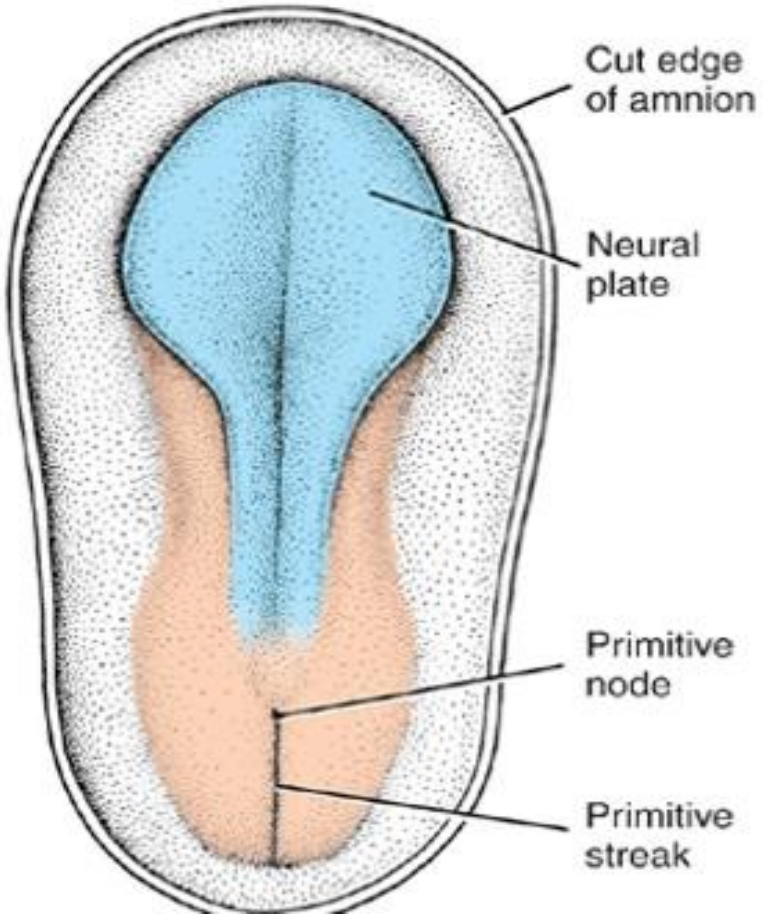
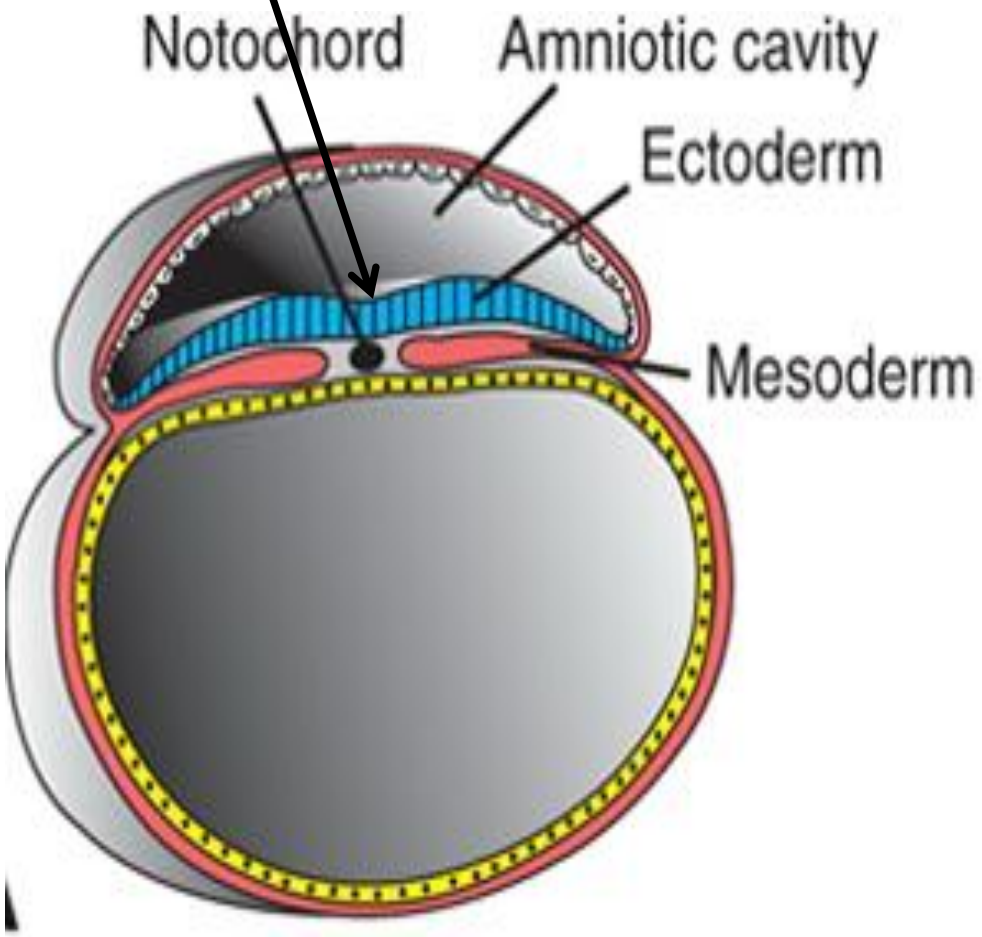
Development of the neural tube

At the middle of the epiblast another swelling called

1- <u>neural plate appears</u>

The neural plate replaces the receding primitive streak and closes the pore formed before



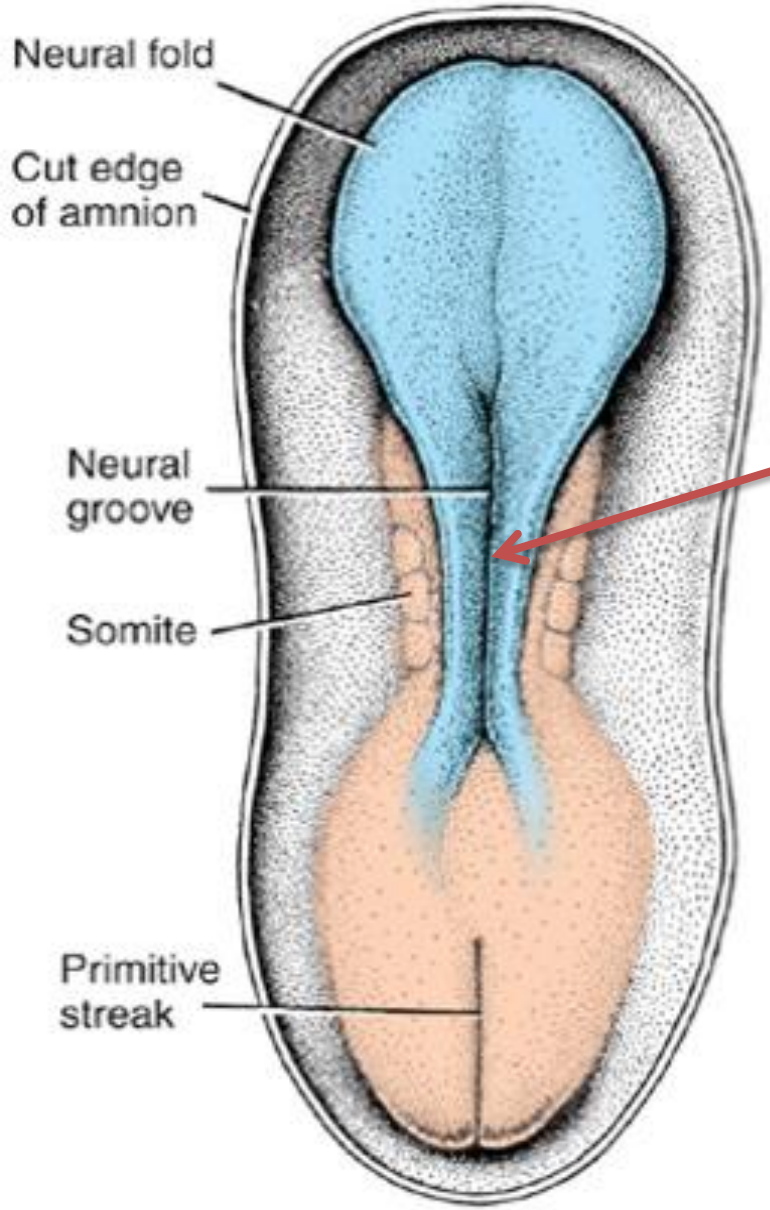


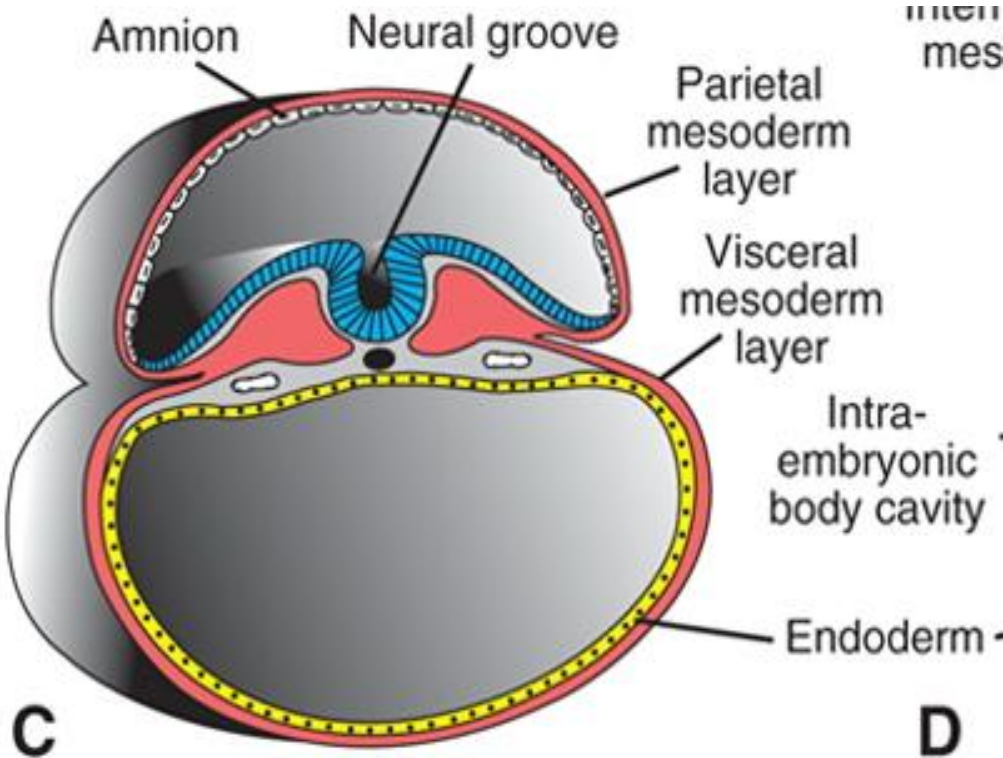
By the end of the third week,
the lateral edges of the neural plate become more elevated to form

neural folds

the depressed midregion forms the

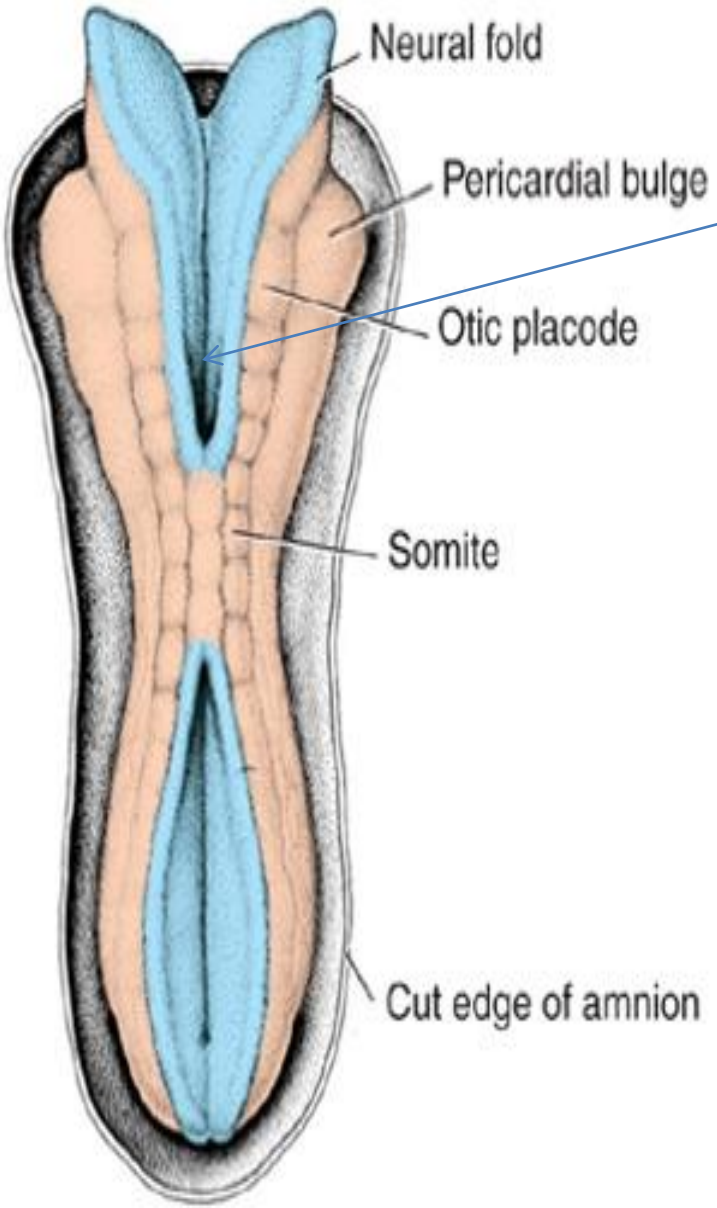
2-Neural groove

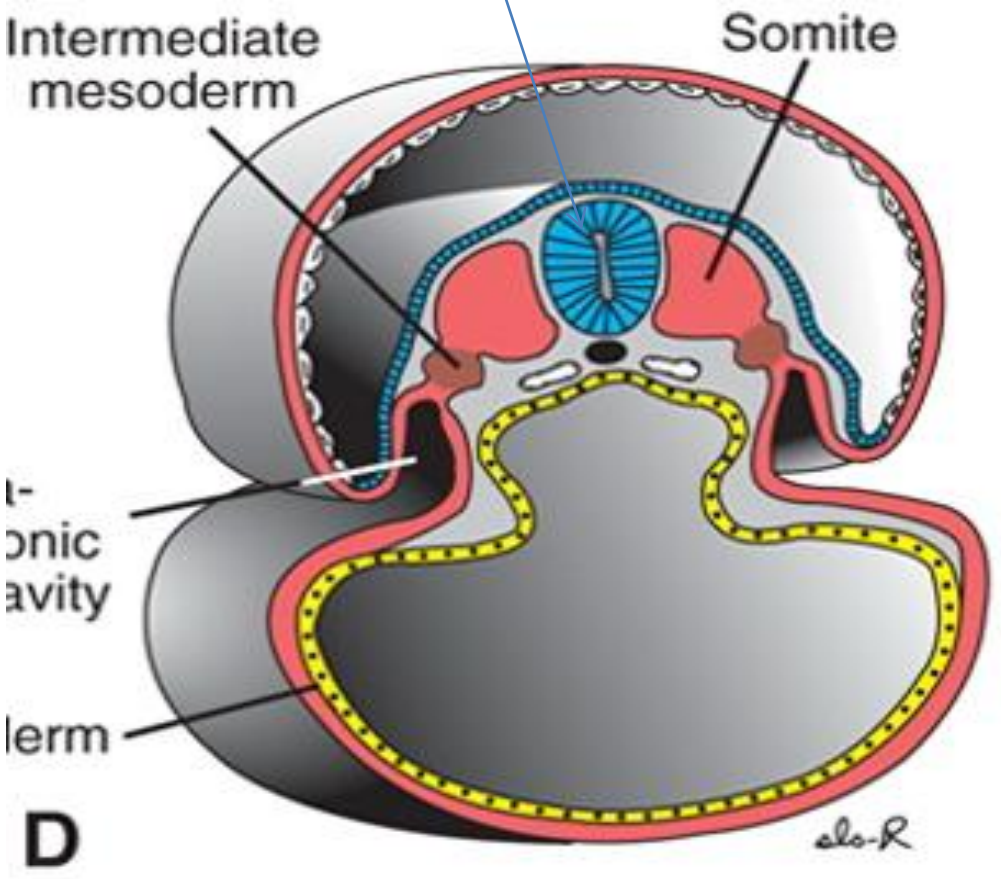




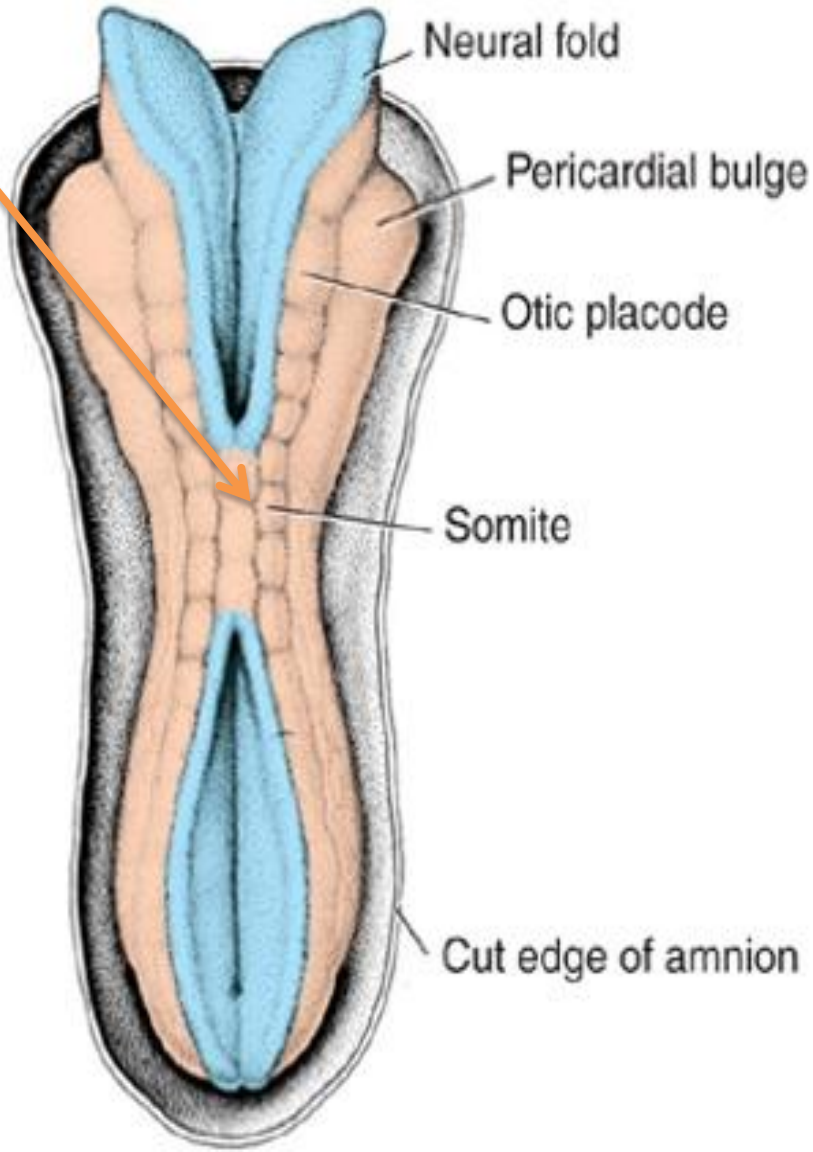
Gradually, the neural folds approach each other in the midline, where they fuse and form:

3-Neural tube



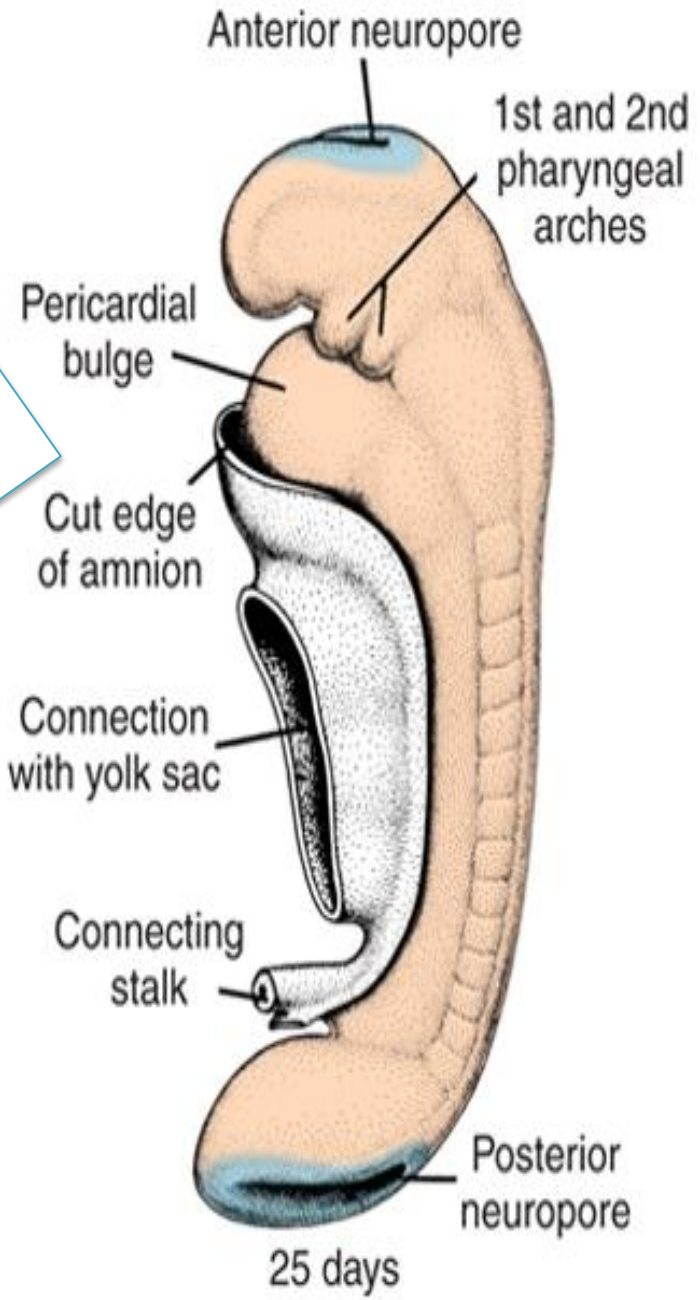


Fusion begins in the cervical region
(fifth somite)
and proceeds cranially and caudally As a result the **neural tube is formed.**



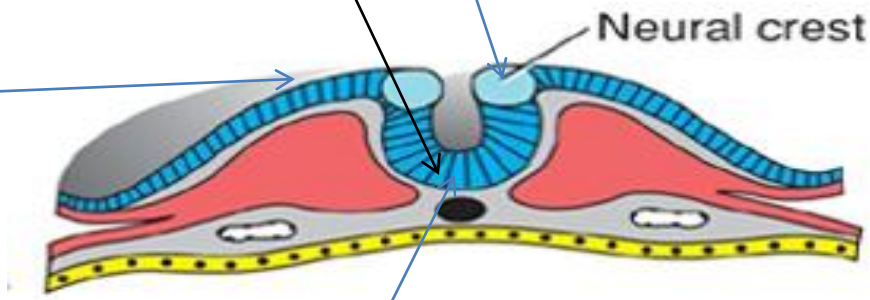
Until fusion is complete
the cephalic and caudal ends
of the neural tube
communicate with the amniotic cavity
by way of
the **cranial and caudal neuropores**

Closure of
the **cranial neuropore**
occurs at approximately
day **25**
whereas the **posterior neuropore** closes at
day **27**



Parts of the neural tube

1-neural crest
2-alar plate
3-basal plate



alar plate

basal plate

THE NERVOUS SYSTEM IS FORMED FROM THE ECTODERM (THE NEURAL TUBE)

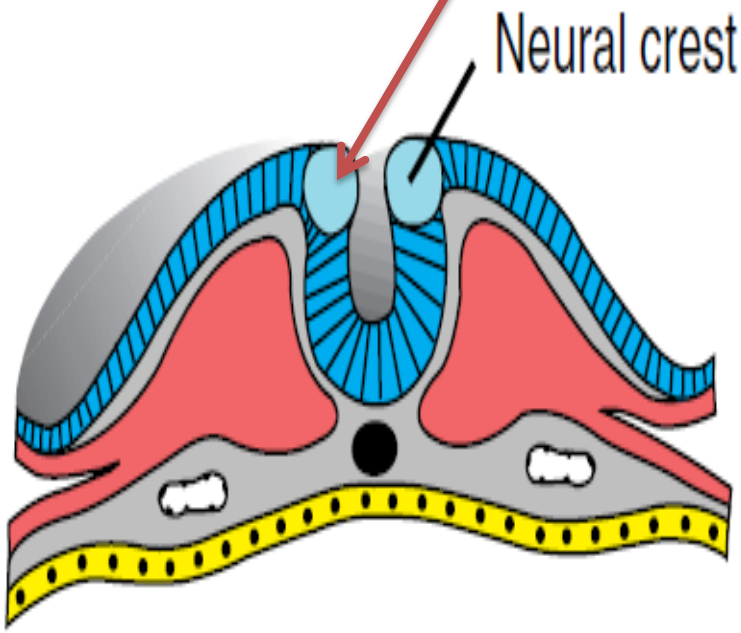
The **neural crest** gives rise to **the ganglia**

The **alar plate** gives rise to **the sensory** part of the nervous system

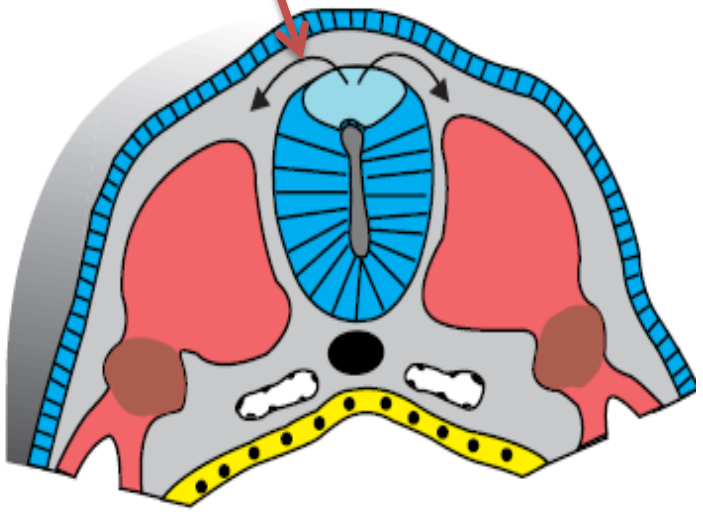
The **basal plate** gives rise to **the motor** part of the nervous system

NEURAL CREST

<u>Cells at the lateral border</u> or crest of the neuroectoderm begin to dissociate from their neighbors AND **undergo an epithelial-to-mesenchymal transition as it leaves the neuroectoderm by active migration and displacement to enter the underlying mesoderm**



A



B

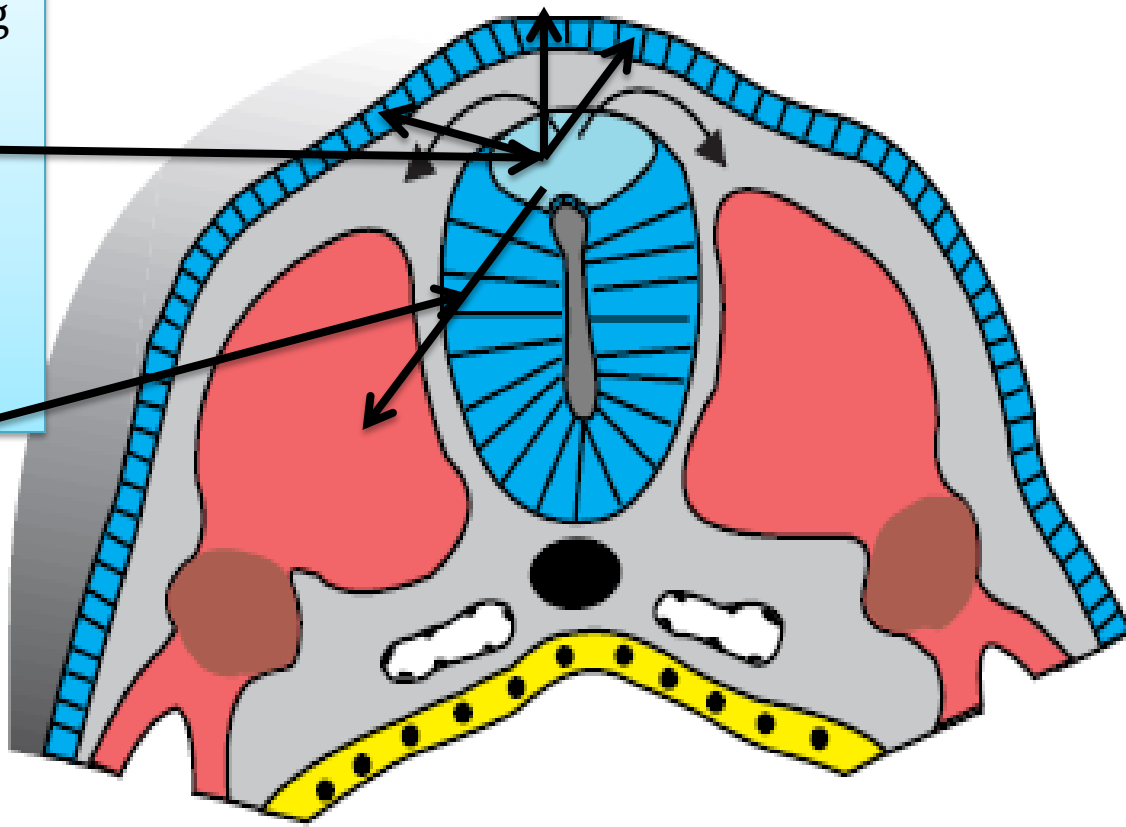
NEURAL CREST cells migrate along one of two pathways:

1) a dorsal pathway through the dermis, where they will enter the ectoderm to form

melanocytes

In the skin and hair follicles

2) a ventral pathway through the anterior half of each somite to become **sensory ganglia, sympathetic and enteric neurons , Schwann cells, and cells of the adrenal medulla**



B

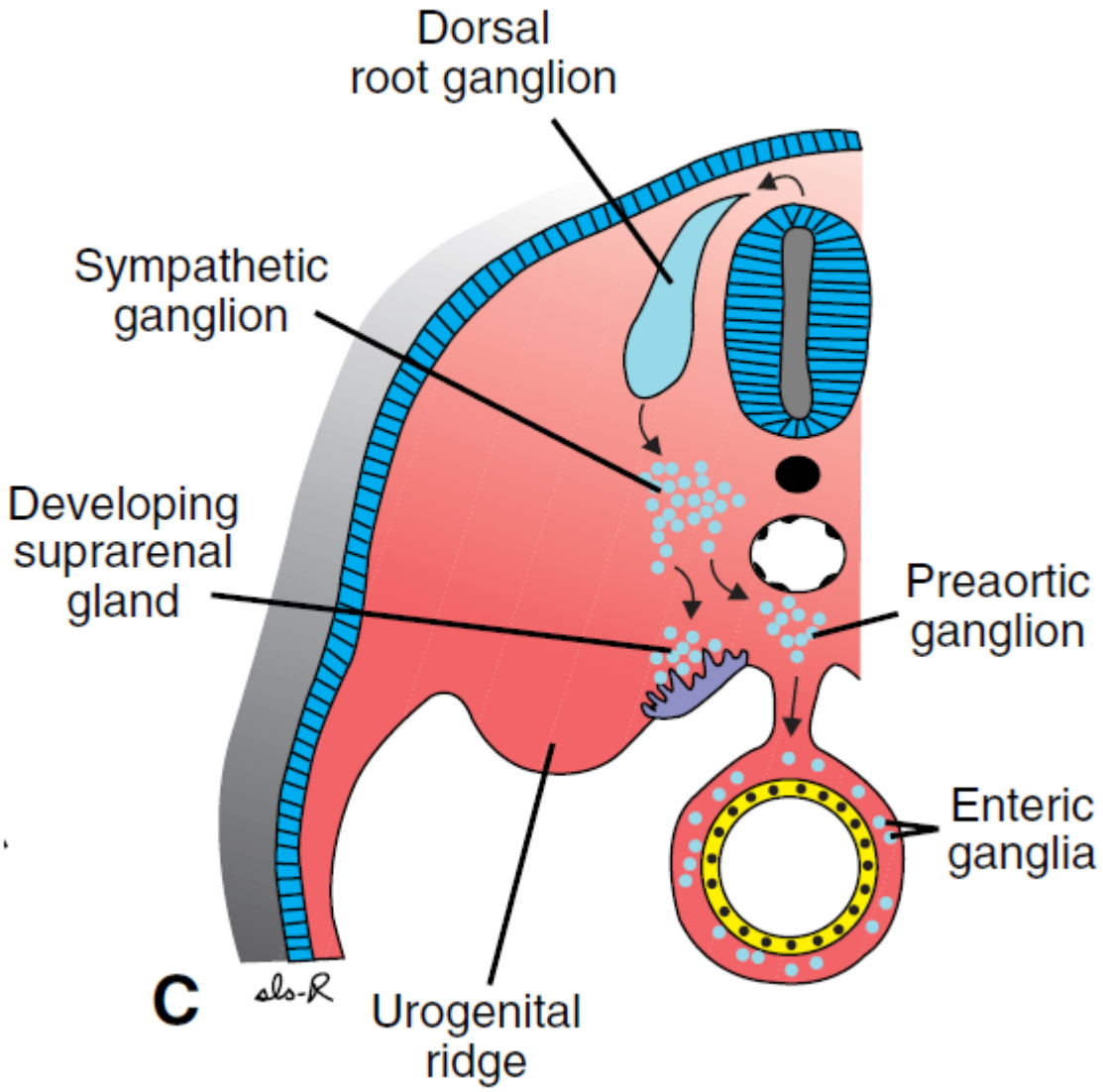
Neural crest cells

also

form and migrate from

cranial neural folds,

leaving the neural tube before closure in this region These cells contribute to the **craniofacial skeleton as well as neurons for cranial ganglia**



Neural Crest Derivatives

1-Connective tissue and ***bones of the face and skull***
2-Cranial nerve ganglia
3-C cells of the thyroid gland
4-Conotruncal septum in the heart
5-Odontoblasts
6-Dermis in face and neck
7-Spinal (dorsal root) ganglia
8-Sympathetic chain and preaortic ganglia
9-Parasympathetic ganglia of the gastrointestinal tract
10-Adrenal medulla
11-Schwann cells
12-Glial cells
13-Arachnoid and pia mater (leptomeninges)
14-**Melanocytes**

In general terms, the ectodermal germ layer
gives rise to organs and structures
that maintain contact with the outside world:

(a) the central nervous

(b) the peripheral nervous system

c) the sensory epithelium of the ear, nose, and eye

(d) the epidermis, including the hair and nails

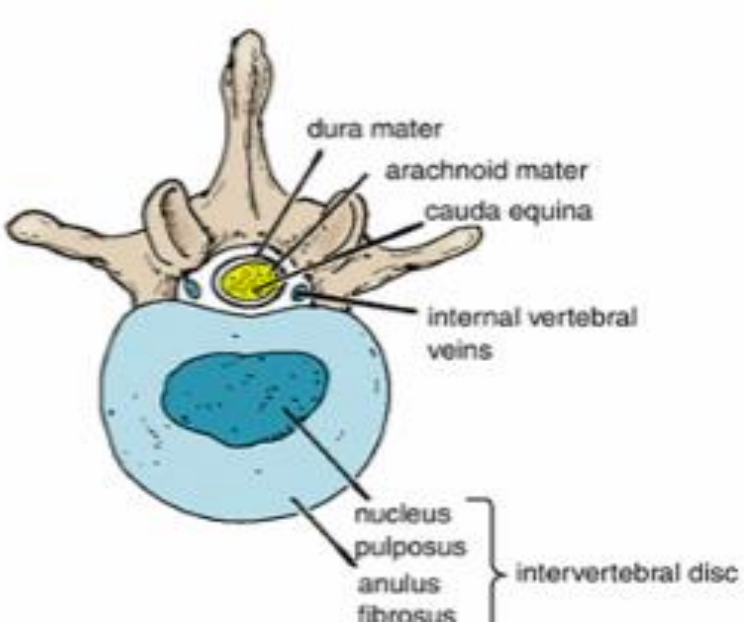
In addition,
it gives rise to subcutaneous glands,
the mammary glands,
the pituitary
gland,
and enamel of the teeth.

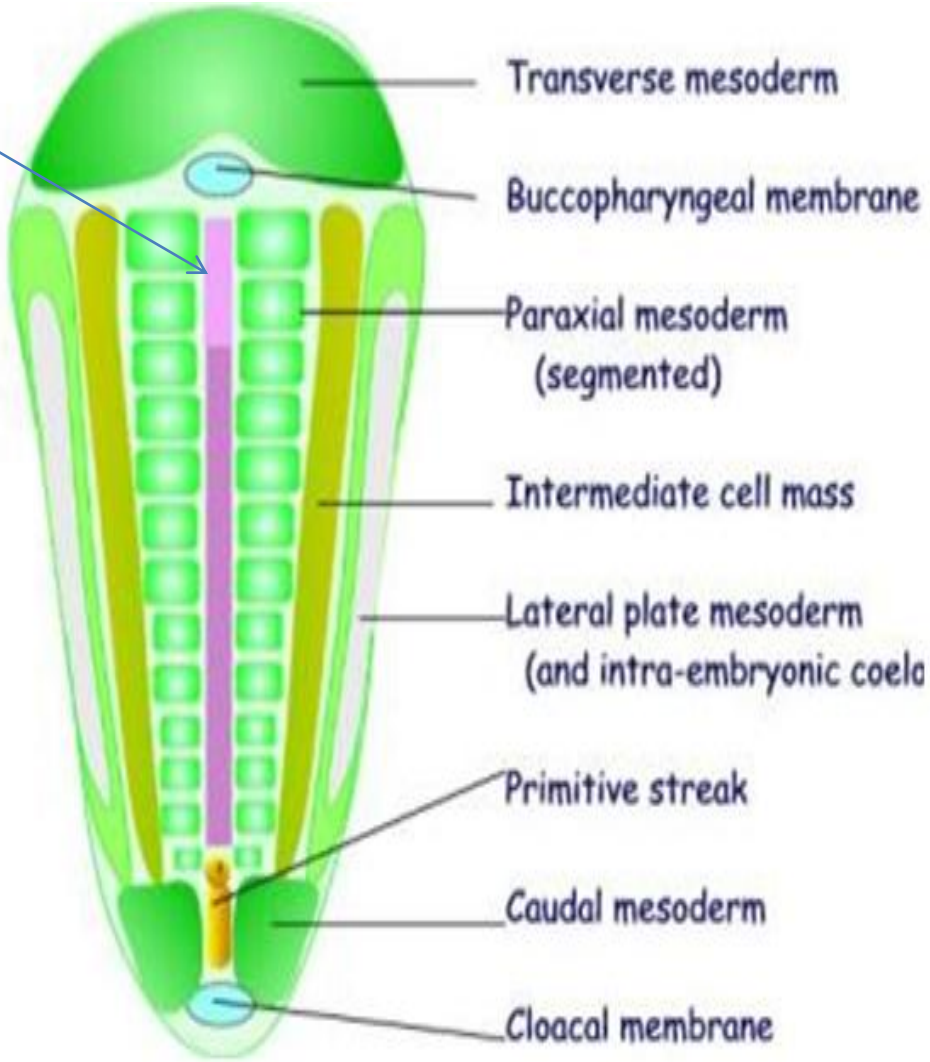
The notochord

gives rise to the

Nucleus pulpous

Of the intervertebral disk





MAJOR EVENTS OF THE SECOND WEEK OF DEVELOPMENT

A-Completion of implantation of the blastocyst

B-Production of a bilaminar embryonic disc

C-FORMATION OF EXTRAEMBRYONIC STRUCTURES:

1 - AMNIOTIC CAVITY

2 - AMNION

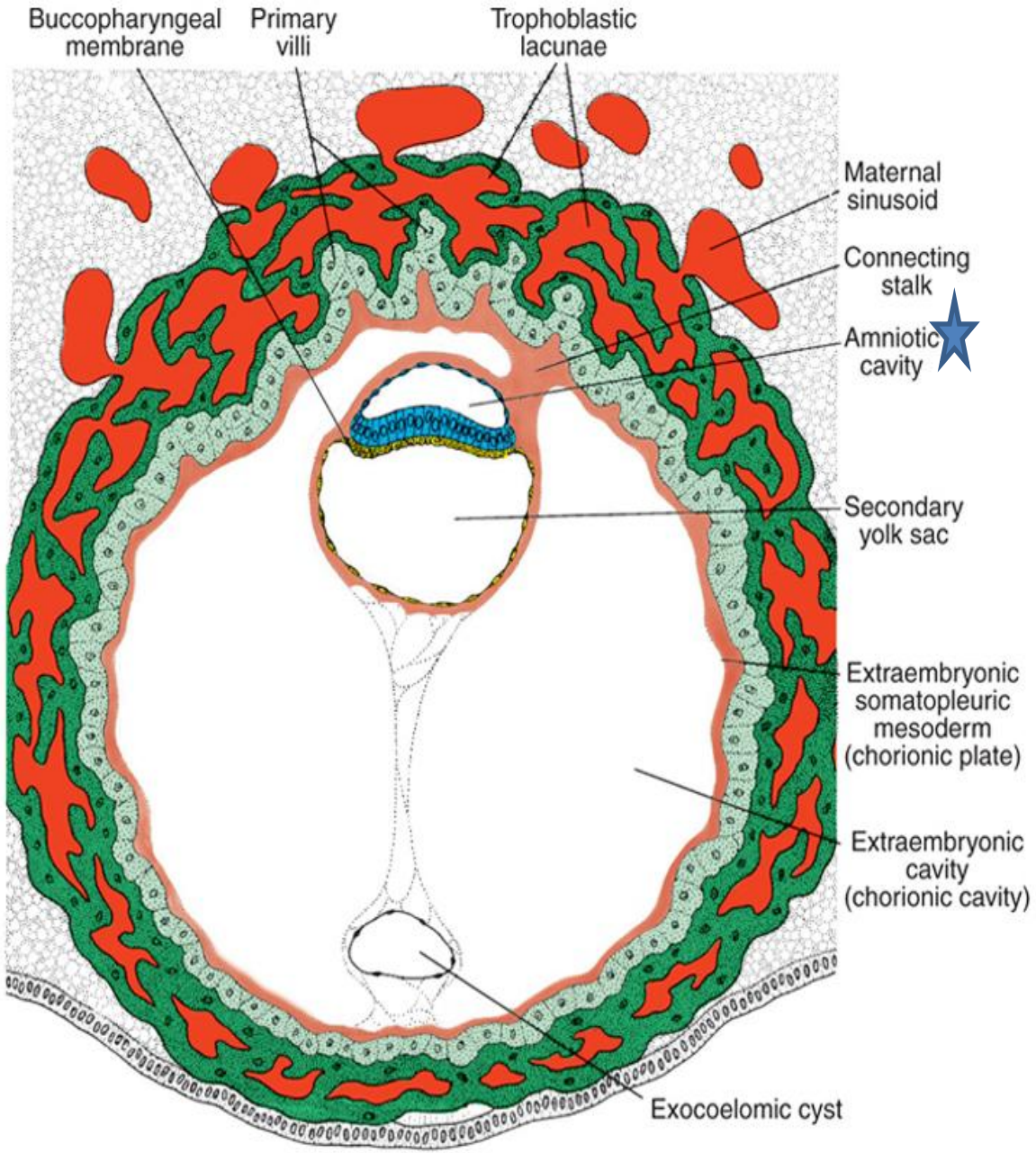
3 - YOLK SAC

4 - CHORIONIC SAC

5 - CONNECTING STALK

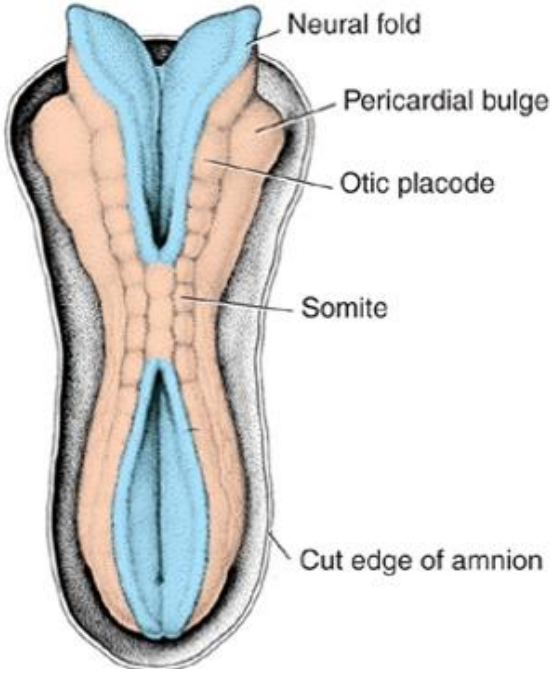
D-APPEARANCE OF PRIMARY CHORIONIC VILLI

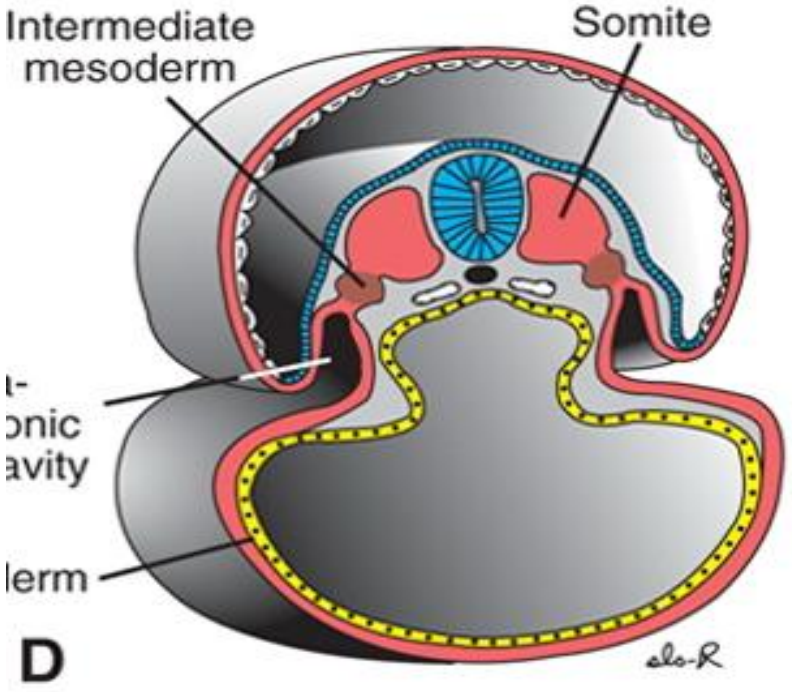
E-APPEARANCE OF THE PRECHORDAL PLATE



MAJOR EVENTS OF THE THIRD WEEK

- **Development of**
  THE PRIMITIVE STREAK
- **Development of**
  THE NOTOCHORD
- **Formation of**
  THE TRILAMINAR GERM DISC
- **Beginning of formation**
  OF NEURAL TUBE





Teratogenesis Associated With Gastrulation

Because this stage is reached 2 weeks after fertilization, it is **approximately 4 weeks** from the last menses. Therefore, the woman may not recognize she is pregnant, having assumed that menstruation is late and will begin shortly. Consequently, she may not take precautions she would normally consider if she knew she was pregnant

High doses of alcohol at this stage kill cells in the anterior midline of the germ disc, producing a deficiency of the midline in craniofacial structures and resulting in **holoprosencephaly.**
In such a child, the forebrain is small