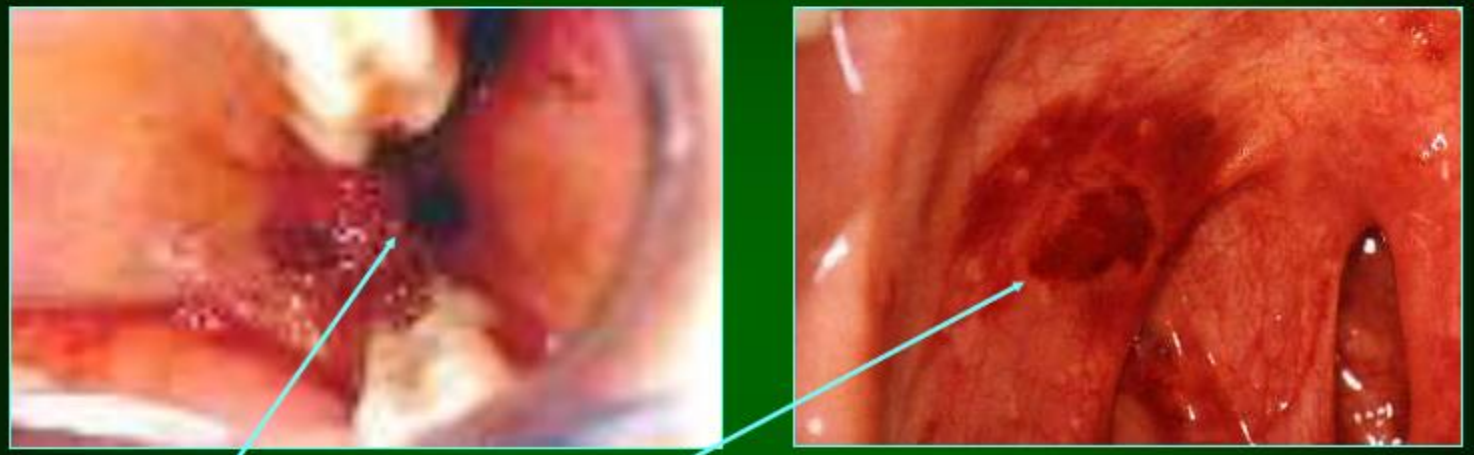
Bulla: Sharply circumscribed serous fluid-filled elevation more than 1 cm in diameter

Vesicle: Sharply circumscribed serous fluid-filled elevation up to 1 cm in diameter

Bulla: Sharply circumscribed serous fluid-filled elevation more than 1 cm in diameter

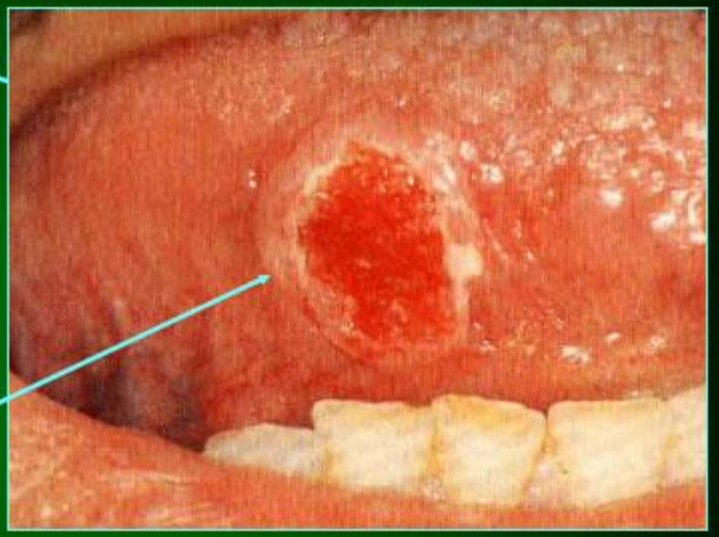
Pustule: Sharply circumscribed pus-filled elevation similar to vesicle or bulla

Petechiae: Sharply circumscribed deposit of blood or blood pigments up to 1 cm in diameter



Ecchymosis: Sharply circumscribed deposit of blood or blood pigments more than 1 cm in diameter

Erosion: Loss of superficial layers of epithelium



Ulcer: Break in the continuity of the epithelium (deeper than an erosion)

Scar: Deposit of highly fibrous tissue subsequent to ulcer or injury

Infiltration: Extension of the primary lesion into the deeper tissue causing fixity or induration

Oral Examination

- **Many diseases (systemic or local) have signs that appear on the face, head & neck or intra-orally.**
- **Making a complete examination can help you create a differential diagnosis in cases of abnormalities and make treatment recommendations based on accurate assessment of the signs & symptoms of disease.**

- **Each disease process may have individual manifestations in an individual patient**
- **And there may be individual host reaction to the disease**
- **Careful assessment will guide the clinician to accurate diagnosis**

Equipment

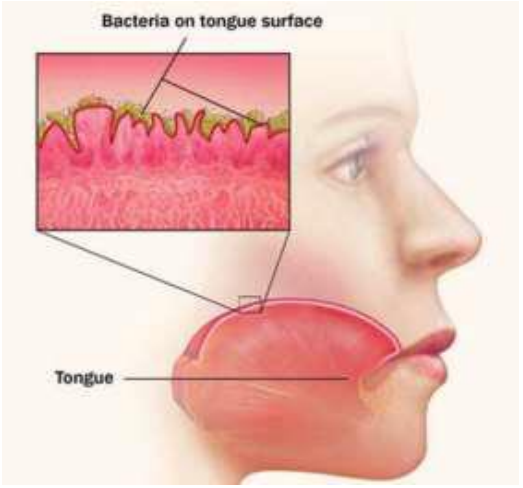
- Assure that you have all the supplies
- necessary to complete an oral examination
- Mirror
- Tissue retractor (tongue blade)
- Dry gauze

Equipment

- You must dry some of the tissues in order to observe the nuances of any color changes

Breath

- Oral odors can indicate:
- Infection: caries, periodontal dx
- URT infections
- Chronic G.I. disturbances
- Lung abscess
- Diabetic acidosis
- Uremia, kidney problem
- Liver failure: mousy, musty odor
- Self-medication with alcohol

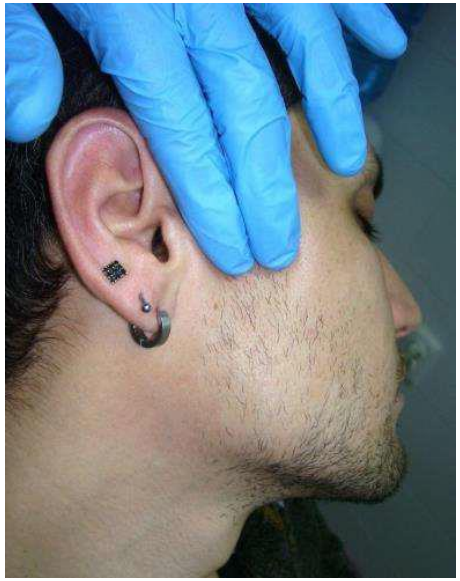


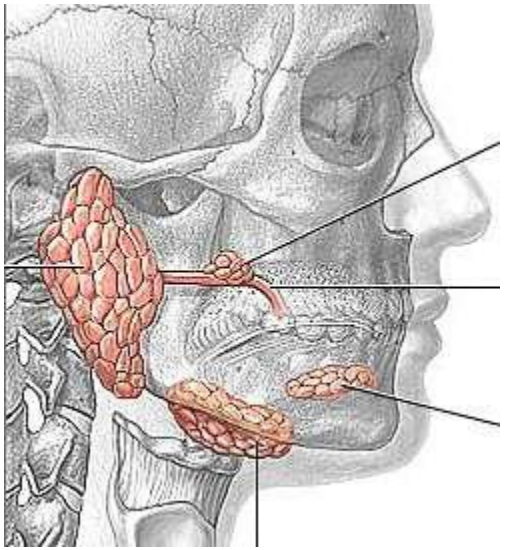
Extra-oral examination

- Observe: color of skin, eyes

Extra-oral examination

- Major salivary glands (palpation)
- -Position
- -Size



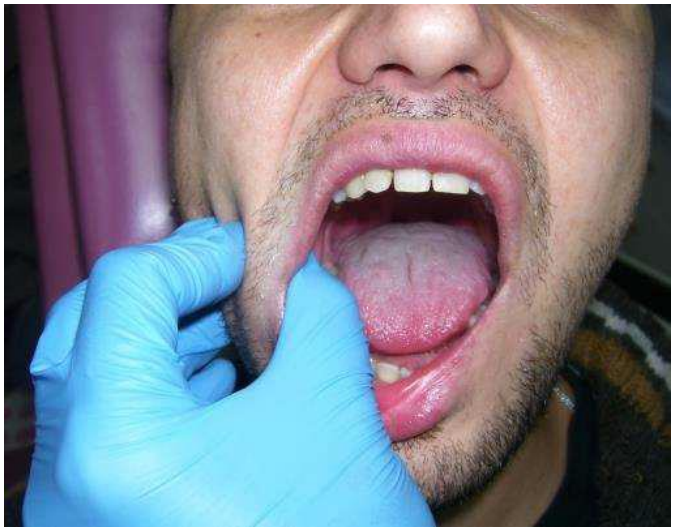


Extra-oral examination

- TMJ
- Palpate upon opening
- Use stethoscope to listen to sounds

Extra-oral examination

- **Digestion mussels – m. masseter m. temporalis**
- Bidigital palpation during function
- Pain?
- Trismus (lockjaw)
- Tumors?



Extra-oral examination

- Lymph node palpation

Intra-oral examination, Exam: Lips

- Observe the color & its consistency: intra-orally and
- externally
- Is the vermillion border distinct?
- Bi-digitally palpate the tissue around the lips. Check for
- nodules, bullae, abnormalities, mucocele, fibroma

Exam: Lips

Exam: Lips

- **Clear mucous filled pockets may be seen on the inner side of the lip (mucocele). This is a frequent, non-pathologic entity which represents a blocked minor salivary gland**

Exam: Lips

- Evert the lip and examine the tissue
- Observe frenum attachment/tissue tension

Examination: Buccal Mucosa

- Observe color, character of the mucosa
- Normal variations in color among ethnic groups
- Amalgam tattoo
- Palpate tissue
- Observe Stenson's duct opening for inflammation or signs of blockage
- Visualize muscle attachments, hamular notch, pterygomandibular folds

Examination: Buccal Mucosa

- Linea alba
- Stenson's duct

Examination: Buccal Mucosa

- Lesions – white, red
- Lichen Planus, Leukedema

Gingiva

- Note color, tone, texture, architecture & mucogingival relationships

Gingiva

- How would you describe the gingiva?
- Marginal vs. generalized?
- Erythematous vs. fibrous
- Drug reactions: Anti-epileptic, calcium channel blockers, immunosuppressant

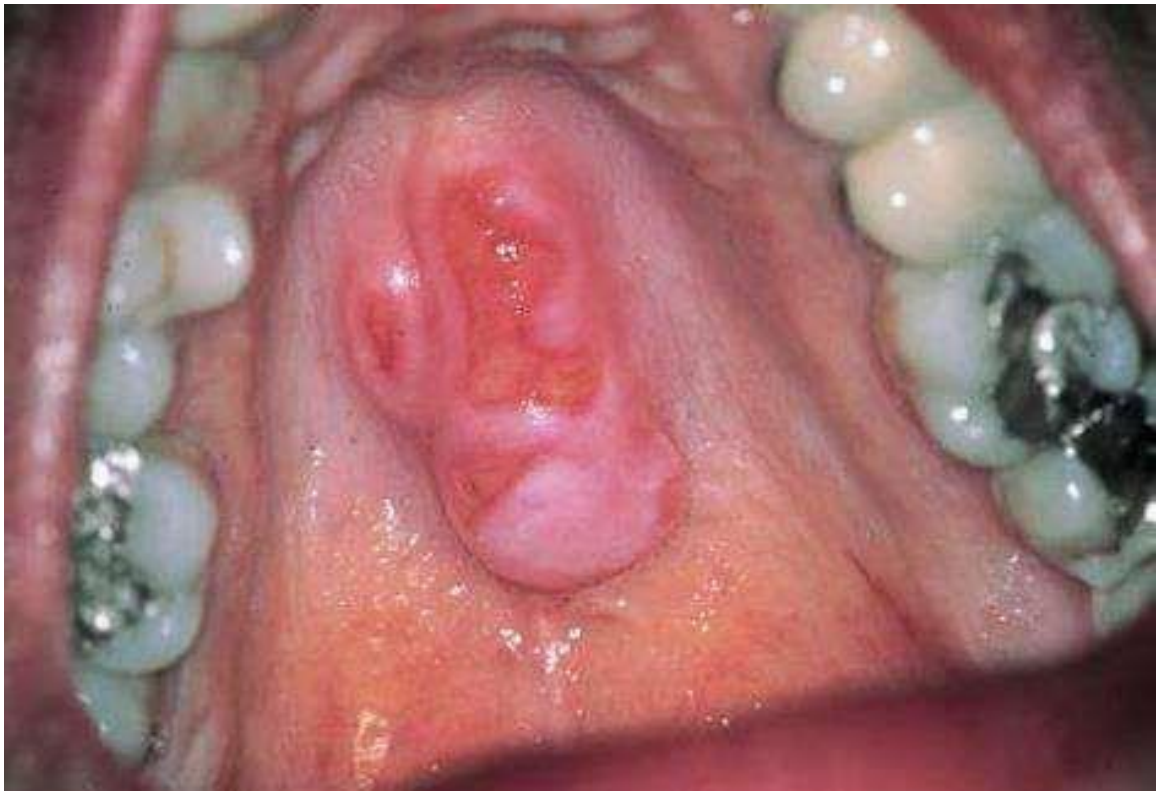
Exam: Hard palate

- Minor salivary glands, attached gingiva
- Note presence of tori

Nicotine stomatitis (smoker's palate)

Oro-nasal communication

Ulcerated torus palatinus



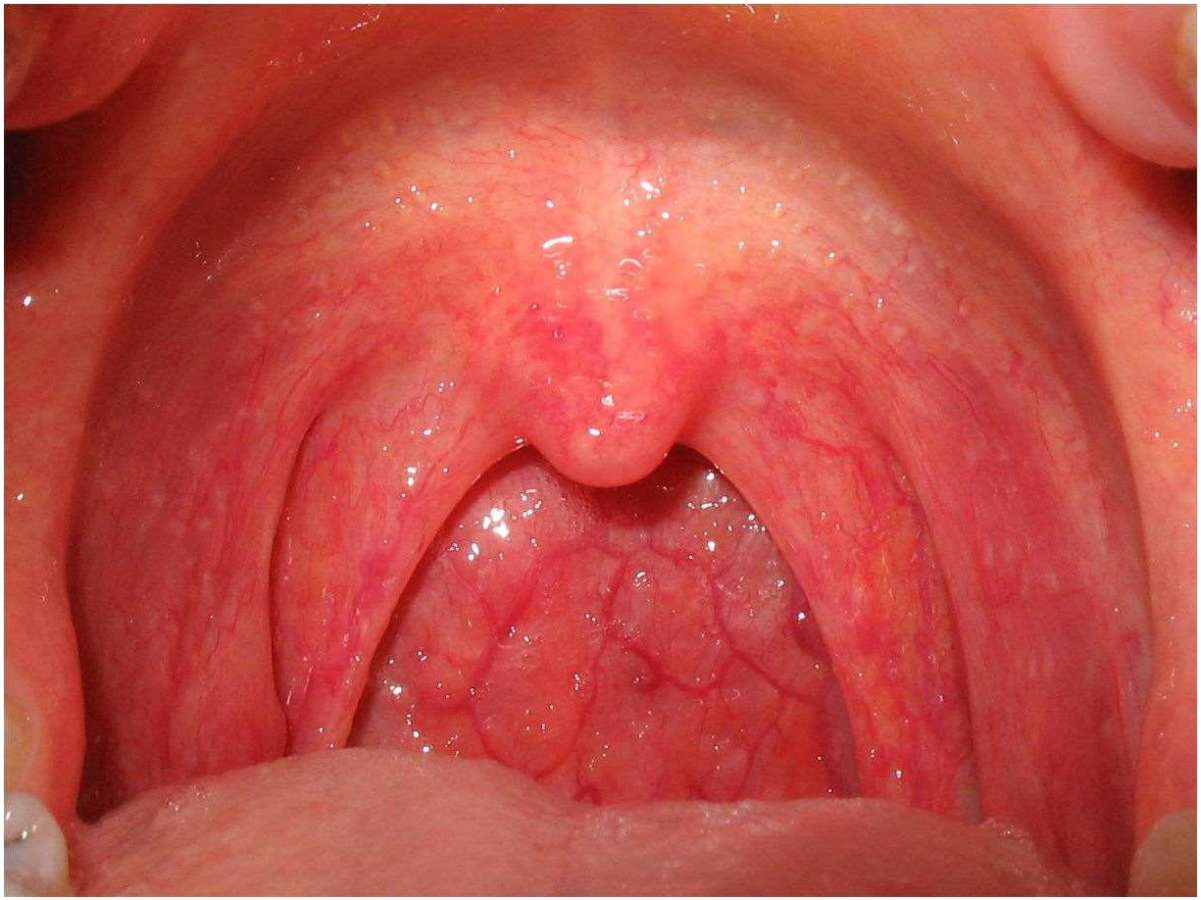
Exam: Soft palate

- How does soft palate raise upon “aah”?
- Vibrating line, tonsilar pillars, tonsils,
- oropharynx

Exam: Oropharanyx

- Color, consistency of tissue
- Look to the back, beyond the soft palate
- Note occasional small globlets of transparent or pink opaque tissue which are normal and may include lymphoid tissue

Exam: Oropharanyx



Exam: Tonsils

- Tucked in at base of anterior & posterior tonsilar pillars
- Globular tissue that has “punched out” appearing areas
- Regresses after adulthood
- May see white “orzo rice like” or “torpedo” shaped white concretions within the tissue

Exam: Tongue

- The tongue and the floor of the mouth are the most common places for oral cancer to occur
- It can occur other places; so visualize all areas
- You may observe:
- Circumvalate papillae, epiglottis

Exam: Tongue

Exam: Tongue

- You may observe lingual varicosities

Exam: Tongue

- You may observe geographic tongue

Exam: Tongue

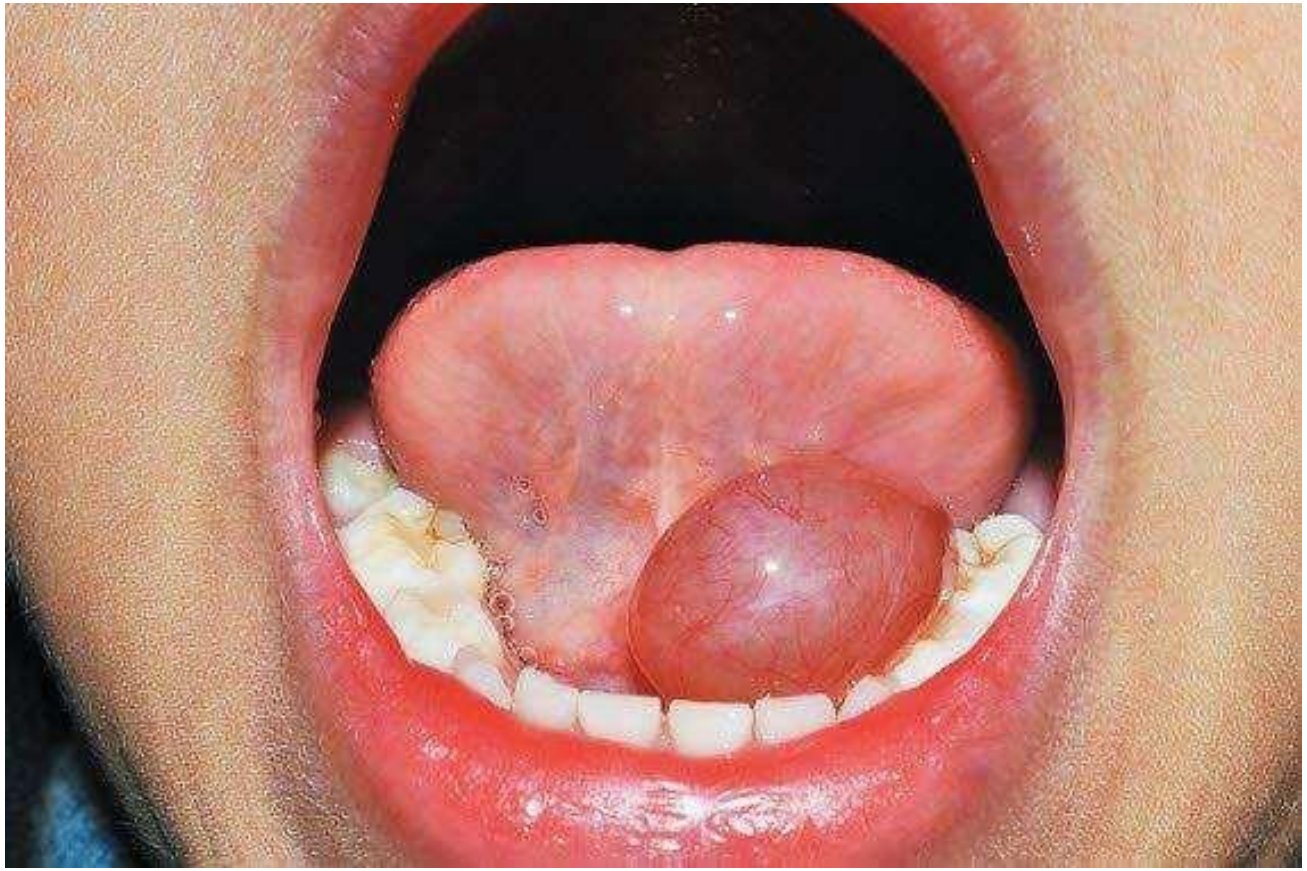
- You may observe oral cancer

Exam: Floor of mouth

- Visualize, palpate - bimanually
- Wharton's duct
- Must dry to observe
- Does "lesion" wipe off ?
- Where are the two most likely areas for oral cancer?
- lateral border of the tongue
- Floor of mouth

Palpation of the floor of the mouth

“Ranula”



BLOOD INVESTIGATIONS

- These can detect abnormalities such as
- Infection
- Anaemia
- Allergies

Blood investigation helps in diagnosing

- Leukopenia
- Thrombocytopenia
- Myeloma
- Anemia *Iron deficiency

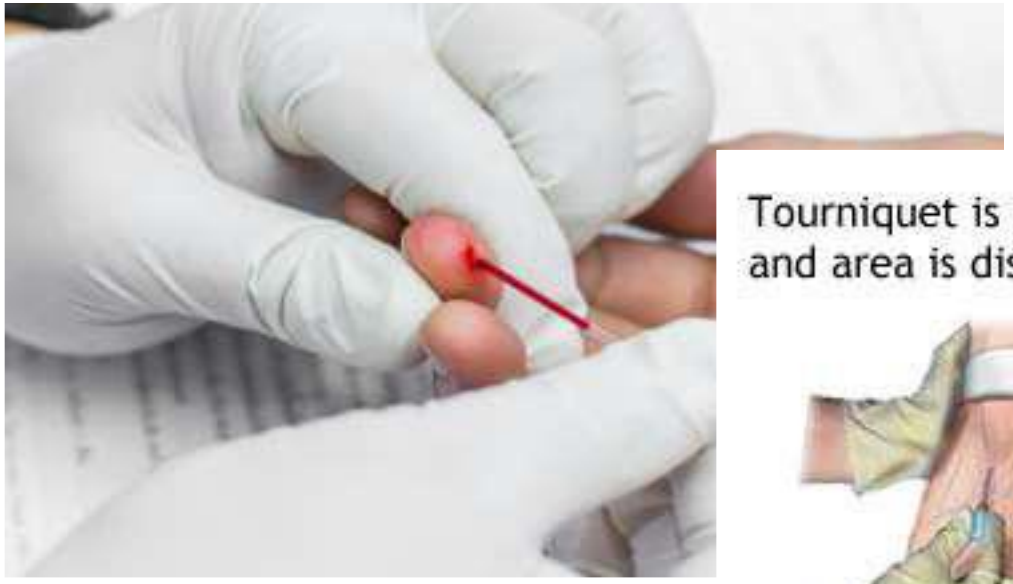
Aplastic

Sickle cell anemia

Thalassemia

- Acute and Chronic leukemia
- liver disease
- Myxedema
- Diabetes

COLLECTION OF BLOOD SAMPLE



Tourniquet is applied and area is disinfected

Needle is introduced into vein, blood is drawn into vial and analyzed

- WBC count
- •Differential
- Leukocyte count
- •RBC count
- •Hemoglobin
- •Hematocrit
- •Erythrocytes indices
- •Platelet Count
- •Bleeding time
- •Capillary Fragility Test
- •Clotting Time
- •Erythrocyte Sedimentation Rate

WBC

- White blood cell count (WBC or leukocyte count)
- WBC differential count

RBC

- Red blood cell count (RBC or erythrocyte count)
- Hematocrit (Hct)
- Hemoglobin (Hbg)
- Mean corpuscular volume (MCV)
- Mean corpuscular hemoglobin (MCH)
- Mean corpuscular hemoglobin concentration (MCHC)

PLATELET

- Platelet count

Other investigation

- Cytological examination
- Biopsy
- bacteriological

CLASSIFICATION OF ORAL DISEASES

- Based on etiology: viral, traumatic
- Based on the pathological process involved: inflammatory, neoplastic
- Based on symptoms: recurrent, painful conditions, tumorous conditions
- Based on clinical appearance of lesions: ulcerative, vesicular, erosive
- Based on origin: developmental, acquired

At the department of hospital dentistry MMSI used in teaching and clinical work following classification of diseases of the oral mucosa.

- I. Traumatic injuries (mechanical, chemical, physical), namely traumatic erythema, erosion, ulcers, leukoplakia, nicotine leykokeratoz, actinic cheilitis, radiation, chemical damage, etc.

- II. Infectious diseases:
- 1) viral (herpetic stomatitis, herpes zoster, foot and mouth disease, viral warts, influenza);
- 2) necrotizing stomatitis Vincent;
- 3) bacterial infections (strep stomatitis, pyogenic granuloma, shankriformnaya pyoderma, tuberculosis, etc.);
- 4) venereal diseases (syphilis, gonorrheal stomatitis);
- 5) fungal infections (candidiasis, actinomycosis, etc.).

- III. Allergic diseases (angioedema, allergic stomatitis, cheilitis and glossitis, drug stomatitis, glossitis, cheilitis, erythema multiforme, chronic recurrent aphthous stomatitis, etc.).
- IV. Changes in the oral mucosa at the exogenous intoxications.
- V. Changes in the oral mucosa in some systemic diseases, and metabolic diseases (hypo-and avitaminosis, endocrine, gastrointestinal tract, cardiovascular system, blood system, nervous system, collagen).

- VI. Changes in the oral mucosa with dermatoses (pemphigoid, dermatitis herpetiformis Duhring, lichen planus, lupus erythematosus).
- VII. Anomalies and distinct diseases language (wrinkled, diamond, desquamative, etc.).
- VIII. Self cheilitis (granular, exfoliative, etc.).
- IX. Precancerous (obligate and facultative) and tumors (benign and malignant).