DEVELOPMENT OF FACE, MOUTH, PHARYNX

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Embryology Course

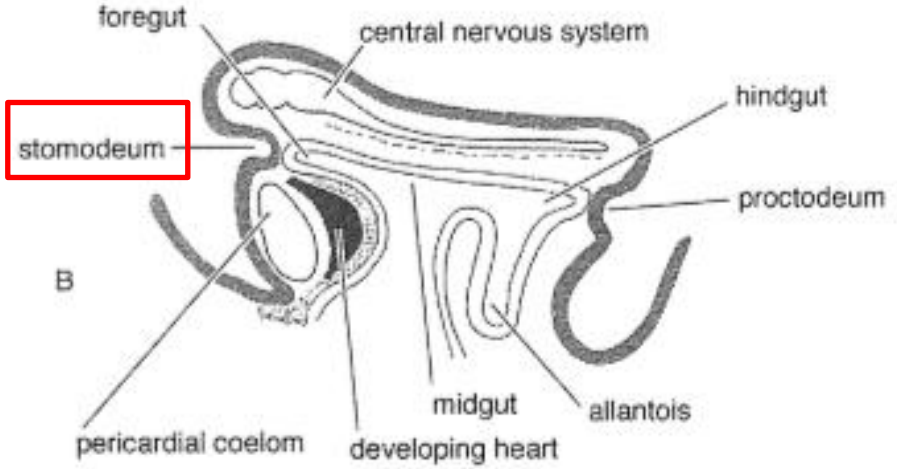
ORIGIN OF THE MOUTH

STOMODEUM (primordial mouth)

1. **the stomodeum appears as a slight depression of the surface ectoderm**
2. **separated from the cavity of the primordial pharynx by a bilaminar membrane - the oropharyngeal membrane**

- **the oropharyngeal membrane composed of fused ectoderm and endoderm**

3. **the oropharyngeal membrane ruptures bringing the primordial pharynx and foregut into communication with the amniotic cavity**



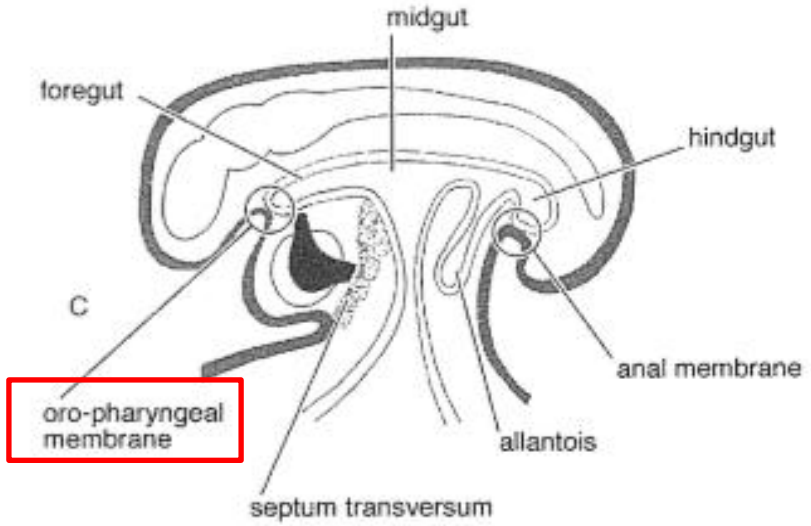


Figure 15.1 Longitudinal sections through an embryo showing sequential stages in cranial and caudal body folding leading to the formation of the foregut, midgut and hindgut.

DEVELOPMENT OF THE FACE

- **the facial primordia begins to appear around the primordial stomodeum**

five facial primordia, which appear around the stomodeum are:

a. the single frontonasal prominence

b. the paired maxillary prominences

c. the paired mandibular prominences

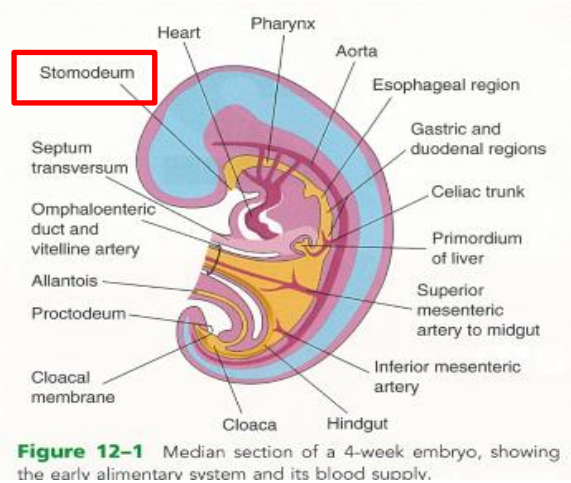
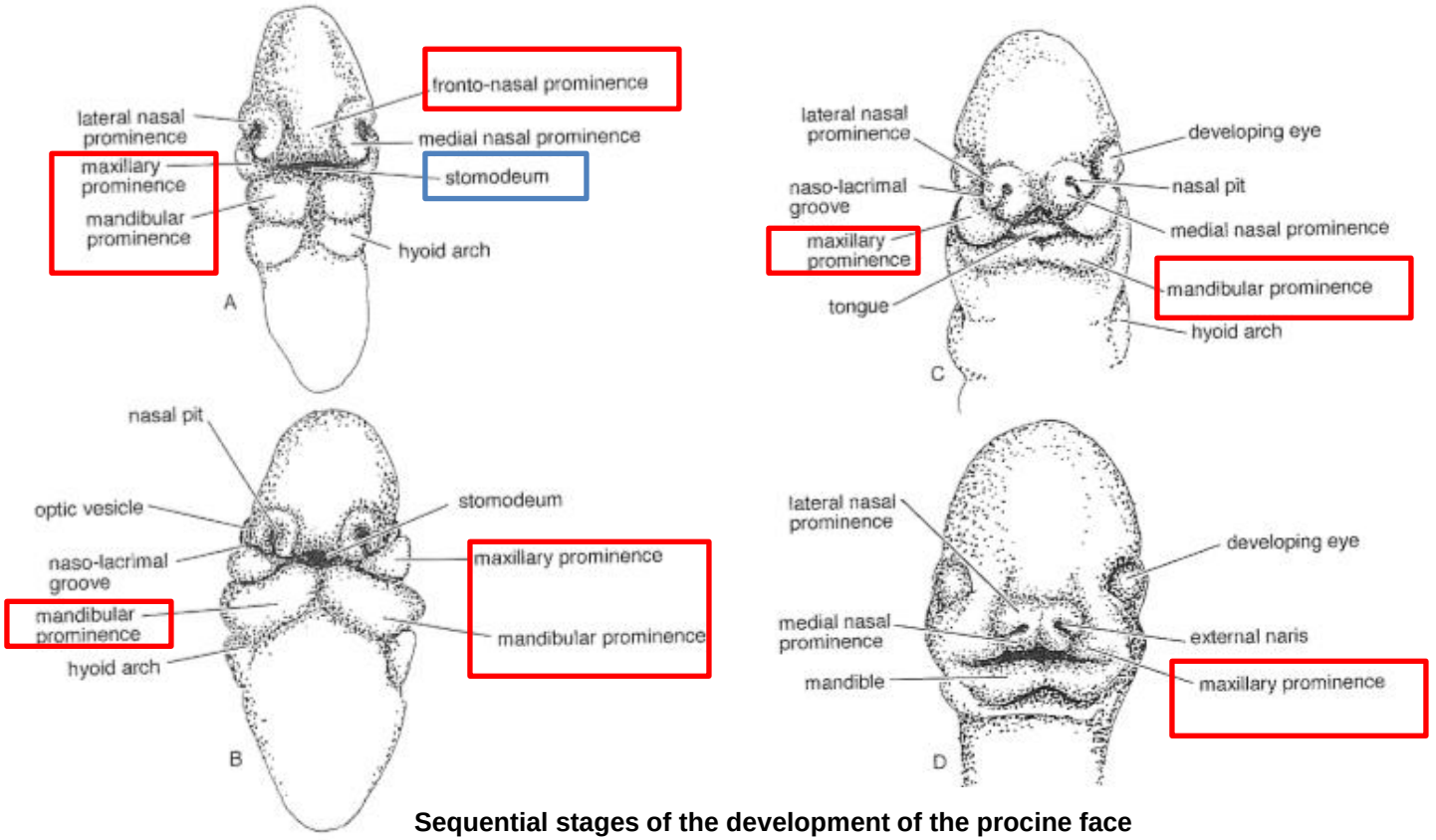


Figure 12–1 Median section of a 4-week embryo, showing the early alimentary system and its blood supply.



Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

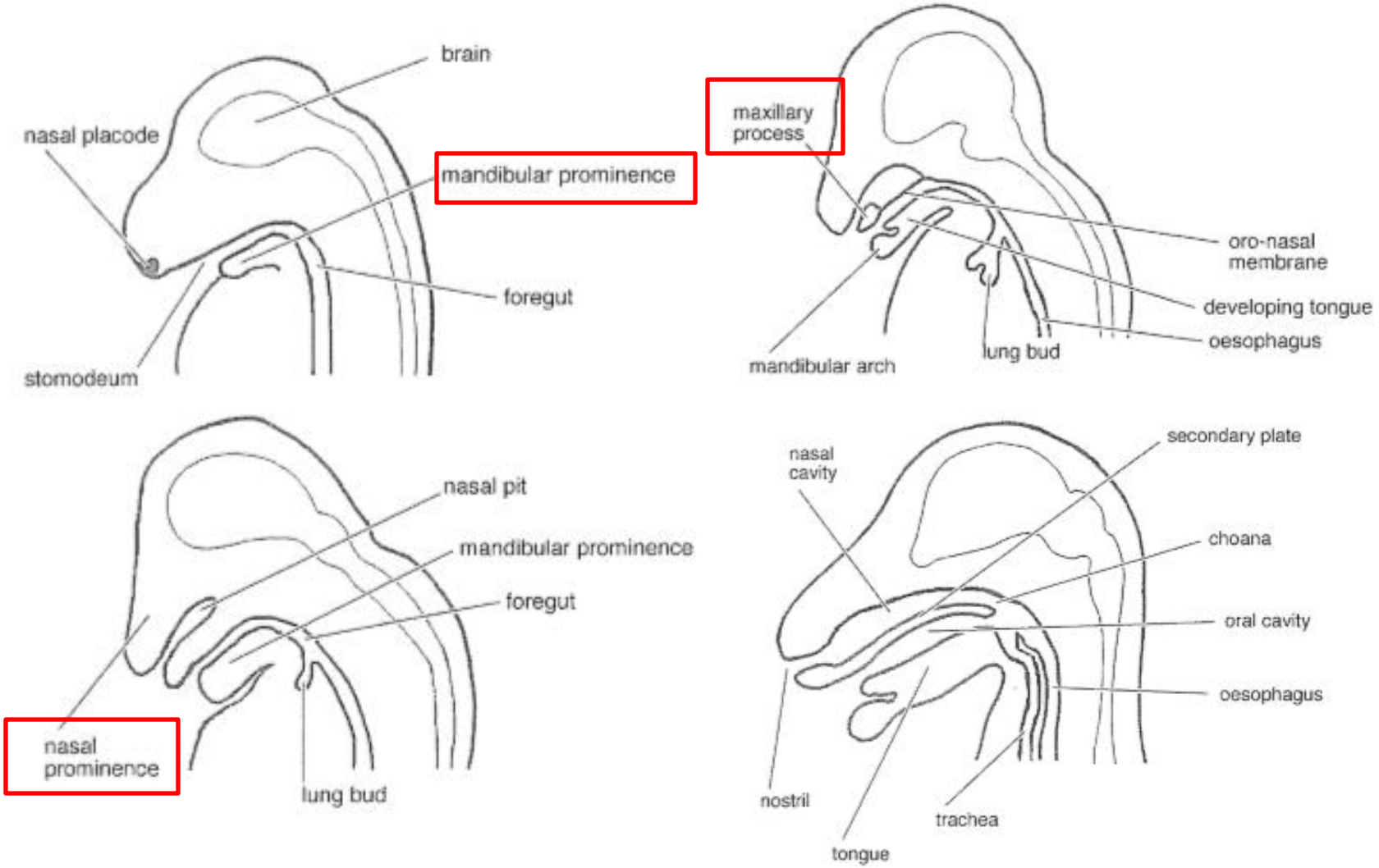
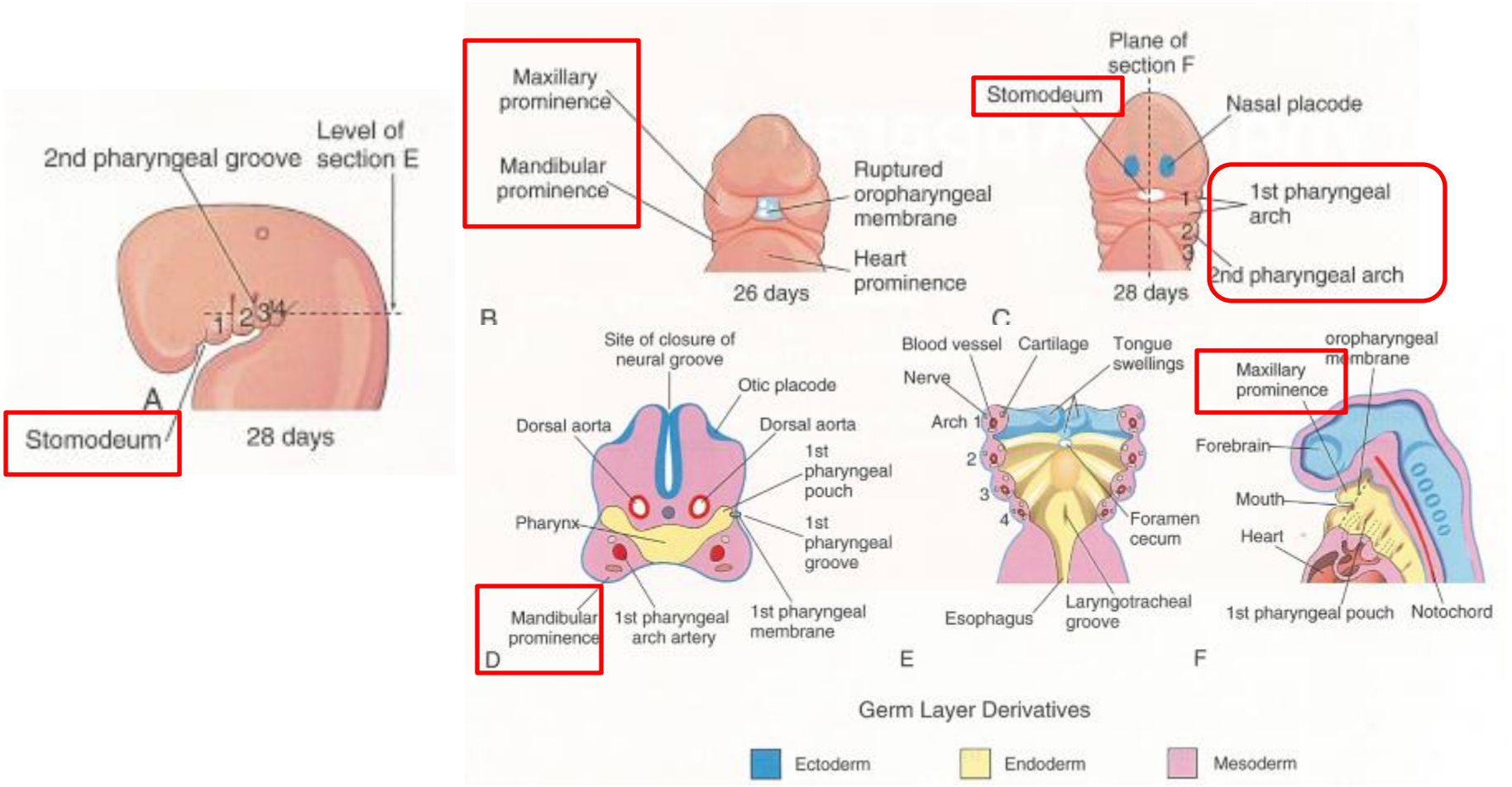


Figure 19.4 Longitudinal sections through the cranial regions of developing embryos at the level of the nasal pit showing progressive development of the nasal and oral cavities.

DEVELOPMENT OF THE FACE

- **both paired prominences are derivatives of the first pair of pharyngeal arches**
- **the prominences are produced by mesenchyme derived from neural crest cells – that migrate into the arches**
- **these cells are the major source of connective tissue components (cartilage, bone, ligaments in the facial and oral regions)**



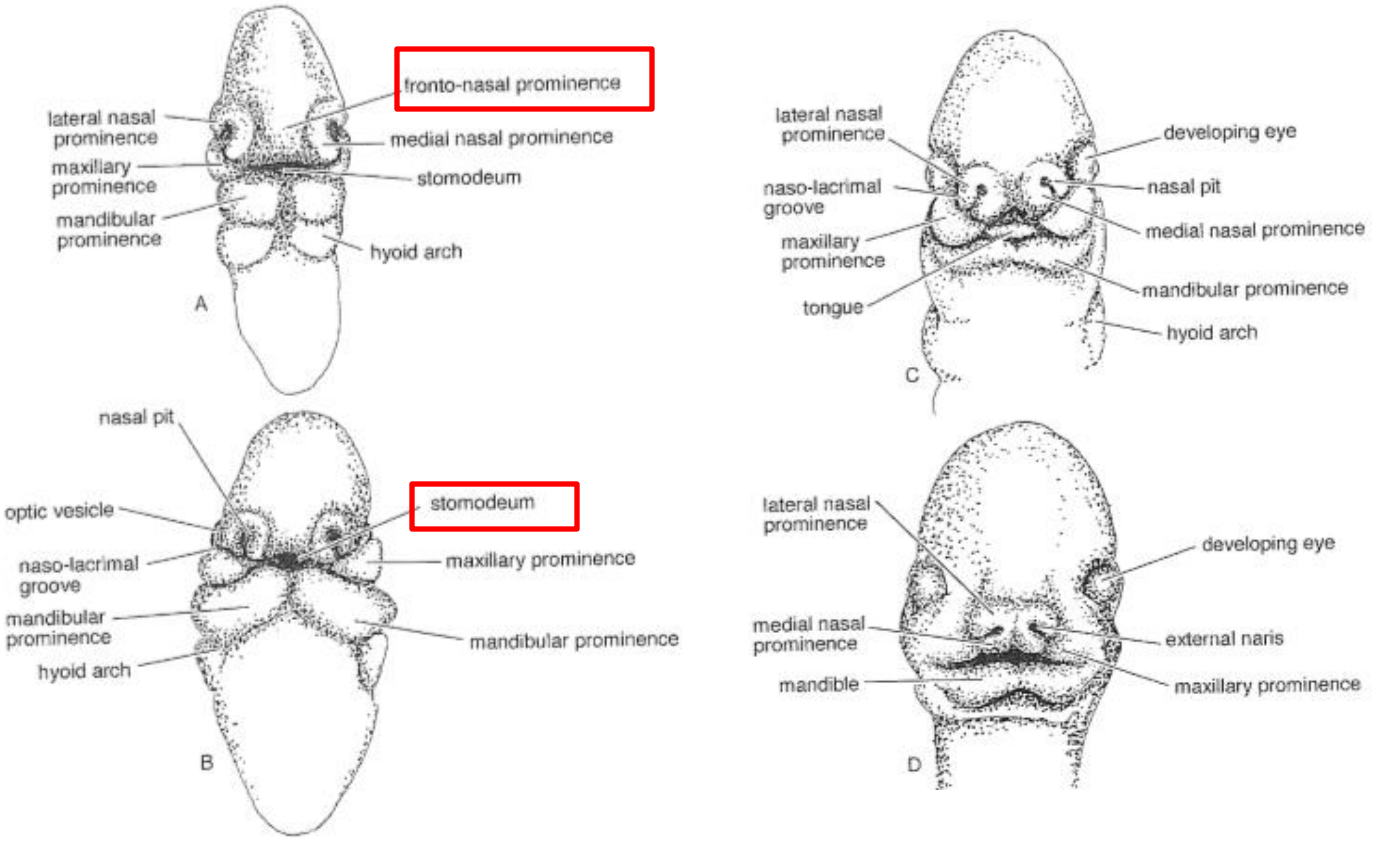
DEVELOPMENT OF THE FACE

FRONTONASAL PROMINENCE:

- **surrounds the ventrolateral part of the forebrain**

a. the frontal part forms the forehead

b. the nasal part forms the rostral boundary of the stomodeum and the nose

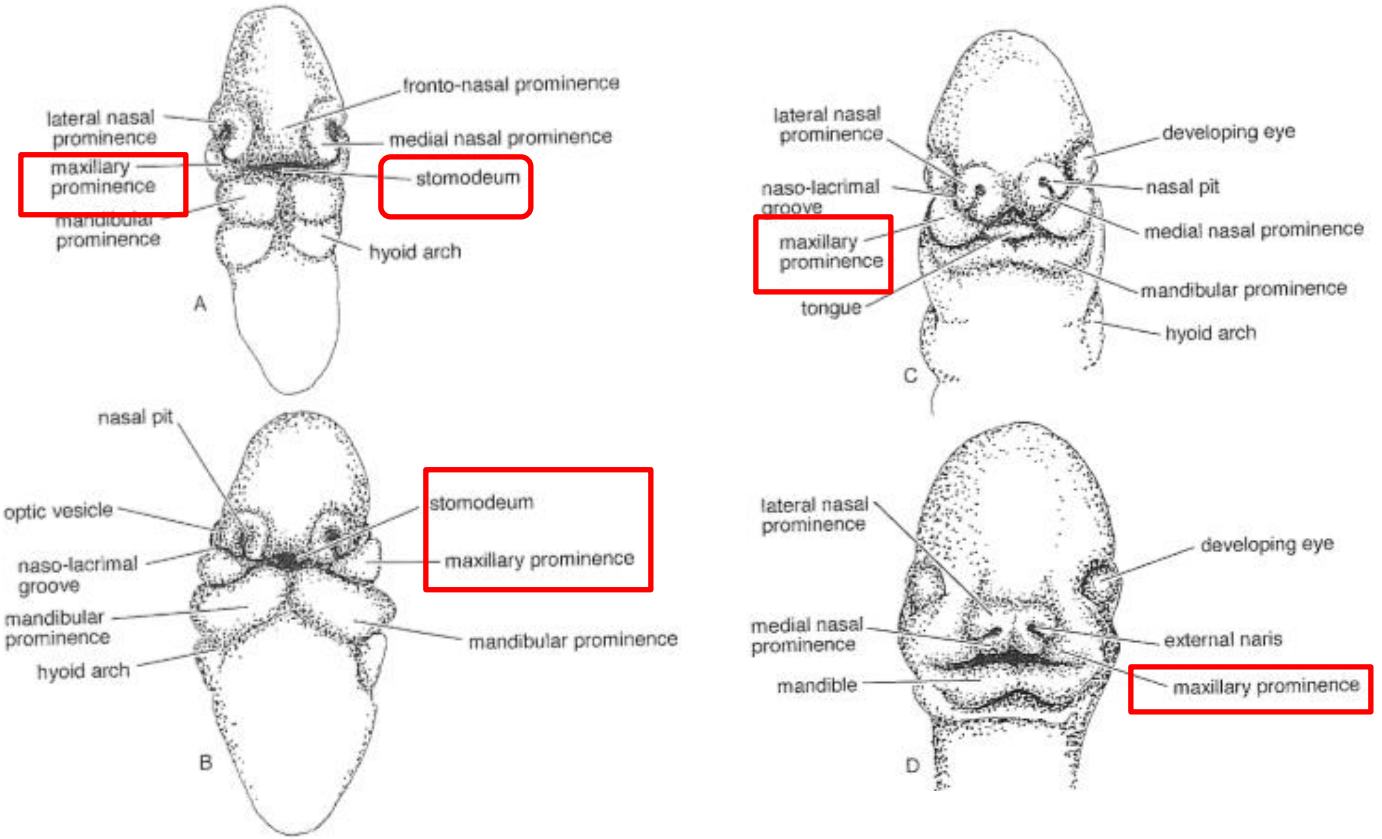


Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

MAXILLARY PROMINENCE:

- **form the lateral boundaries of the stomodeum**

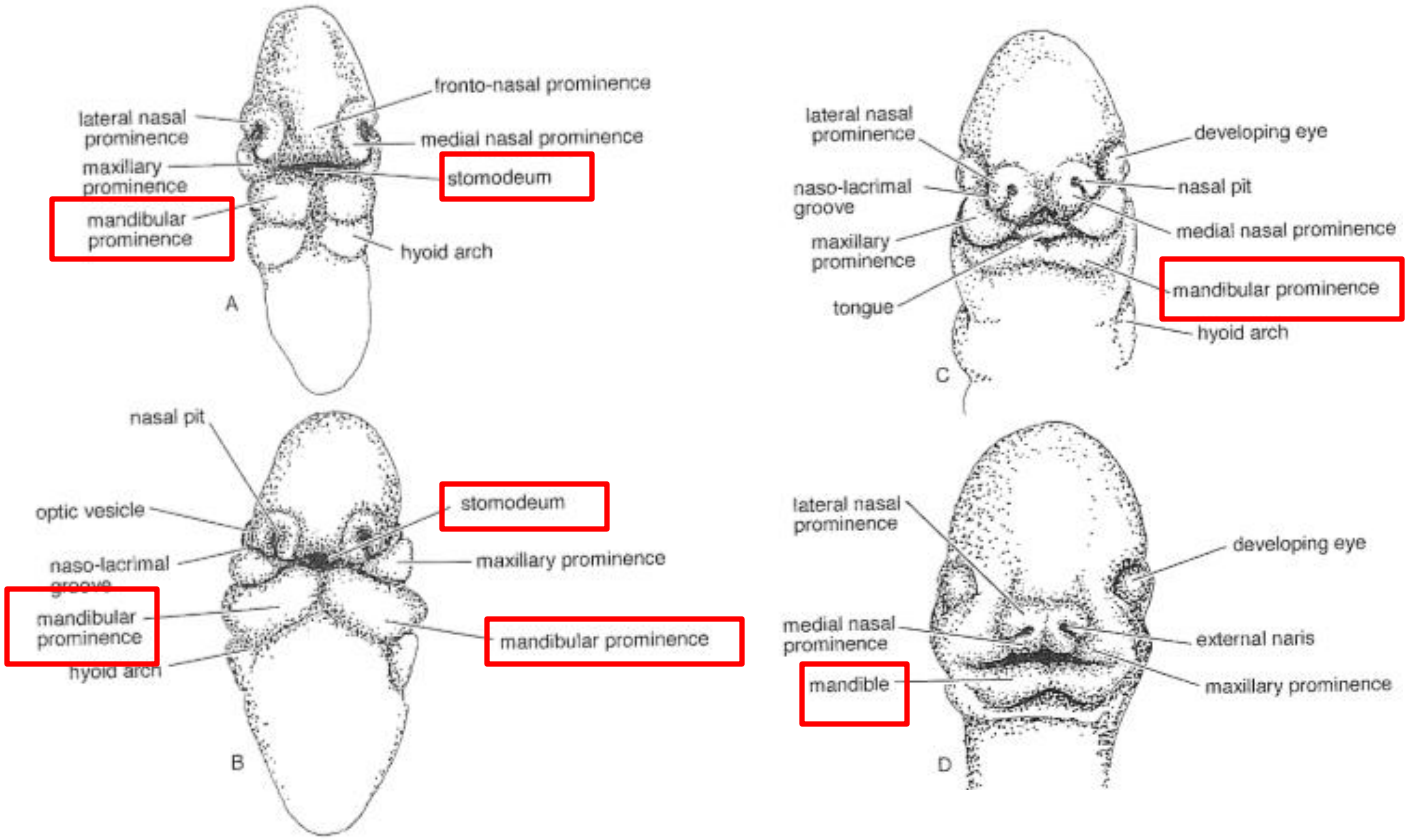


Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

MANDIBULAR PROMINENCE:

- **constitute the caudal boundary of the primordial mouth**
- **the lower jaw and the lower lip are the first part of the face to form – they result from merging of the medial ends of the mandibular prominences**

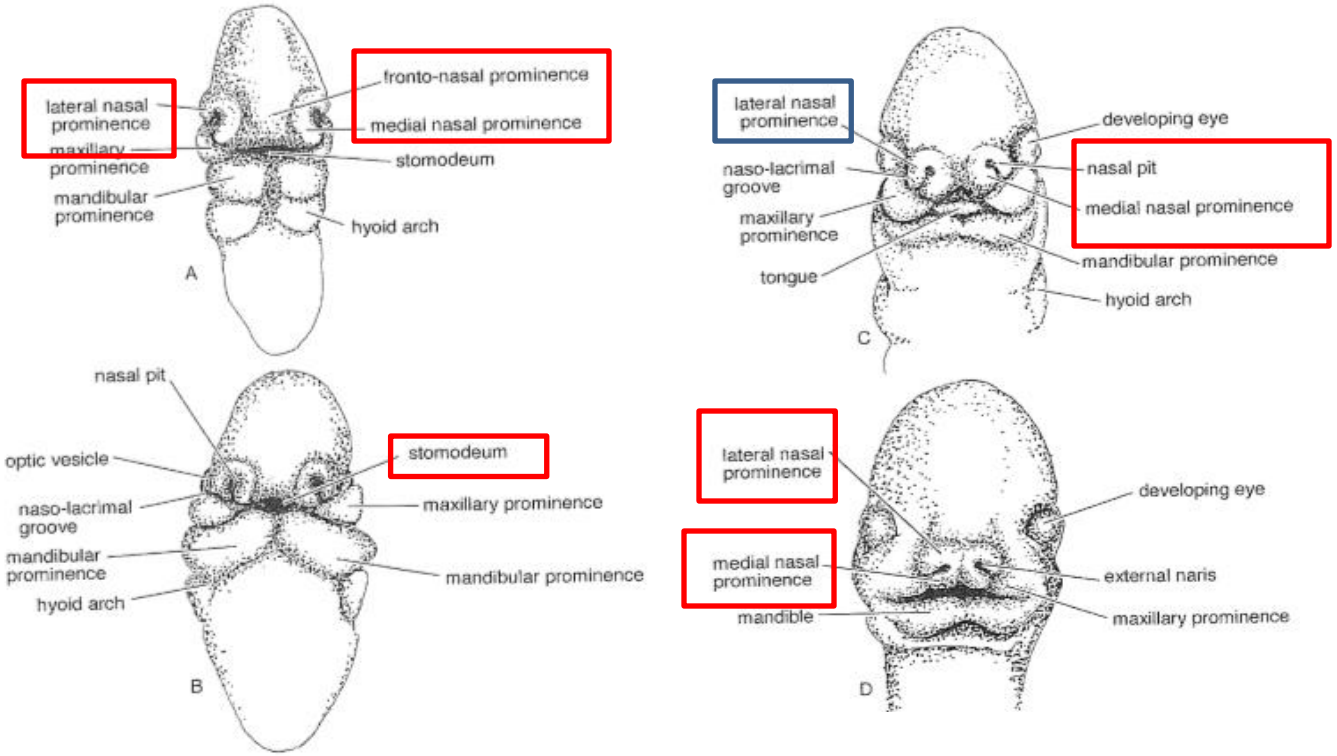


Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

NASAL PLACODES:

- **bilateral oval thickenings of the surface ectoderm develop on the inferolateral parts of the frontonasal prominence**
- **the mesenchyme in the margins of the placodes proliferates – producing horseshoe – shaped elevantions - the medial and lateral nasal prominences**
- **the nasal placodes lie in depressions called nasal pits**



Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

NASAL PLACODES:

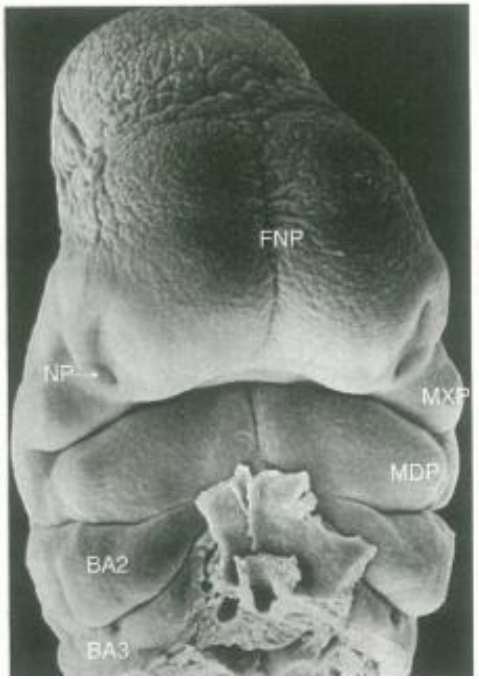
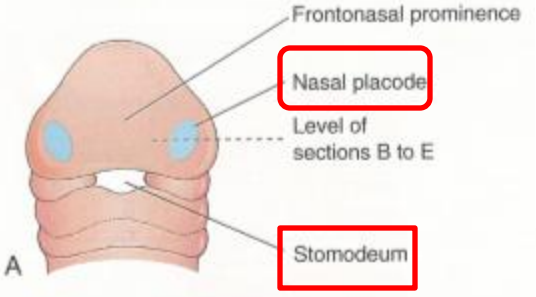
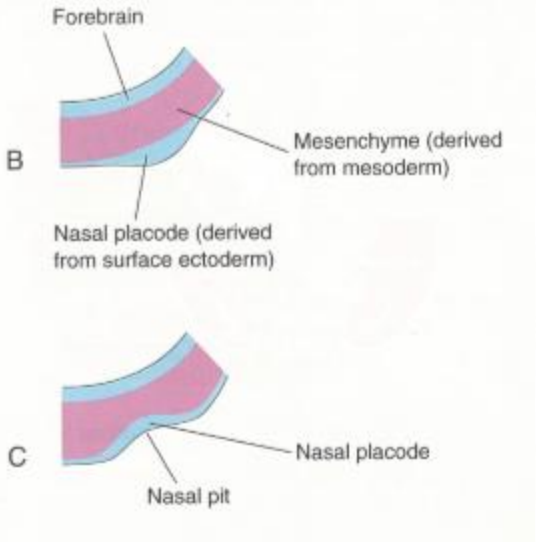


Figure 10–25 Scanning electron micrograph showing a ventral view of a human embryo at approximately 33 days (stage 15; crown–rump length [CRL], 8 mm). Observe the prominent frontonasal prominence *(FNP)* surrounding the telencephalon (forebrain). Also observe the nasal pits *(NP)* located in the ventrolateral regions of the frontonasal prominence. Medial and lateral nasal prominences surround these pits. The wedge-shaped maxillary prominences *(MXP)* form the lateral boundaries of the stomodeum. The fusing mandibular prominences *(MDP)* are located just caudal to the stomodeum. The second pharyngeal arch *(BA2)* is clearly visible and shows overhanging margins (opercula). The third pharyngeal (branchial) arch *(BA3)* is also clearly visible. *(From Hinrichsen K: The early development of morphology and patterns of the face in the human embryo. Adv Anat Embryol Cell Biol 98:1, 1985.)*





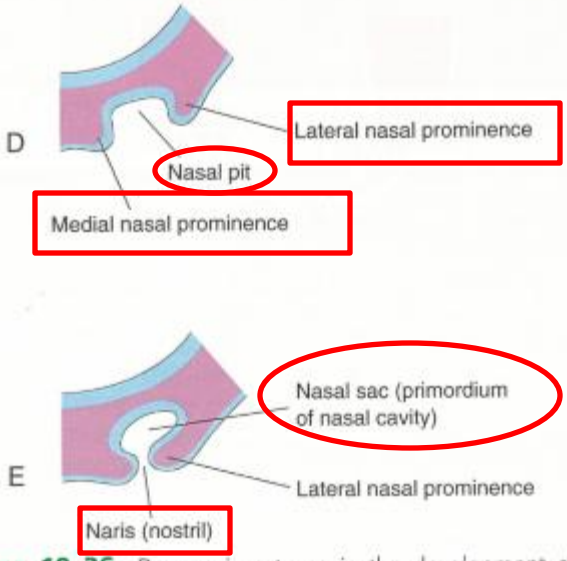
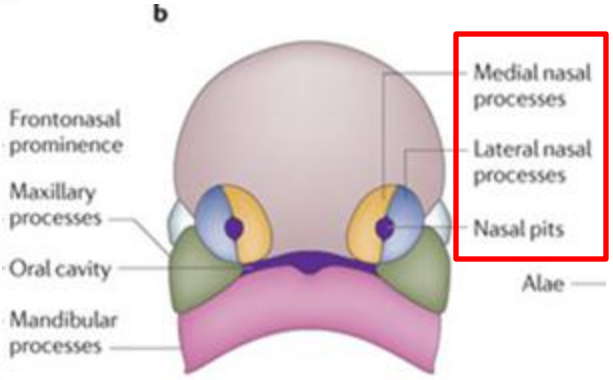


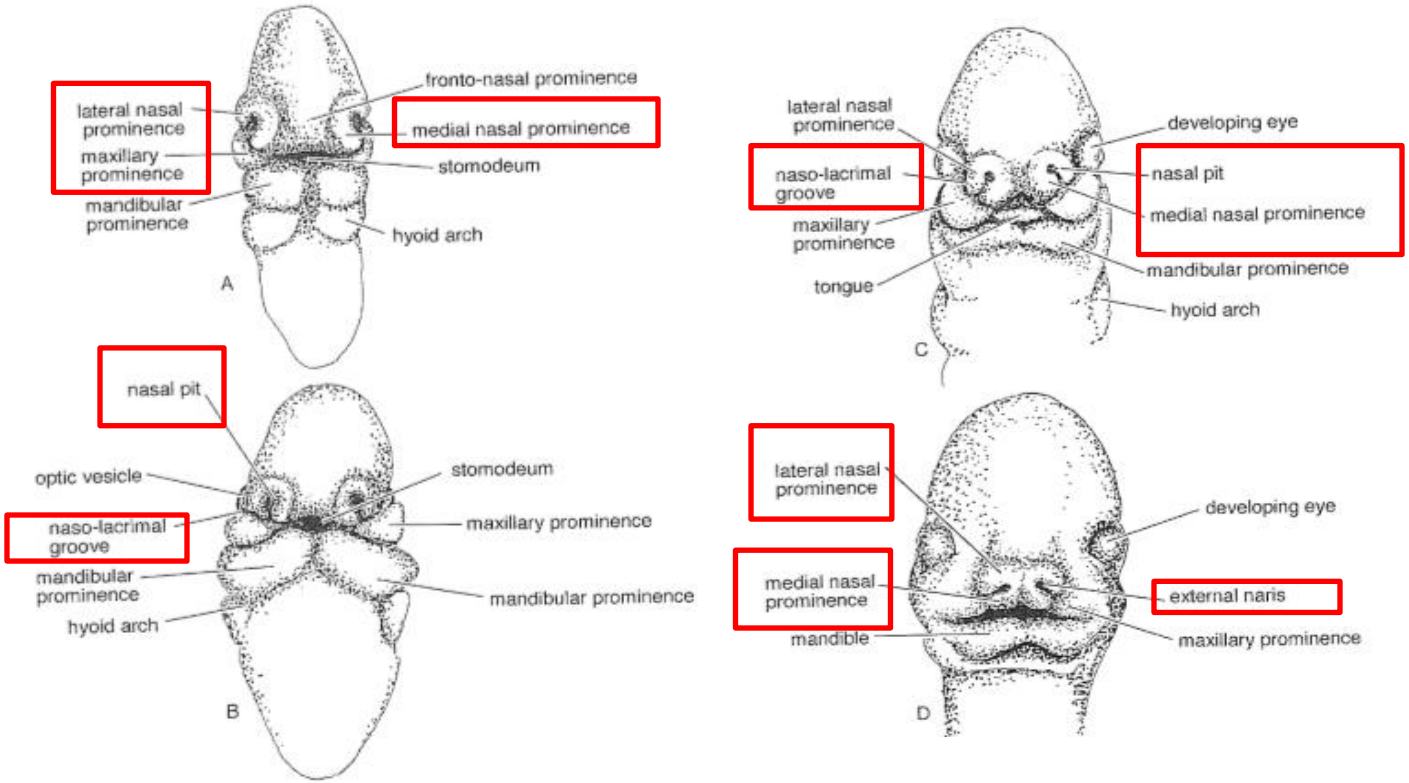
Figure 10–26 Progressive stages in the development of a human nasal sac (primordial nasal cavity). **A,** Ventral view of an embryo at approximately 28 days. **B** to **E,** Transverse sections through the left side of the developing nasal sac.



DEVELOPMENT OF THE FACE

NASAL PITS:

- **the primordia of the nares (nostrils) and nasal cavity**
- **the medial migration of the maxillary prominences moves the medial nasal prominences toward the median plane and each other**
- **each lateral nasal promince is separated from the maxillary prominence by a cleft called nasolacrimal groove**



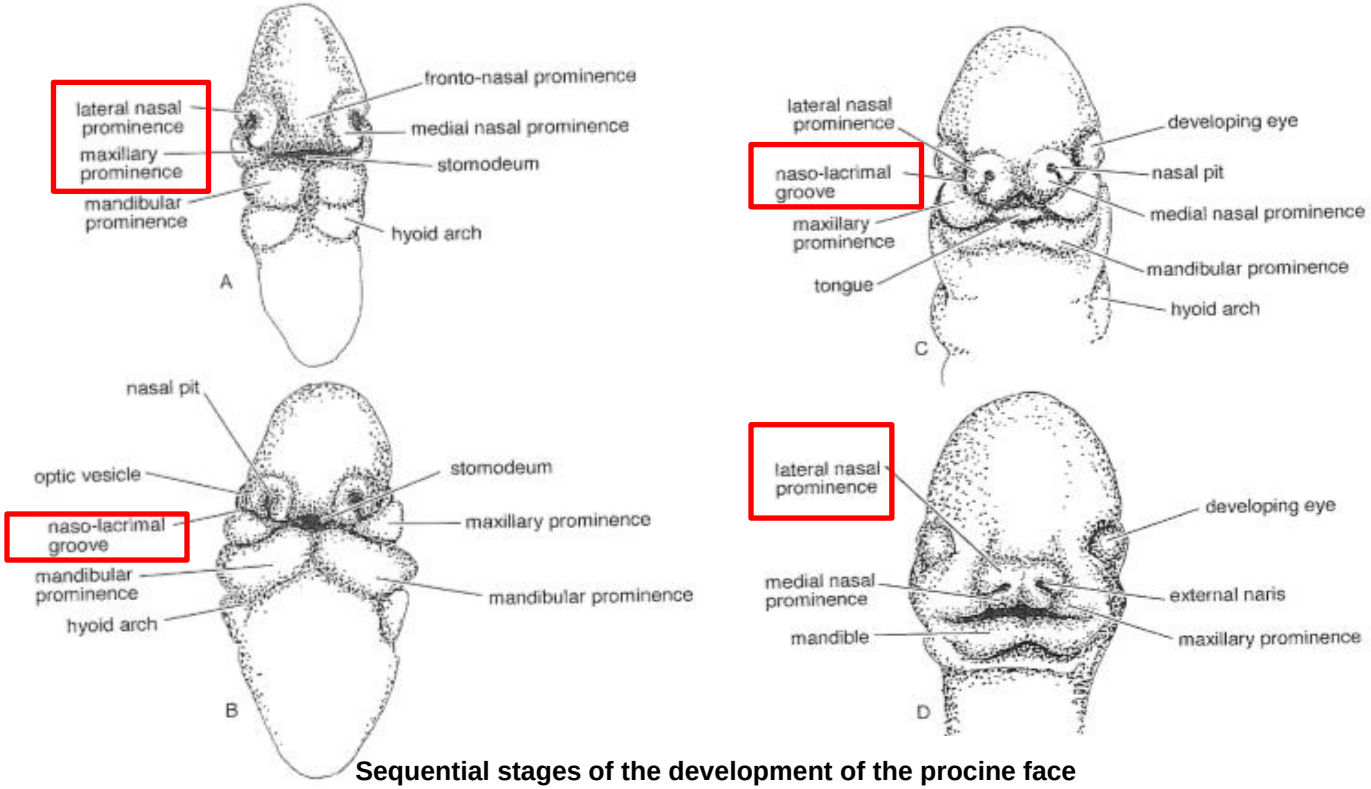
Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

NASOLACRIMAL DUCT:

- each maxillary porminence begins to merge with the lateral nasal prominence along the line of the nasolacrimal groove

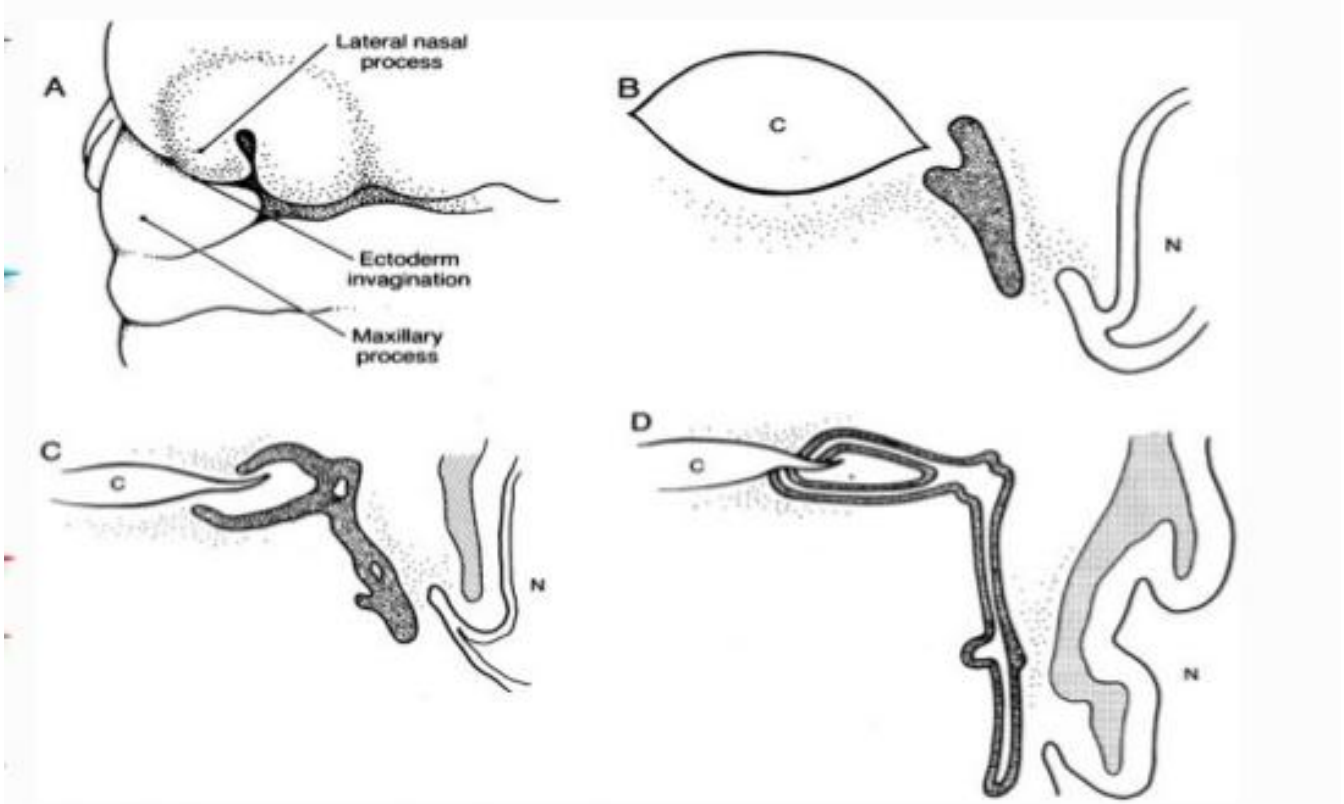
- **the nasolacrimal duct develops from a rod – like thickening of ectoderm in the floor of the nasolacrimal groove**
- **the thickening gives rise to a solid epithelial cord – the cord canalizes to form the nasolacrimal duct**
- **the cranial end of the nasolacrimal duct expands to form the lacrimal sac**



Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

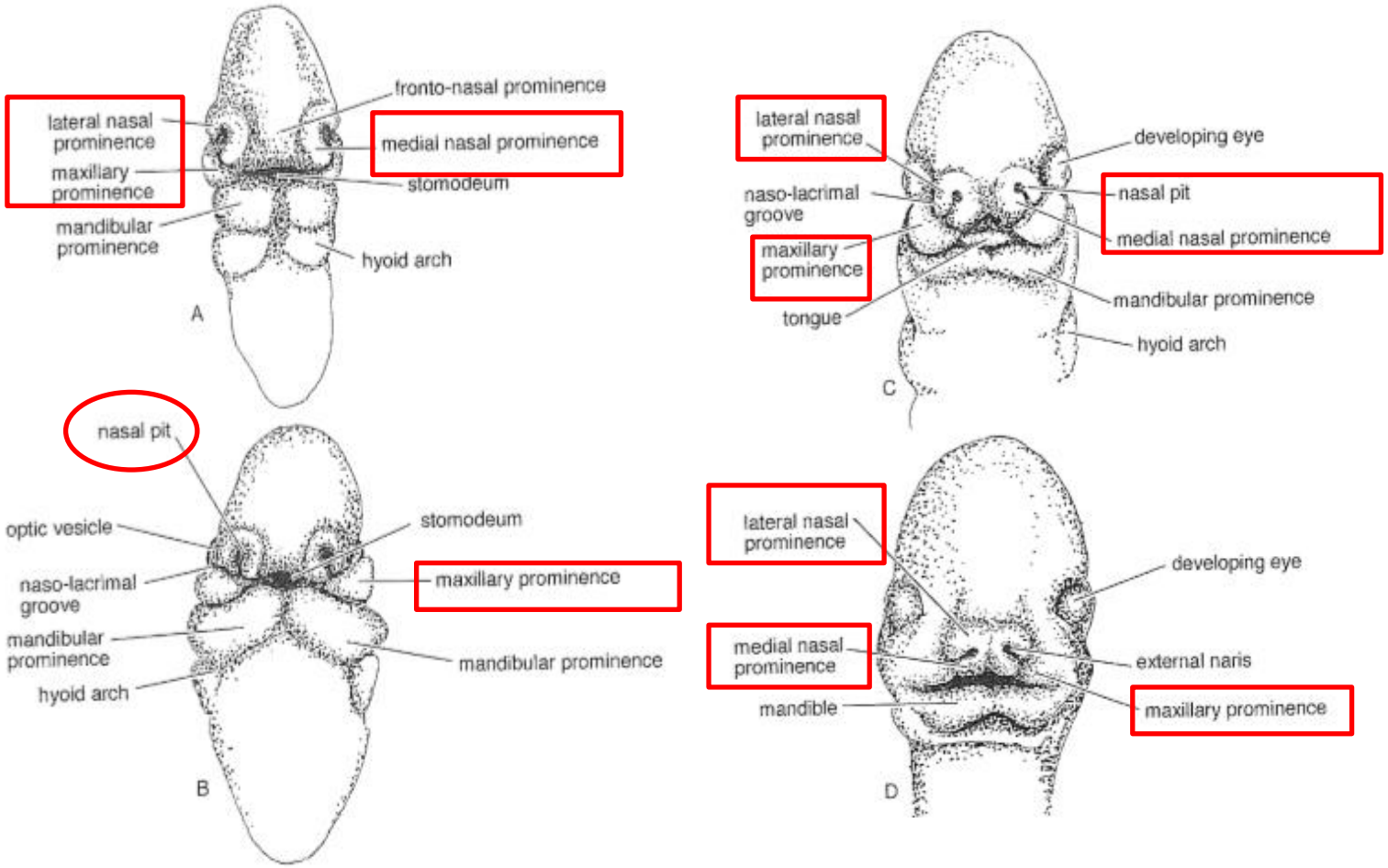
NASOLACRIMAL DUCT:



Lacrimal drainage system embryology. **A**. At 5.5 weeks' gestation, an ectodermal invagination forms between the lateral nasal process and maxillary process, which becomes pinched off from the surface. **B**. At 6 weeks' gestation, a solid cord of ectoderm is located between the primitive medial canthus and nose. **C**. At 12 weeks' gestation, proliferation of the cord occurs laterally toward the eyelid and inferiorly toward the inferior turbinate. The isolated cavities shown appear at 3 to 4 months. **D**. At 7 months, canalization is nearly complete, with only the puncta and valve of hasner remaining imperforate.

DEVELOPMENT OF THE FACE

- merging of the medial nasal and maxillary prominences results in continuity of the upper jaw and lip and separation of the nasal pits from the stomodeum



Sequential stages of the development of the procine face

DEVELOPMENT OF THE FACE

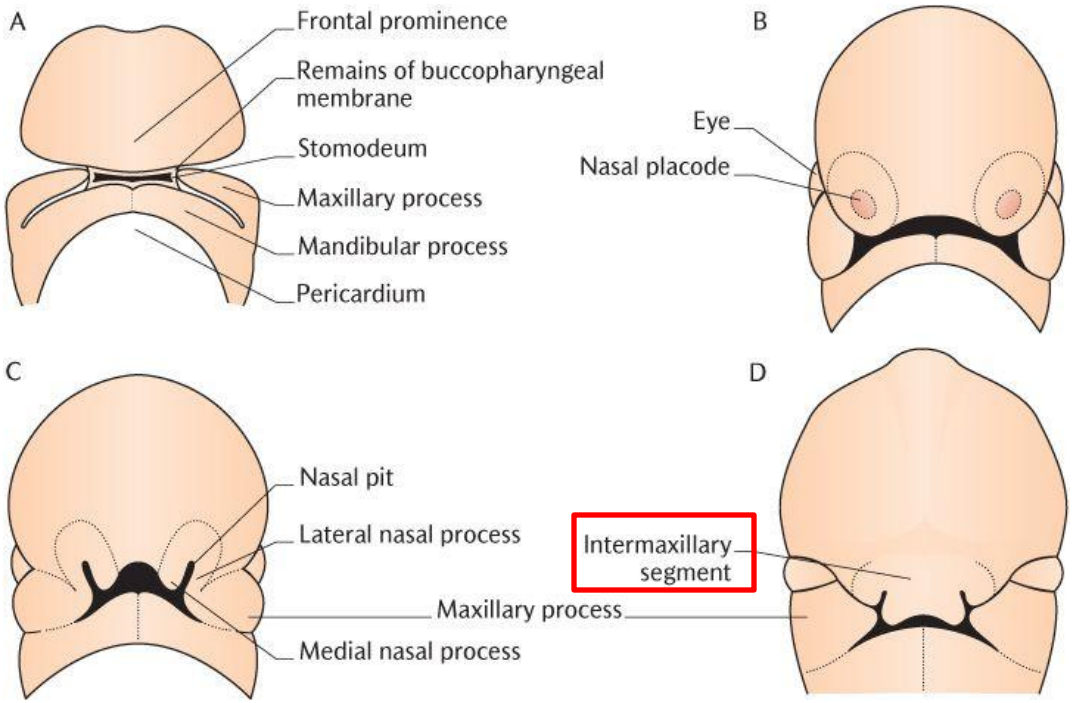
- **as the medial nasal prominences merge - they form an intermaxillary segment**

THE INTERMAXILLARY SEGMENT gives rise to:

a. the deep median part of the upper lip

b. the premaxillary part of the maxilla and its associated gingive (gum)

c. the primary palate



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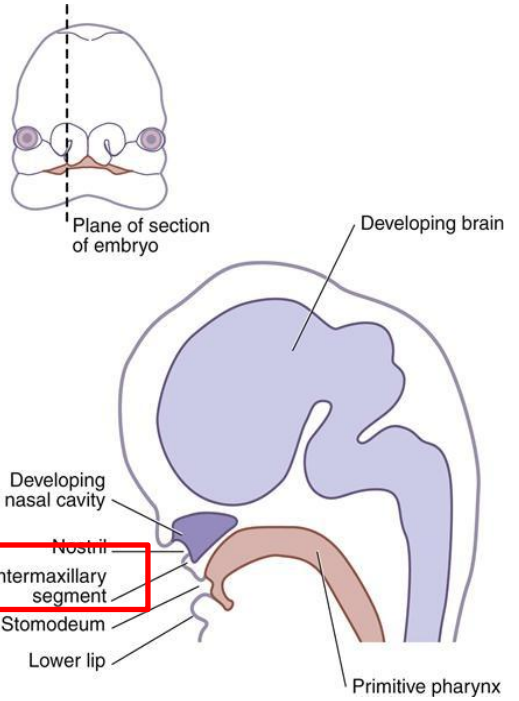
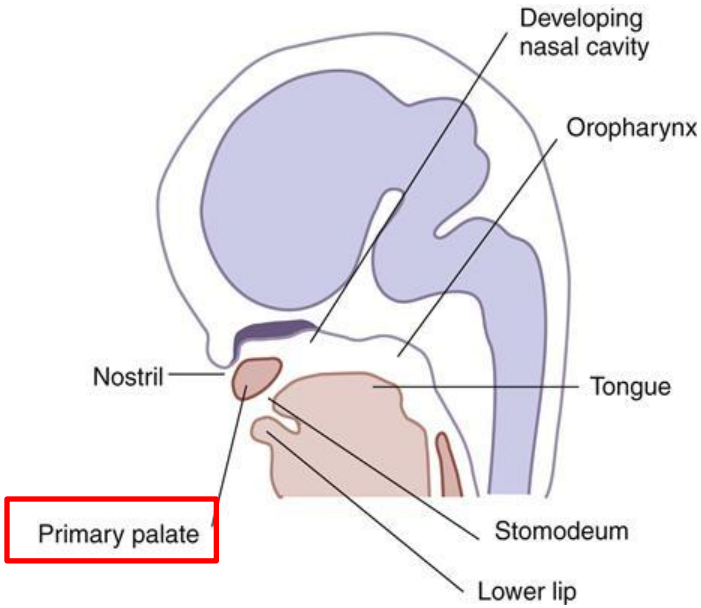
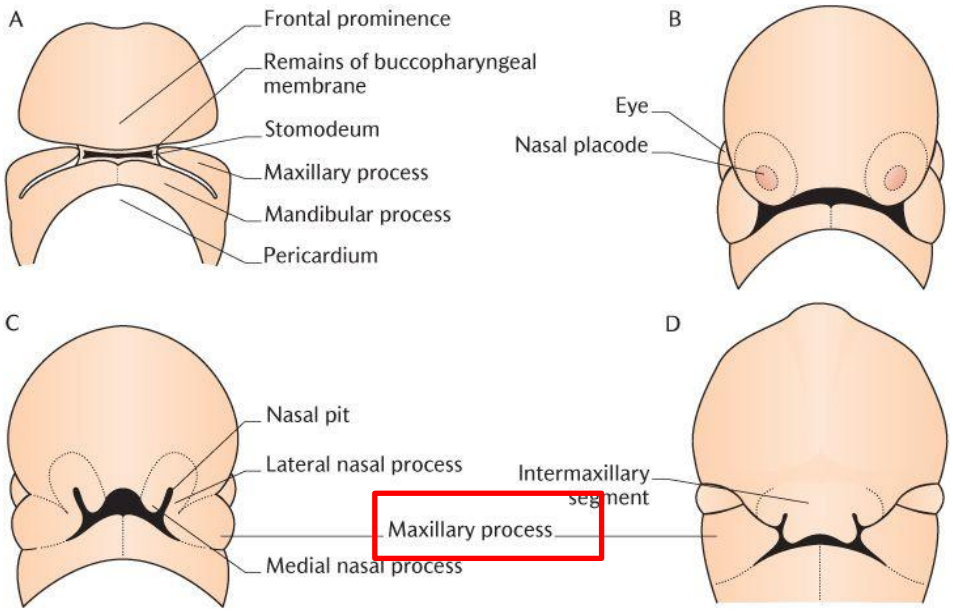




https://pocketdentistry.com/5-development-of-orofacial-structures/

DEVELOPMENT OF THE FACE

- **the lateral parts of the upper lip, most of the maxilla, the secondary palate form from the maxillary prominences**
- **the primordial lips and cheeks are invaded by myoblasts from the second pair of phayrngeal arches – which differentiate into the facial muscles**
- **the myoblasts from the first pair of pharyngeal arches differentiate into the muscles of mastication**



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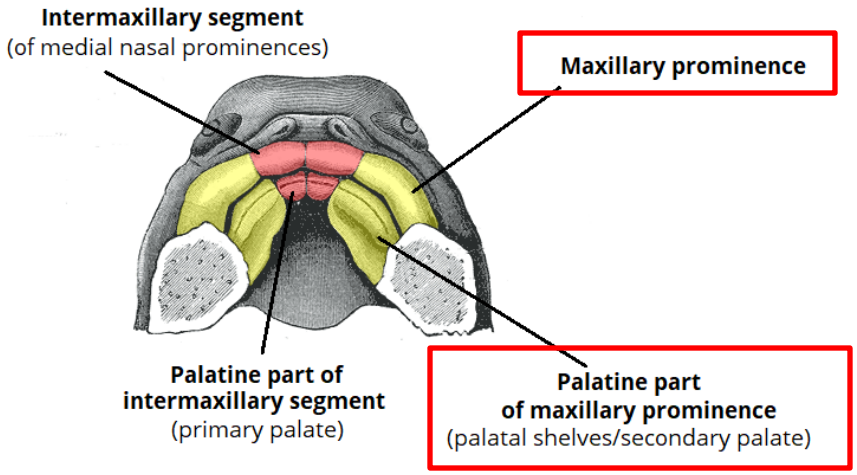


https://teachmeanatomy.info/the-basics/embryology/face-palate/

DEVELOPMENT OF THE FACE

1. the medial nasal prominence form:

a. the nasal septum

b. vomer

c. incisive bone

2. lateral nasal prominece form:

a. nasal bone

b. lacrimal bone

c. fleshy portions of the alae (wings of the nose)

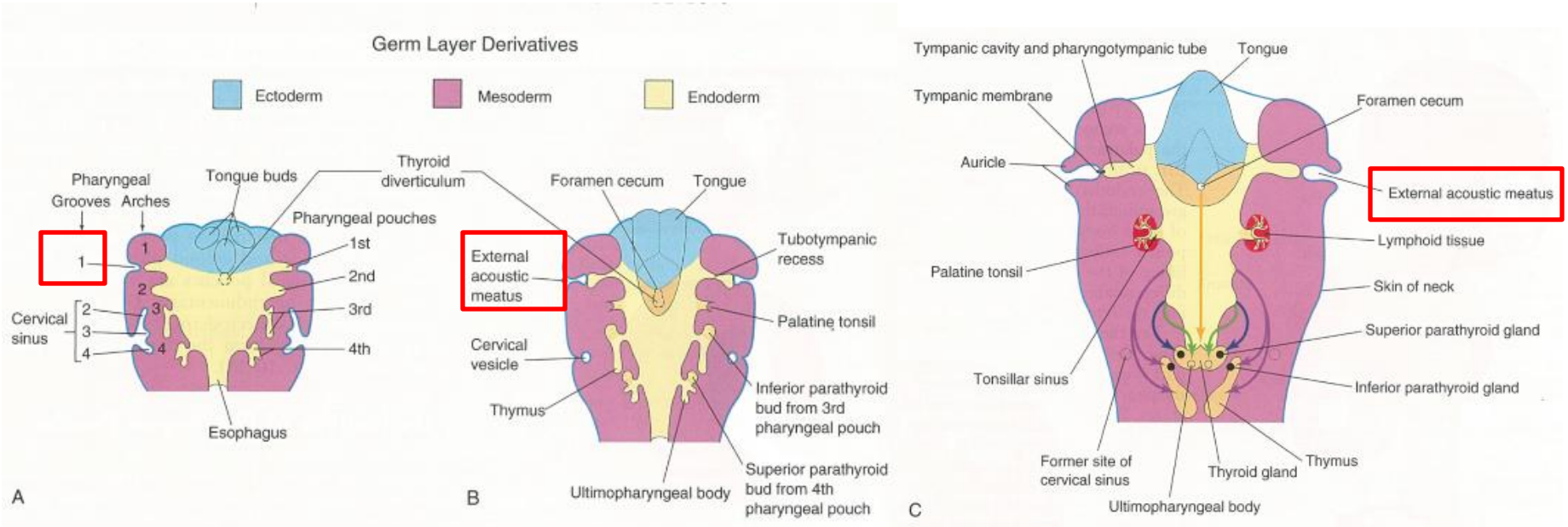
3. maxillary prominence form:

a. zygomatic bone

DEVELOPMENT OF THE FACE

PRIMORDIA OF THE AURICLE:

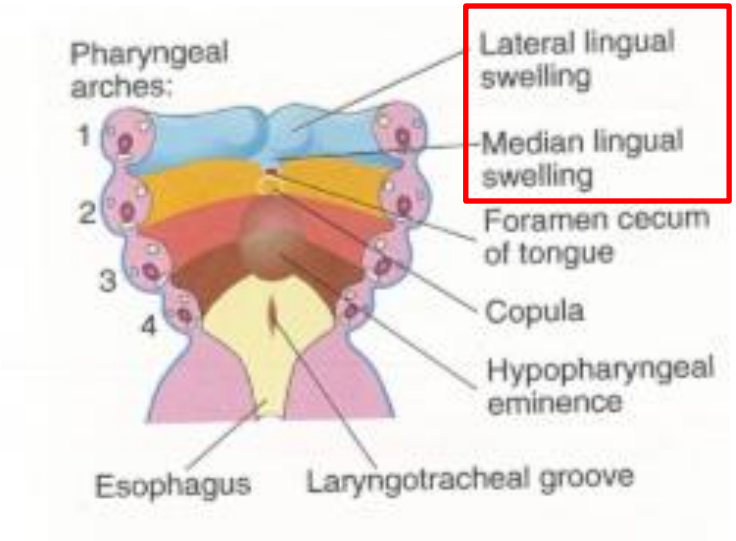
- six auricular hillocks – primordia of the auricle (mesencymal swellings) form around the 1st pharyngeal groove (three on each side)
- the 1st pharyngeal groove is the primordium of the external acoustic meatus (canal)
- the external ears positioned in the neck region – however as the mandibula develops – they ascend to the side of the head at the level of the eyes

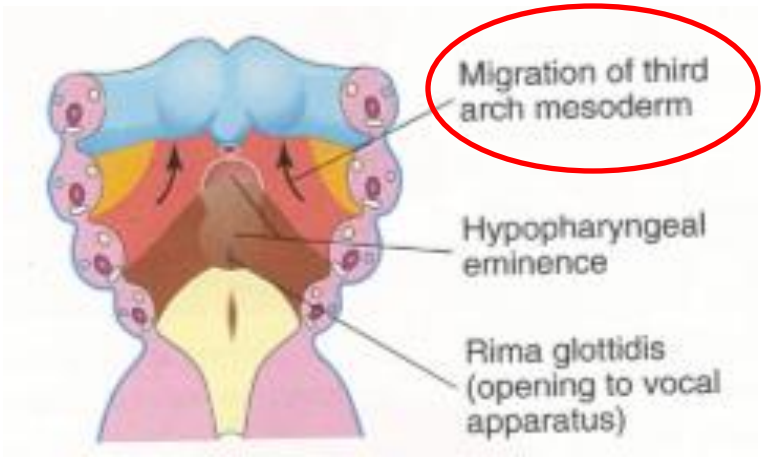


DEVELOPMENT OF THE TONGUE

1. **a median triangular elevation appears in the floor of the primordial pharynx**
2. **this swelling – the median lingual swelling (tuberculum impar) – is the first indication of the tongue development**
3. **two oval lateral lingual swellings soon develop on each side of the median swelling**

- **the swellings result from the proliferation of mesenchyme in the ventromedial parts of the first pair of pharyngeal arches**

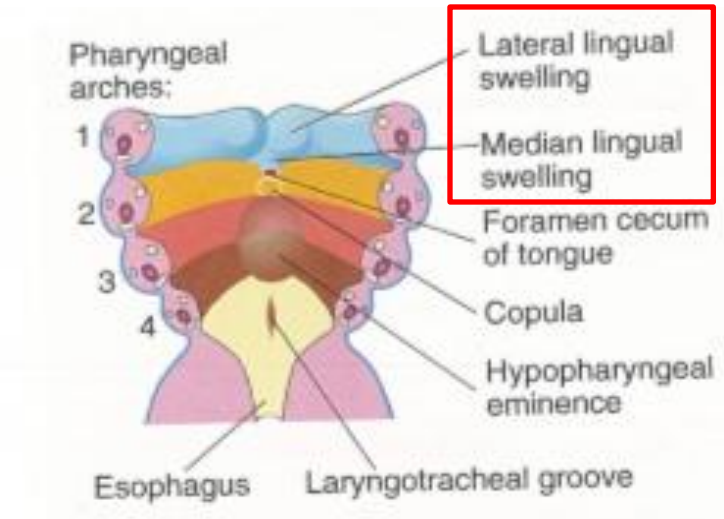


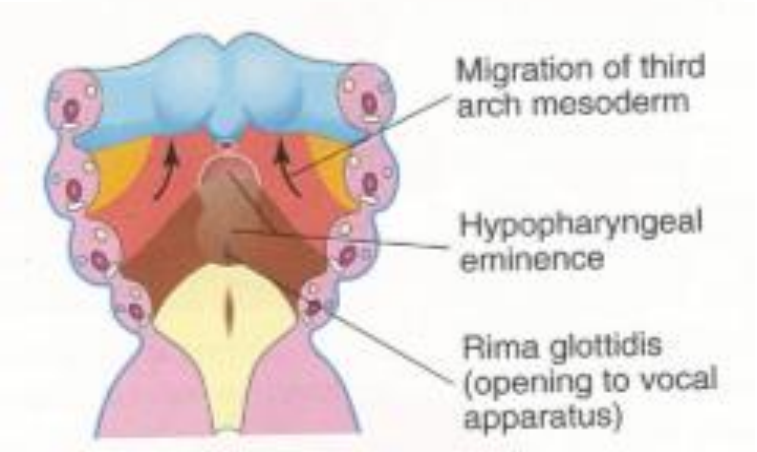


DEVELOPMENT OF THE TONGUE

4. the lateral swellings rapidly incerase in size, merge and overgrow the median tongue swelling

5. the merged lateral swellings form the rostral two thirds or the oral part of the tongue





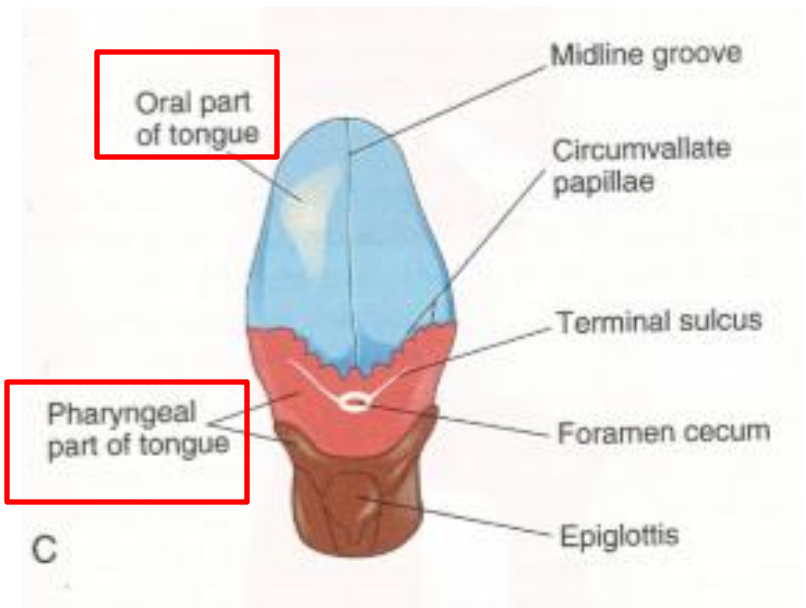


Figure 10–22 **A** and **B**, Schematic horizontal sections through the pharynx at the level shown in Figure 10-4*A*, showing successive stages in the development of the tongue during the fourth and fifth weeks. **C**, The adult tongue, showing the pharyngeal arch derivation of the nerve supply of its mucosa.

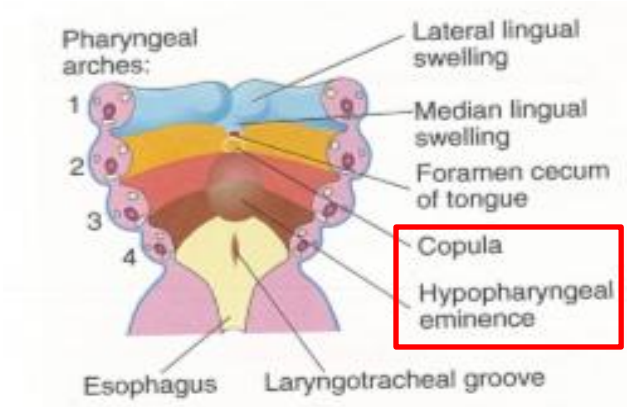
DEVELOPMENT OF THE TONGUE

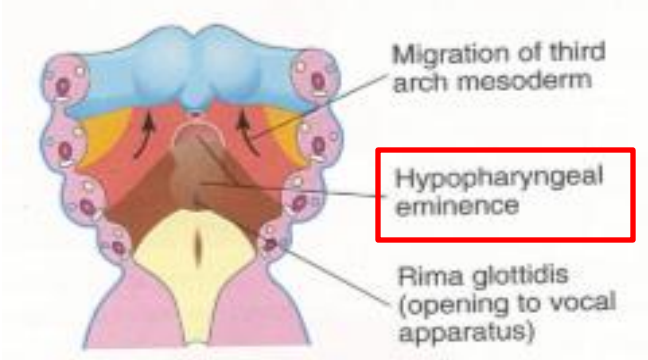
formation of the caudal third or the pharyngeal part of the tongue is indicated by two elevations:

a. Copula :

– forms by fusion of the ventromedial parts of the second pair of the pharyngeal arches

- **overgrown by the hypopharyngeal eminence**
- **forms the root of the tongue**





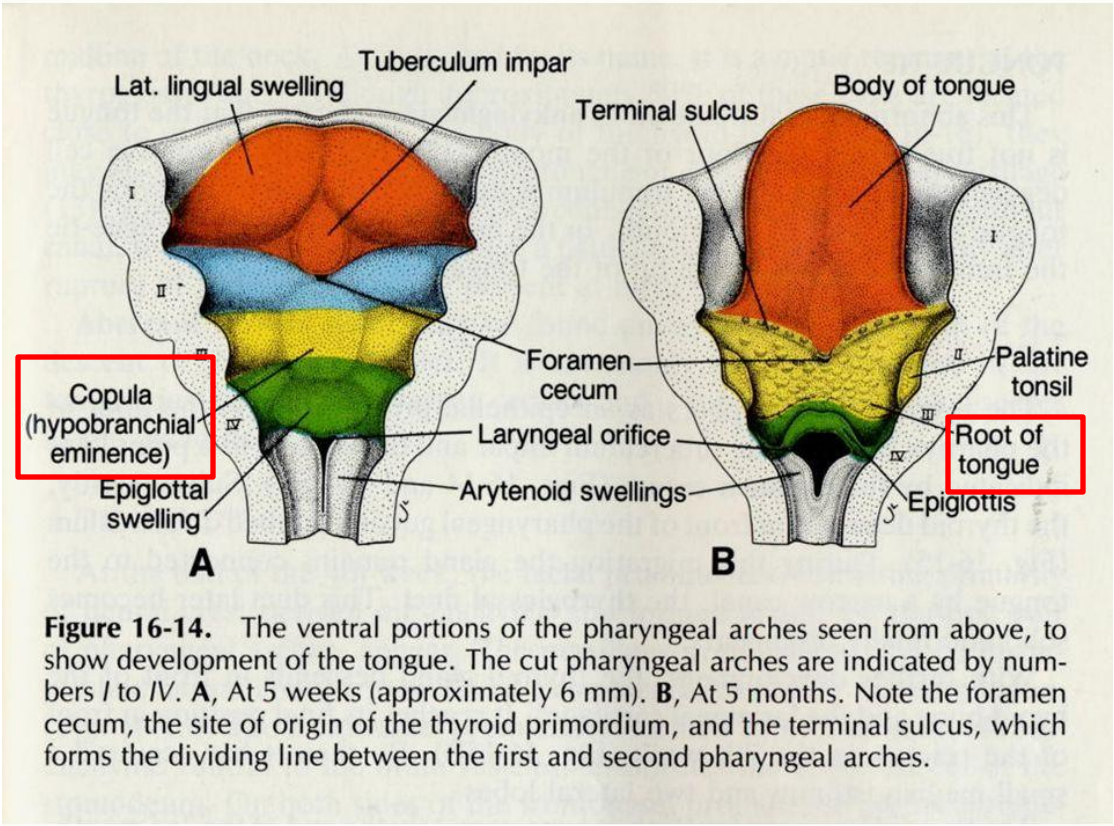


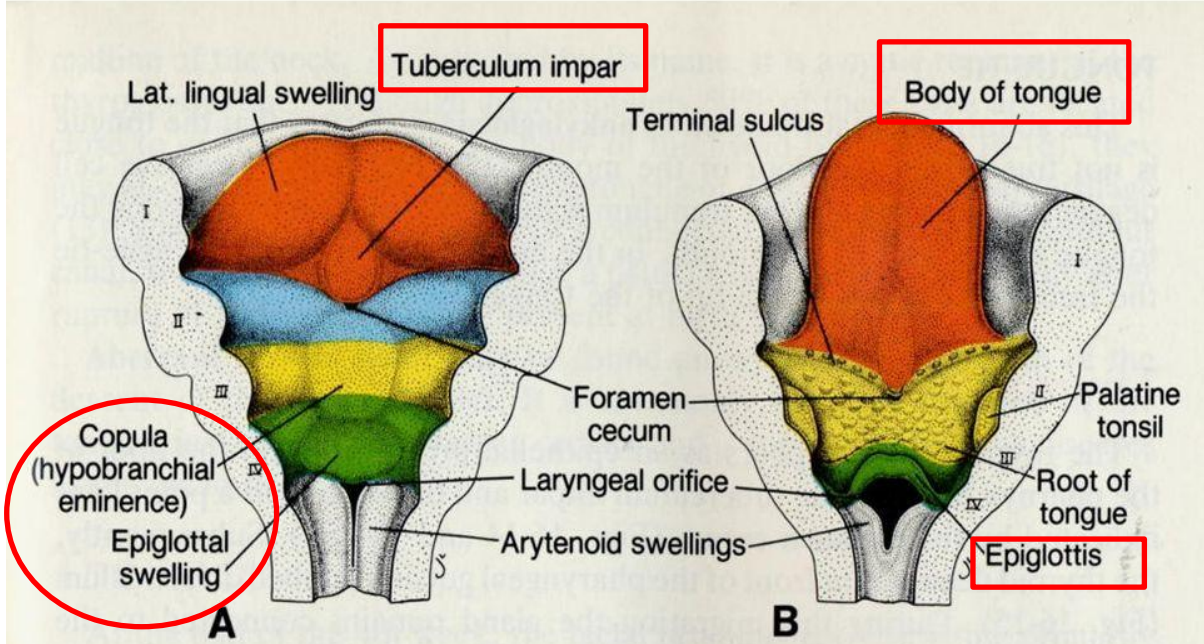
Figure 16-14. The ventral portions of the pharyngeal arches seen from above, to show development of the tongue. The cut pharyngeal arches are indicated by numbers *I* to *IV*. **A**, At 5 weeks (approximately 6 mm). **B**, At 5 months. Note the foramen cecum, the site of origin of the thyroid primordium, and the terminal sulcus, which forms the dividing line between the first and second pharyngeal arches.

DEVELOPMENT OF THE TONGUE

b. hypopharyngeal eminence:

- develops from the mesecnhyme in the ventromedial parts of the 3rd and 4th pairs of pharyngeal arches

- Its caudal part forms the epiglottis



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DEVELOPMENT OF THE TONGUE

the pharyngeal arch mesenchyme forms :

a. the connective tissue

b. vasculature of the tongue

the intrinsic tongue muscles derived from:

- **myoblasts, that migrate from the occipital somites**

the hypoglossal nerve:

- **accompanies the myoblasts during their migration**
- **innervates the tongue muscles**

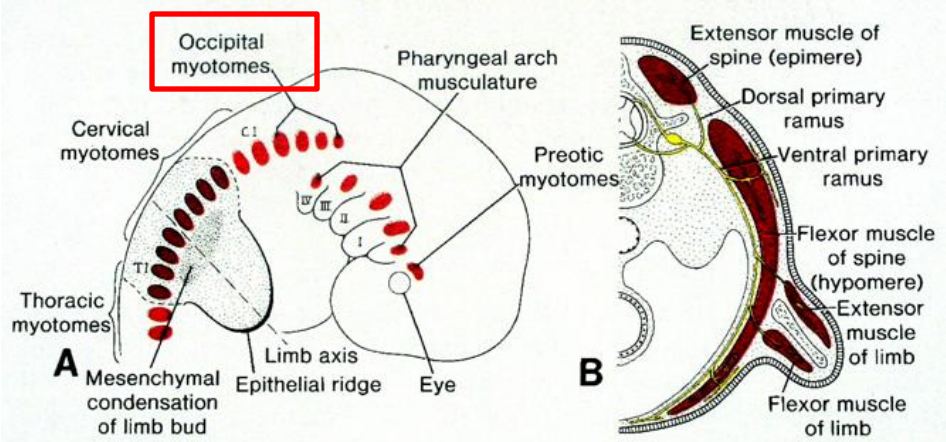


Figure 9.4. **A.** Myotomes in the head, neck, and thoracic region of a 7-week embryo. Note the location of the preotic and occipital myotomes and condensation of mesenchyme at the base of the limb bud. **B.** Transverse section through the region of attachment of the limb bud. Note the dorsal (extensor) and ventral (flexor) muscular components of the limb.

http://education.med.nyu.edu/courses/macrostructure/lectures/lec_images/pages/09-04.html

DEVELOPMENT OF THE TONGUE

INNERVATION OF THE TONGUE:

1. the sensory supply to the mucosa of almost the entire rostral tongue (oral part):

- **from the lingual branch of the mandibular division of the trigeminal nerve**
- **the trigeminal nerve is the nerve of the 1st pharyngeal arch**

2. taste buds innervated by:

- **chorda tympani – branch of the facial nerve - rostral 2/3 of the tongue**
- **the facial nerve is the nerve of the 2nd pharyngeal arch**
- **the vallate papillae innervated by the glossopharyngeal nerve – the nerve of the 3rd pharyngeal arch**

DEVELOPMENT OF THE TONGUE

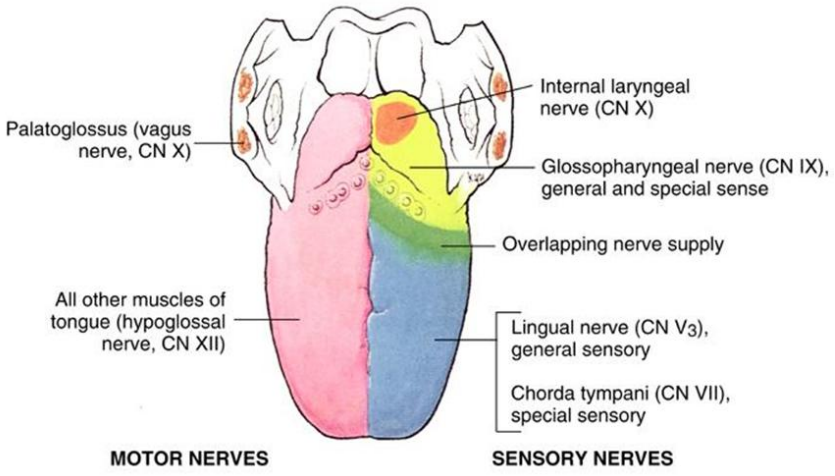
INNERVATION OF THE TONGUE:

3. the caudal portion of the tongues innervated by:

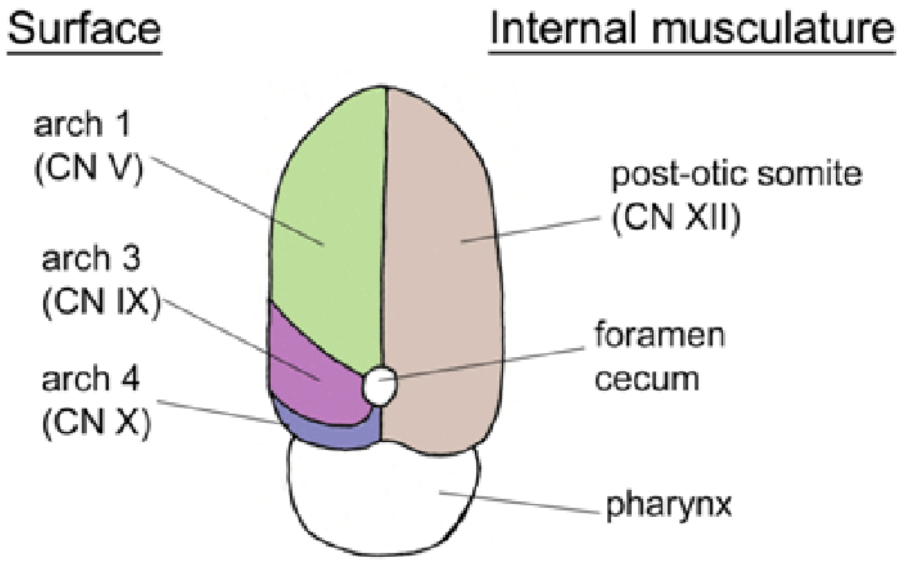
- **the glossopharyngeal nerve**
- **the cranial laryngeal branch of the vagus nerve – the vagus nerve of the 4th pharyngeal arch**

4. all muscles of the tongue:

- **supplied by the hypoglossal nerve**



https://www.memorangapp.com/flashcards/99552/1.05+-+Face+%2B+Oral+Cavity+%2B+Nose+%2B+Paranasal+Sinus+%2B+Pharynx/



https://www.researchgate.net/figure/Tongue-development-and-innervation-the-surface-of-the-tongue-is-formed-by-contributions_fig10_301358883

DEVELOPMENT OF THE TONGUE

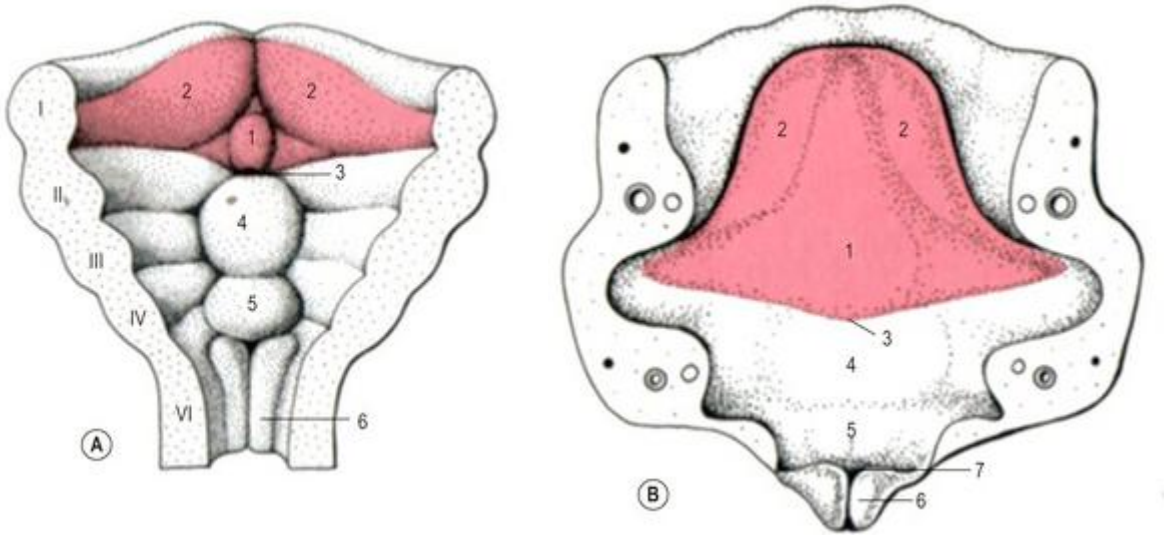
- the lateral lingual swellings fuse with each other and with the tuberculum impar

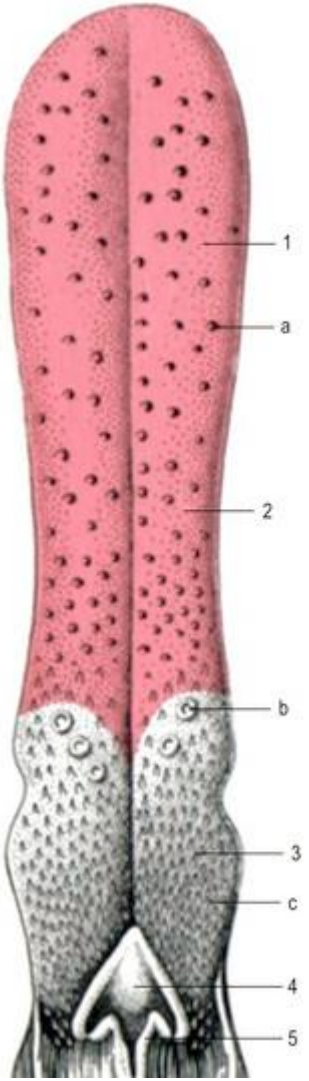
- the midline fusion of the lateral swellings gives rise to:

a. the lingual septum

b. the lyssa in carnivores

c. cartilago dorsi linguae in the horse





Development of the tongue and the larynx. Red: Components developed from the first pharyngeal arch. A: I–VI: Pharyngeal arches I–VI, 1: Tuberculum impar; 2: lateral lingual swellings; 3: Primordium of the thyroid gland; 4: Copula; 5: Eminentia hypobranchialis; 6: Arytenoid swelling. B: Later developmental stages of the structures defined in A. 7: Laryngeal orifice. C: Tongue of the dog. 1: Apex linguae; 2: Corpus linguae; 3: Radix linguae; 4: Epiglottis; 5: Arytenoid; a: Papillae fungiformes; b: Papillae valatae; c: Papillae filiformes.

https://veteriankey.com/of-the-gastro-pulmonary-system/

PHARYNGEAL APPARATUS

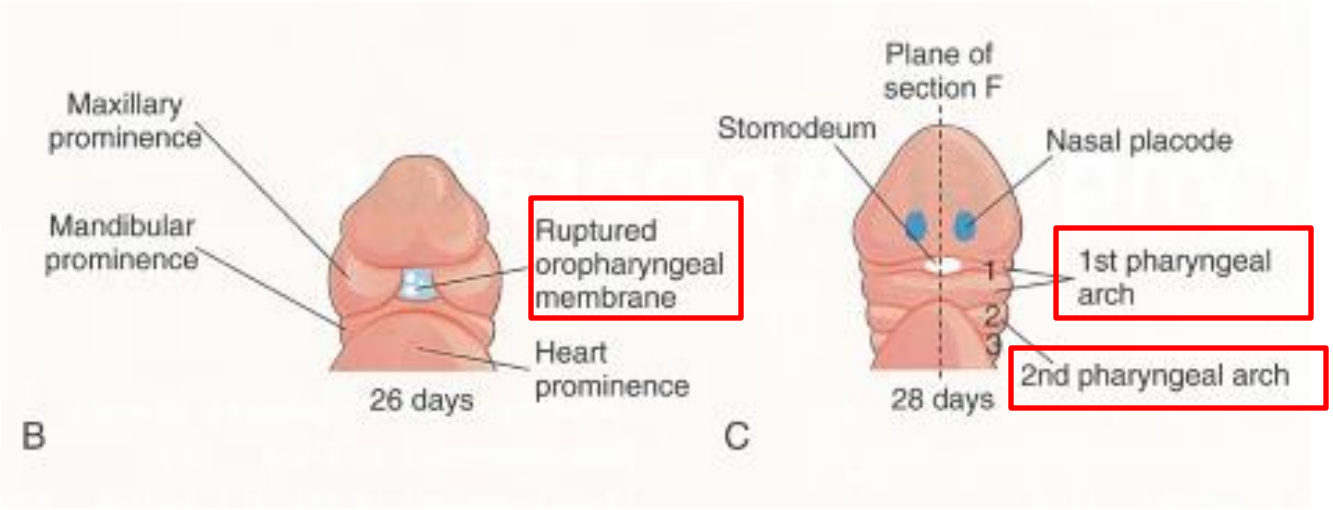
consists of:

a. pharyngeal arches

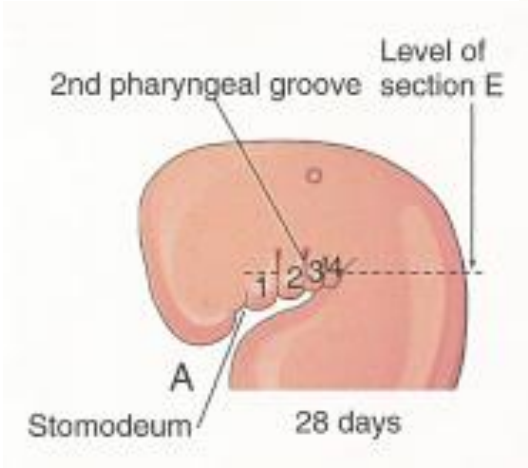
b. pharyngeal pouches

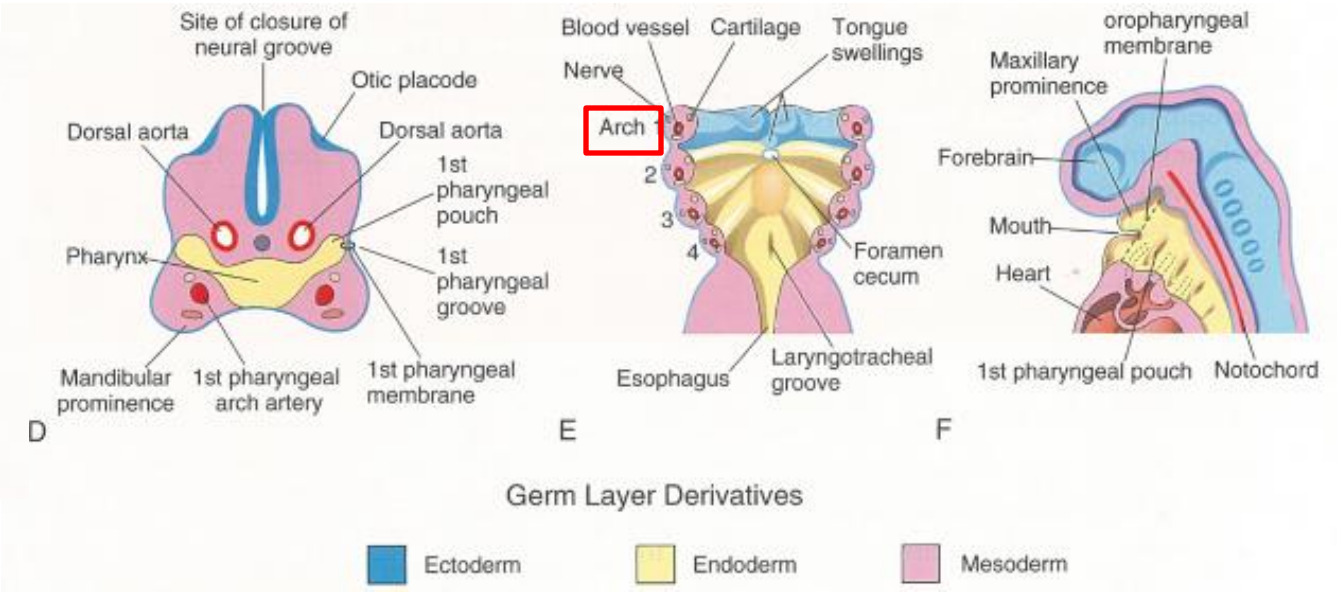
c. pharyngeal grooves

d. pharyngeal membranes



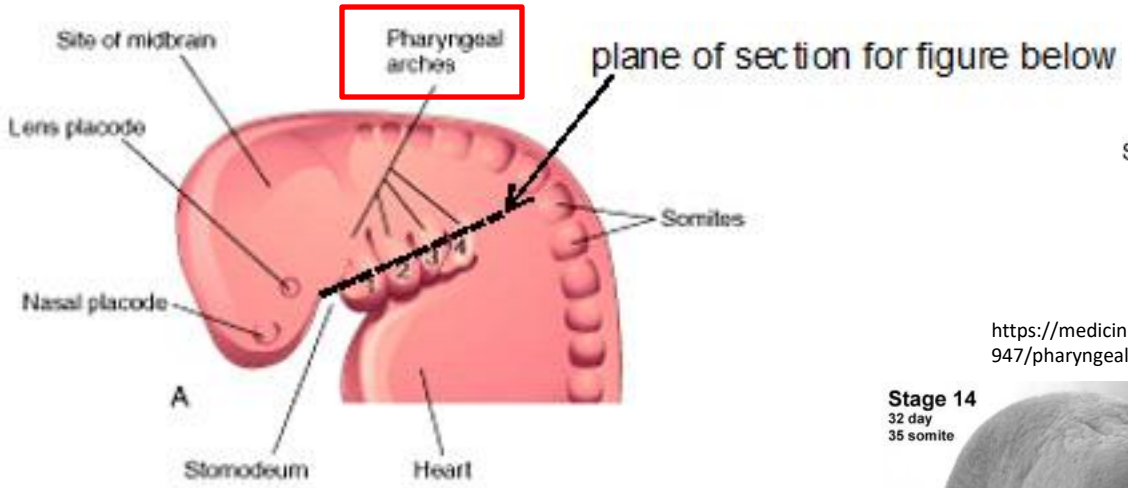
- these embryonic structres contribute to the formation of the face and the neck

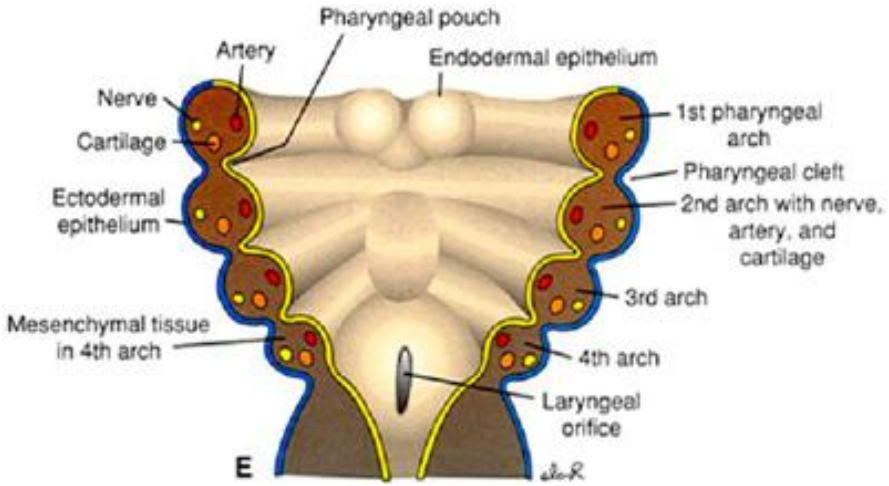




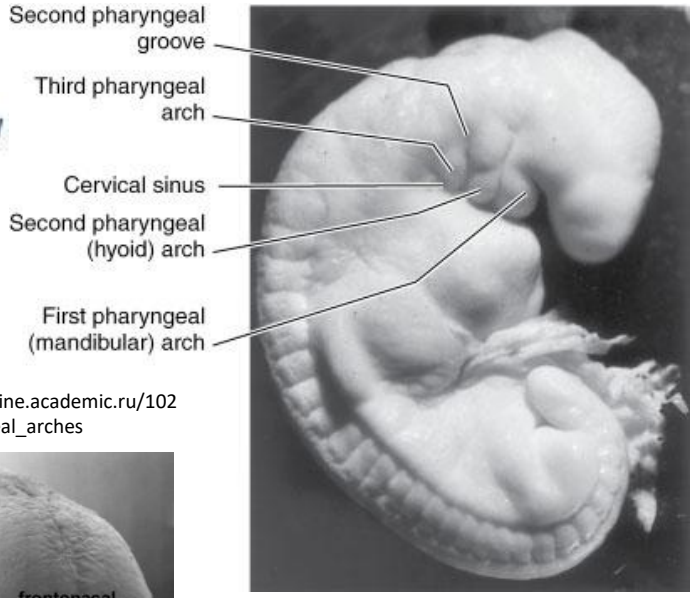
PHARYNGEAL (BRANCHIAL) ARCHES

1. **begin to develop as neural crest cells migrate from the hindbrain into the mesenchyme of the future head and neck regions**

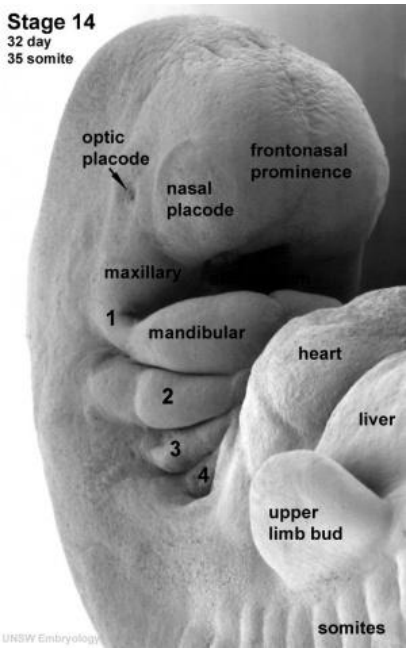




https://web.duke.edu/anatomy/embryology/craniofacial/craniofacial.html



https://medicine.academic.ru/102947/pharyngeal_arches



https://embryology.med.unsw.edu.au/embryology/index.php/Pharyngeal_arches

PHARYNGEAL ARCHES

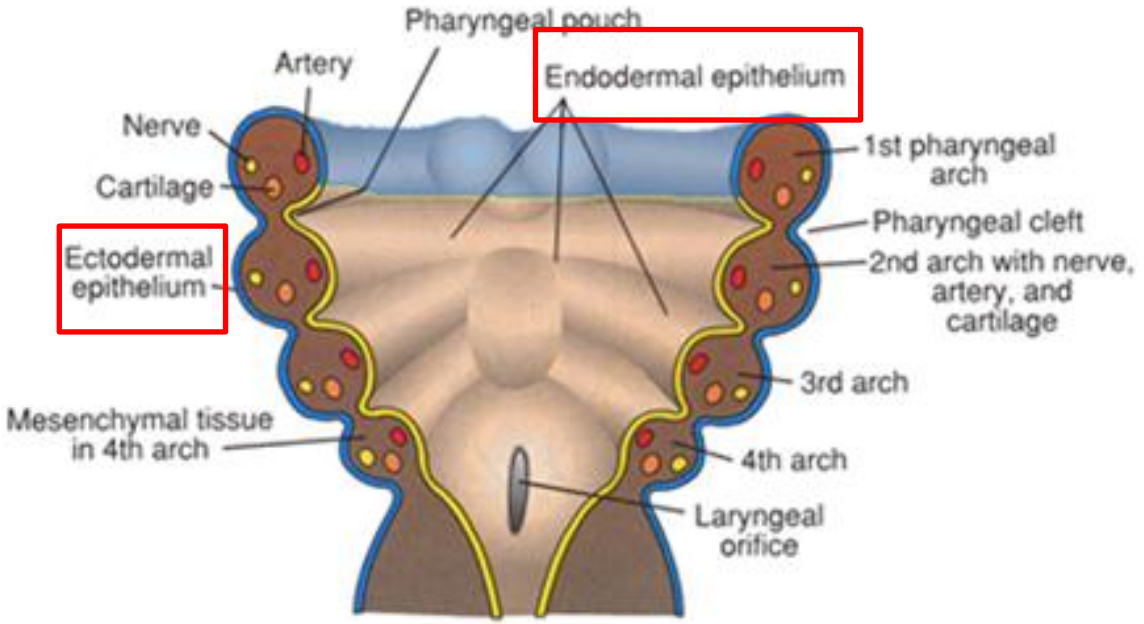
each pharyngeal arch consists of:

a. a core of mesenchyme

b. the core covered externally by ectoderm

c. the core covered internally by endoderm

- the pharyngeal arches support the lateral wall of the primordial pharynx



(note: 1st arch ectoderm (blue) extends to inside (of what will become the oral cavity))

PHARYNGEAL ARCH COMPONENTS

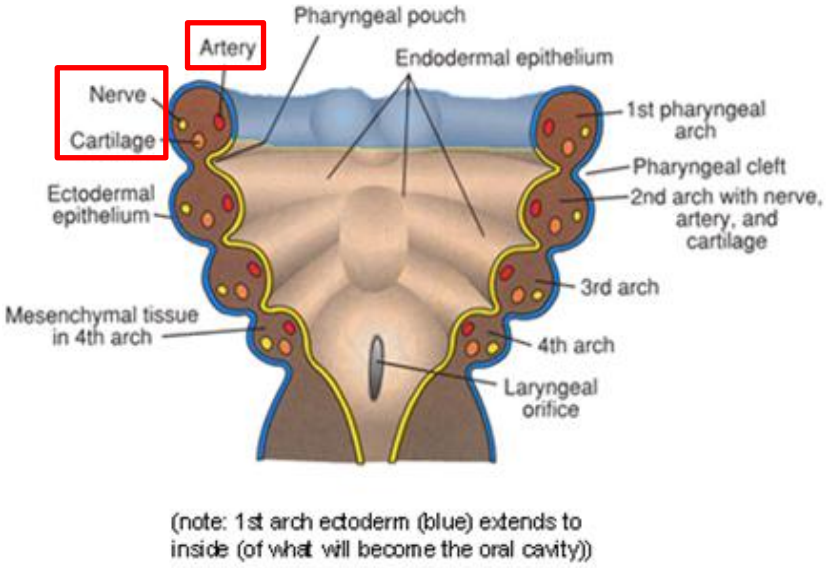
A typical pharyngeal arch has the following components:

a. a pharyngeal arch artery (aortic arch artery):

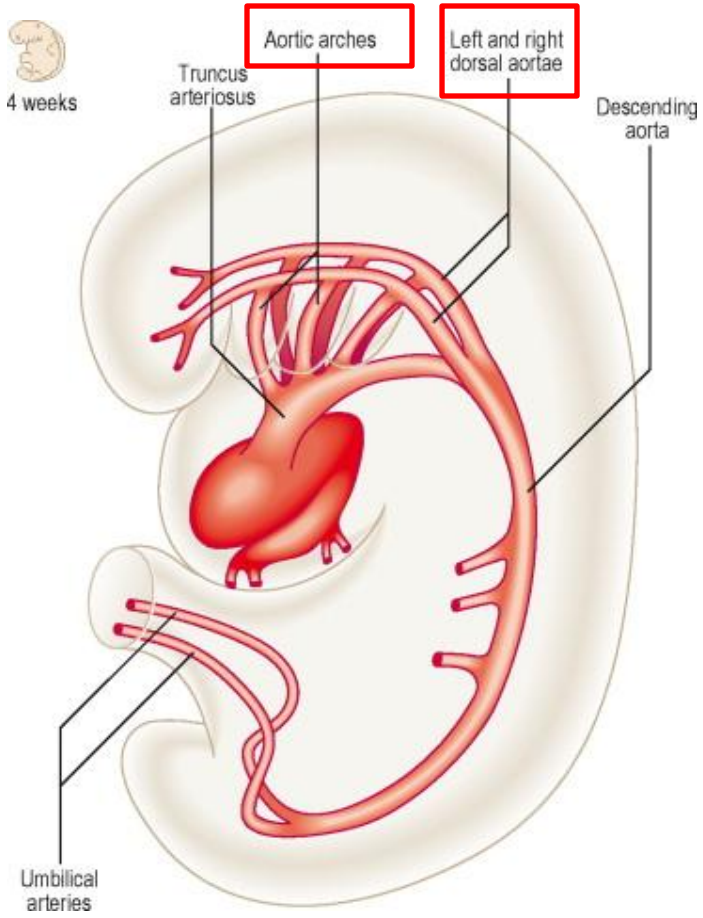
- **arises from the truncus arteriosus of the primordial heart**
- **courses around the primordial pharynx to enter the dorsal aorta**

b. a cartilaginous rod:

- **forms the skeleton of the arch**



(note: 1st arch ectoderm (blue) extends to inside (of what will become the oral cavity))



https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/aortic-arches

PHARYNGEAL ARCH COMPONENTS

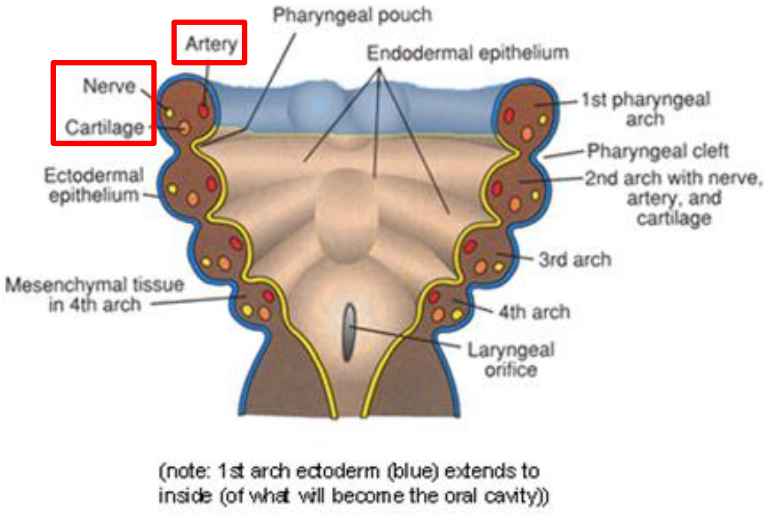
A typical pharyngeal arch has the following components:

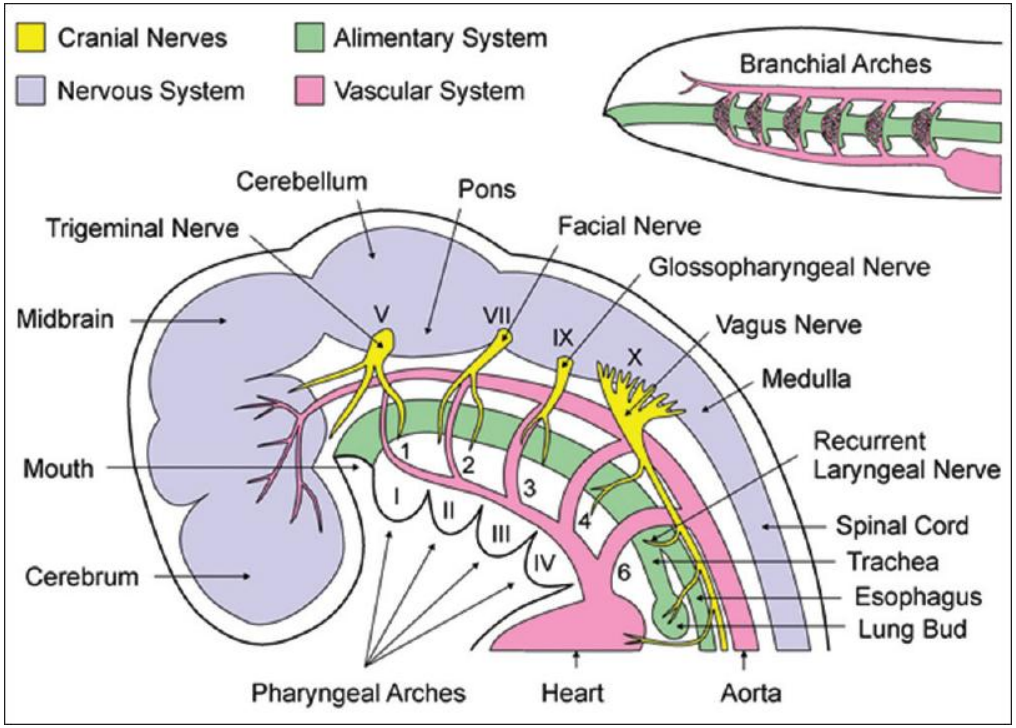
c. a muscular component:

- **the primordium of the muscles in the head and the neck**

d. a nerv:

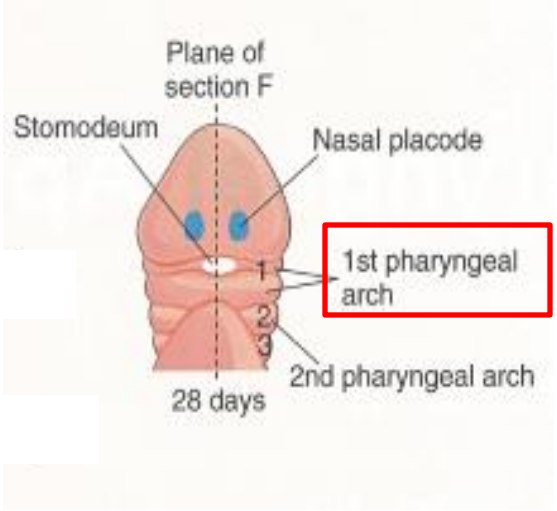
- supplies the mucosa and the muscles derived from each arch





http://www.jclpca.org/viewimage.asp?img=JCleftLipPalateCraniofacAnomal_2017_4_1_37_205416_f13.jpg

PHARYNGEAL ARCHES

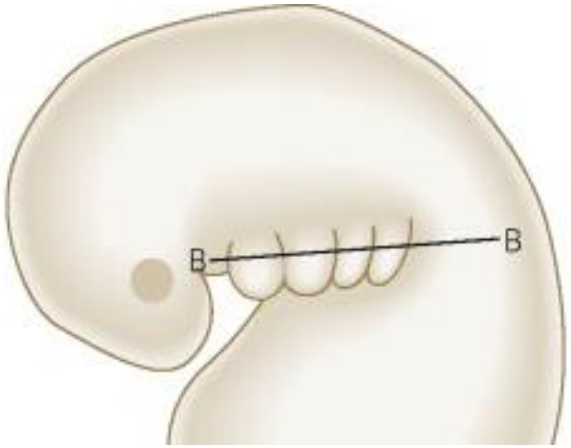


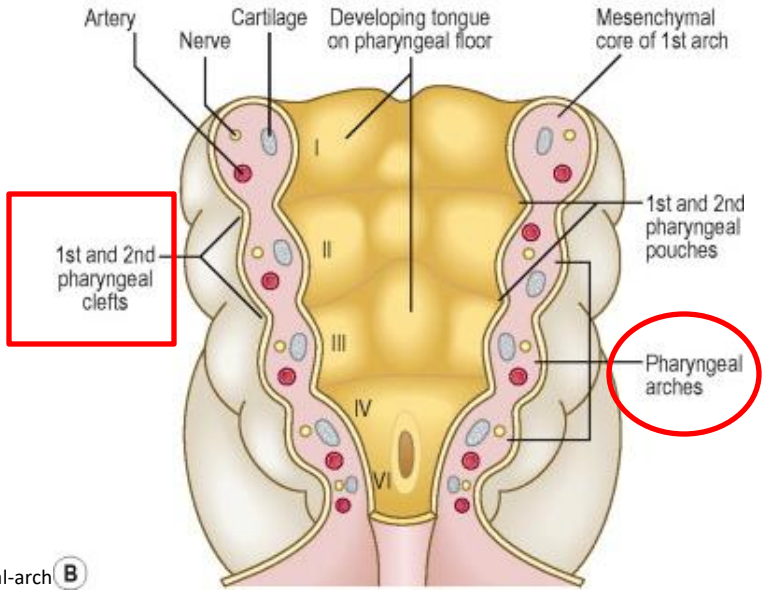
1. the 1st pair of arches:

- **the primordia of the jaw**
- **appears as a surface elevations lateral to the developing pharynx**

2. other arches:

- appear as obliquely disposed, rounded ridges on each side of the future head and neck regions





https://www.sciencedirect.com/topics/neuroscience/pharyngeal-arch B

PHARYNGEAL ARCHES

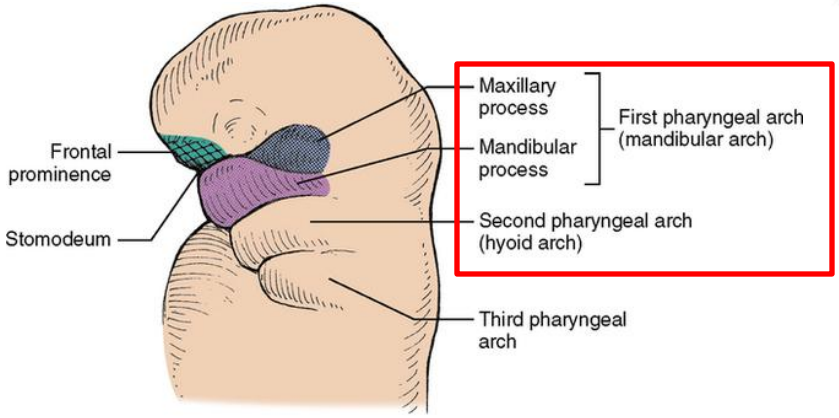
1. **from the 1st pharyngeal arch (mandibular arch) develop:**

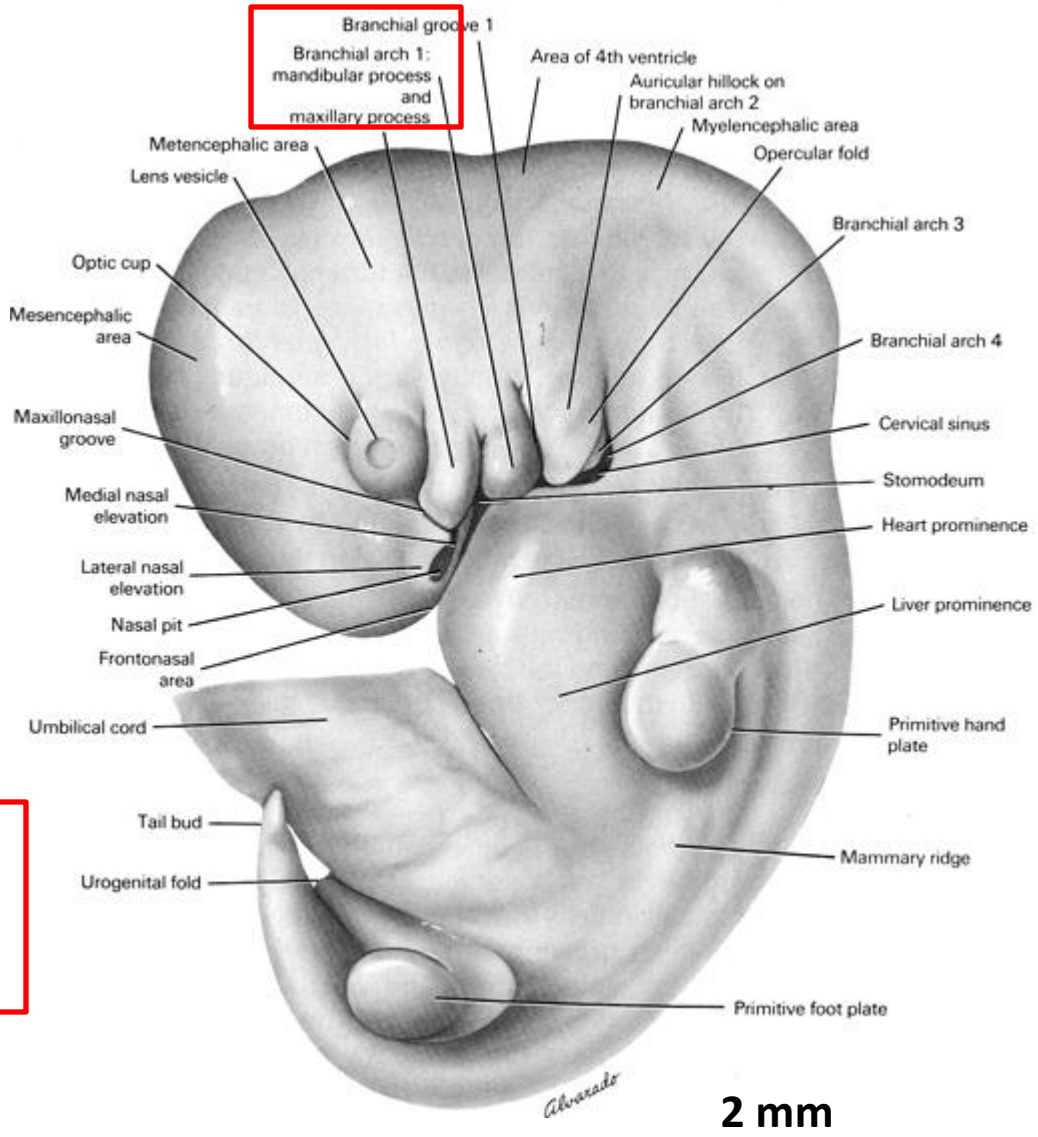
   a. **maxillary porminence**

   b. **mandibular prominence**

2. the 2nd pharyngeal arch (hyoid arch) makes:

a. **a major contribution to the formation of the hyoid bone**





https://www.ehd.org/virtual-human-embryo/figure.php?stage=16&figure=3

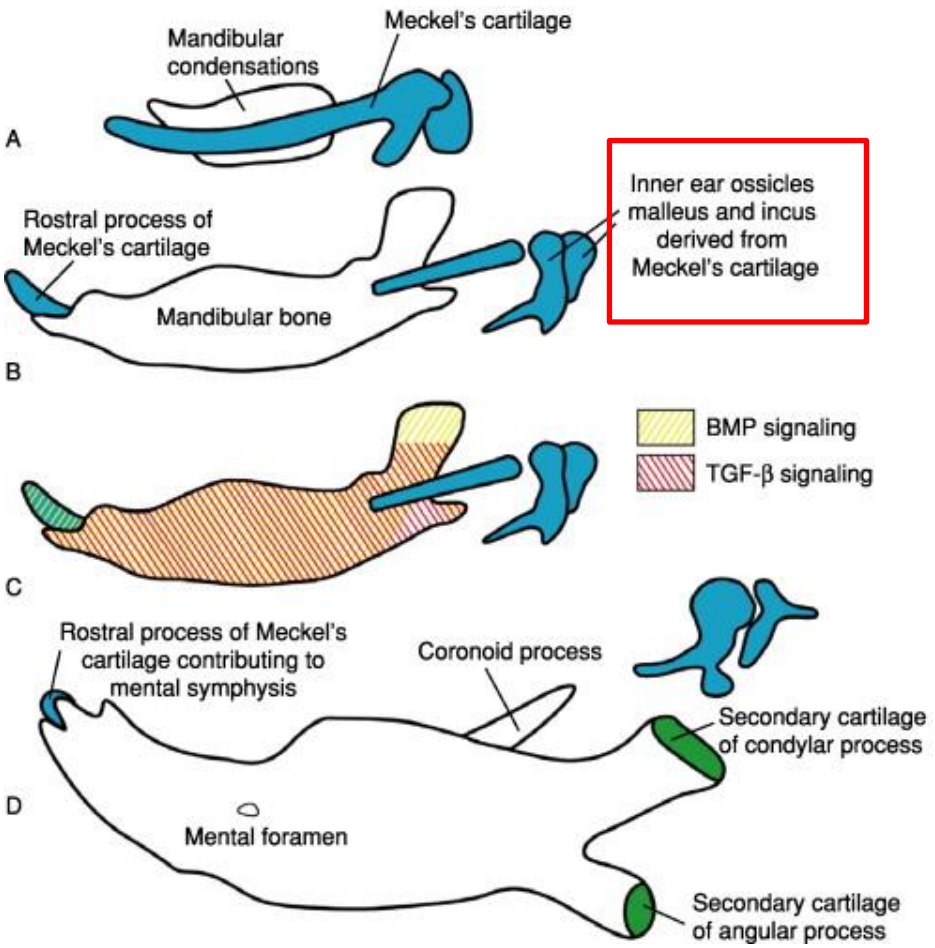
DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

1. 1st pharyngeal arch (mandibular arch) cartilage:

- its dorsal end becomes ossified to form:

a) malleus

b) incus



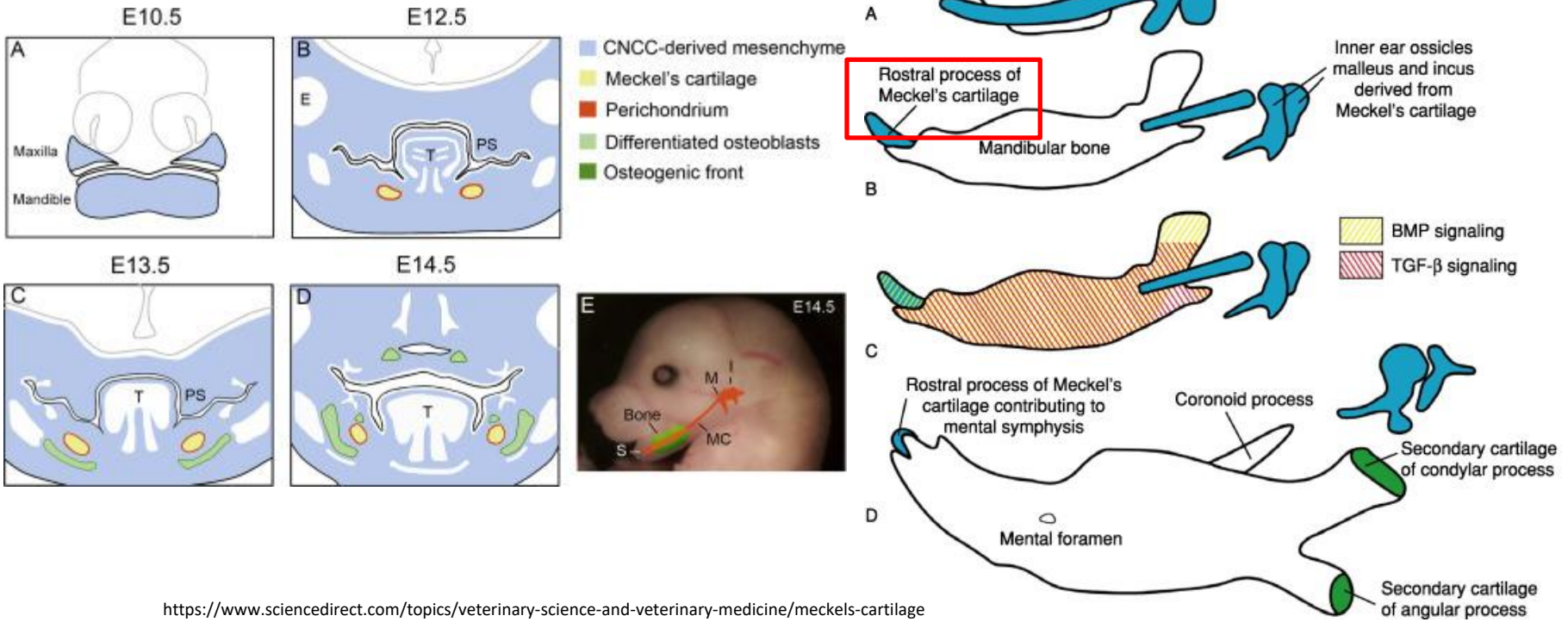
https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/meckels-cartilage

DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

1. 1st pharyngeal arch (mandibular arch) cartilage:

c. ventral part (Meckel's cartilage) forms the tip of the mandible

- **each part of the mandible forms lateral to and in close association with the cartilage**
- **the cartilage disappears as the mandible develops around it by intramembranous ossification**



https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/meckels-cartilage

DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

1. 1st pharyngeal arch (mandibular arch) cartilage:

d. maxilla

e. pterygoid bone

f. palatine bone

g. squamous part of temporal bone

h. zygomatic bone

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
Second (hyoid)	Muscles of facial expression, stapedius, stylohyoid, caudal belly of digastricus	Auricle of ear, stapes, stylohyoid, ceratohyoid, part of basihyoid	Stylohyoid ligament	Palatine tonsils	None	Facial (VII)
Third	Stylopharyngeus	Part of basihyoid bone, thyrohyoid cartilage	None	Parathyroids III, stroma of thymus	None	Glossopharyngeal (IX)
Fourth and sixth	Cricothyroid, levator veli palatini, constrictors of pharynx, intrinsic muscles of larynx	Cricoid, thyroid, arytenoid, corniculate and cuneiform cartilages of larynx.	None	Parathyroids IV, stroma of thymus, ultimobranchial bodies	None	Cranial and recurrent laryngeal branches of vagus (X)

DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

2. 2nd pharyngeal arch (Hyoid arch) cartilage:

- **tip of Reichert's Cartilage (the name given to the cartilage formed in the second arch) forms:**

a. the stapes

- **other part of the cartilage form:**

a. part of the tympanic bulla

b. tympanohyoid

c. stylohyoid

d. epi - ceratohyoid

e. lingual process of basihyoid

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
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Fourth and sixth	Cricothyroid, levator veli palatini, constrictors of pharynx, intrinsic muscles of larynx	Cricoid, thyroid, arytenoid, corniculate and cuneiform cartilages of larynx.	None	Parathyroids IV, stroma of thymus, ultimobranchial bodies	None	Cranial and recurrent laryngeal branches of vagus (X)

DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

3. 3rd pharyngeal arch cartilage:

- **caudal part of the basihyoid**
- **thyrohyoid**
- **laryngeal cartilages**

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
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DERIVATIVES OF PHARYNGEAL ARCH CARTILAGES

4. 4th and 6th phyaryngeal arch cartilages:

- **laryngeal cartilages**

NOTE THAT:

- ❖ **the epiglottic and thyroid cartilages develop from neural crest cells**
- ❖ **cricoid cartilage develops from mesoderm**

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
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DERIVATIVES OF PHARYNGEAL ARCH MUSCLES

1st pharyngeal arch muscles:

a. rostral part of digastric

b. muscles of mastication

c. m. tensor tympani

d. m. tensor veli palatini

2nd pharyngeal arch muscles:

a. caudal part of digastric

b. muscles of facial expression

c. stapedius muscle

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
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DERIVATIVES OF PHARYNGEAL ARCH MUSCLES

3rd pharyngeal arch muscles:

a. stylopharyngeal

b. other pharyngeal muscles

4th and 6th pharyngeal arch muscles:

a. pharyngeal constrictors

b. laryngeal muscles

Pharyngeal arch	Arch derivatives			Pouch derivatives	Cleft derivatives	Cranial nerve
	Muscles	Bone and cartilage	Other connective tissues			
First (mandibular)	Muscles of mastication, mylohyoid, rostral belly of digastricus, tensor tympani, tensor veli palatini	Mandible, maxilla, pre-maxilla, zygomatic, auricle of ear, malleus, incus	Ligament of malleus, spheno-mandibular ligament, tympanic membrane (from first pharyngeal membrane)	Auditory tube, guttural pouch	External auditory meatus	Trigeminal (V)
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DERIVATIVES OF PHARYNGEAL ARCH NERVES

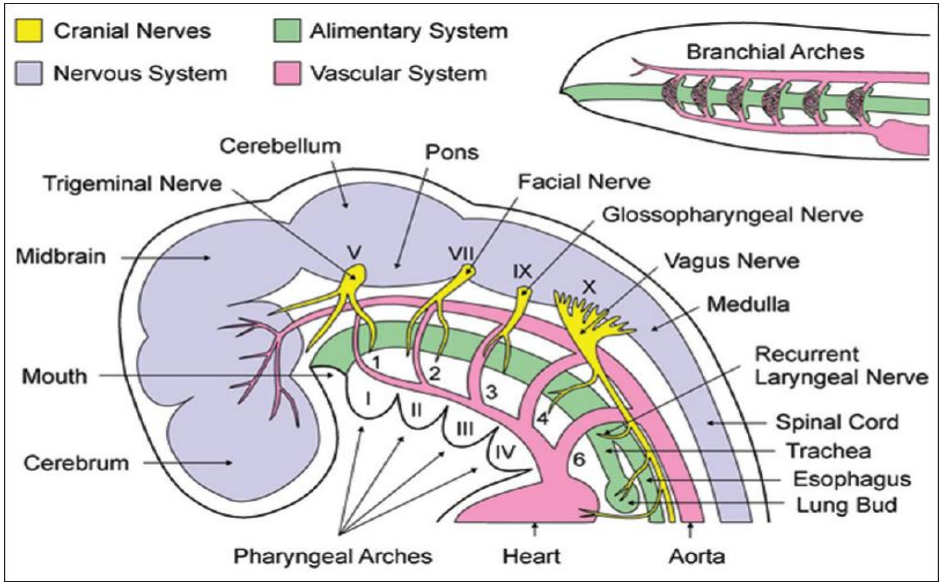
- **each arch supplyed by its own cranial nerve**
- **the special visceral efferent (branchial) components of the cranial nerves supply muscles derived from the pharyngeal arches**

a. 1st pharyngeal arch nerve – trigeminal nerve (N. V.)

b. 2nd pharyngeal arch nerve – facial nerve (N. VII.)

c. 3rd pharyngeal arch nerve – glossopharyngeal nerve (N. IX.)

d. 4th and 6th pharyngeal arches nerve – vagus nerve (N. X.)



http://www.jclpca.org/viewimage.asp?img=JCleftLipPalateCraniofacAnomal_2017_4_1_37_205416_f13.jpg

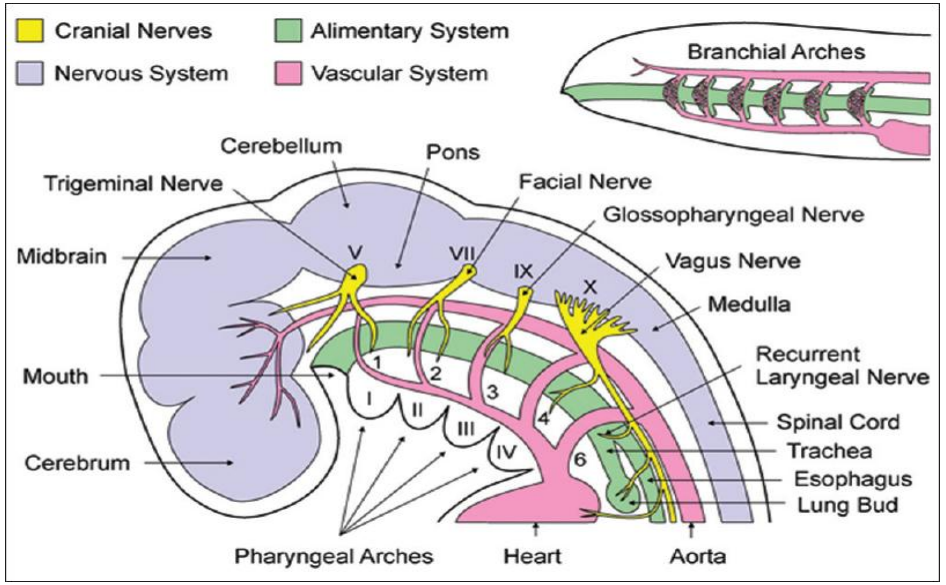
DERIVATIVES OF PHARYNGEAL ARCHES

ARTERIES:

1. **1st pharyngeal arch - maxillary artery**
2. **2nd pharyngeal arch - stapedial artery**
3. **3rd pharyngeal arch - common carotid, - internal and external carotid arteries**
4. **4th pharyngeal arch :**

a. right side – proximal part of the right subclavian artery

b. left side – the distal part of the aortic arch



http://www.jclpca.org/viewimage.asp?img=JCleftLipPalateCraniofacAnomal_2017_4_1_37_205416_f13.jpg

DERIVATIVES OF PHARYNGEAL ARCHES

ARTERIES:

5. 6th pharyngeal arches:

on the right:

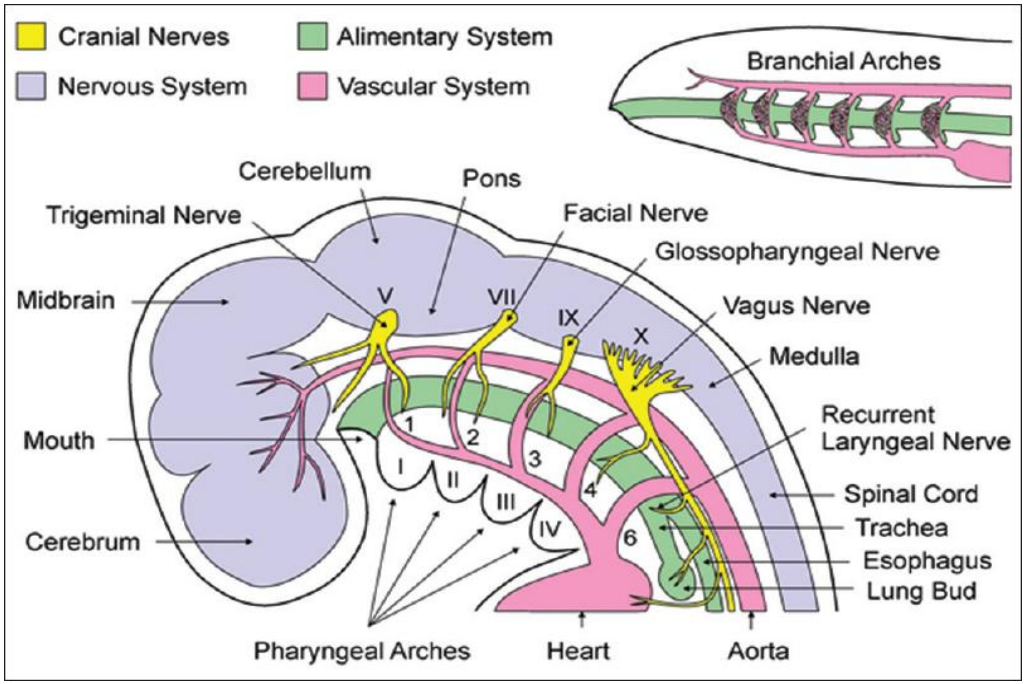
a. proximal – the right pulmonary artery

b. distal part disappears

on the left:

a. proximal – left pulmonary artery

b. distal – ductus arteriosus



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PHARYNGEAL POUCHES

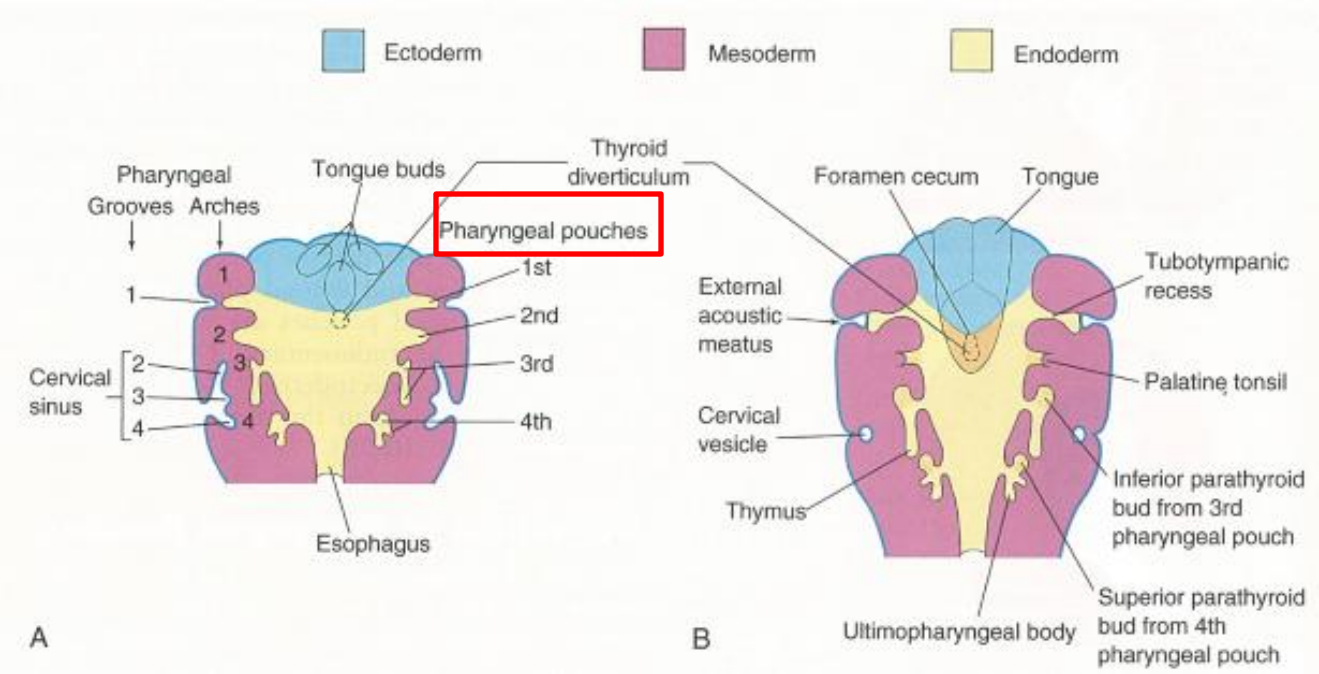
a) the primordial pharynx widens cranially, where it joins the stomodeum

b) the primordial pharynx narrows caudally, where it joins the esophagus

c) the endoderm of the pharynx lines the internal aspects of the pharyngeal arches and passes into the pharyngeal pouches

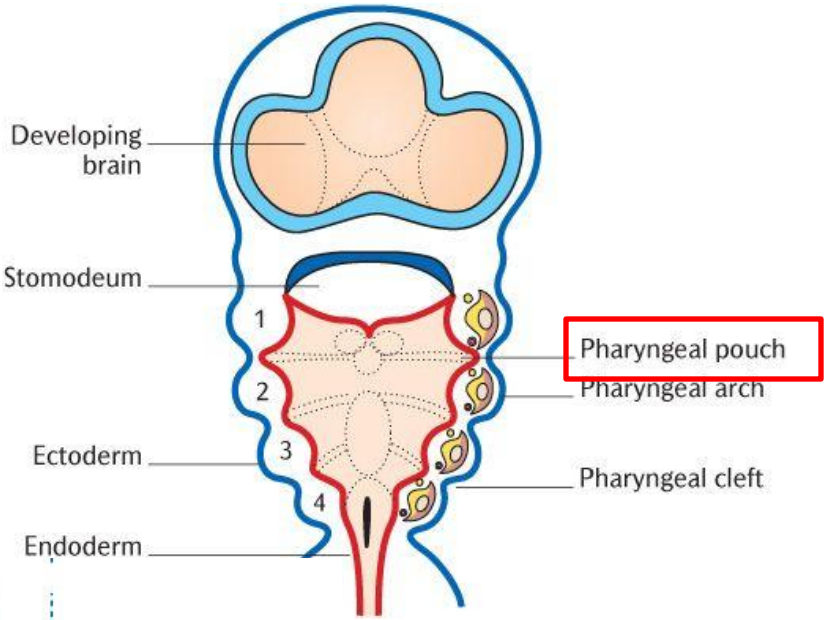
d) these paires of pouches develop in craniocaudal sequence between the pharyngeal arches

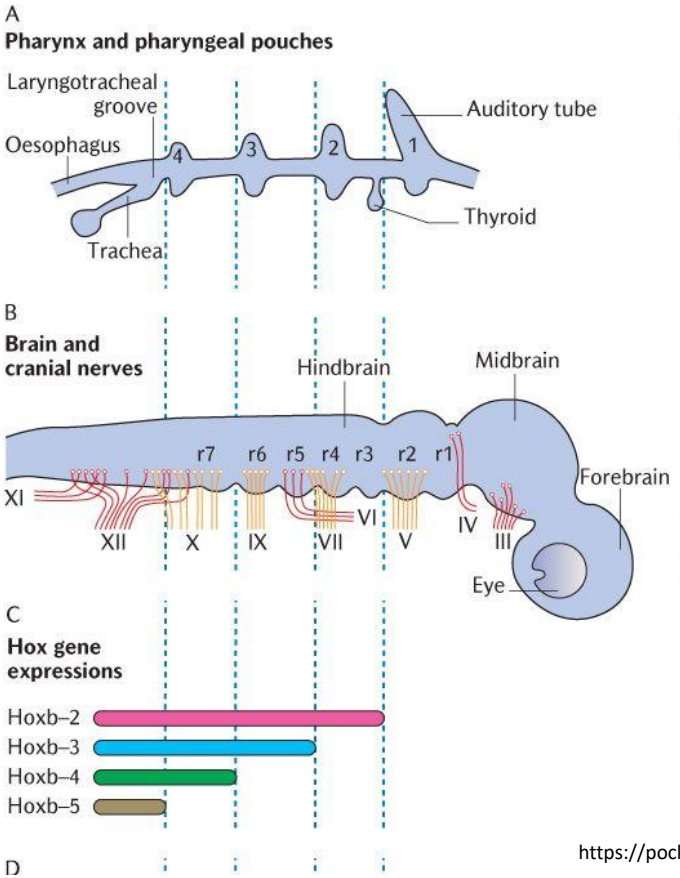
e) the endoderm of the pouches contacts the ectoderm of the pharyngeal grooves, and together form the double – layered pharyngeal membranes

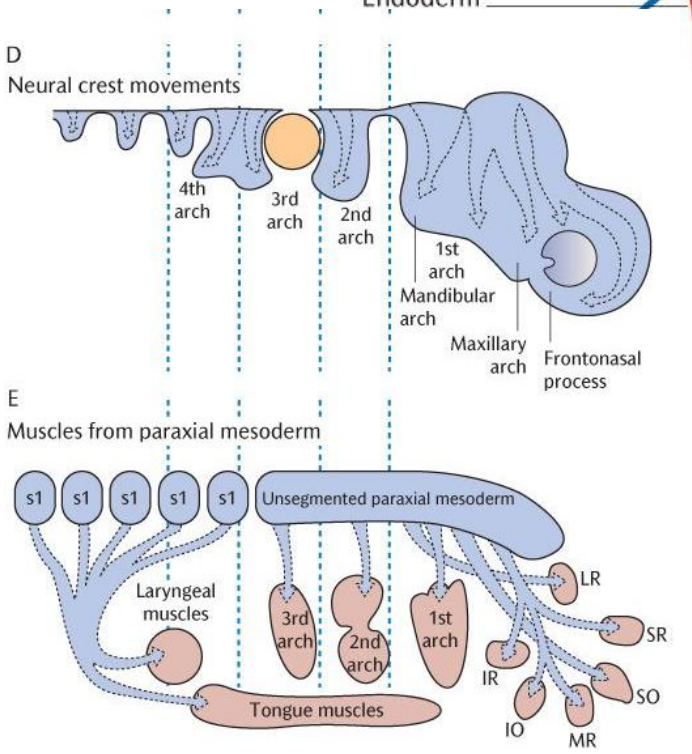


PHARYNGEAL POUCHES

- four pairs of pharyngeal pouches are well defined
- the fifth pair is absent or rudimentary







The rhombomeres and internal tissues of the pharyngeal arches in an exploded view. The vertical dotted lines indicate how the axial levels of each frame correspond. A) The pharyngeal pouches. B) The rhombomeres and cranial nerves. C) The homeobox code. D) The migration of ectomesenchymal tissue into the pharyngeal arches. E) The paraxial mesoderm and its muscle derivatives. Redrawn after D.M. Noden and P.A. Trainor, Journal of Anatomy 207, 588 (2005).

https://pocketdentistry.com/21-embryology-of-the-head-and-neck/

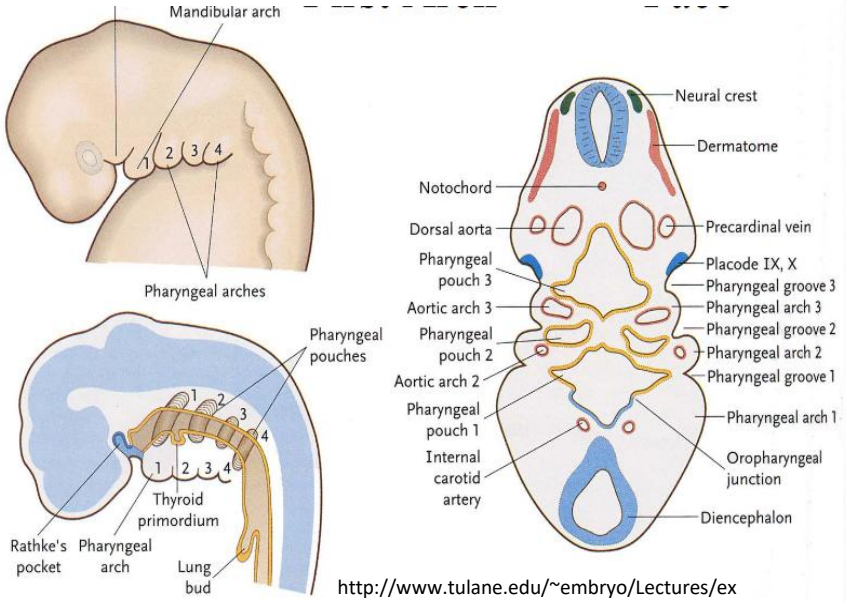
DERIVATIVES OF THE PHARYNGEAL POUCHES

1st pharyngeal pouch gives rise to:

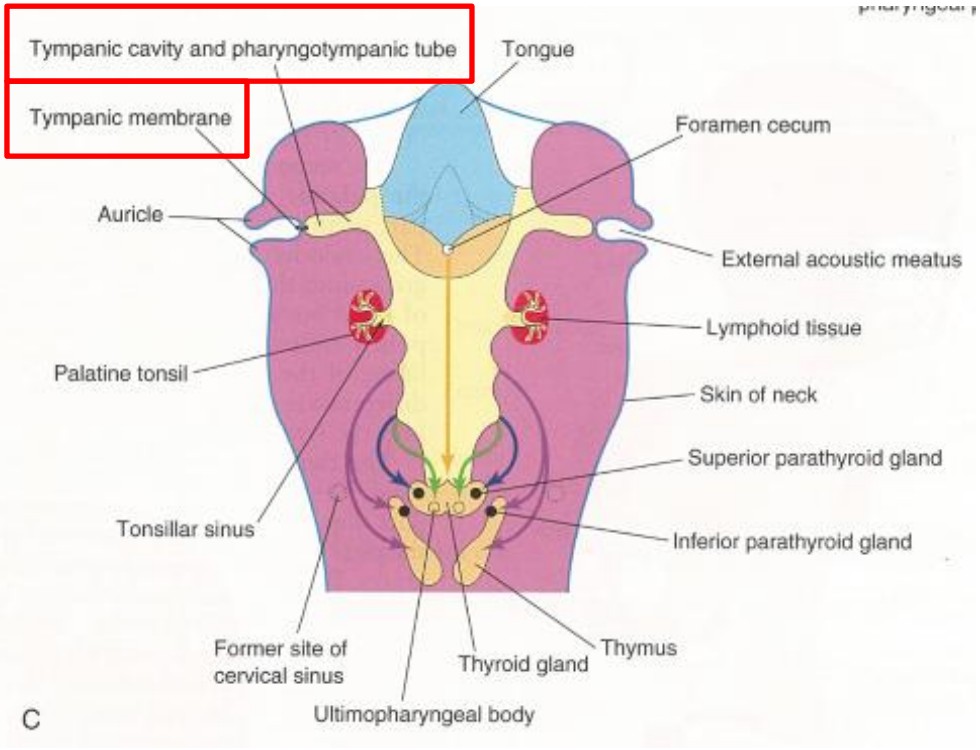
a. tympanic cavity

b. auditory tube

c. the first pharyngeal membrane becomes the tympanic membrane

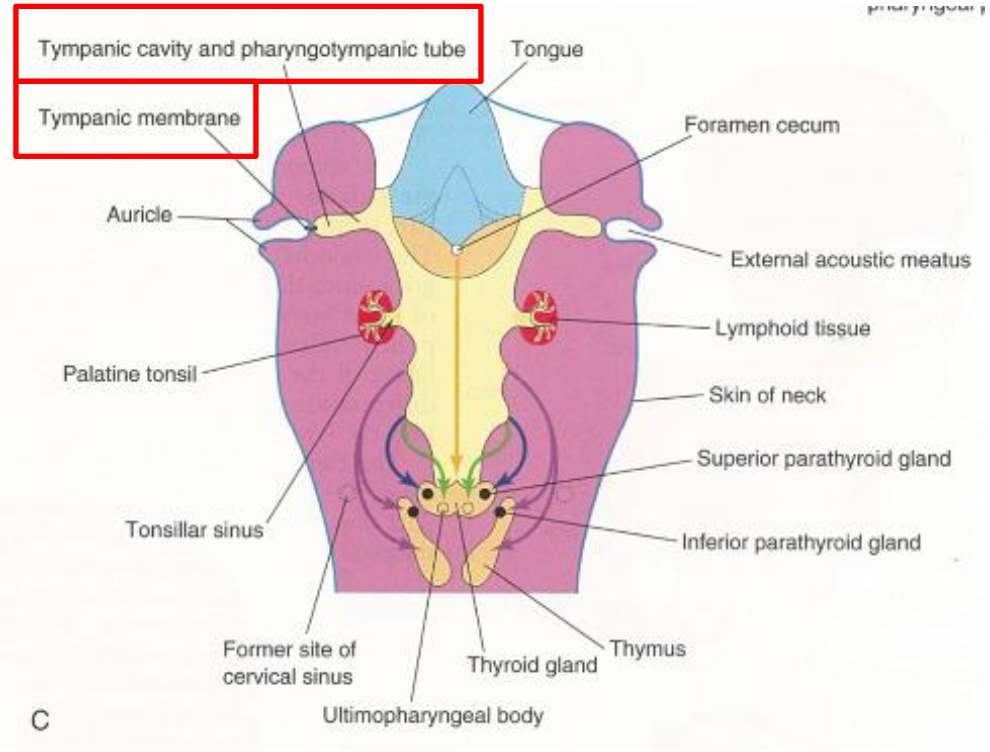


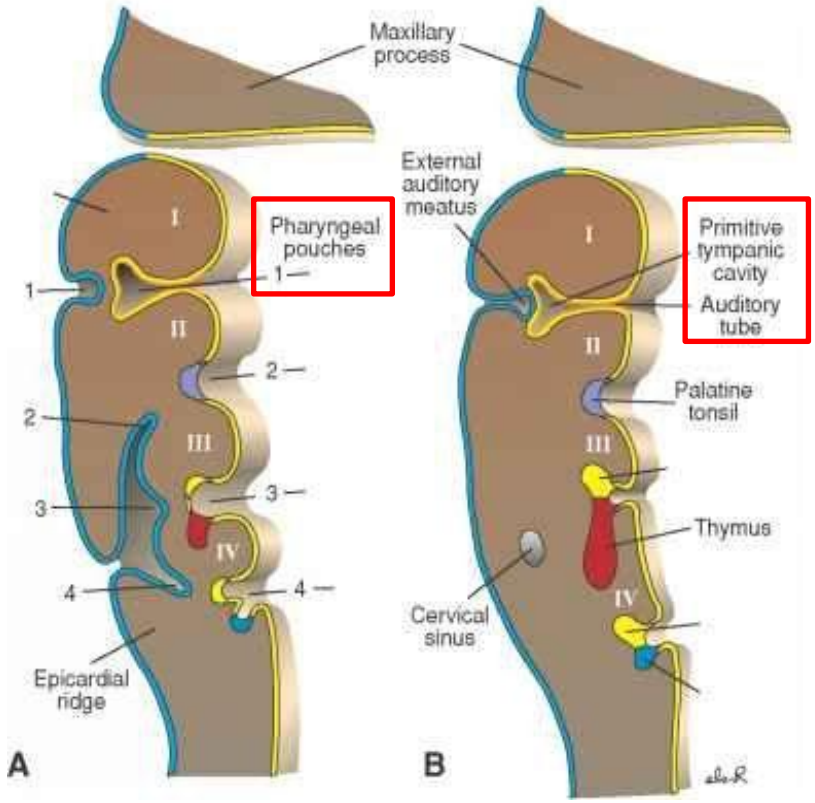
http://www.tulane.edu/~embryo/Lectures/exam%203/14%20Pharyngeal%20Apparatus.pdf



DERIVATIVES OF THE PHARYNGEAL POUCHES

1st pharyngeal pouch :





https://hu.pinterest.com/pin/661818107725514607/

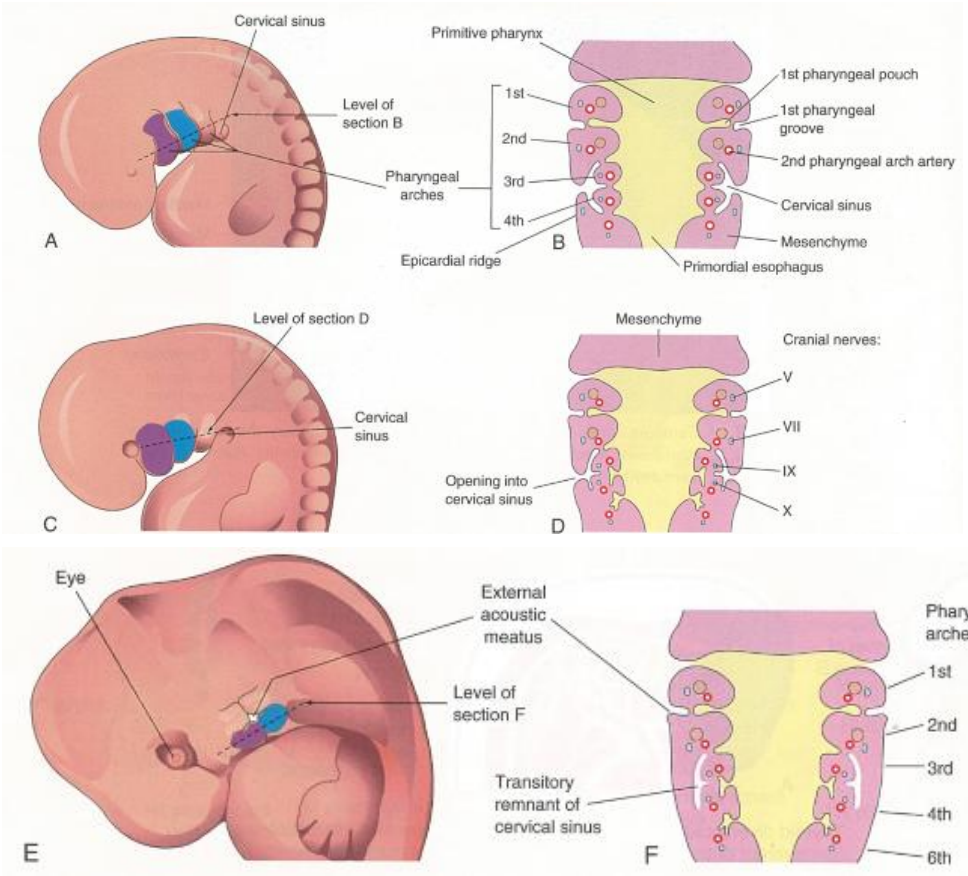
DERIVATIVES OF THE PHARYNGEAL POUCHES

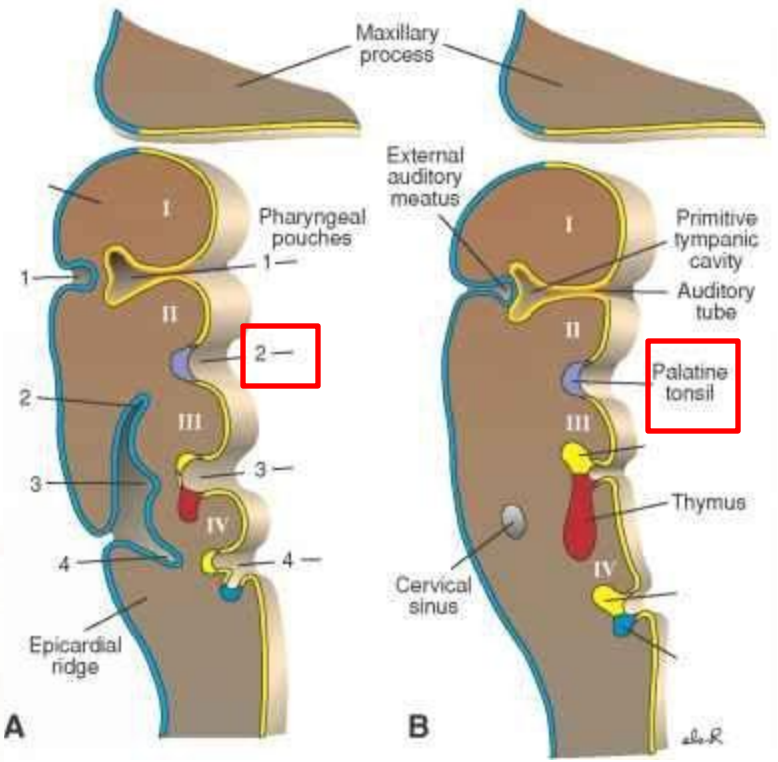
2nd pharyngeal pouch gives rise to:

- the largest part obliterted

a. the lumen of the dorsal part becomes the crypt of palatine tonsil

b. fossa tonsillaris





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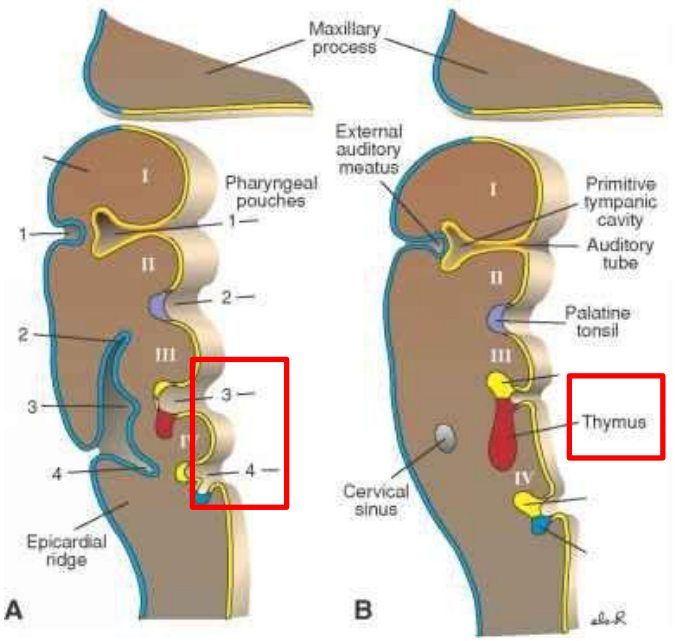
DERIVATIVES OF THE PHARYNGEAL POUCHES

3rd pharyngeal pouch :

- **develops dorsal and ventral part**
- **these outpouching directed caudally**
- **become detached from the pharynx proper**

a. the endoderm of the dorsal portion proliferates into cords of cells that invade the mesenchyme and become external parathyroid glands

b. the ventral part of the pouch becomes the thymus



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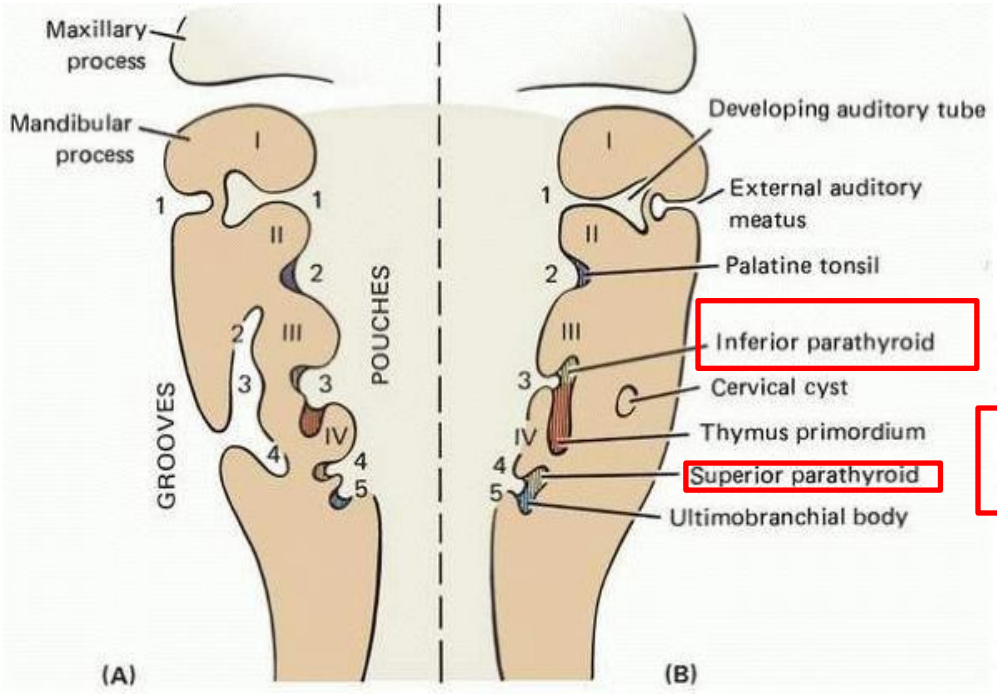
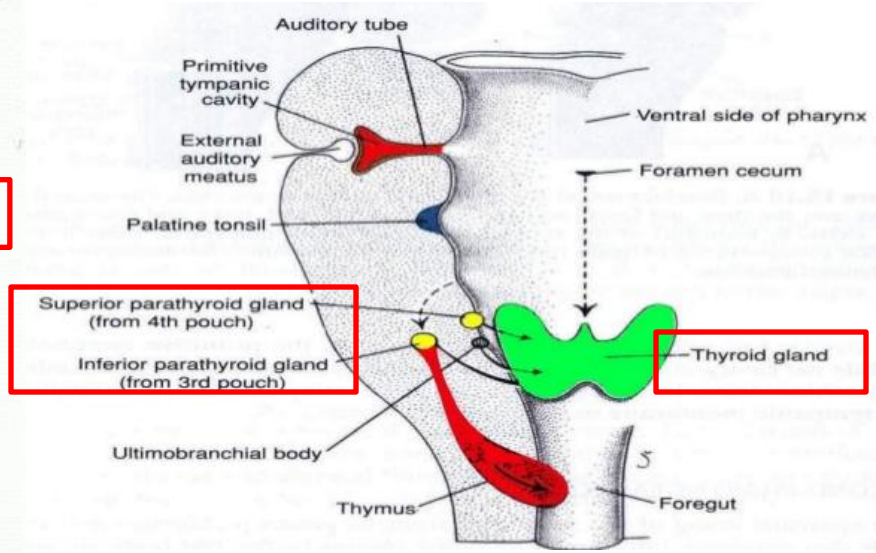
DERIVATIVES OF THE PHARYNGEAL POUCHES

4th and 6th pharyngeal pouch form:

a. parathyroid tissue

b. the thyroid gland comes into close contact with pharyngeal pouch complex IV, and the whole complex becomes incorporated into the thyroid gland

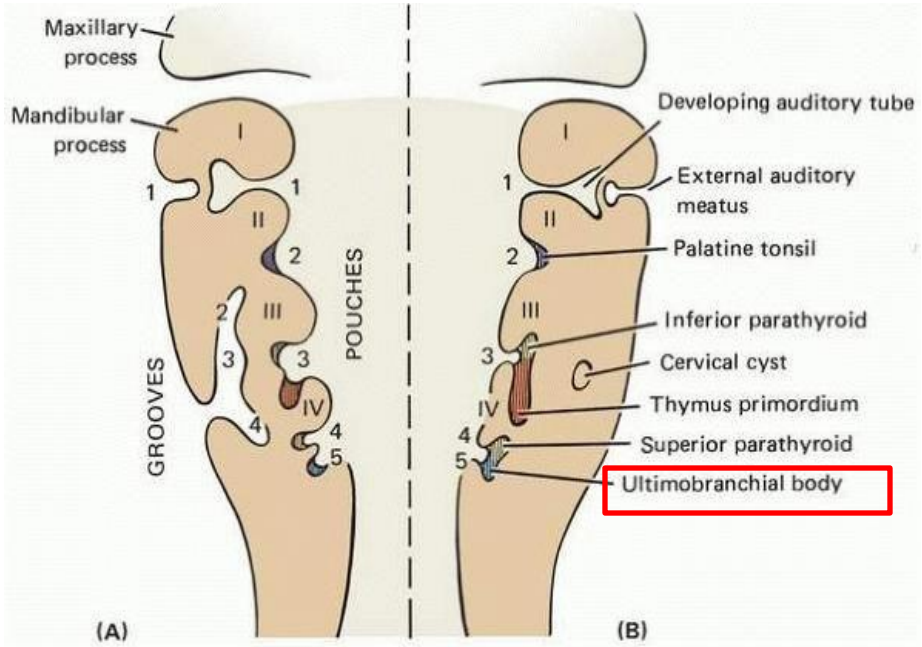


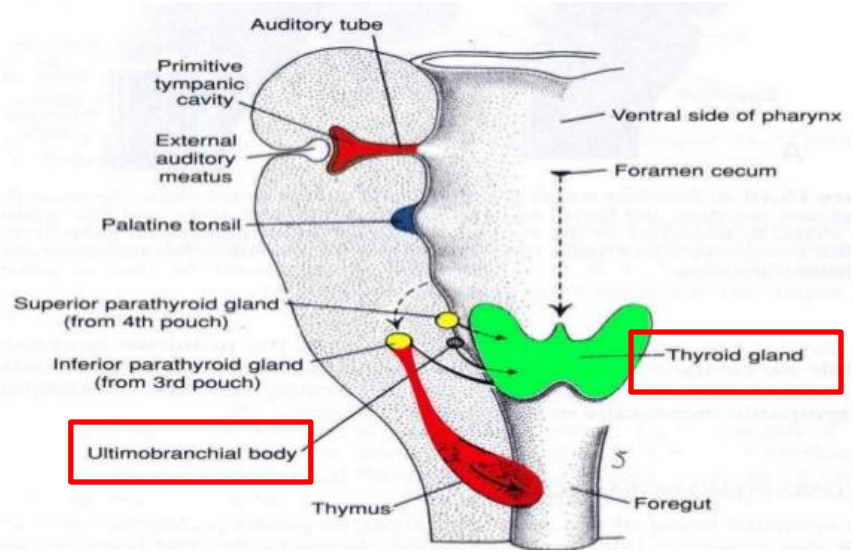


DERIVATIVES OF THE PHARYNGEAL POUCHES

5th pharyngeal pouch:

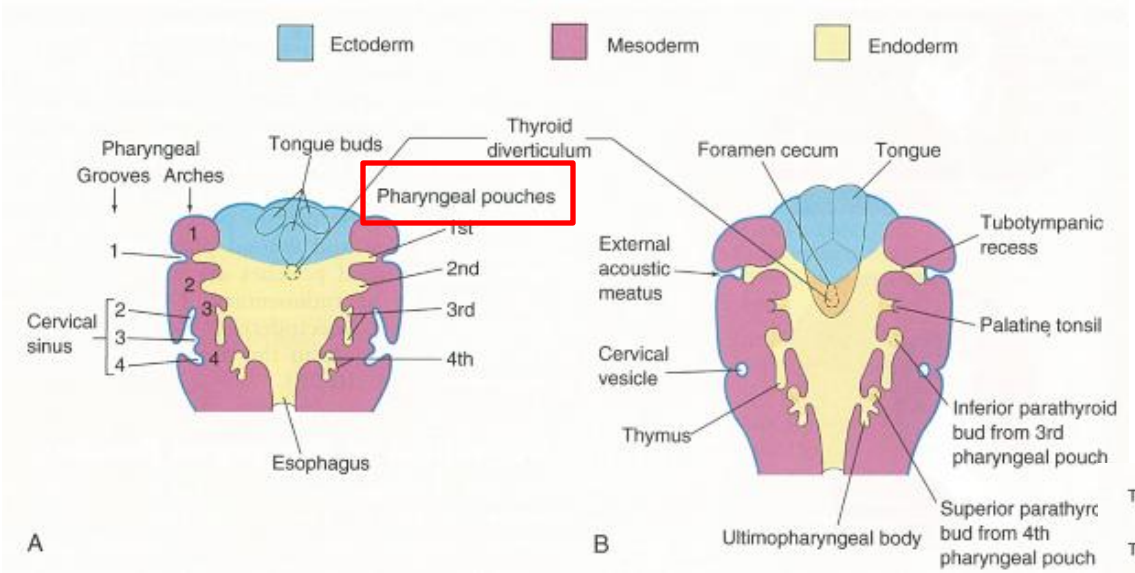
- **called ultimobranchial body**
- **becomes incorporated into the developing thyroid gland**
- **gives rise to the parafollicular cells (C- cells) of the thyroid gland**

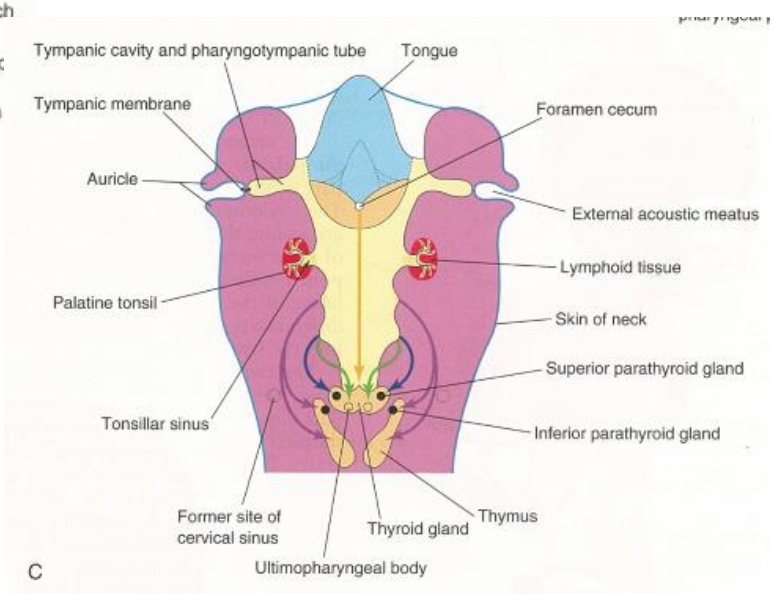




PHARYNGEAL GROOVES

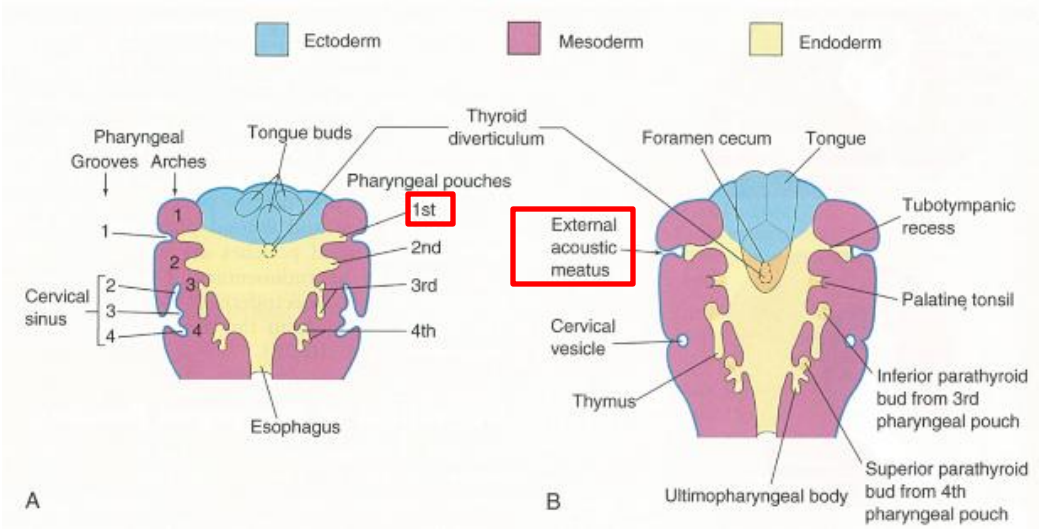
- **the head and the neck regions of the embryo exhibit 4 pharyngeal grooves on each side**
- **these grooves separate the pharyngeal arches externally**

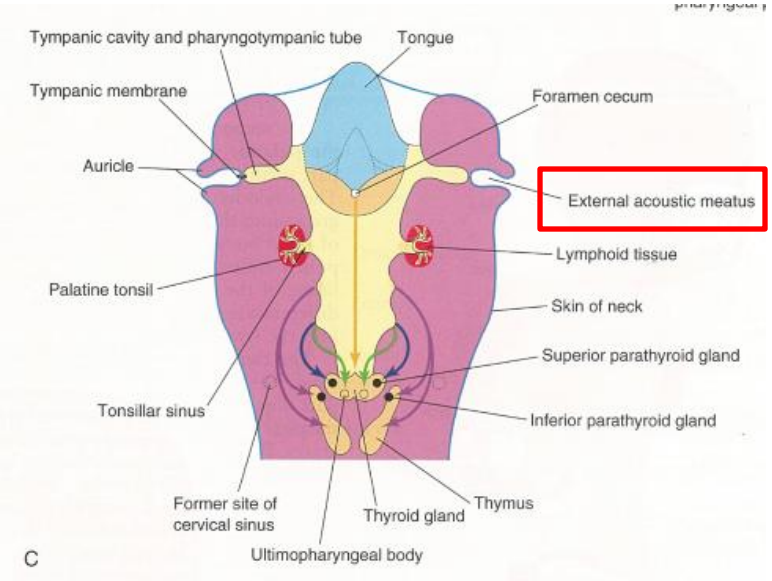




PHARYNGEAL GROOVES

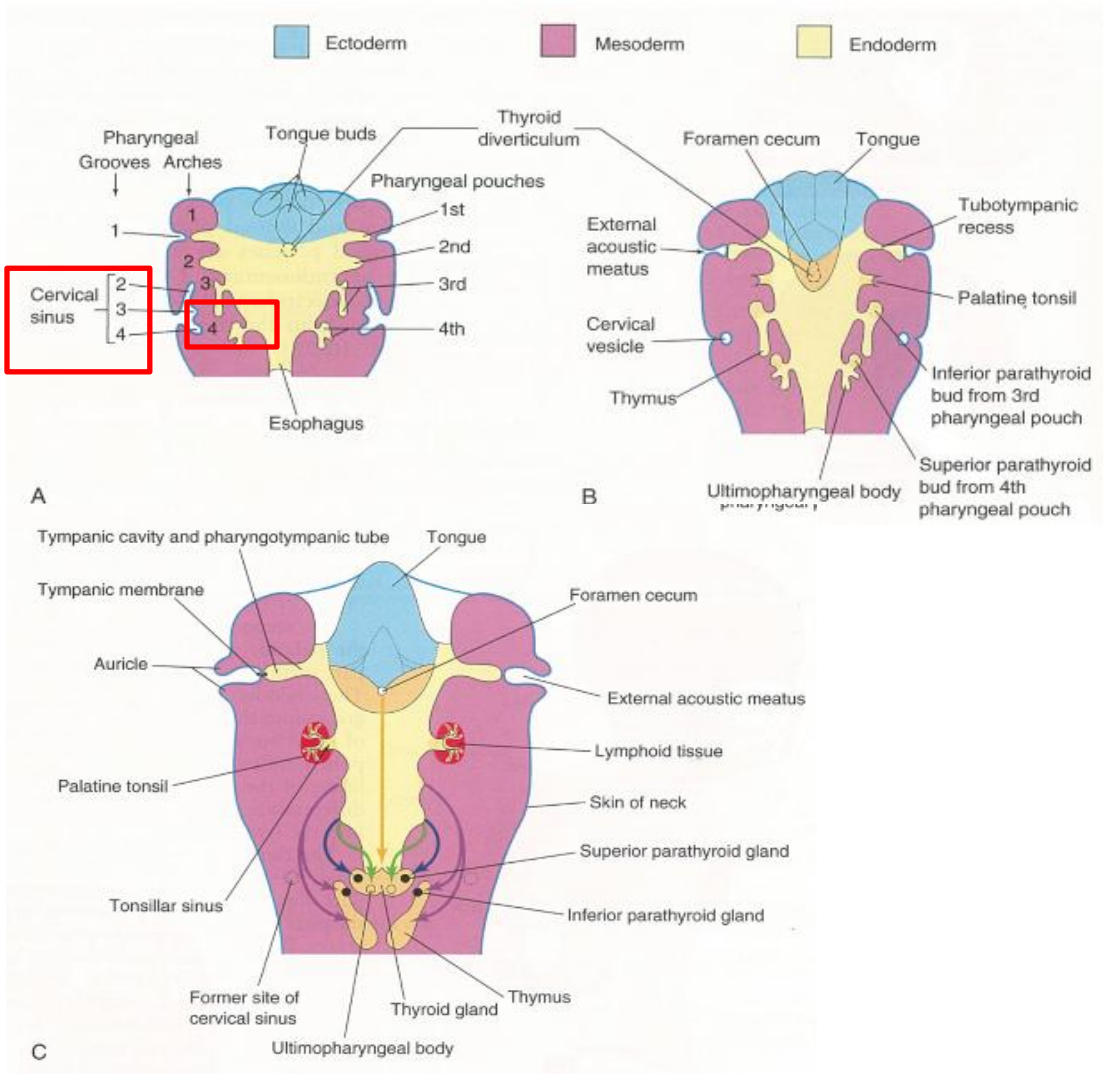
- **only the 1st groove has a definitive derivative in adult - the first pair persists as the external acoustic meatus**
- **the other grooves lie in a slit – like depression – the cervical sinus – and usually obliterated with it as the neck develops**





PHARYNGEAL GROOVES

- **sometimes the cervical sinus and caudal grooves persist and form cervical cysts**



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