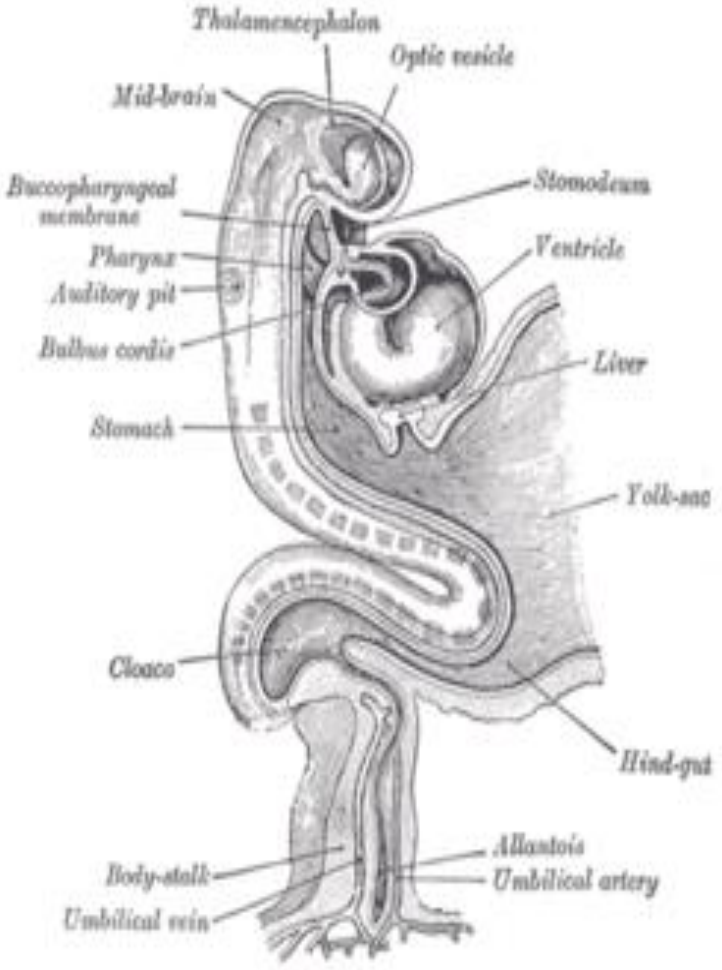
Gi tract embryology 1

Development of the oral cavity

- The mouth has 2 sources of development:
- 1. depression in the stomodeum (lined with ectoderm)
- 2. cephalic end of the foregut(lined with endoderm)
- These two points are separated by the buccopharyngeal membrane
- During the 3rd week of development the membrane disappears

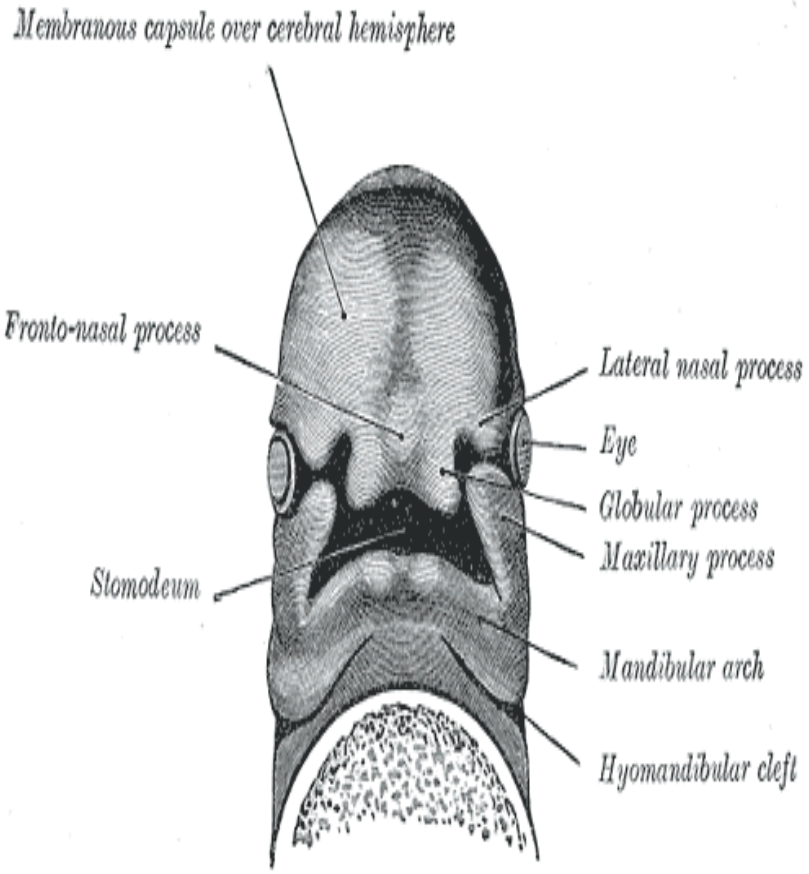


- If the membrane persists (we create an imaginary line), it will extend to:

- Body of sphenoid
- Soft palate
- Inner surface of the mandible, inferior to the incisor teeth

- Structures that are anterior to this plane are ectodermic in origin(epithelium) like:

- Hard palate
- Sides of the mouth
- Lips
- Enamel of the teeth

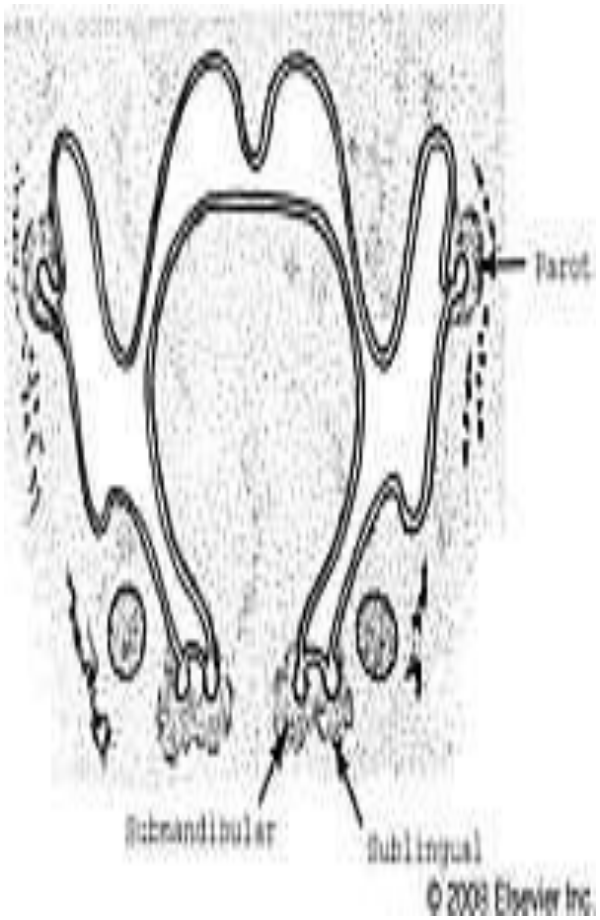


- Structures situated posterior to this plane are derived from endoderm:

- Tongue
- Soft palate
- Palatoglossus and palatopharyngeal folds
- Floor of the mouth

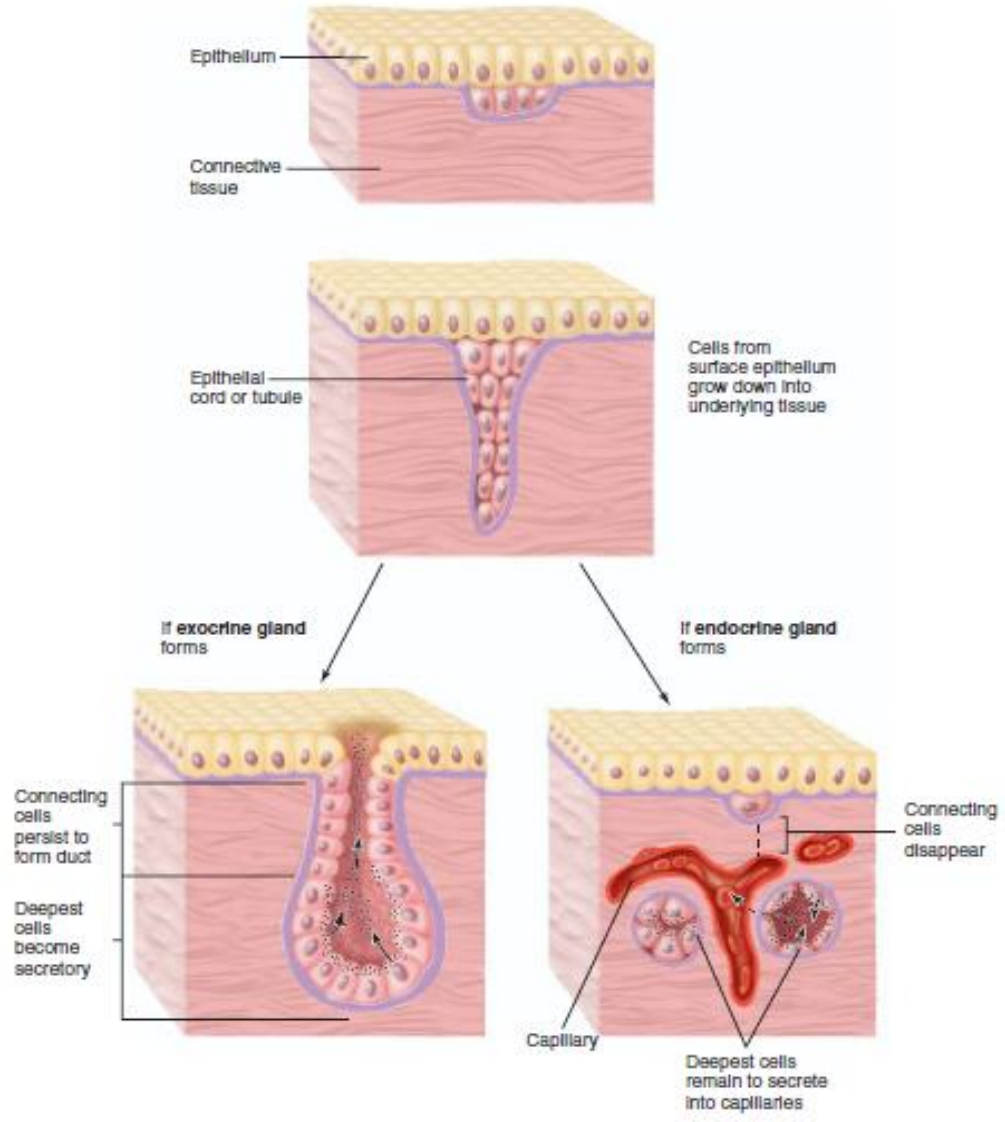
Development of the salivary glands

- During the 7th week it arises as a solid outgrowth of cells from the walls of the developing mouth
- These cells will grow into the underlying mesenchyme
- The epithelial buds will go through repeated branching to form solid ducts
- The ends of these ducts will form the secretory acini, and they will both go through canalization



Development of the glands

- Most glands are formed during development by proliferation of epithelial cells so that they project into the underlying connective tissue
- Some glands retain their continuity with the surface via a duct and are known as **EXOCRINE GLANDS, as they maintain contact with the surface**
- Other glands lose this direct continuity with the surface when their ducts degenerate during development. These glands are known as **ENDOCRINE** glands, and they lose contact with the surface.
- Endocrine glands are either arranged in cords or follicles



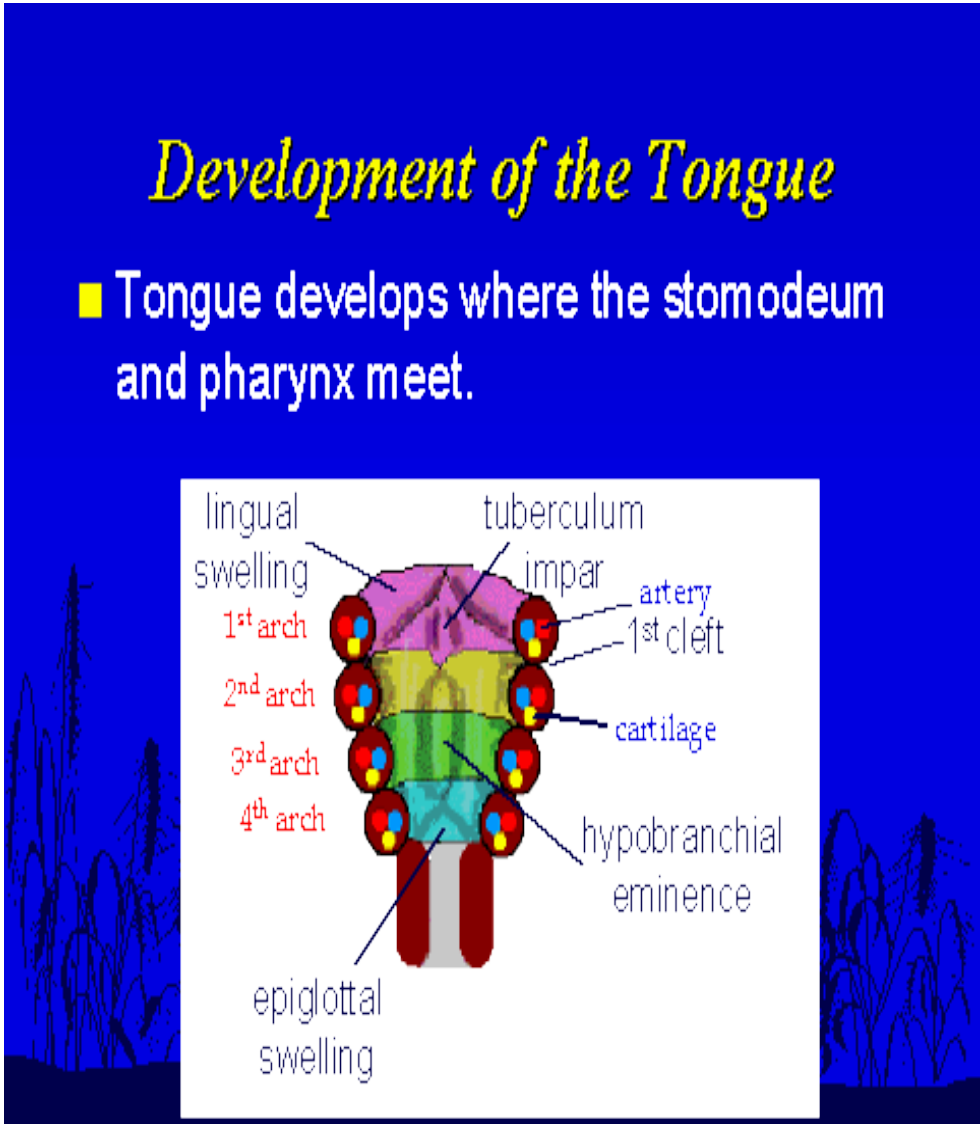
- The surrounding mesenchyme will condense to form:
- The capsule of the gland
- Septa that divide the gland into different lobes and lobules

- The ducts and acini of the parotid gland are both derived from the ectoderm

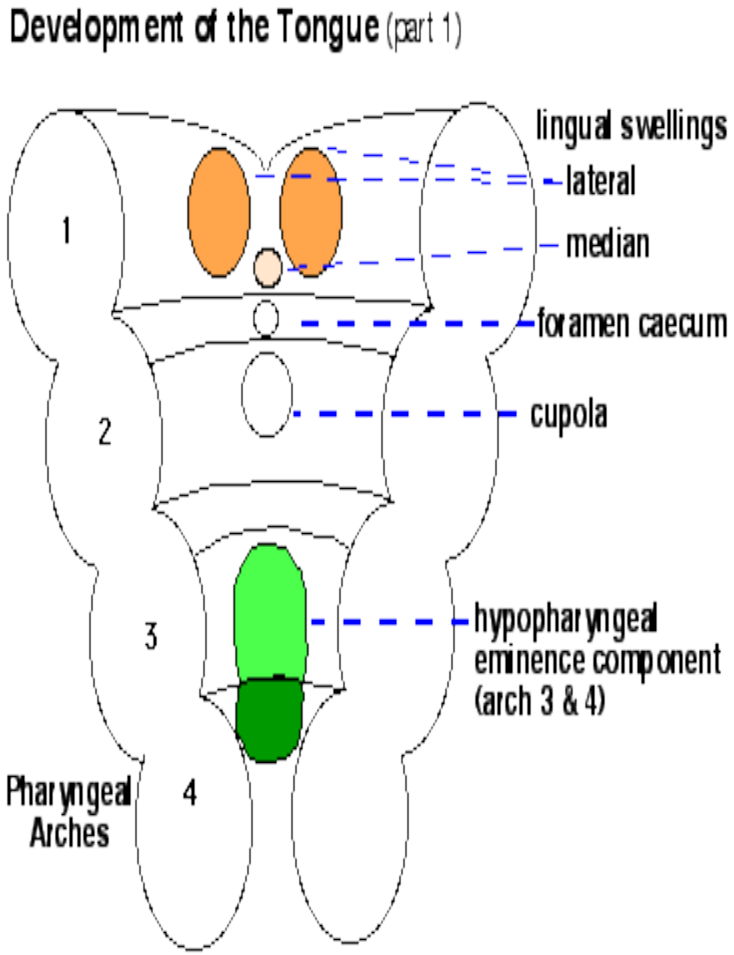
- Submandibular and sublingual glands are derived from the endoderm

Tongue

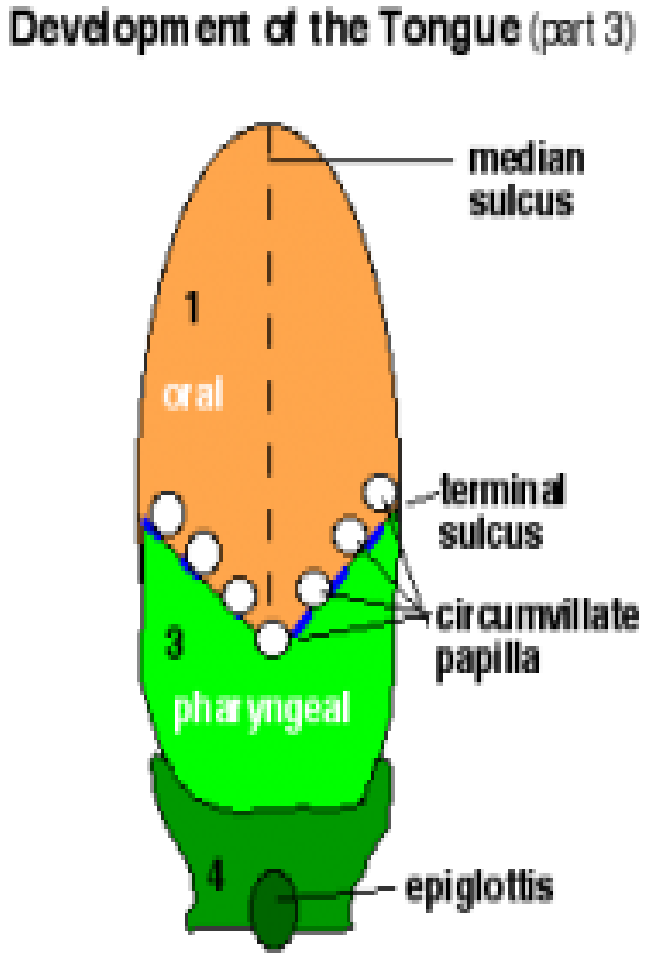
- The tongue appears in embryos of approximately 4 weeks in the form of two **lateral lingual swellings and one medial swelling, the tuberculum impar**
- These three swellings originate from the first pharyngeal arch.
- A second median swelling, the **copula, or hypobranchial eminence,** is formed by mesoderm of the second, third, and part of the fourth arch.
- Finally, a third median swelling, formed by the posterior part of the fourth arch, marks development of the epiglottis.



- Immediately behind this swelling is the **laryngeal orifice, which is flanked by the arytenoids swellings**
- As the lateral lingual swellings increase in size, they overgrow the tuberculum impar and merge, forming the anterior two-thirds, or body, of the tongue
- Since the mucosa covering the body of the tongue originates from the first pharyngeal arch, **sensory innervation to this area is by** the **mandibular branch of the trigeminal nerve.**
- The body of the tongue is separated from the posterior third by a V-shaped groove, the **terminal sulcus**



- The posterior part, or root, of the tongue originates from the second, third, and part of the fourth pharyngeal arch.
- The fact that **sensory innervation to** this part of the tongue is supplied by the **glossopharyngeal nerve indicates that** tissue of the third arch overgrows that of the second.
- The epiglottis and the extreme posterior part of the tongue are innervated by the **superior laryngeal nerve, reflecting their development from the fourth** arch.



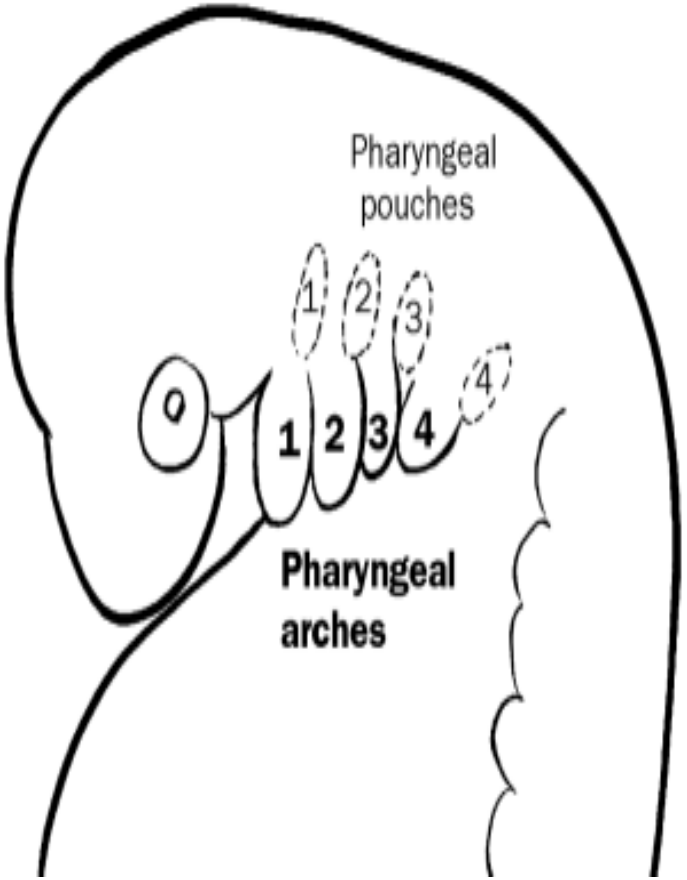
- Some of the tongue muscles probably differentiate in situ, but most are derived from myoblasts originating in **occipital somites.**

- Thus, tongue musculature is innervated by the **hypoglossal nerve.**

- **Special sensory innervation (taste)** to the anterior two thirds of the tongue is provided by the **chorda tympani**
- **branch of the facial nerve, while the posterior third is supplied by the glossopharyngeal** nerve.

Development of the pharynx

- The pharynx develops in the neck from the endoderm of the foregut
- The endoderm is separate from the surface ectoderm by mesenchyme
- The mesenchyme in each side splits up to 5-6 arches
- Each arch forms a swelling on the surface of the walls of the foregut
- As a result of these swellings a series of clefts are seen between the arches….pharyngeal clefts
- Similar grooves are found on the lateral walls of the foregut…..pharyngeal pouches
- The foregut on this level is known as the pharynx



Development of the anterior abdominal wall

- Following the segmentation of the mesoderm, the lateral mesoderm divides into:
- Somatic layer
- Splanchic layer
- Both lined by endo and ectoderm

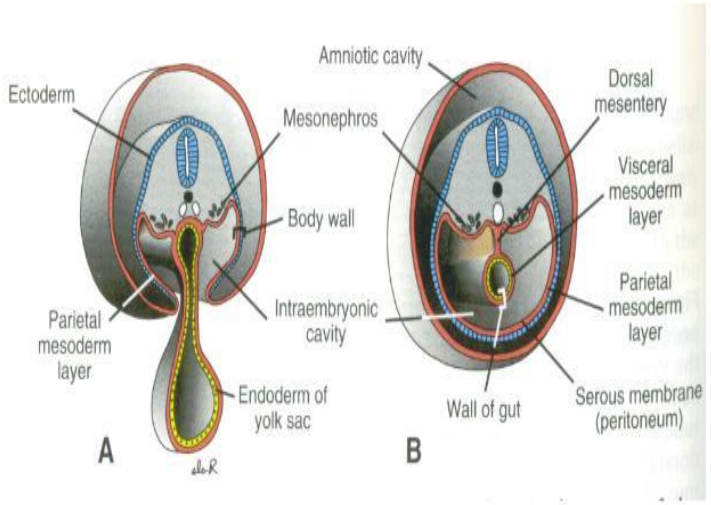
- The ant. Abdominal wall is derived from the somatoplueric mesoderm and they retain their innervation from the ventral rami of the spinal nerves

- The somatoplueric mesoderm then tangentially divides into three layers:
- Ext. oblique
- Int. oblique
- Trans. abdominus

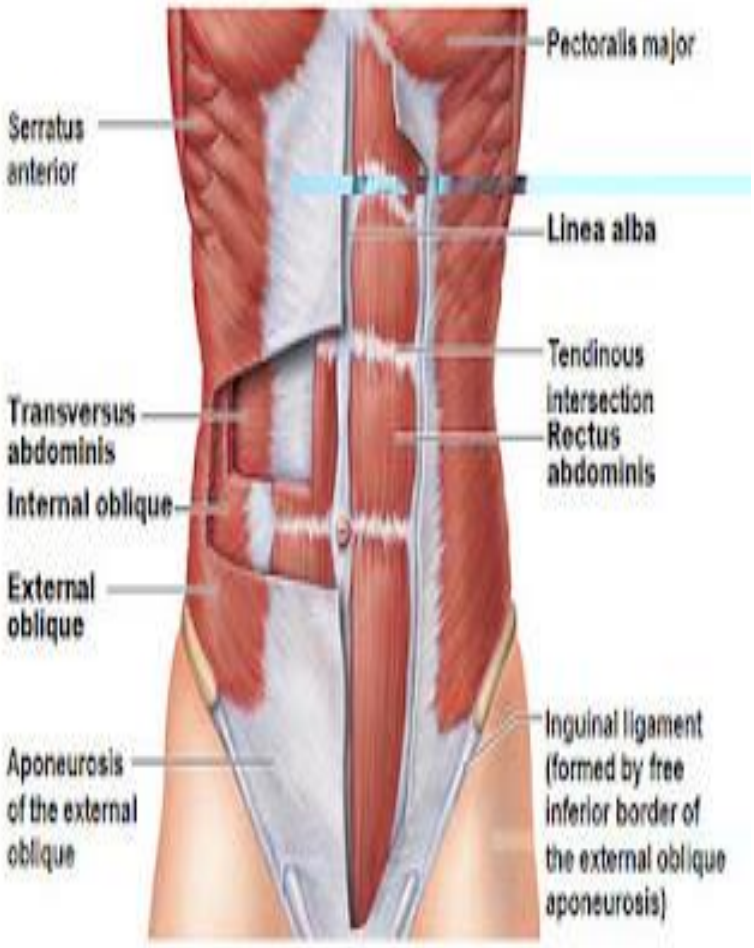
Lateral Plate Mesoderm Further Divides into Somatopleuric mesoderm and Splanchnopleuric mesoderm.

Somatopleuric mesoderm becomes parietal mesoderm which form serous membranes that line the peritoneal, pleural, and pericardial cavities.

Splanchnopleuric mesoderm becomes visceral mesoderm which form serous membranes that line each organ.

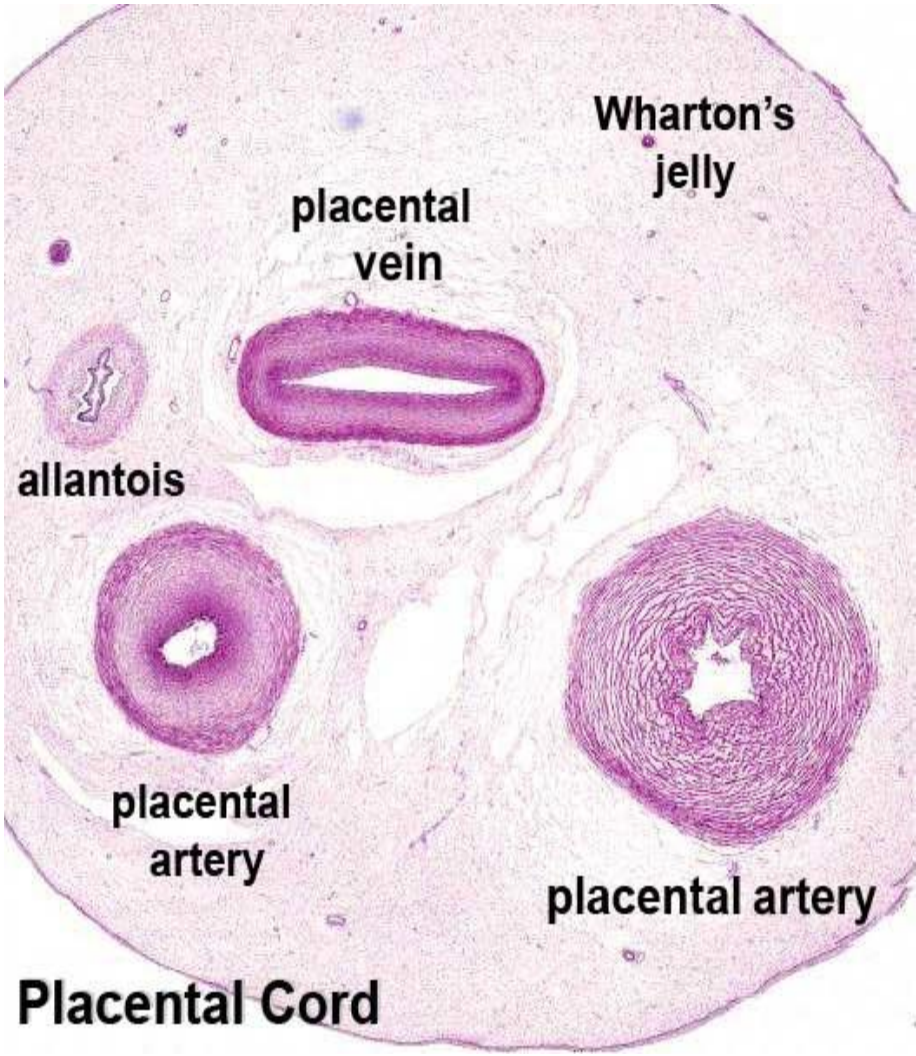


- The rectus abdominus muscle retains the indications of the segmental origin (the presence of tendinous intersections)
- Finally the abd. Wall right and left sides of mesenchyme fuses together at 3 months into the midline to form the linea alpa.
- On either side of the lina alpa the rectus muscles lies within their rectus sheaths



Development of the umblicus and the umblical cord

- The amnion and the chorion fuse together
- The amnion encloses the body stalk and the yolk sac with their blood vessels to form the tubular umbilical cord
- The mesenchyme core of the cord (whartons jelly) form a loose connective tissue which embed the following:
- Remains of yolk sac
- Vittelline duct
- Remains of allantois
- Umbilical blood vessels
- We have 2 arteries that carries deoxygenated blood from the fetus to the chorion (placenta)
- 2 veins carry oxygenated blood from the placenta
- , but the right vein will soon disappear

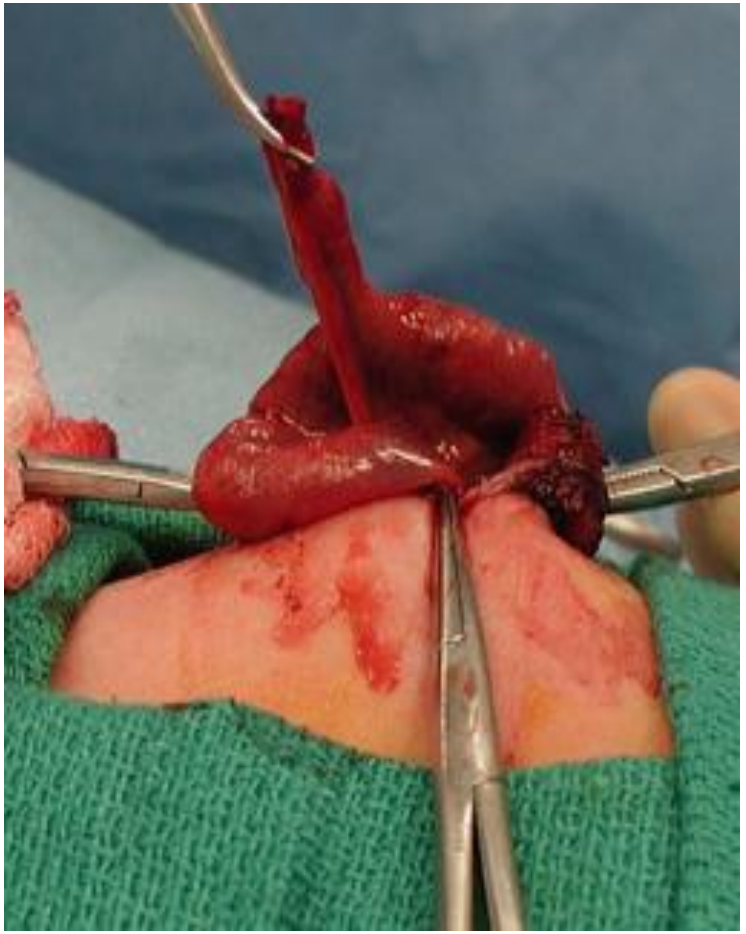


Vitelline Duct Abnormalities

- In 2 to 4% of people, a small portion of the **vitelline duct persists, forming** an outpocketing of the ileum, **Meckel's diverticulum or ileal diverticulum**

- In the adult, this diverticulum, approximately 40 to 60 cm from the ileocecal valve on the antimesenteric border of the ileum, does not usually cause any symptoms.

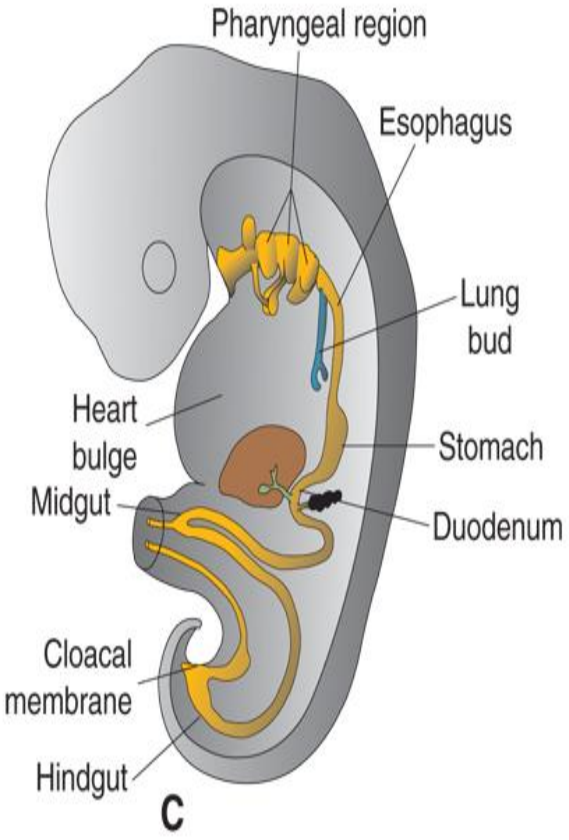
- However, when it contains heterotopic pancreatic tissue or gastric mucosa, it may cause ulceration, bleeding, or even perforation.



- Sometimes both ends of the vitelline duct transform into fibrous cords, and the middle portion forms a large cyst, an **enterocystoma, or vitelline cyst**

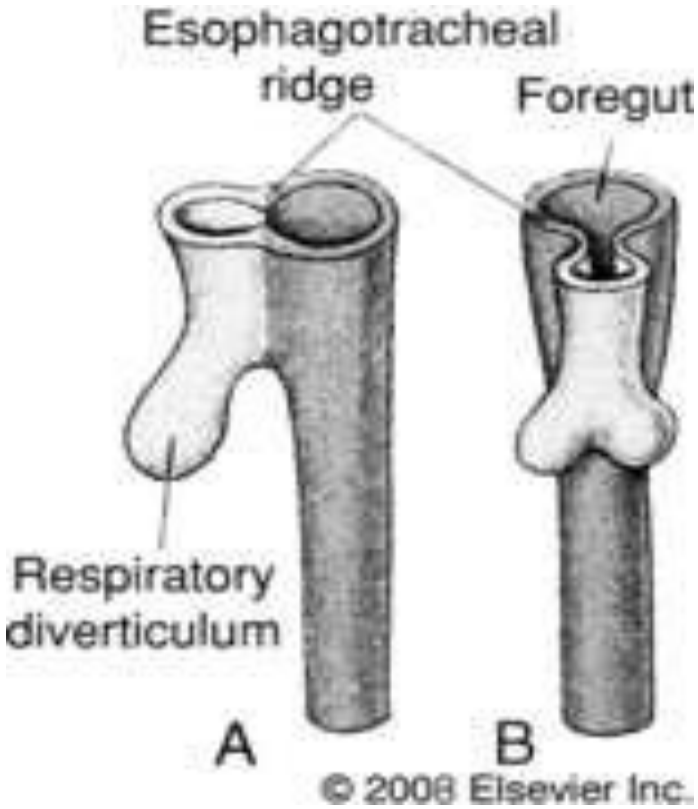
Formation of the Lung Buds

- When the embryo is approximately 4 weeks old, the **respiratory diverticulum (lung bud) appears as** an outgrowth from the ventral wall of the foregut
- The location of the bud along the gut tube is determined by signals from the surrounding mesenchyme, including fibroblast growth factors (FGFs) that "instruct"the endoderm.
- Hence **epithelium of the** internal lining of the larynx, trachea, and bronchi, as well as that of the lungs, is entirely of **endodermal origin.**
- The **cartilaginous, muscular, and connective tissue components** of the trachea and lungs are derived from **splanchnic mesoderm** surrounding the foregut



6-1C Lung bud initiation and branching

- Initially the lung bud is in open communication with the foregut
- When the diverticulum expands caudally, however, two longitudinal ridges, the **tracheoesophageal ridges, separate it** from the foregut
- Subsequently, when these ridges fuse to form the **tracheoesophageal septum, the foregut is divided into a** dorsal portion, the **esophagus, and a ventral portion, the trachea and lung buds**
- The respiratory primordium maintains its communication with the pharynx through the **laryngeal orifice**



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