



# GIT

Oral cavity \* voluntary + involuntary

## Mastication : (chewing)

• It is the process of mechanical breakdown of large food particles into smaller ones in the mouth.

(التواطع)

• The crushing force of incisors 11-25 & of molars 20-40 kg.

• Its importance (imp)

a- Stimulation of taste and smell receptors → sense of satiety.

b- Help swallowing by lubrication of food by saliva.

c- Help digestion by break down of indigestible cellulose membrane around the digestive portion of fruits and vegetables also by increasing the exposed surface area to enzymatic effect.

• It is partly voluntary and partly reflexly by chewing reflex in which :

Presence of food in mouth → reflex relaxation of chewing muscles → drop of mandible and open the mouth → stretch on the muscles → reflex re-contraction and closure of the mouth and so on. (the mastication muscles are supplied by the motor branch of the trigeminal nerve).

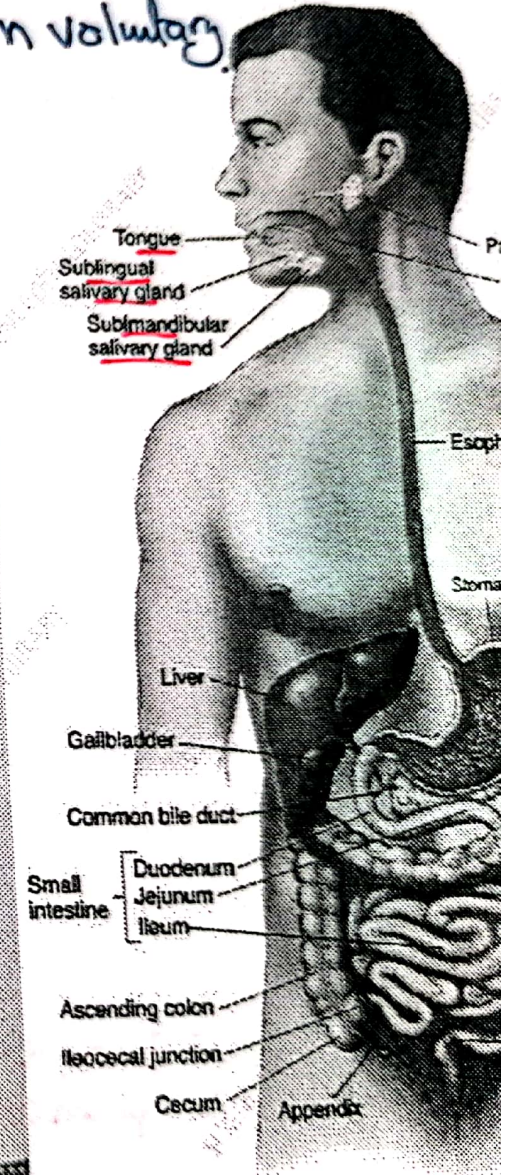
• The chewing center is present in the pons.

الضرس ←

مربوطين ببعض ←

( buccinator ← )

mcq ←





$< 0.9\% \text{ NaCl} / < 300 \text{ ml osmotic / L}$

### Salivary Secretion (acidic)

- Saliva : 1.5 L/day, hypotonic, pH is 6.3-6.8 but in the mouth it becomes more alkaline due to loss of  $\text{CO}_2$ .
- Salivary glands : three pairs of salivary glands :

Parotid	Sub maxillary	sublingual
<ul style="list-style-type: none"> <li>• 20%</li> <li>• Serous acini for secretion (watery &amp; rich in enzymes.)</li> <li>• supplied by glossopharyngeal</li> </ul>	<ul style="list-style-type: none"> <li>• 75%</li> <li>• Mixed. (enzyme + liquid)</li> <li>• Facial. XII</li> </ul>	<ul style="list-style-type: none"> <li>• 5%</li> <li>• Mucus acini (thick, rich in mucin) → mucous</li> <li>• Facial.</li> </ul>

N.B : Ebner's glands and buccal glands secrete 5% of saliva.

Composition of saliva : a- 99.5% water. b- 0.5% solids.  
 • 0.3% organic : as enzymes (amylase, Lipase, Lysozymes), mucus, somatostatin, kalikrein enzyme, immuno-globulin A and blood groups substances.

(The protein in saliva are amylase enzyme & Mucus)

• 0.2% inorganic:

- Buffers as  $(\text{H}_2\text{CO}_3 : \text{NaHCO}_3 \text{ \& \; } \text{NaH}_2\text{PO}_4 : \text{Na}_2\text{HPO}_4)$ .

- Soluble calcium salts:  $\text{Ca}(\text{HCO}_3)_2, \text{Ca}(\text{H}_2\text{PO}_4)_2$  which saturate saliva to prevent decay.

- Some electrolytes as  $\text{Na}^+, \text{Cl}^-, \text{HCO}_3^-, \text{ \& \; } \text{K}^+$ , they act as coenzymes for enzymes.

IX



### • Functions of saliva :

- 1) Facilitation of speech and deglutition. (swallowing) / buccal phase
- 2) Cleaning (hygiene) of the mouth by washing and antibacterial effect of lysozymes, thionin, immunoglobulins and Immunoglobulin A.
- 3) Buffering function : by bicarbonate and phosphate systems to keep the PH at about 7.0 → they do not loose their calcium. Also saliva neutralizes gastric secretion in case of gastroesophageal reflux.
- 4) Digestive function :
  - Ptyalin (salivary  $\alpha$ - amylase) : digest starch to maltose in PH 6.9 so it is inhibited in the stomach (acidic media)
  - Lingual Lipase: digest 30% of lipids and secreted from Ebner's gland of tongue.
- 5) Excretory function : of lead, mercury, iodides, fluoride and some drugs as morphine and alcohol.
- 6) Facilitate taste sensation and the kalikrein enzyme produce bradykinin which acts as vasodilator during salivary secretion.
- 7) Regulation of water balance (in dehydration and give thirst sensation).
- 8) Contains hormones as somatostatin & glucagone.

\*  $\text{frank-cell}$  in pancreatic

\* acidic but near to (7.0)

\* if it was high

acidic  
 (a will be eroded)



## Control of salivary secretion

Nervous only via conditioned and unconditioned reflexes.

### [I] Unconditioned reflex :

Inborn reflex that needs no previous learning.

a. Stimuli: direct contact of food, Chewing & Irritation of GIT.

b. Receptor: taste receptors & Receptors in GIT wall.

c. Afferent:

- Chorda tympani: from ant. 2/3 of tongue.

- IX - Glossopharyngeal: from post. 1/3 of tongue

- Lingual nerve: movement of tongue.

- Vagus nerve: from epiglottis.

d. Center: superior & inferior salivatory nuclei in M.O. (medulla oblongata)

e. Efferent: chordae tympani & glossopharyngeal.

f. Response: ↑ salivary glands secretion.

IX 2/3 Ant 1/3 Post Tongue  
VII 2/3 Ant

or  
Function

### [II] Conditioned reflex :

Acquired reflexes and need previous learning.

a. Stimuli :

- Sight of food.

- Smelling of food.

- Hearing about food.

- Thinking of food.

b. Receptors: special sense receptors.

c. Afferent: optic, olfactory & auditory nerves.

d. Center: to cerebral cortex → salivatory nuclei.

e. Efferent & response → as unconditioned reflex.

## Swallowing (Deglutition)

- o It is the propelling of food bolus from mouth to stomach.
- o It is under control of the swallowing center in the medulla.
- o It can be divided into 3 phases:

1- Buccal phase: (voluntary) elevation and retraction of tongue against the hard palate propels the bolus to the pharynx.

2- Pharyngeal phase (involuntary) :

It is very rapid (1 second), occur reflexly via:

Swallowing reflex :

• Receptor: in oropharynx (tonsillar pillars).

• Afferent: glossopharyngeal nerves. IX

• Center: medulla oblongata (swallowing center).

• Efferent: motor fibers of cranial nerves V, IX, X, XII.

• Response: series of reflexes to prevent entry of food in to air passages:

① Elevation of soft palate → closure of nasal cavity. (posterior)

② Approximation of palate-pharyngeal folds → sagittal slit through which small food particles pass and prevent passage of large particles.

③ Closure of glottis (opening of larynx) by approximation of vocal cords & elevation of larynx and folding of epiglottis

④ Inhibition of breathing (swallowing apnea).

⑤ Relaxation of pharyngo-esophageal sphincter and contraction of superior pharyngeal muscles → rapid pharyngeal peristalsis → forces the food into relaxed upper esophagus.

MCQ

(The only voluntary one)



28cm

**3-Esophageal phase (involuntary) :**

**a-Upper esophageal sphincter : (UES)**

The pharyngo - esophageal junction is normally closed by striated muscle tone to prevent entry of inspired air into stomach. During swallowing the sphincter relaxes reflexly and then reclosed after swallowing.

**b-Traveling along the esophagus :**

Entry of food bolus into the esophagus initiate peristaltic waves of 2 types :

• Primary peristaltic waves : (usual)

- a. They start at the upper end of oesophagus.
- b. They are continuation of the pharyngeal peristalsis.
- c. It travels at the rate of 2-4 cm/sec. But gravity may increase velocity of food bolus to about 4cm/sec

• Secondary peristaltic waves :

- a. Presence of bolus in the esophagus initiate peristaltic waves at site of bolus.
- b. These waves repeated until food bolus is driven down the stomach.
- c. Peristaltic movements in the upper half of esophagus is coordinated by vago - vagal reflex (striated ms.), while in lower half is coordinated by local enteric reflex so, bilateral vagotomy → difficult swallowing in the upper half only (In this case the food bolus must be small, soft and well lubricated and by aid of gravity).

(when failure of primary)

(afferent & efferent vagus)