

# Practicals 3

Tonsils

Introduction to teeth

# Tonsils – Waldeyer's ring

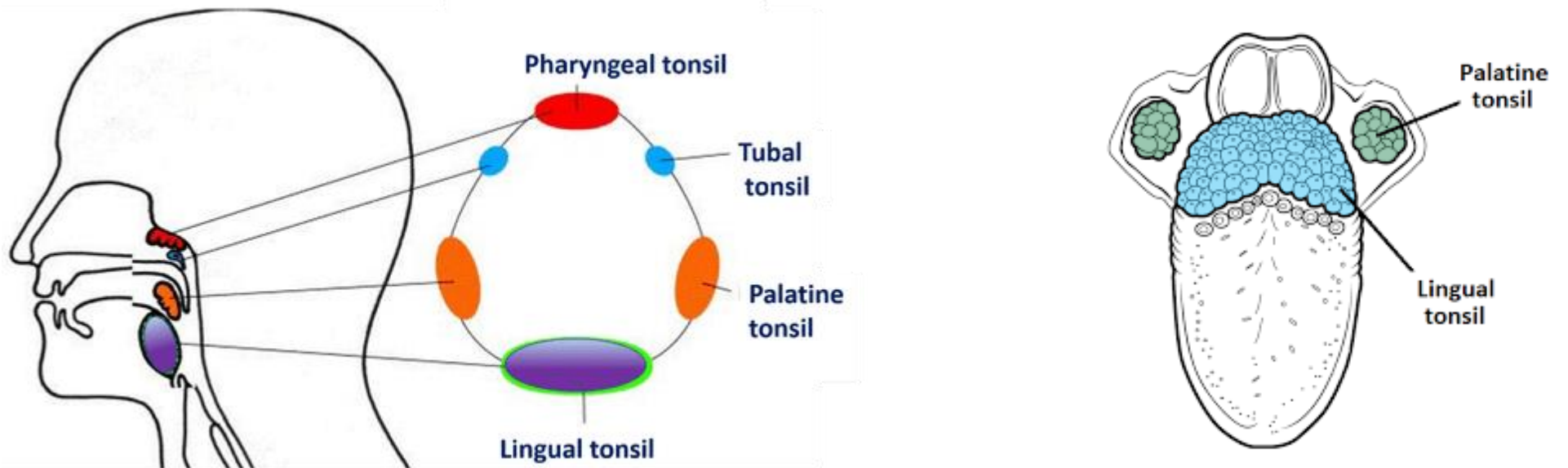
Group of peripheral lymphoid organs positioned at the entrance into naso- and oropharynx

Total 6 (*tonsillae palatinae*, *tonsillae tubariae*, *tonsilla lingualis*, *tonsilla pharyngea*)

**Mucosal organs** – accumulation of lymphoid tissue in lamina propria

**B - dependent areas - secondary lymph follicles**

**T - dependent regions - interfollicular zones**



# Palatine tonsils

Positioned on the right and left side between glossopalatal and pharyngopalatal arches, ovoid shape, deep and branched tonsillar crypts, there are usually up to 35 (contain detritus), tonsil separated by fibrous capsula – can have septa.

The surface of the tonsil is covered by a stratified squamous epithelium

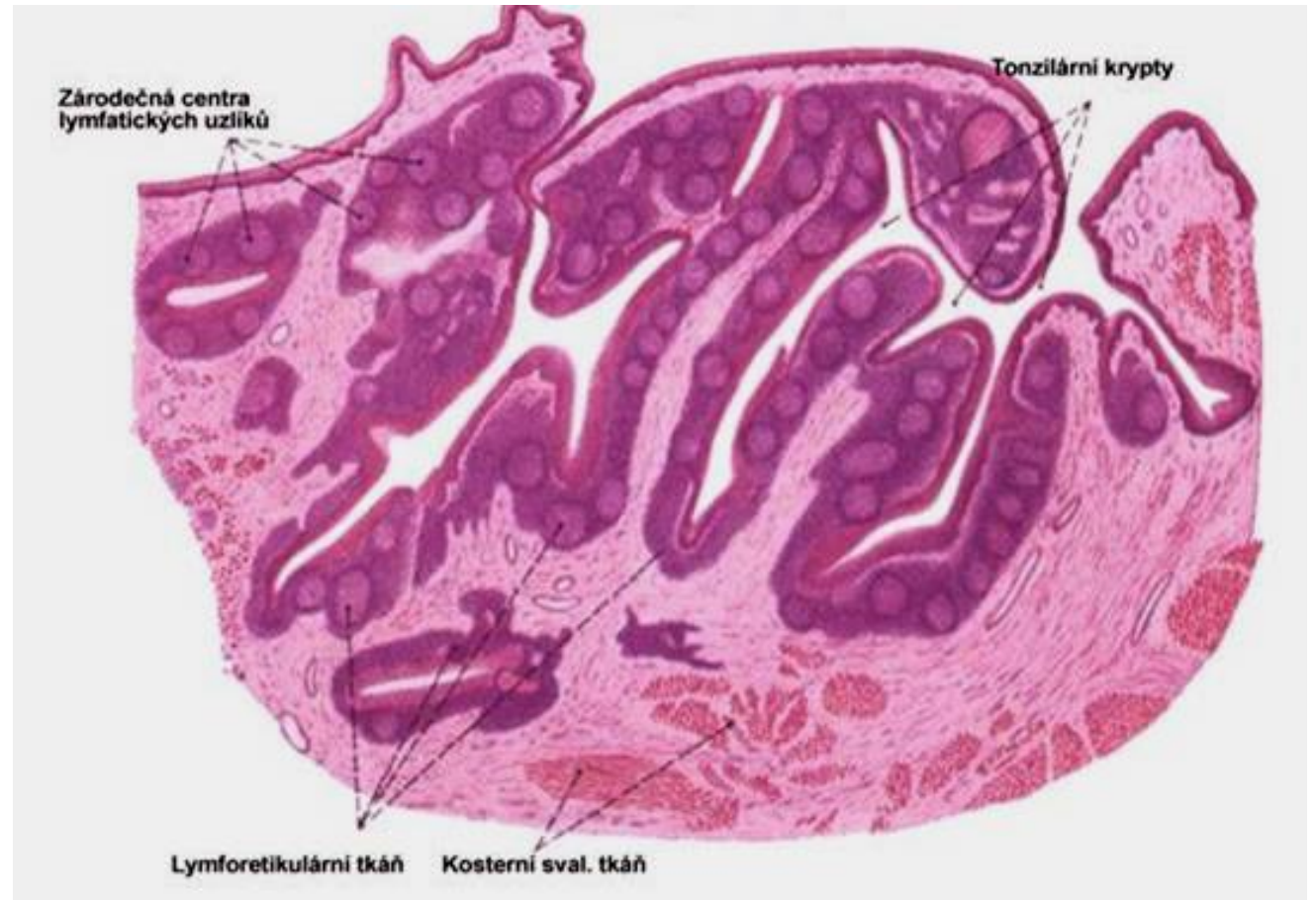
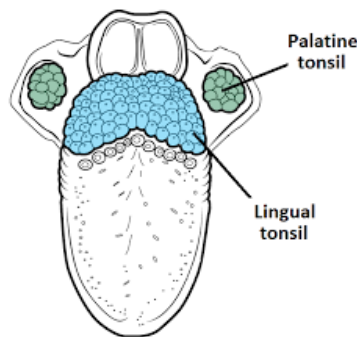
**In lamina propria** are large lymphatic follicles with light germinal centers

Brighter center - contains centroblasts

## Epithelium above nodules (differences):

The structure of the epithelium and the contacts between the cells are very loose, caused by infiltration by lymphocytes, macrophages, dendritic cells, discontinuous basement membrane

**FAE** – (follicle associated epithelium)



# Palatine tonsils

Lymphocytes which penetrate into the oral cavity are referred to as **salivary bodies**

**A**

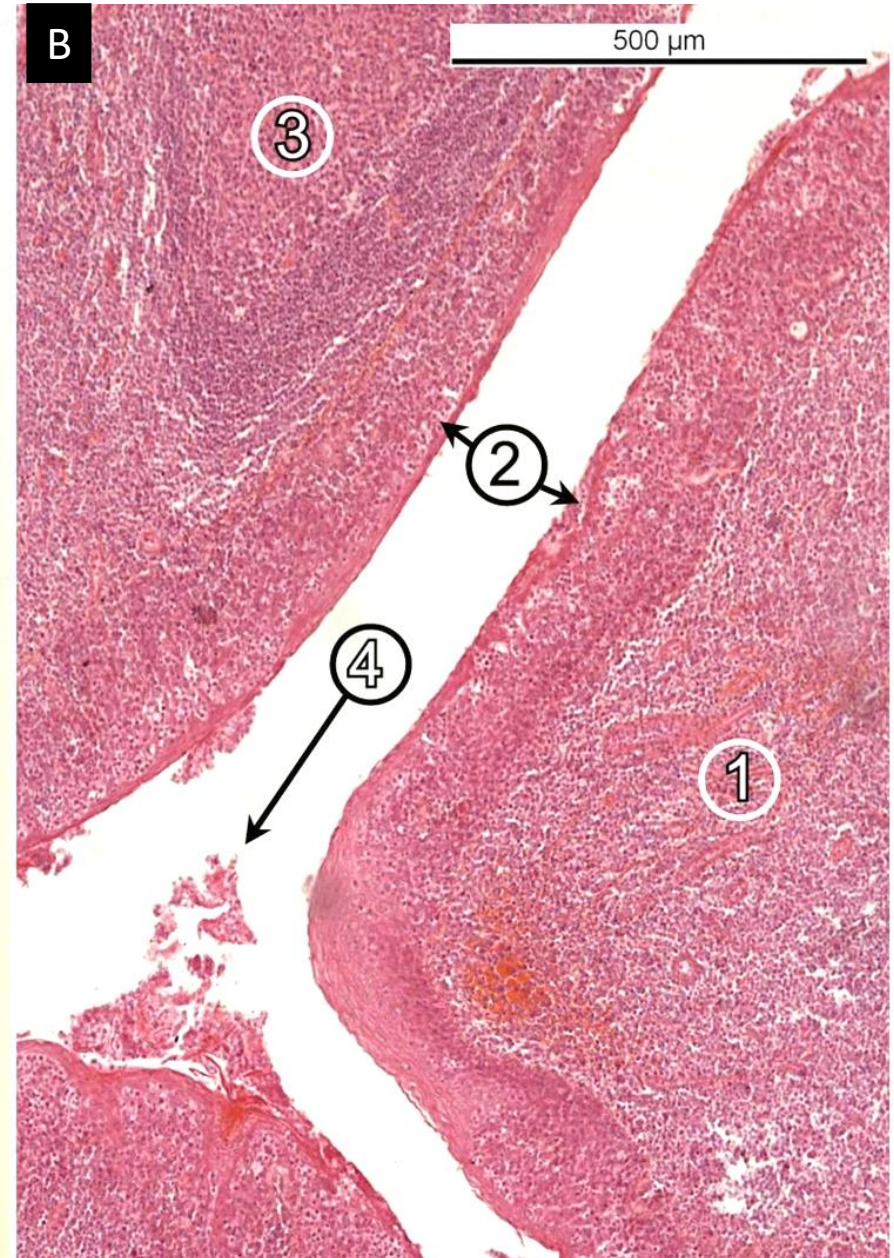
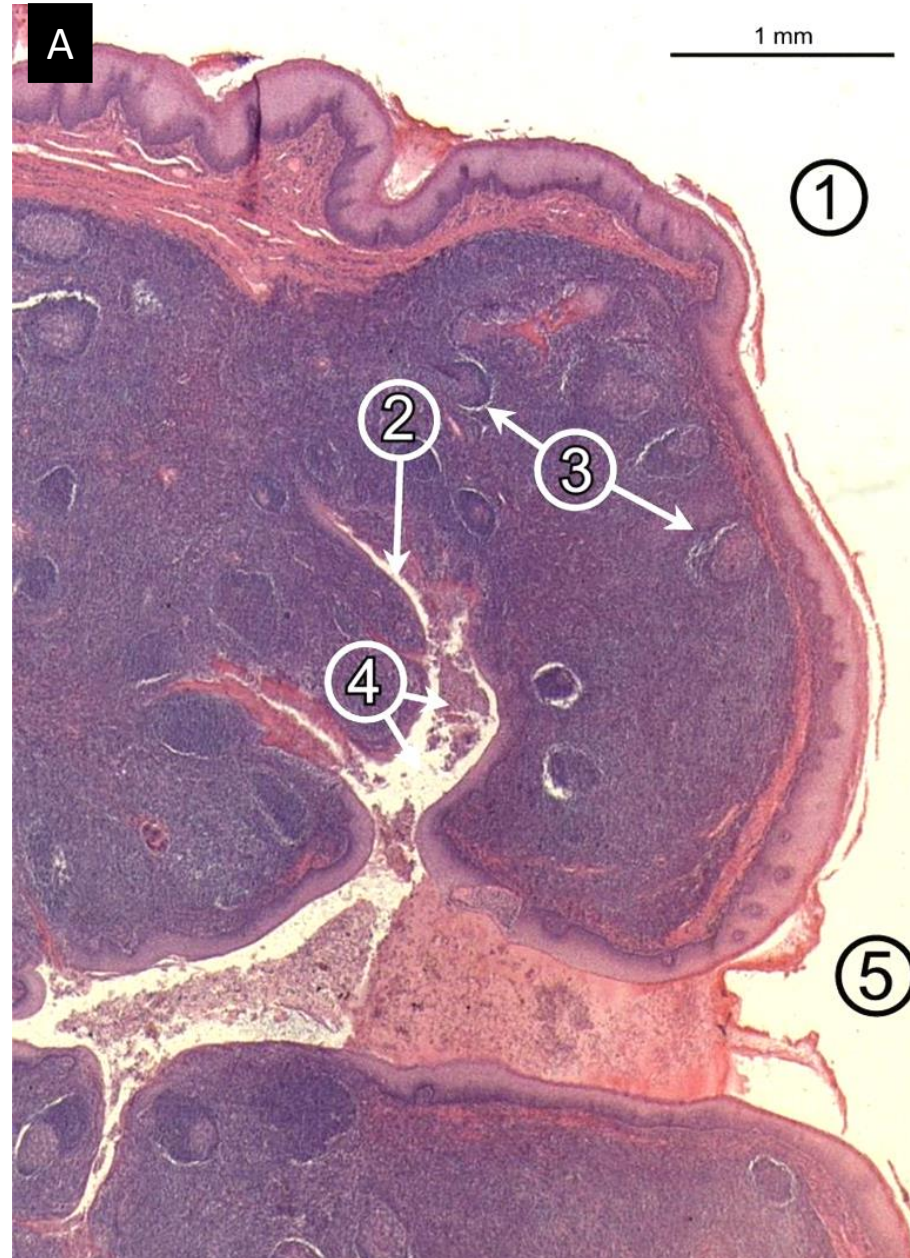
## Tonsilla palatina (H.E.)

- 1 – stratified squamous epithelium
- 2 – lymphocytes infiltrated epithelium (FAE)
- 3 – secondary lymph nodules or follicles
- 4 – detritus in tonsilar crypt

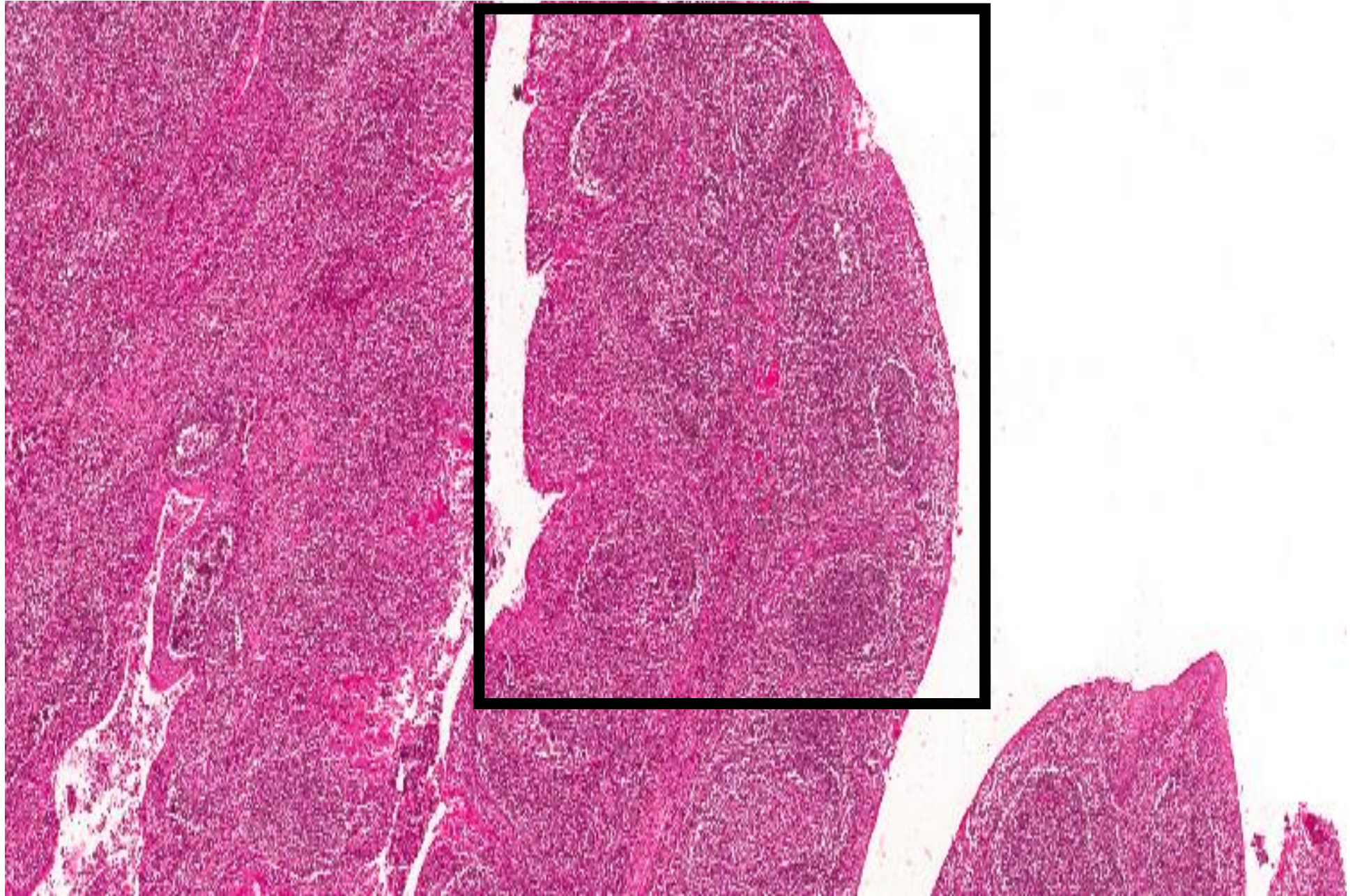
**B**

## Tonsilar crypt in detail (H.E.)

- 2 – with lymphocytes infiltrated epithelium
- 3 – germinal centre of a secondary nodule
- 4 – detritus



## Palatine tonsils



# Lingual tonsil

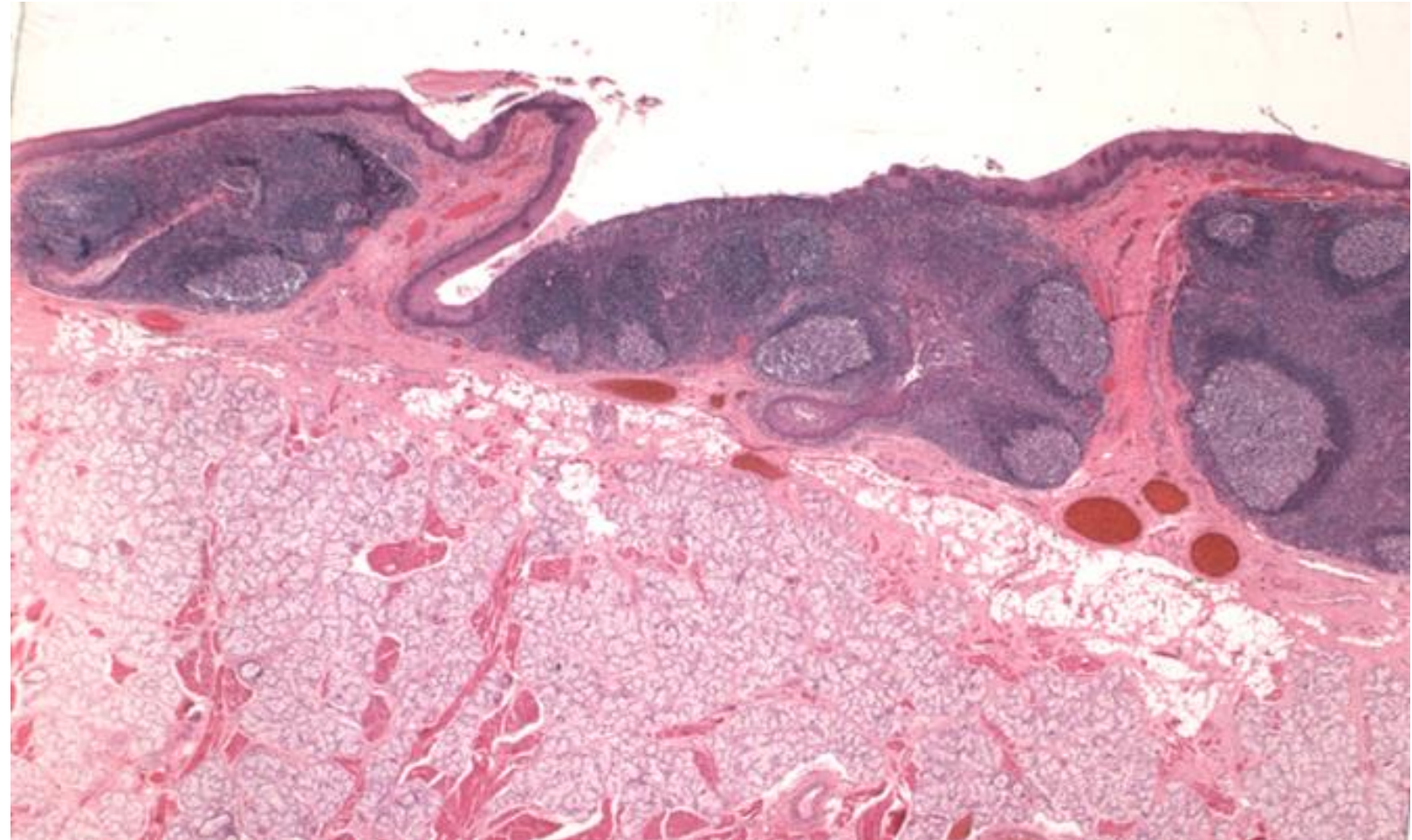
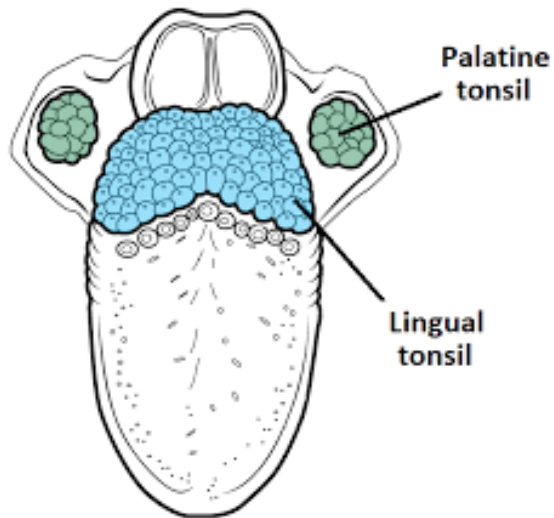
Group of lymph nodules (*folliculi linguales*) in the mucosa of **lamina propria** on the dorsal side of radix linguae behind the circumvallate papillae

Surface covered by **stratified squamous epithelium**

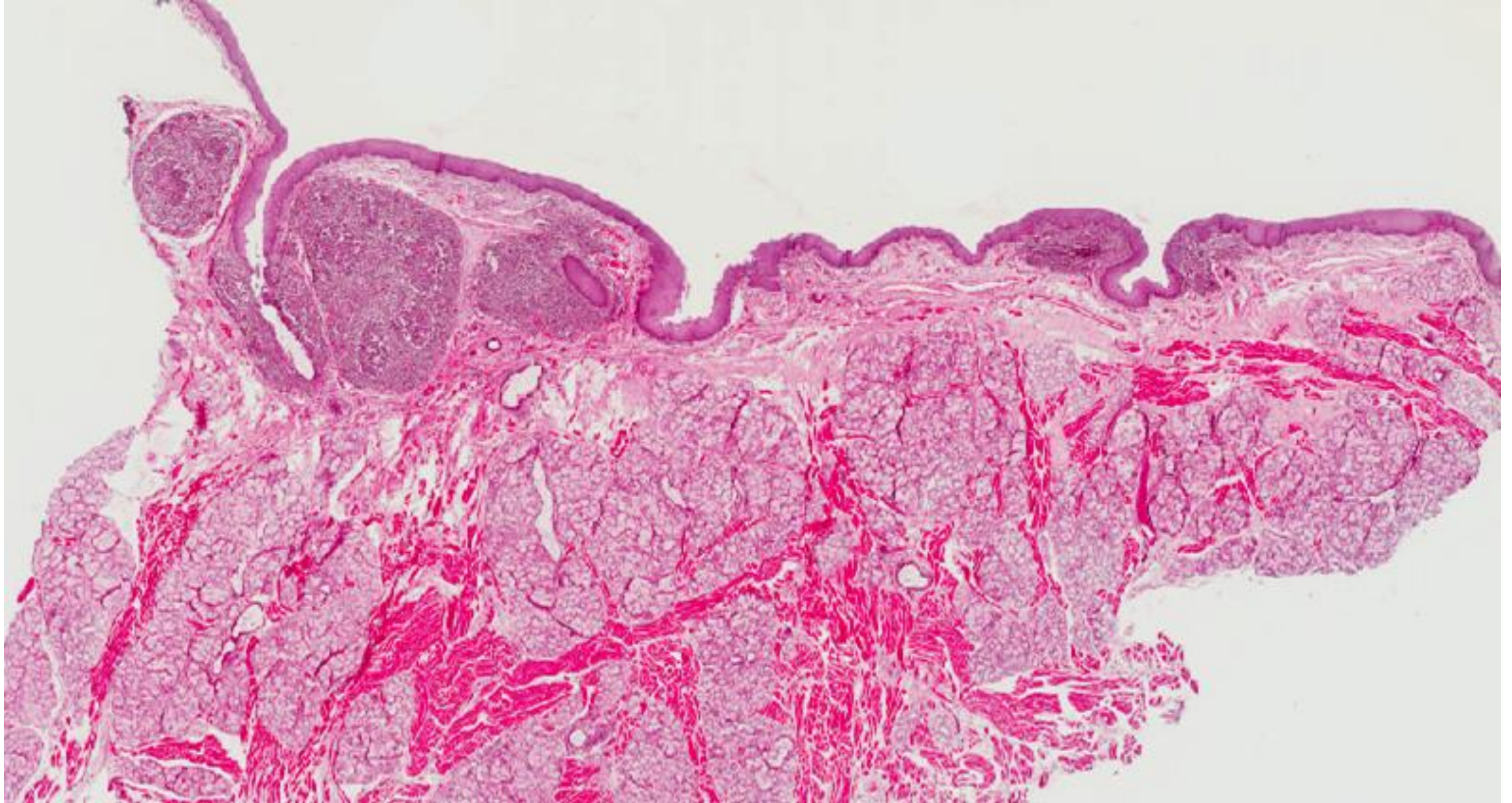
At the bottom of shallow crypts are openings of purely mucinous Webers glands (*gll. Linguales posteriores*)

Crypts are perpetually washed out – no detritus.

No obvious capsula.



# Lingual tonsil



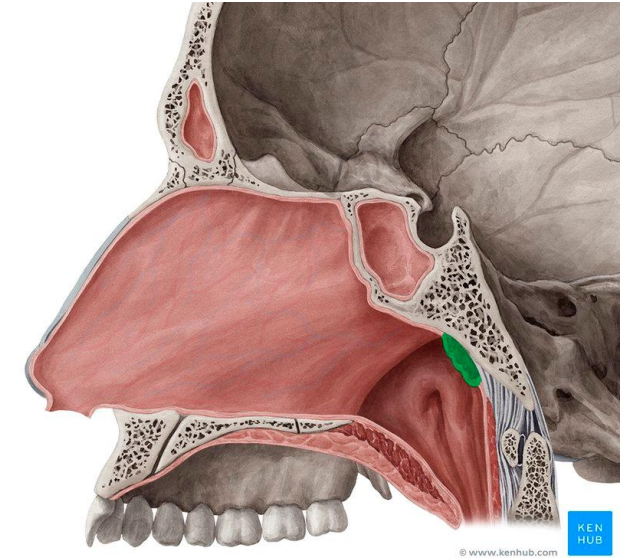
# Pharyngeal tonsil (Adenoid)

Located on the top of pharynx (*fornix pharyngis*)

From the other it differs by the surface covered by pseudostratified columnar epithelium which might contain goblet cells

Shallow crypts

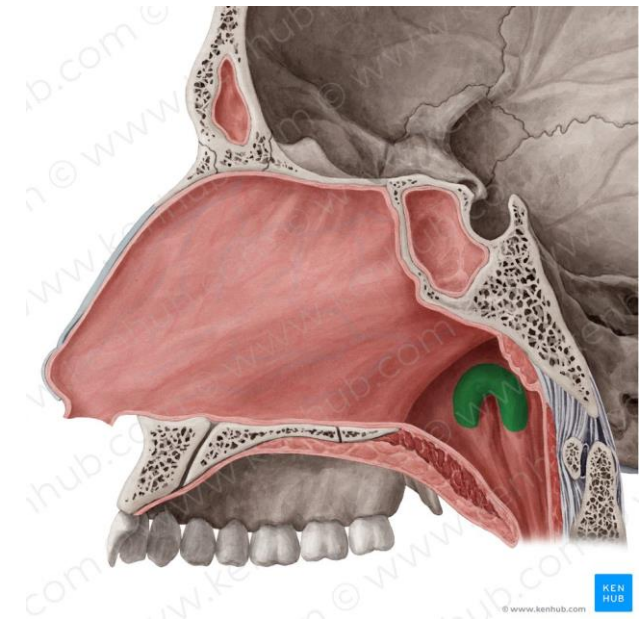
In childhood tonsilla pharyngea can often be hypertrophic which cause problems with nose breathing



# Tubal tonsils (Gerlach tonsils)

Paired tonsil

Group of small lymphoid tissue in lamina propria of mucosa in the pharyngeal opening of the eustachian tube (*ostium pharyngeum tubae auditivae*)





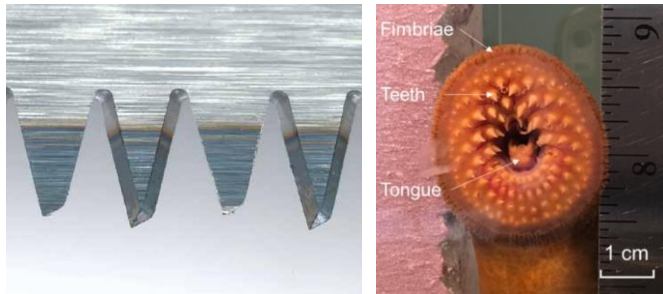
What are teeth?

# What are teeth?

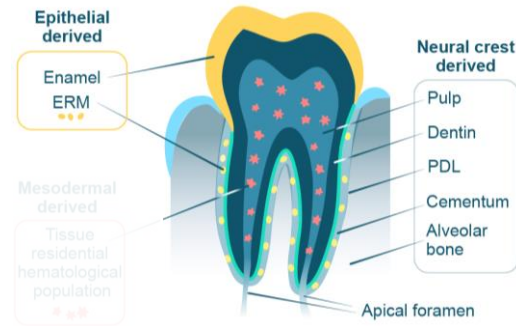
„Tooth“ as a term

Functional view

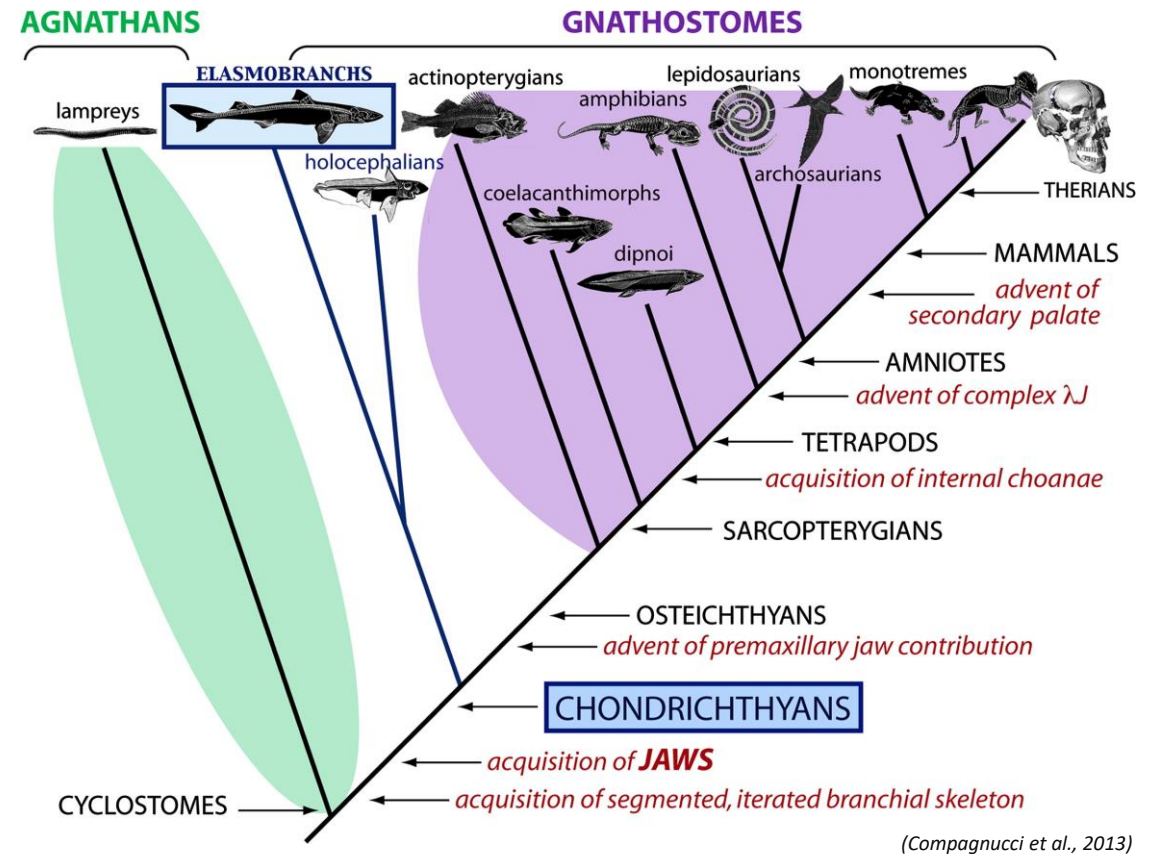
Embryonic view



(Shi et al., 2021)



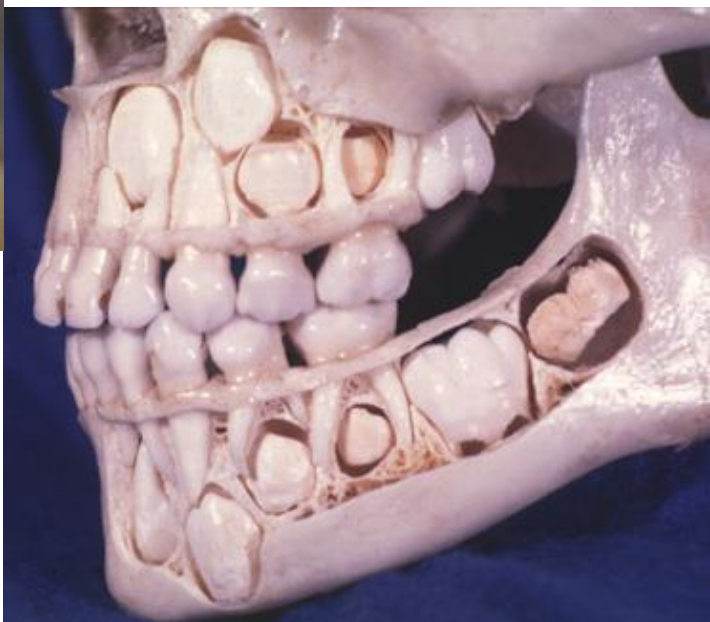
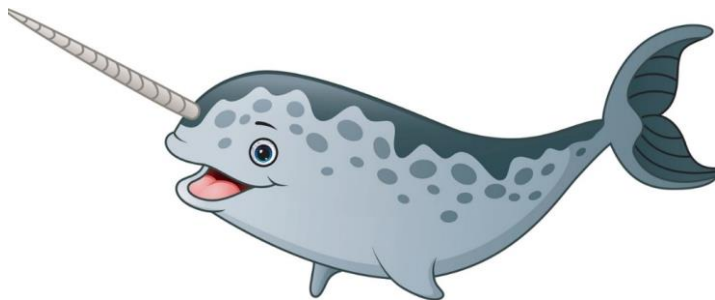
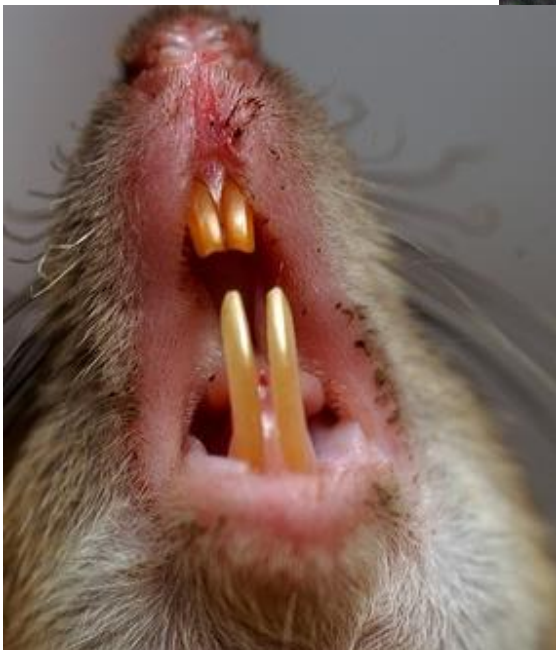
(Krivanek et al., under review)



(Compagnucci et al., 2013)

Calcified structures at the beginning of the digestive tract of jawed vertebrates (not all).

Significant evolutionary diversity



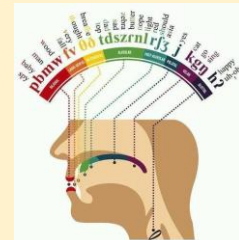
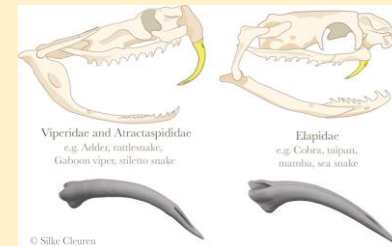
# Classification of teeth

Significant evolutionary adaptation

## Function

## Function

- Mechanical food processing
  - Tearing of food
  - Crushing of food
- Predation & killing
  - Poisonous teeth (fangs)
- Social interaction
  - Defence
  - Dominance
  - Articulation
- Sensory organ
- Mechanical interaction with the environment



# Classification of teeth

Significant evolutionary adaptation

**Function**



Shape

Topographic attachment in the jaw

Functional attachment in the jaw

**Regeneration**

etc.

## Shape of dentition

Homodont

Heterodont

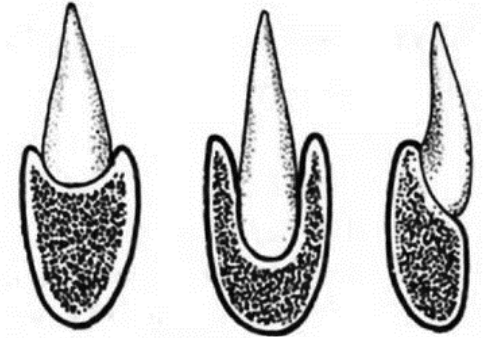


## Anatomical attachment in jaw

Acrodont

Thecodont

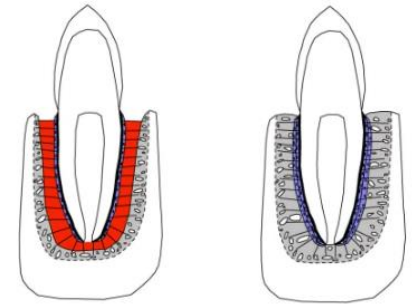
Pleurodont



## Functional attachment in the jaw

Gomphosis

Ankylosis



*Aaron R. H. Le Blanc, Ph.D.*

## Regeneration

### Number of generations

Monophyodont

Diphyodont

Polyphyodont

### Capacity of growth

Brachyodont

Hypsodont

Hypselodont

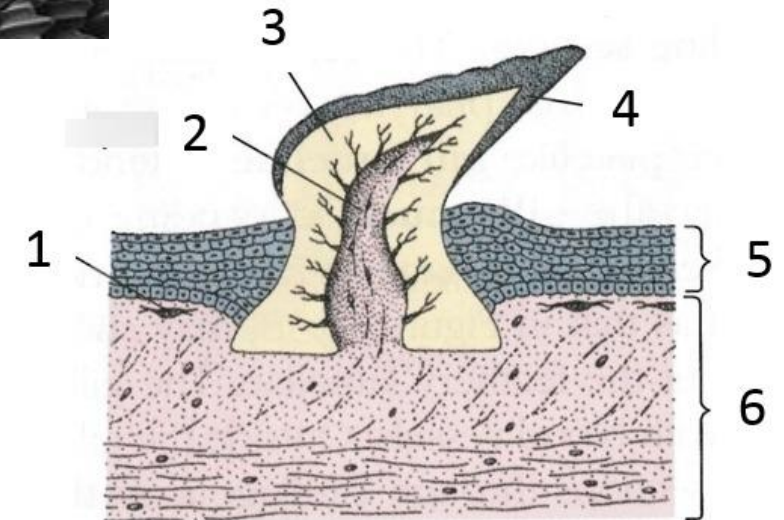
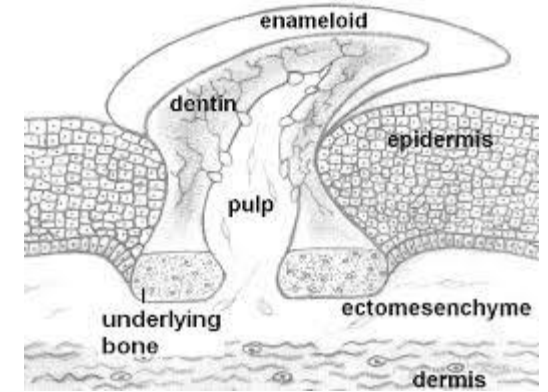
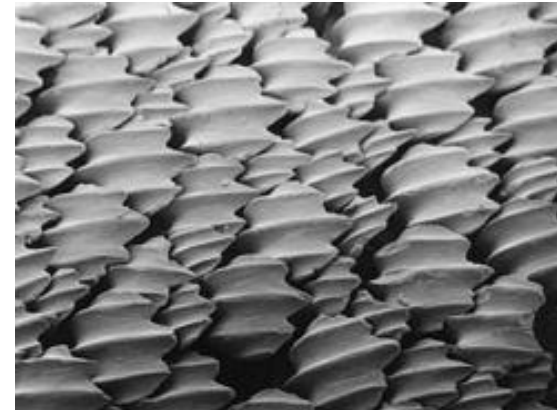
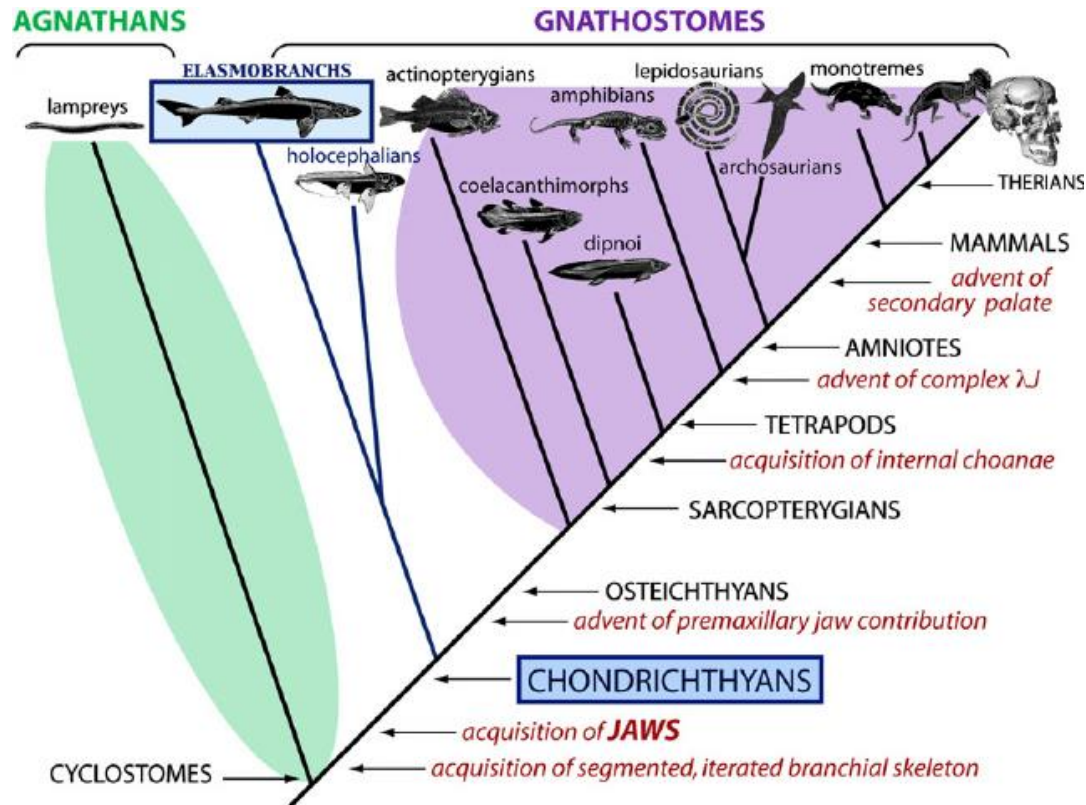
etc.

# Basics in the phylogenesis and comparative tooth anatomy

Teeth - calcified structures that derive from the ectoderm and ectomesenchyme (neural crest)

Evolutionarily in phylogeny, they appear only in **the jawed vertebrates – Gnathostomata**

Ancestor of teeth - **placoid scales** in fishes that covered the surface of the body and the oral cavity





Lampres, cyclostomata



# Set of all teeth = dentition

Brachyodont  
Taurodont  
Bilophodont  
Haplodont  
Polyprotodont  
Acrodont Cynodont Protodont  
Labyrinthodont Secodont  
Loxodont  
orthodont  
Pleurodont Homodont Tritubercular  
Hypsodont Diprotodont  
Lophodont Heterodont  
Monophyodont Selenodont  
Polyphyodont Thecodont Diphyodont  
Triconodont



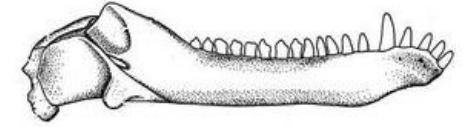
# Set of all teeth = **dentition**

## Types of dentition

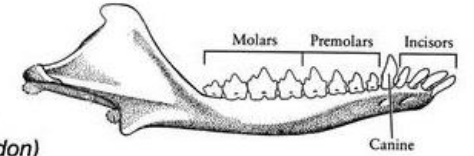
**Shape of teeth:** **homodont** - identical in shape  
**heterodont** - different in shape  
(in mammals *dentes incisivi*, *canini*, *praemolares* and *molares*)

### “REPTILIAN” vs MAMMALIAN DENTITION

Homodont  
(cynodont)



Heterodont  
(*Morganucodon*)

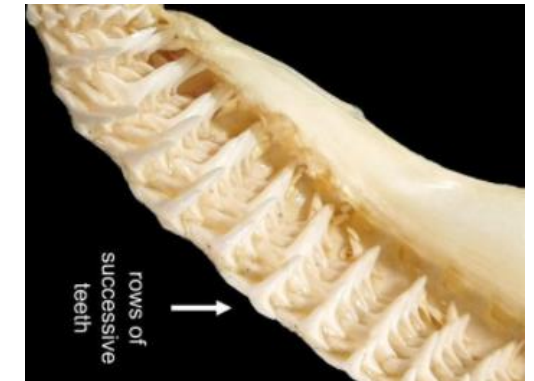


According to the **number of replacements** (sets of teeth) during life:

**monofyodont** - e.g., *Holocephala* - chimeras)

**difyodont** (*dentes decidui*, *dentes permanentes*) – e.g. mammals

**polyphyodont** - e.g., fish, lower amphibians

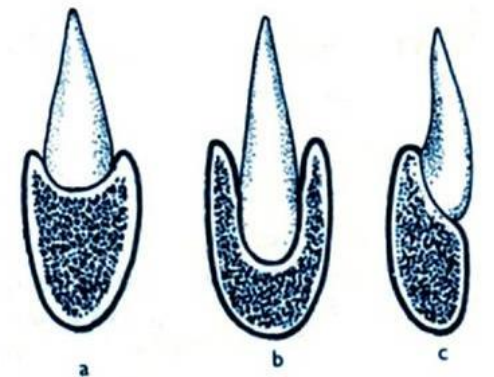


According to the **attachment** of the teeth to the jaw:

**acrodont** - attach to the jaw from above (bony fish, amphibians)

**pleurodont** - on the jaw from the side (for reptiles)

**thecodont** - inserted into dental sockets –  
recent mammals (dinosaurs, crocodiles)

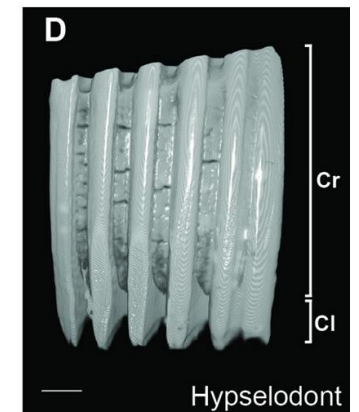
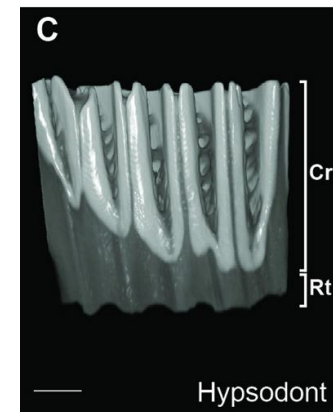
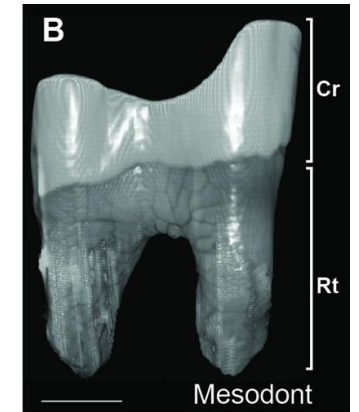
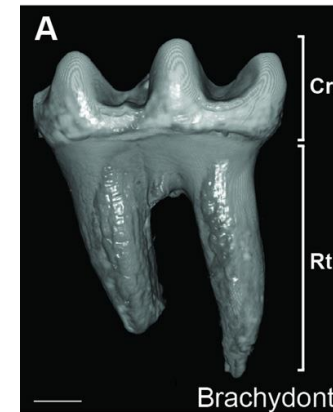
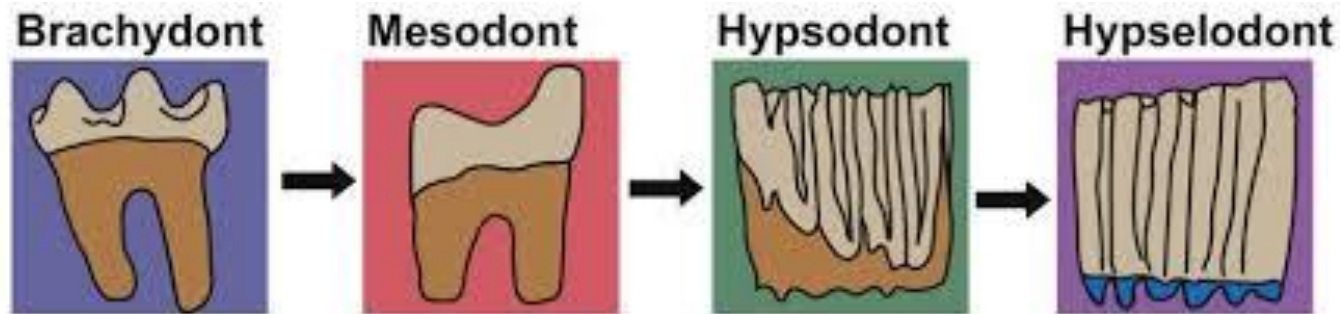


# Set of all teeth = **dentition**

Podle **typu rústu** zubů:

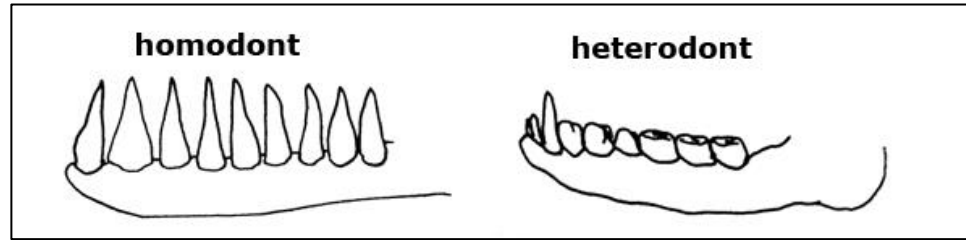
**Brachydont**  
**Hypselodont**  
**Hypsodont**  
**(Mesodont)**

- Long root
- No root – continuously-growing
- High crown

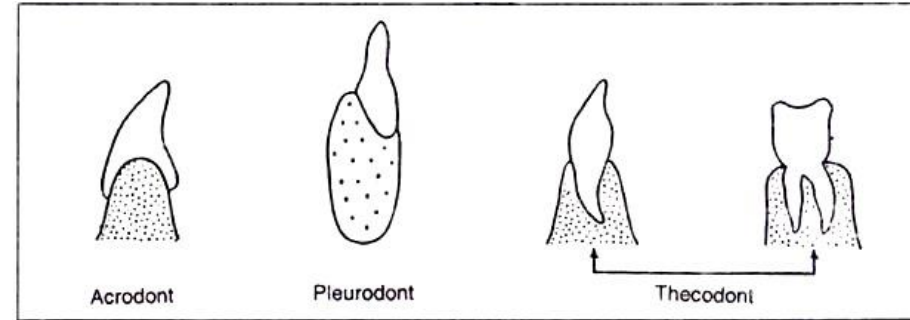


**Human dentition is:**

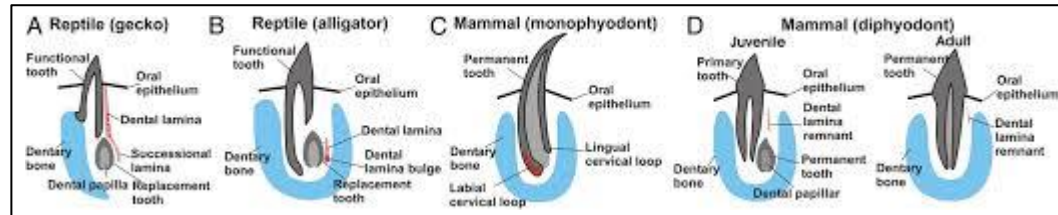
Heterodont



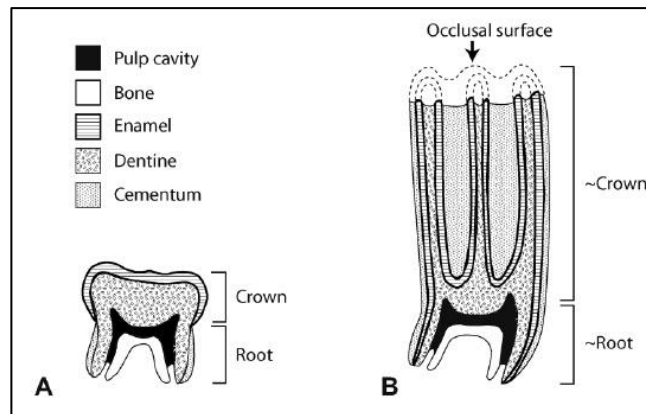
Thecodont



Diphyodont



Brachyodont



# Tooth numbering

## Several possibilities

### Beginning letter

incisors – dentes incisivi

$I_1, I_2 / i_1, i_2$

canines – dens caninus

$C / c$

premolars – dentes premolares

$P_1, P_2$

molars – dentes molares

$M_1, M_2, M_3 / m_1, m_2$

### Number

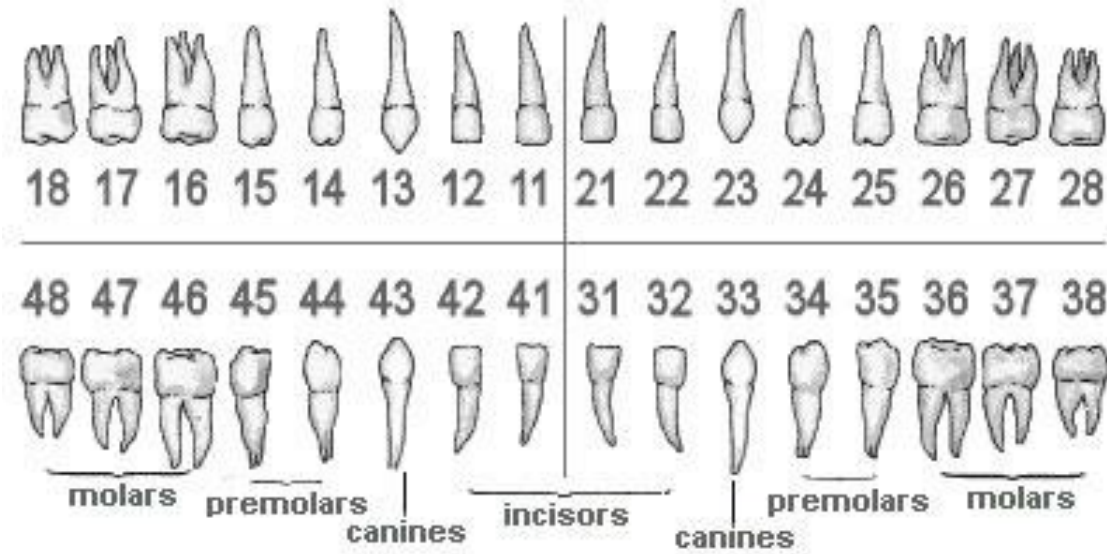
international marking using "two-digit code"

(ISO System - International Standards Organization Designation system: teeth divided into quadrants (clockwise):

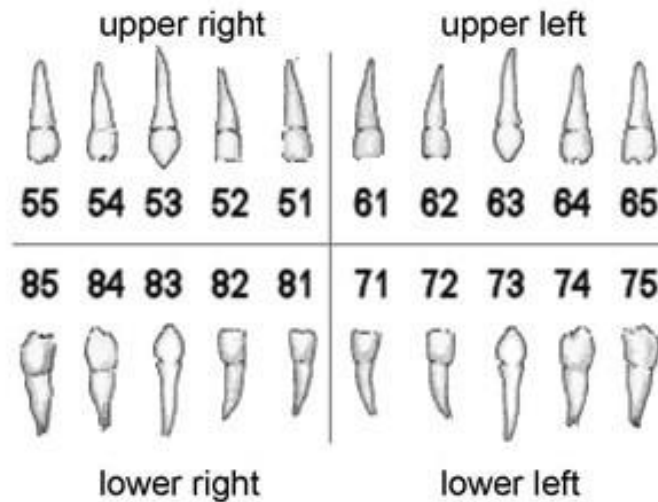
1 - 4      dentes permanentes

5 - 8      dentes decidui

Dentes permanentes



Dentes decidui



Primary teeth notation system

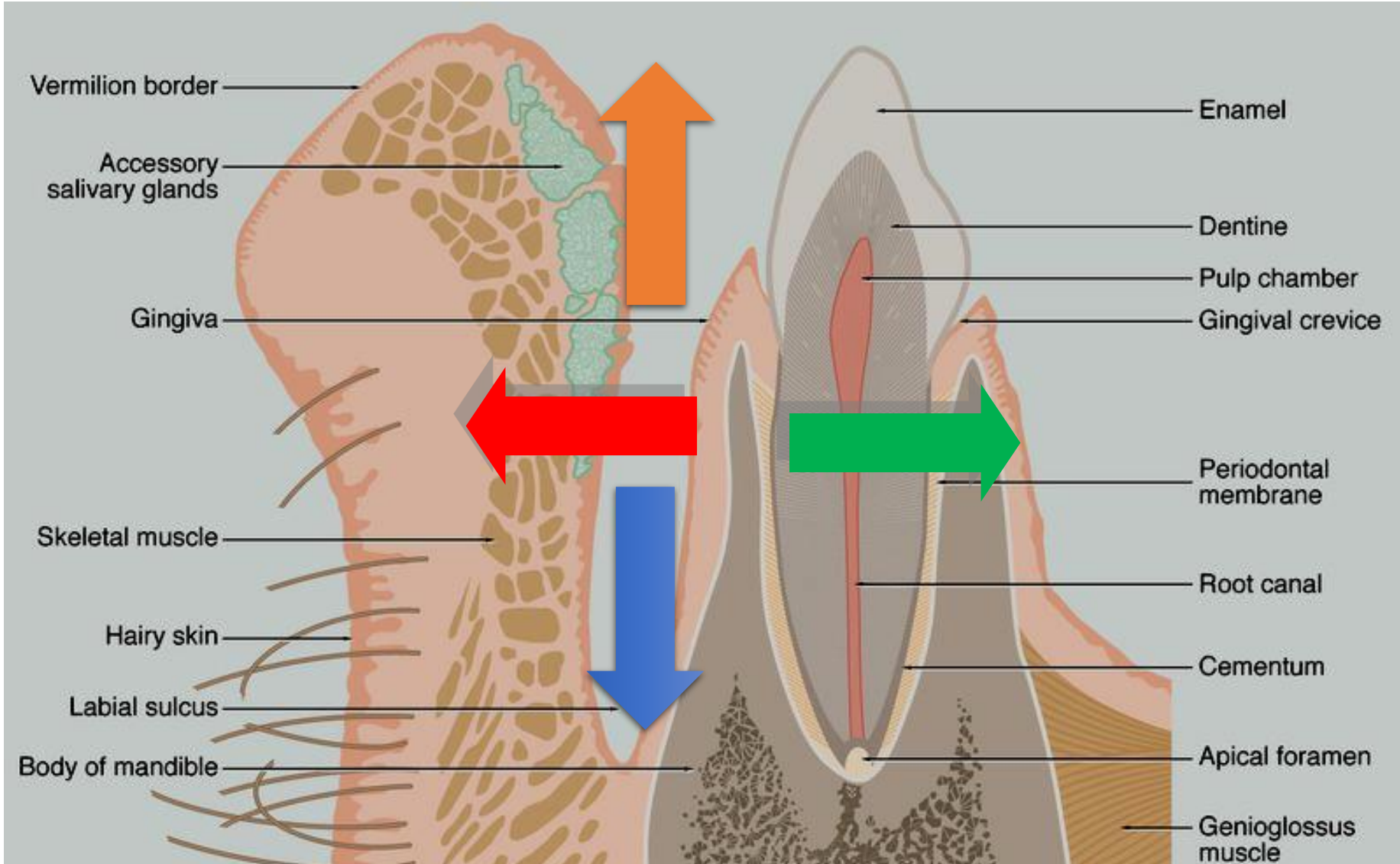
# Directions

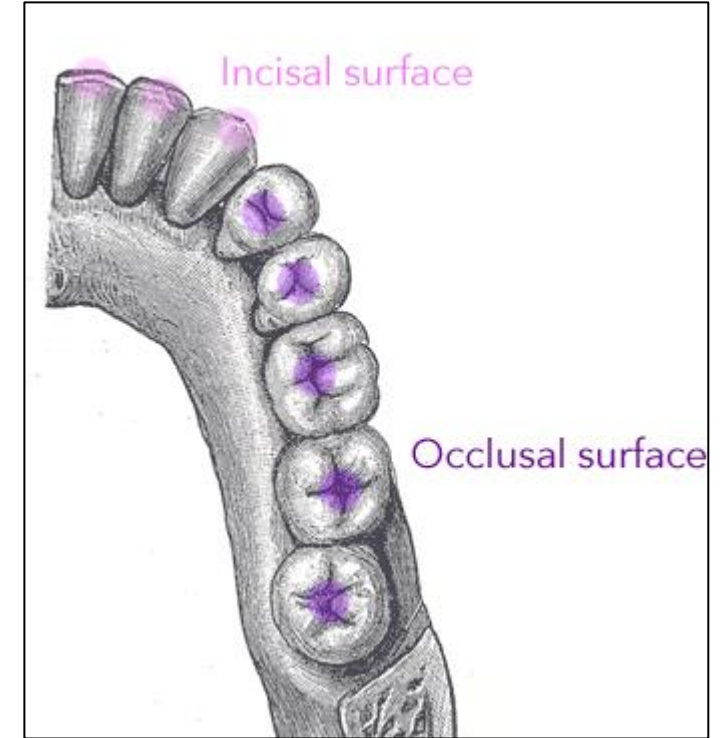
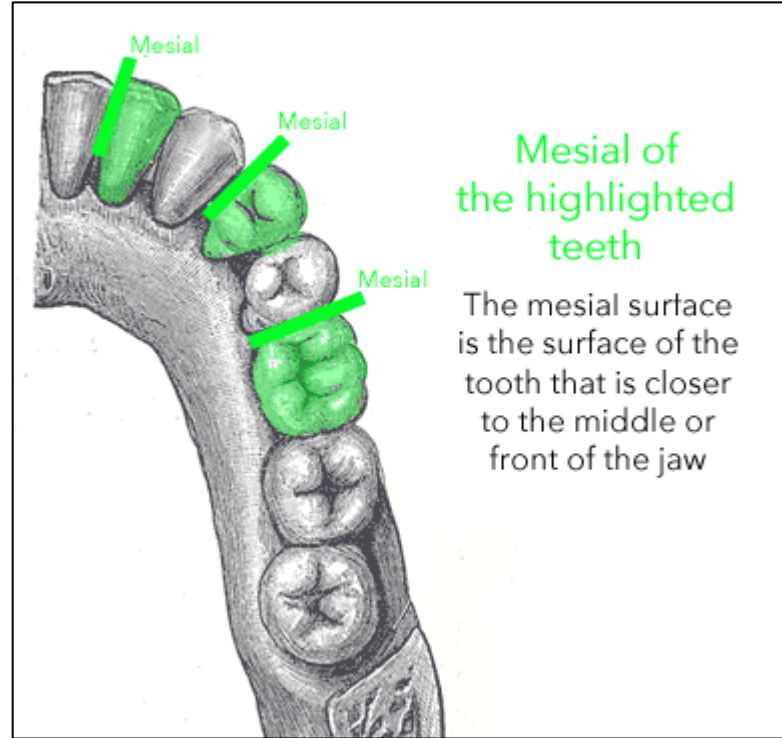
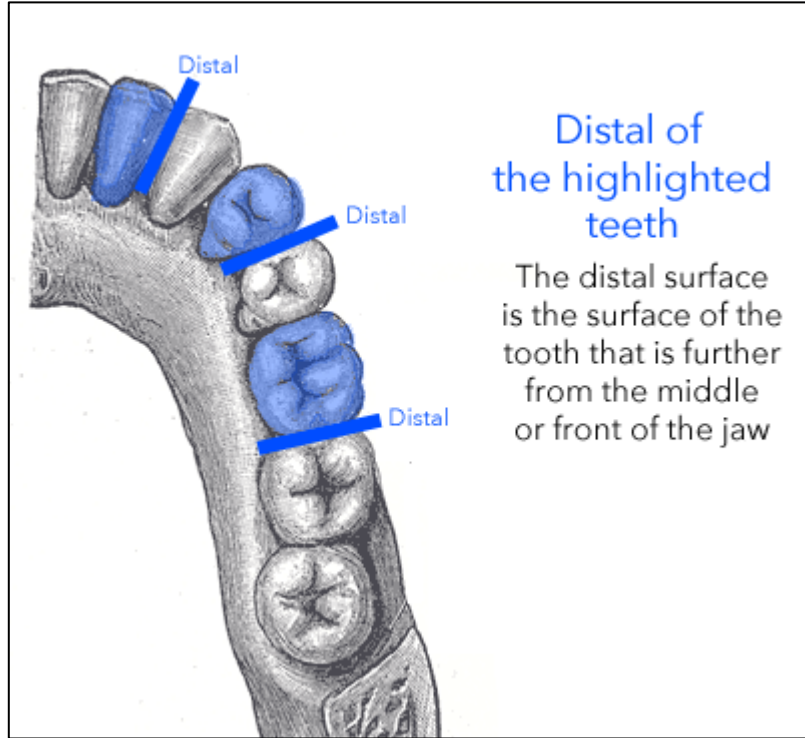
coronal

vestibular (labial, bucal)

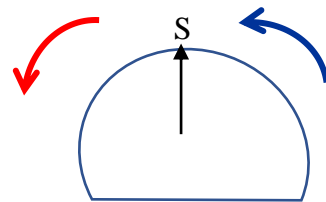
apical

lingual (palatinal)





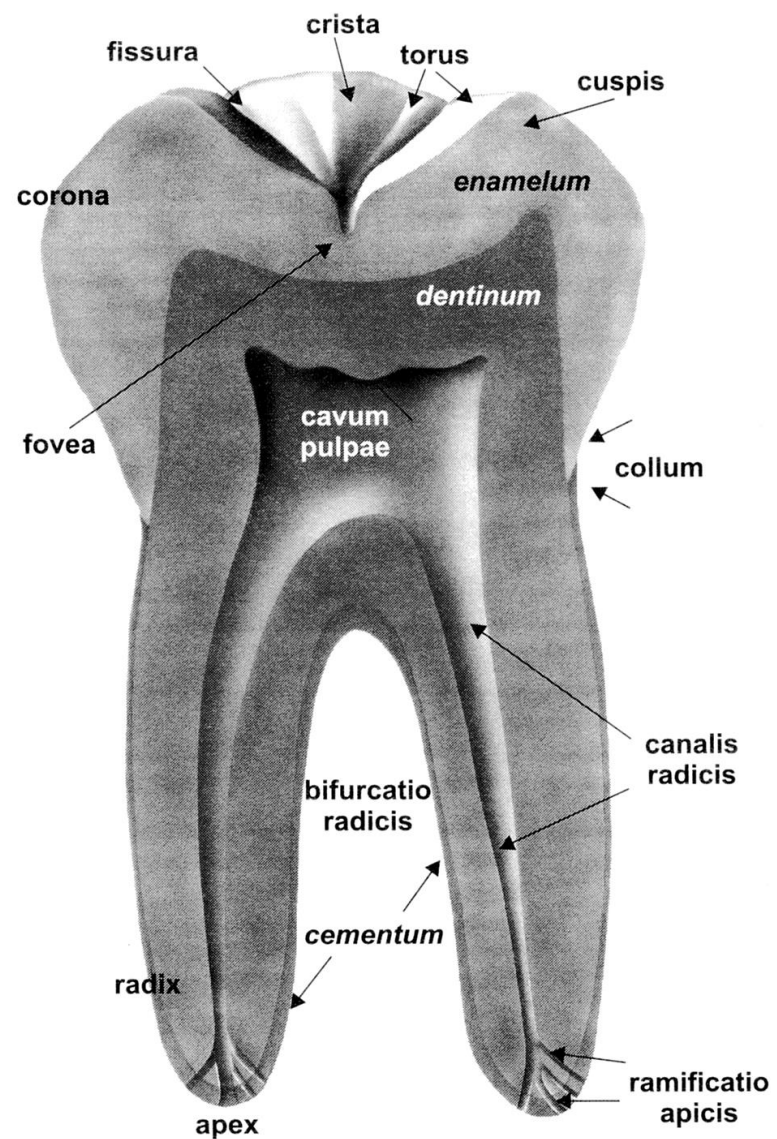
**Distal**  
(towards the last molar)



**Mesial**  
(towards the midline)

# Tooth and dental socket, periodontium, gingiva crown, neck, root

Části zuby:



Klepáček, Mazánek a kol. 2001





# Tooth (dens)

gingiva



## TERMINOLOGIE:

Dentes decidui (lactei)	20	
Dentes permanentes	28-32	
Corona dentis	(crown)	
Collum	(neck)	
Radix	(root)	1-3
Cavum et canalis radices dentis (cavity and root canal)		
Pulpa dentis	(pulp)	
Foramen apicis radices	(opening at the tip of the root)	
Alveolus		
Periodontium		

Vein

Artery

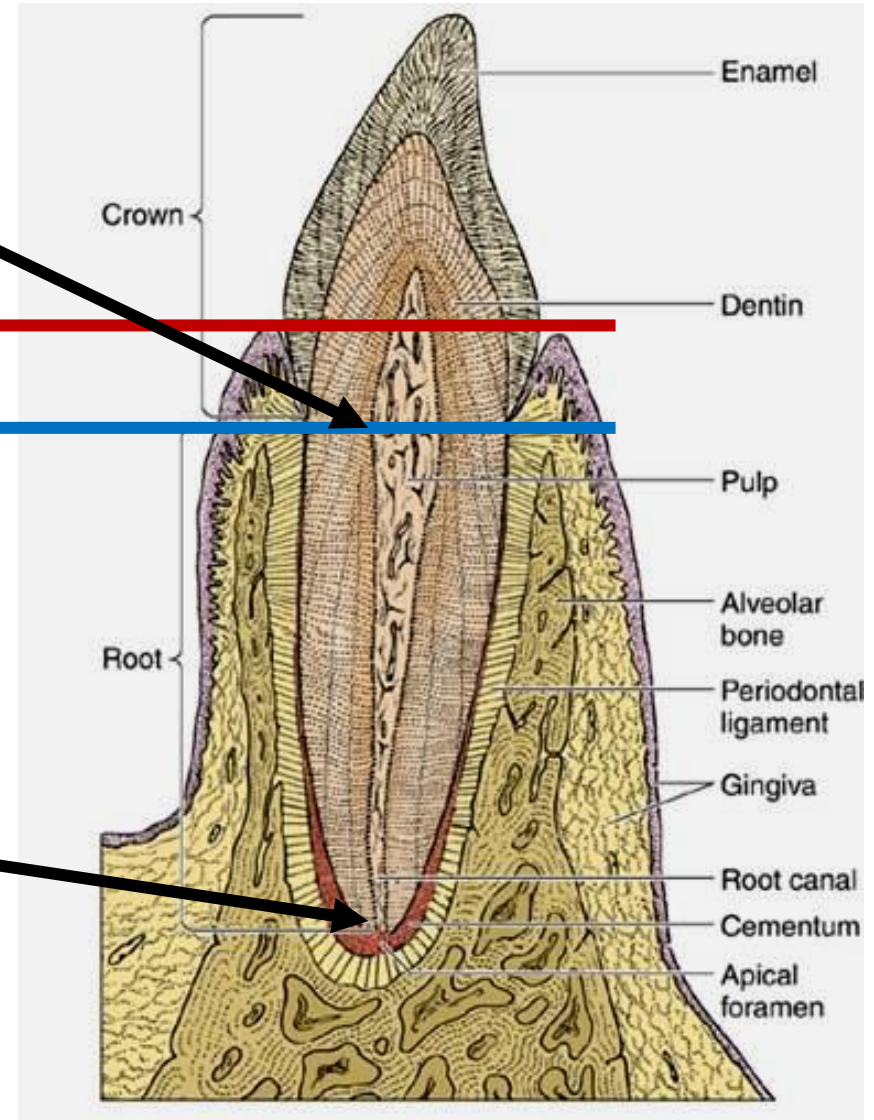
Nerve

# Cavitas dentis passing to canalis radicus dentis

Anatomical vs clinical crown

Anatomical vs clinical root

Foramen apicis radicus Dentis



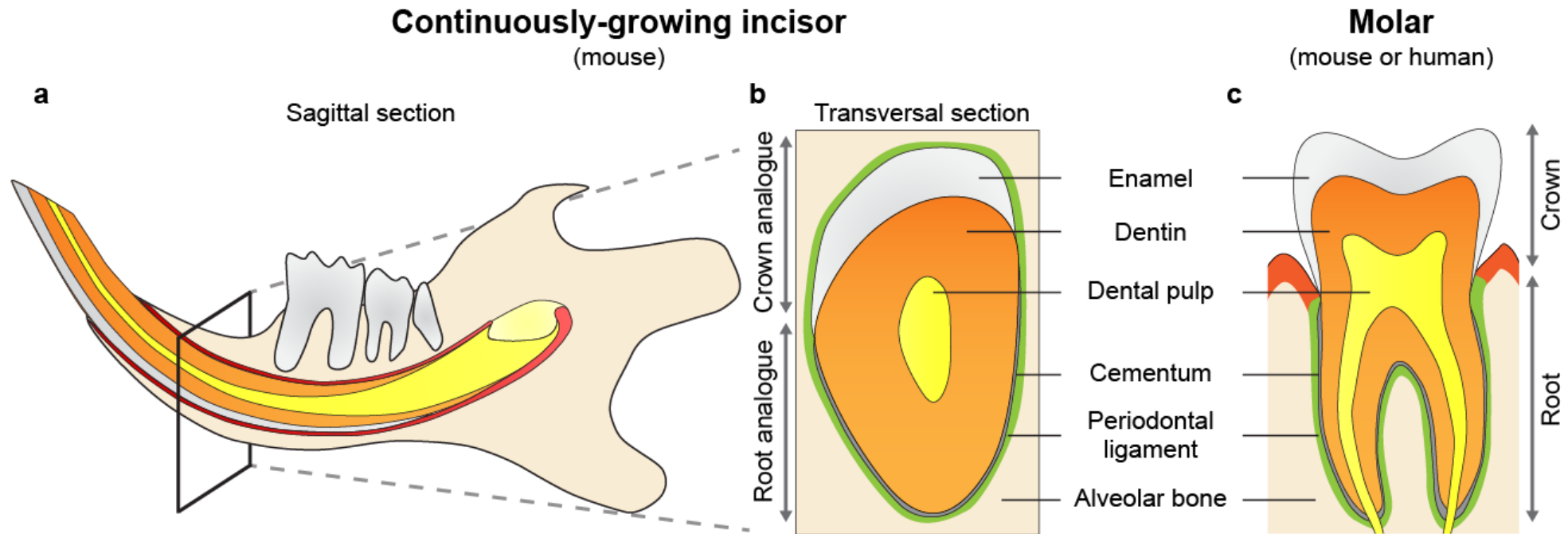
# Tissues of tooth

**Enamel** - enamel, subst. adamantina (row adamas, adamantos = diamond steel), substantia vitrea (lat. vitrum = glass)

**Dentin** - dentin, substantia eburnea (l. Ebur = ivory)

**Cementum** - substantia ossea, crusta petrosa

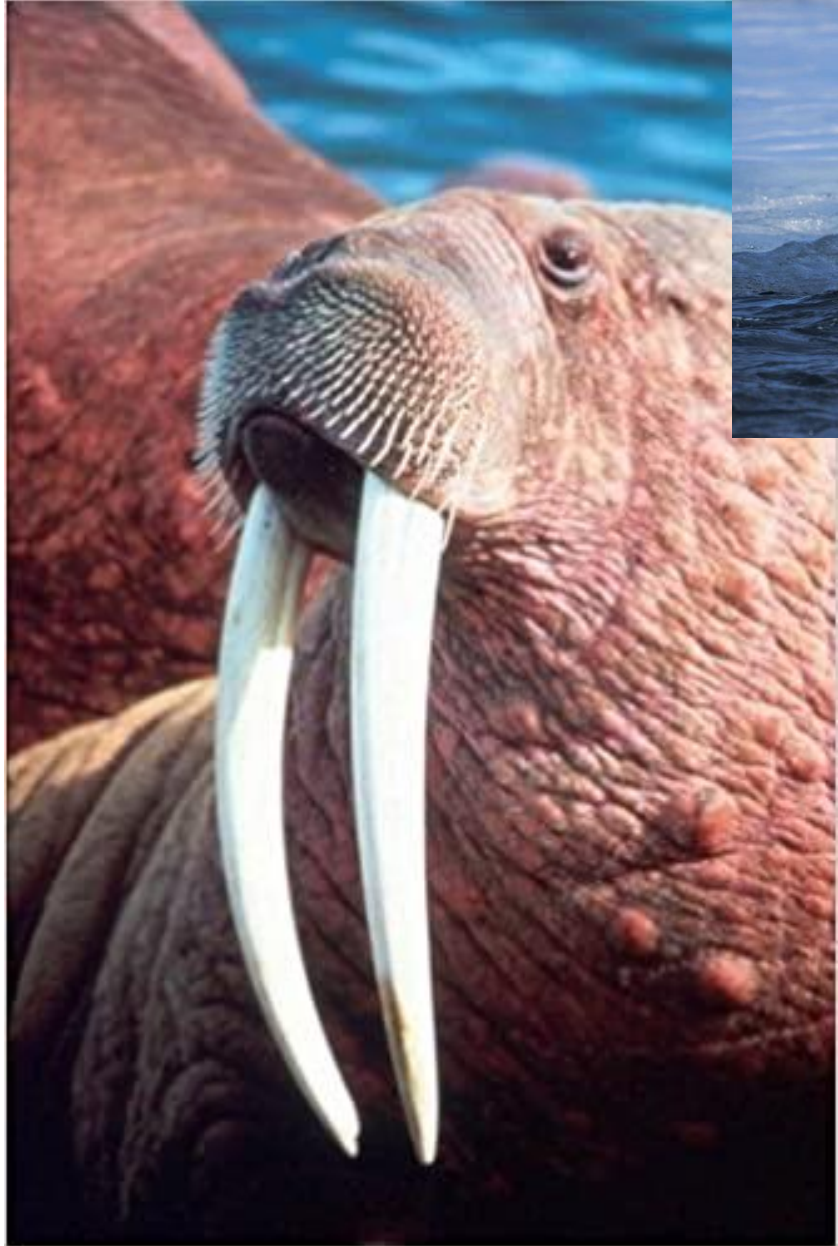
**Dental pulp** - pulpa dentis



# Babirusa



# Tusks



# Differences in the anatomy and structure of primary and permanent teeth

## 1) Thickness of hard dental tissues

- Dentin and cement of temporary teeth is about half the thickness, enamel about 1/3 thinner

## 2) Permeability of dental tissues in permanent teeth decreases with age

- In enamel, the differences between prisms and interprismatic matter become less pronounced with age due to the crystal growth
- In dentin, the decrease in permeability is due to the reduction in the diameter of the dentin tubules

## 3) Chemical composition

- The enamel of temporary teeth contains more nitro compounds than that of permanent teeth

## 4) Crown colour

- For temporary ones, most often blue and white (combination of white and ivory)
- In permanent ones, changes in the colour of the crown occur as a result of dentin thickening and darkening or as a result of the incorporation of substances from the external environment into the enamel
  - Incorporation of heavy metals (Pb, Hg) shades of yellow-copper to grey
  - Incorporation of dyes in toothpaste, tobacco or medicines
  - Incorporation of organic material into enamel

## 5) Abrasion of teeth

- In permanent ones, due to abrasion, the dental arches may shift in a posterior to anterior direction

## 6) Position of longitudinal tooth axes

- In the case of temporary ones, the axes are oriented perpendicular to the occlusal plane, the distal surfaces of temporary molars in one vertical plane
- For permanents, the axes are inclined slightly distally, so that each tooth touches two opposing teeth at bite

