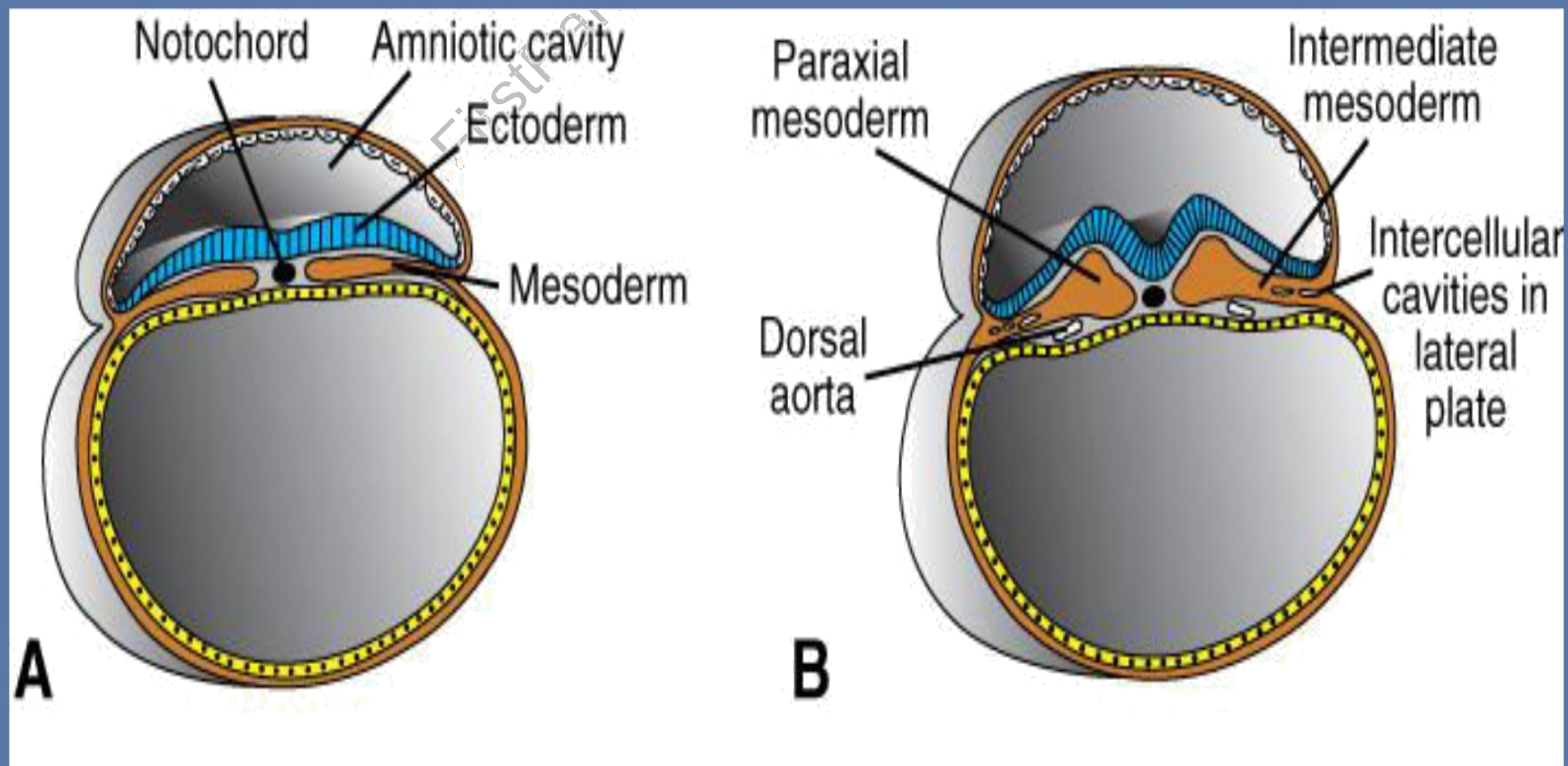


HUMAN EMBRYONIC PERIOD

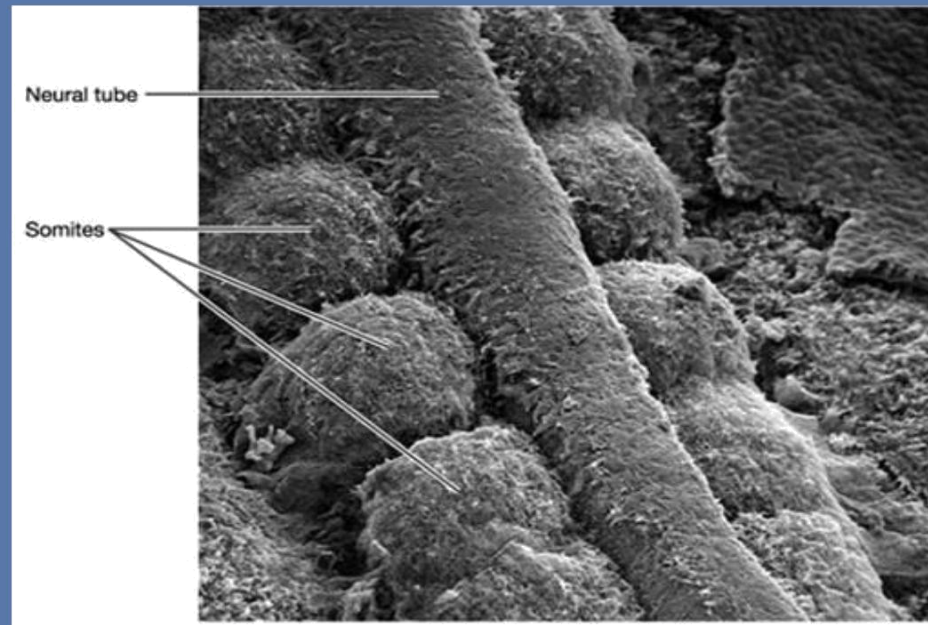
HUMAN EMBRYONIC PERIOD

DERIVATIVES OF MESODERMAL GERM LAYER



PARAXIAL MESODERM

- ▢ Begins to organize cephalocaudally into segmental whorls of mesenchymal cells
– **somitomeres**
- ▢ Somitomeres give rise to head musculature & are formed in



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■ **SOMITES** (from occipital region caudally)

■ First pair appear at about 20th day

■ In the craniocaudal sequence @ 3 pairs per day

■ At the end of 5th week 42- 44 pairs

■ 4 occipital

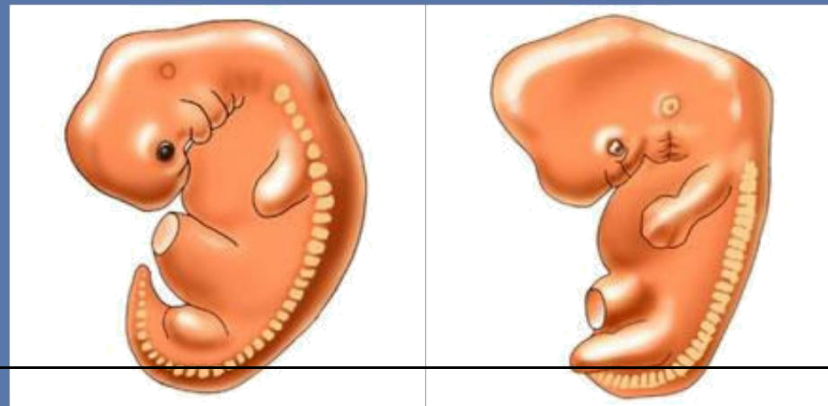
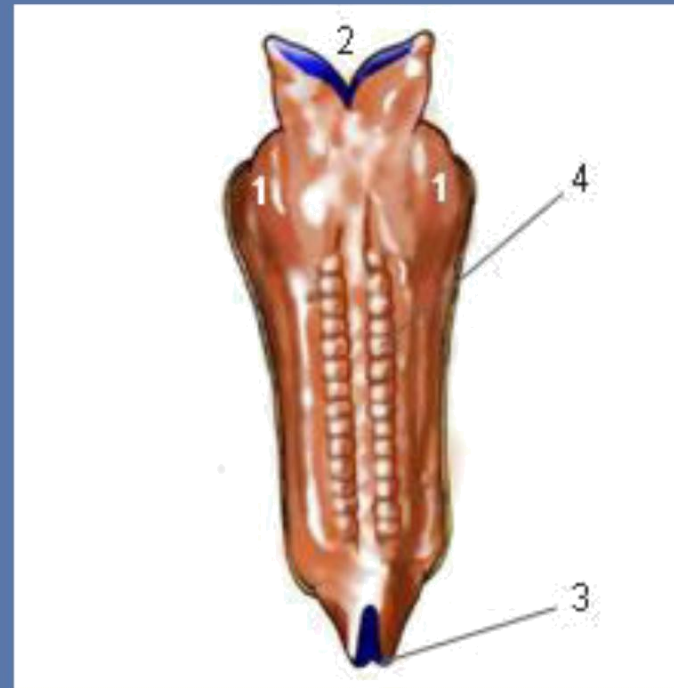
■ 8 cervical

■ 12 thoracic

■ 5 lumbar

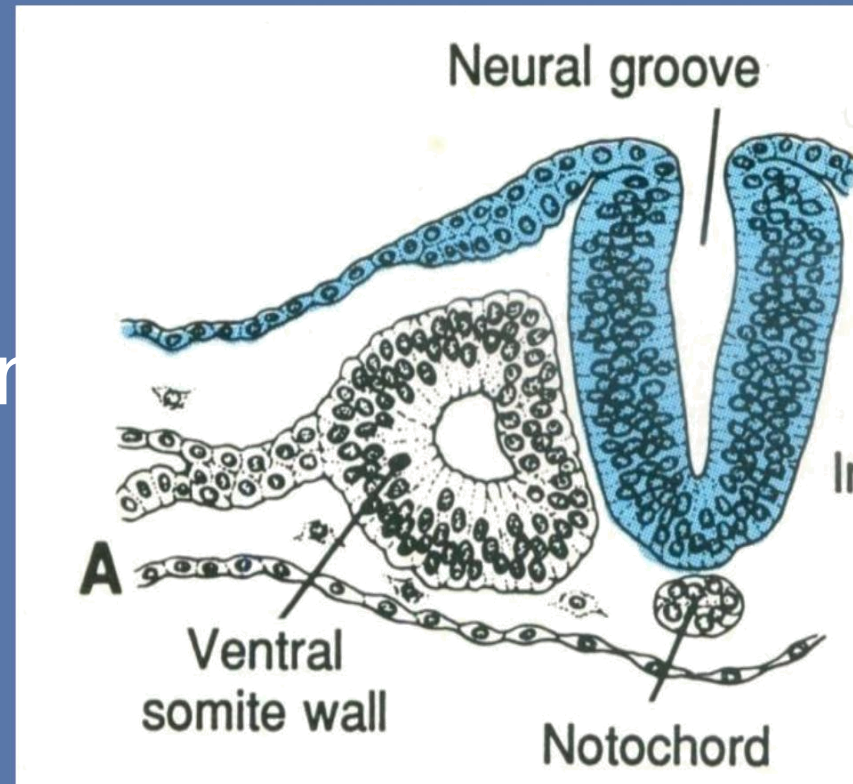
■ 5 sacral

■ 8- 10 coccygeal



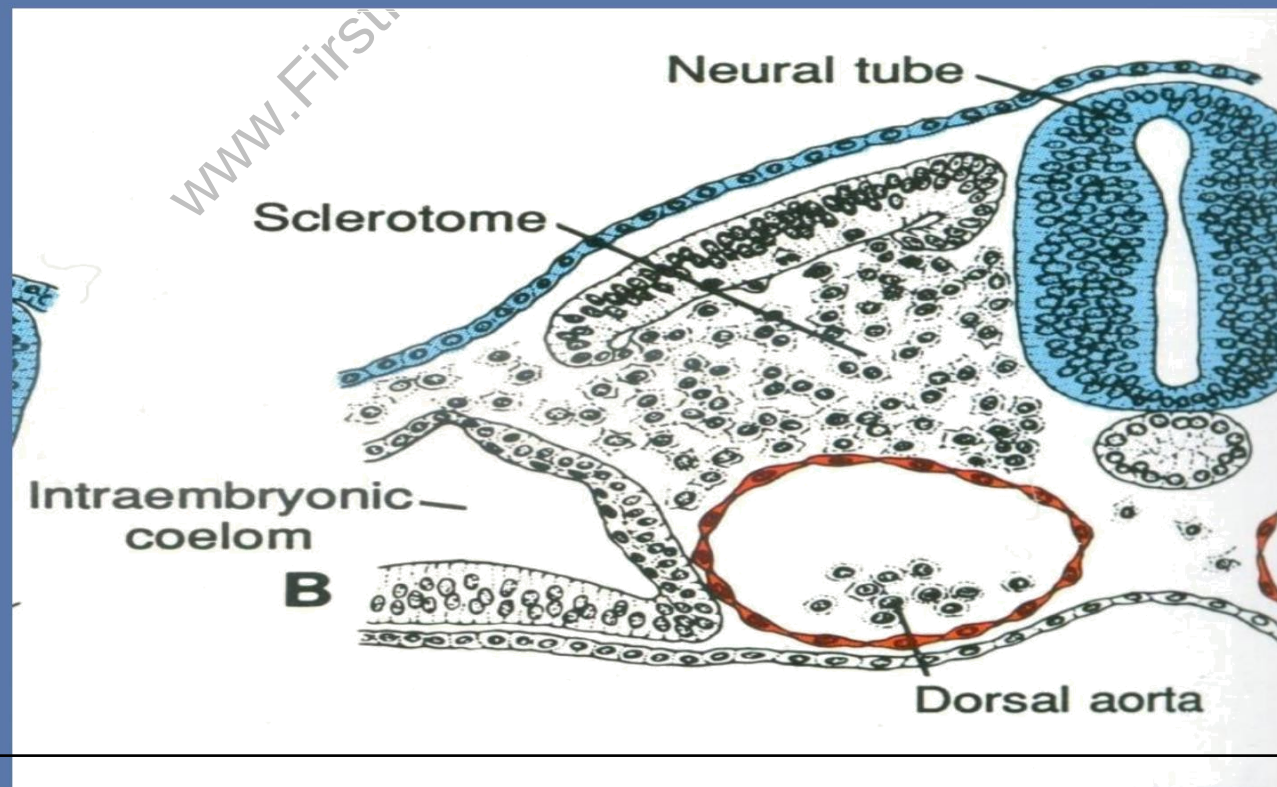
SOMITE DIFFERENTIATION

- **Somites** first form as a ball of mesodermal cells, which then undergo **epithelialization** and arrange themselves as concentric whorls

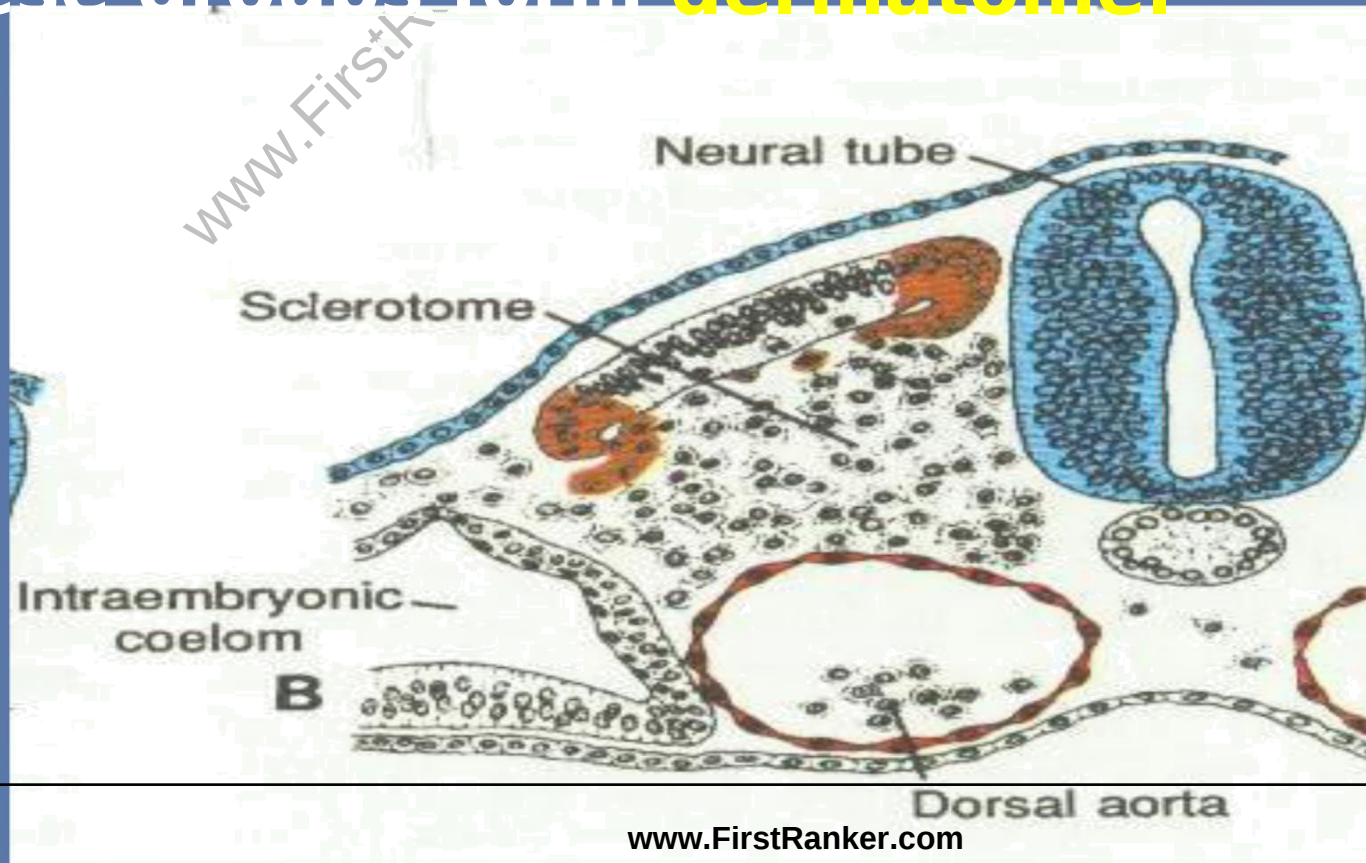


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- By the beginning of the 4th week, cells forming the **ventral and medial walls of the somite** become **mesenchymal** again and form the **sclerotome** that shift their position to surround the neural tube & notochord & differentiate into **vertebrae, ribs and tendons**.

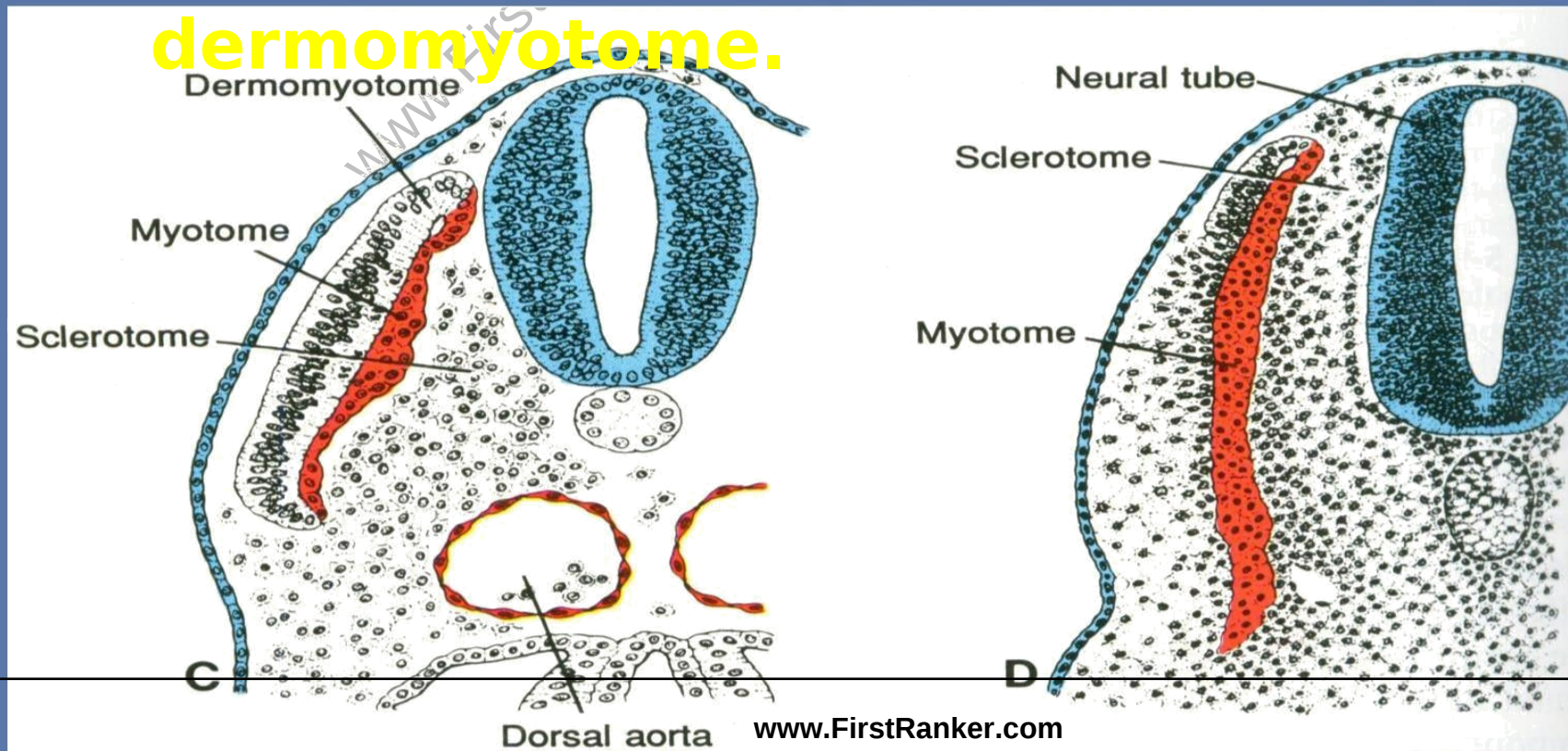


- Cells at the **Ventrolateral** (VLL) and **dorsomedial** (DML) portion of the somite form precursors for muscle cells **myotome**, while the cells b/w these groups form **dermatome**.



- Cells from both the muscle precursor groups become mesenchymal again & migrate beneath the dermatome to form the

dermomyotome.



Cont...

- ▮ In addition cells from the ventrolateral edge migrate into adjacent parietal layer of lateral plate mesoderm to form most of the musculature of body wall (**abdominal muscles**) & most of the **limb muscles**.
- ▮ Remaining cells in the dermamyotome ultimately forms **the dermis of skin of back,**

**muscles of back, and intercostal
muscles and some limb muscles.**

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SOMITES

Each somite forms its own:

- ▮ **Sclerotome** - tendon, cartilage & bone component
- ▮ **Myotome**- providing the segmental muscle component
- ▮ **Dermatome**- segmental skin component (dermis & subcutaneous tissue of skin)
- ▮ Each **dermomyotome** has its own **segmental nerve component**

ESTIMATION OF AGE OF EMBRYO

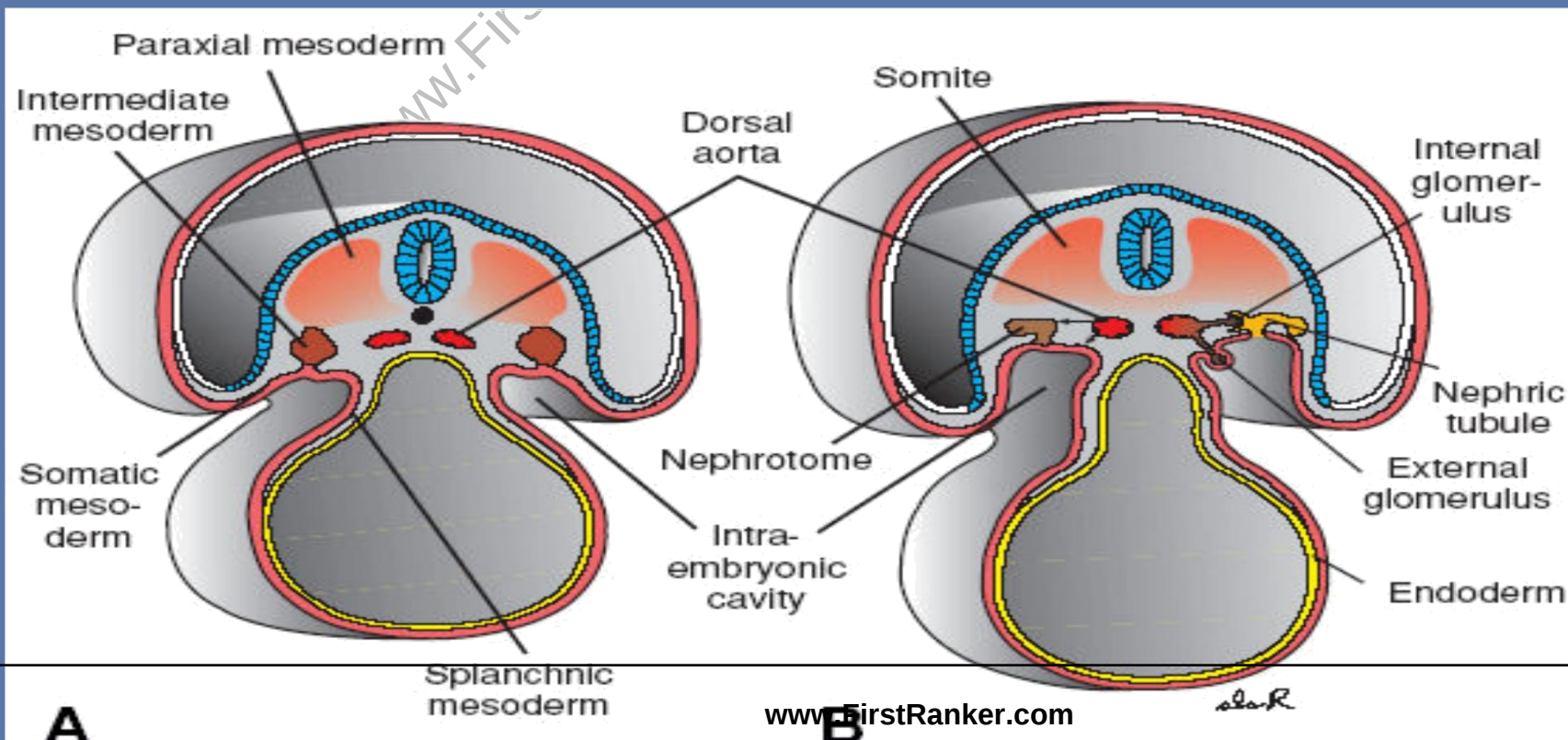
NO OF SOMITE CORRELATED TO AGE IN DAYS

APPROXIMATE AGE(DAYS)	NO OF SOMITE
20	1-4
21	4-7
22	7-10
23	10-13
24	13-17
25	17-20
26	20-23

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THE INTERMEDIATE MESODERM

The intermediate mesoderm forms **Nephrotomes** cranially and **Nephrogenic cords** caudally, both developing into the **excretory units of kidneys, gonads, ducts and accessory glands.**

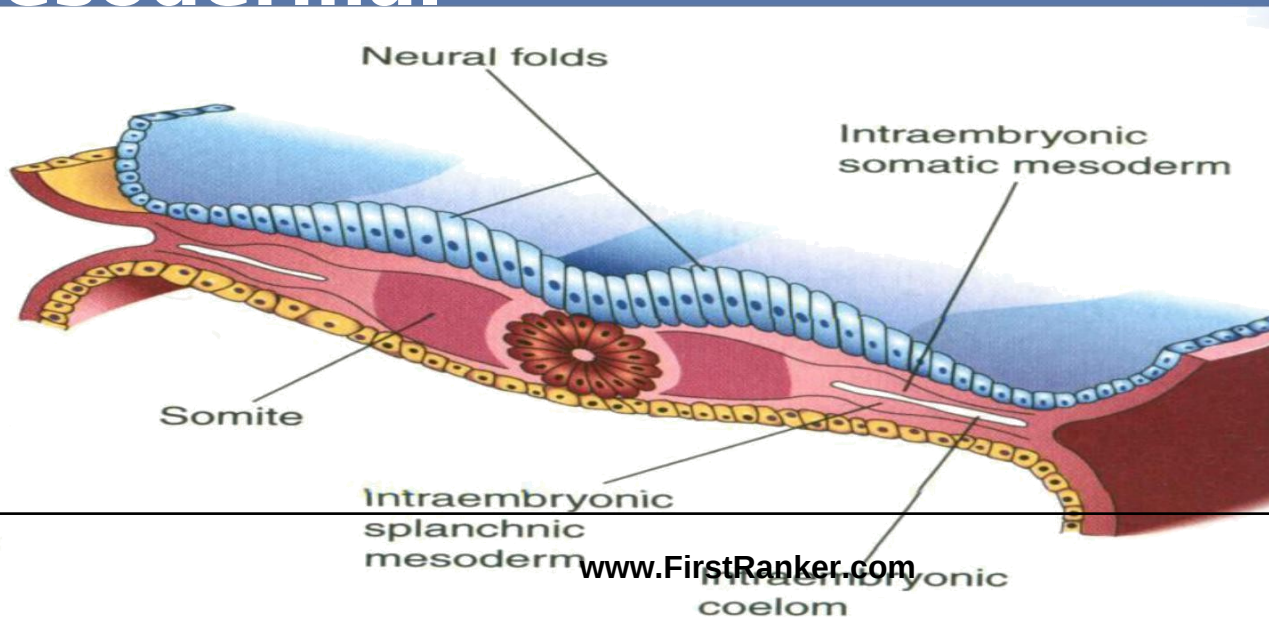
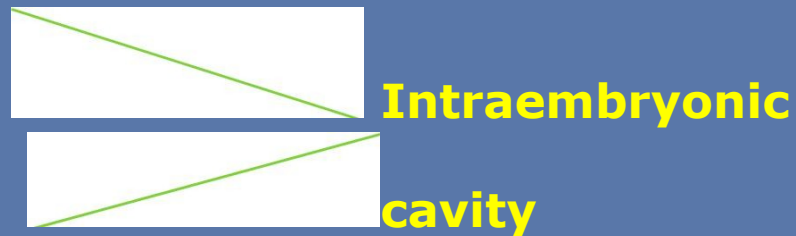


LATERAL PLATE MESODERM

Splits into:

1. Somatic /
parietal
mesodermal
layer

2. Splanchnic /
visceral
mesodermal
layer



- 

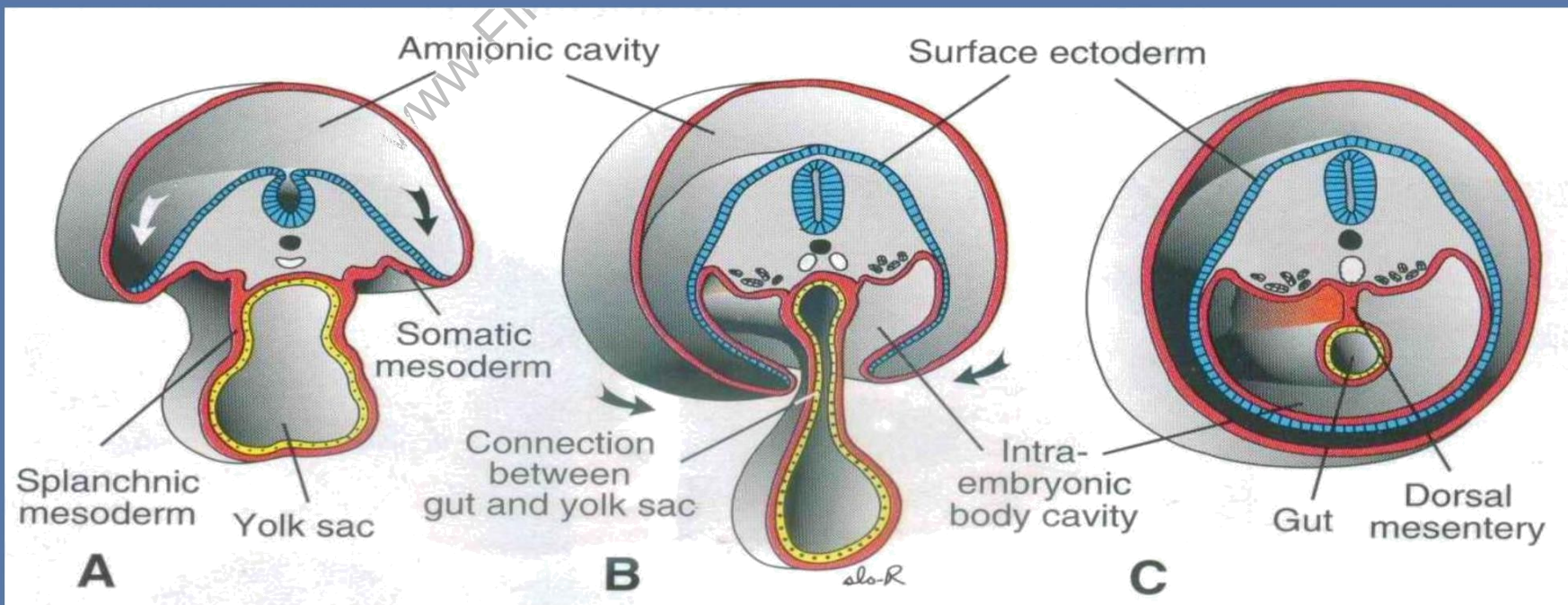


Cont...

- In addition the **sclerotome and muscle precursor cells** that migrate into the parietal layer of lateral plate mesoderm forms the costal cartilages, limb muscles, and most of the body wall muscles

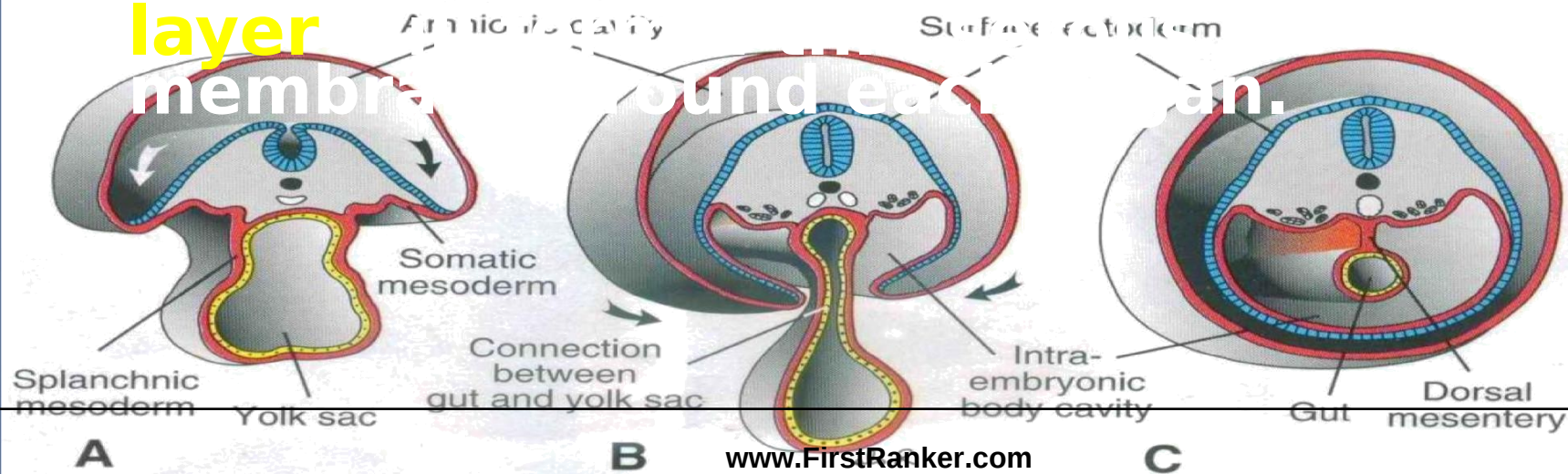
VISCERAL MESODERM

With endoderm - wall of gut



- Mesoderm cells of the parietal layer** surrounding the intraembryonic cavity will form mesothelial membranes or serous membranes which will line **the peritoneal, pleural and pericardial cavities** and secrete serous fluid.

- Mesoderm cells of the visceral layer**



BLOOD AND BLOOD VESSELS

Blood vessels form in two ways:

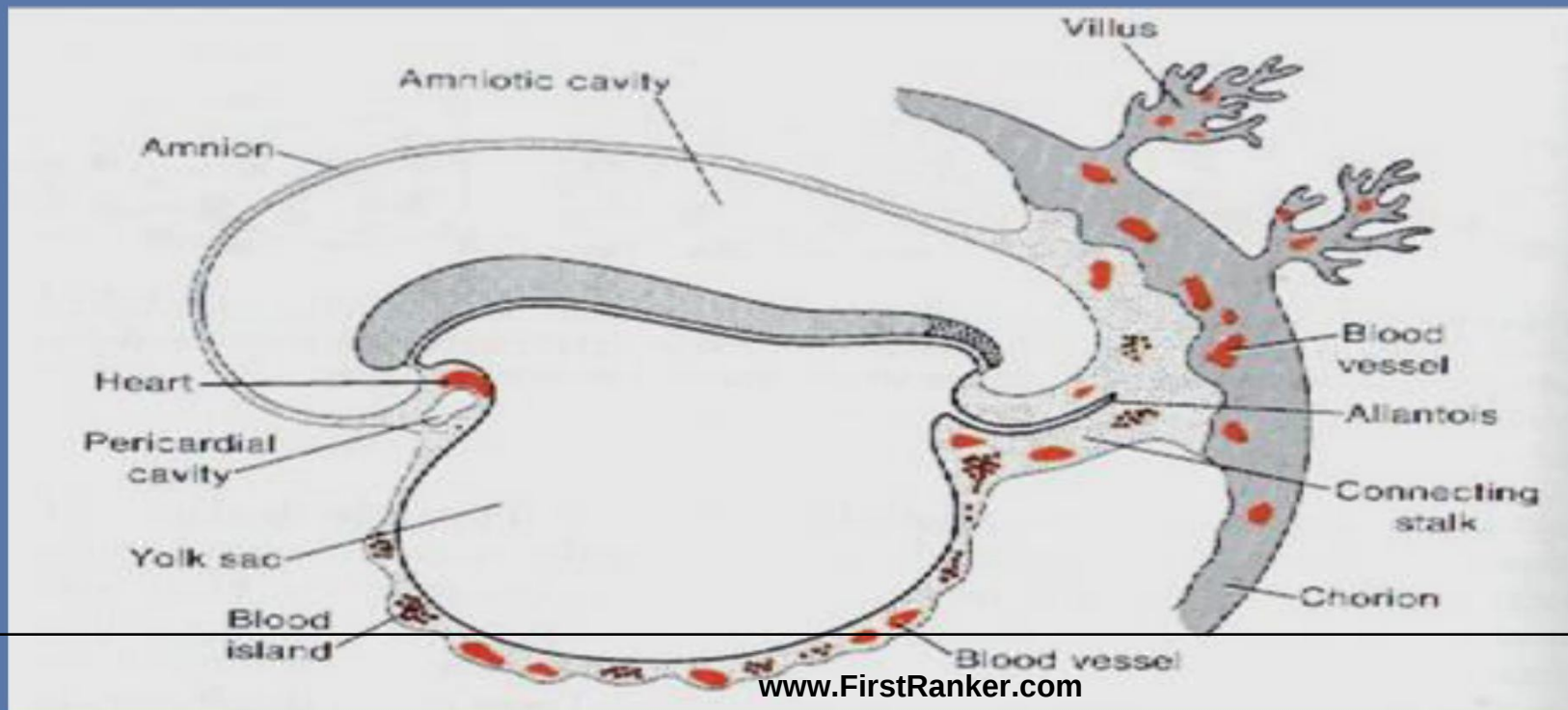
- ▮ **Vasculogenesis**

- ▮ Blood vessels arise from blood islands

- ▮ **Angiogenesis**

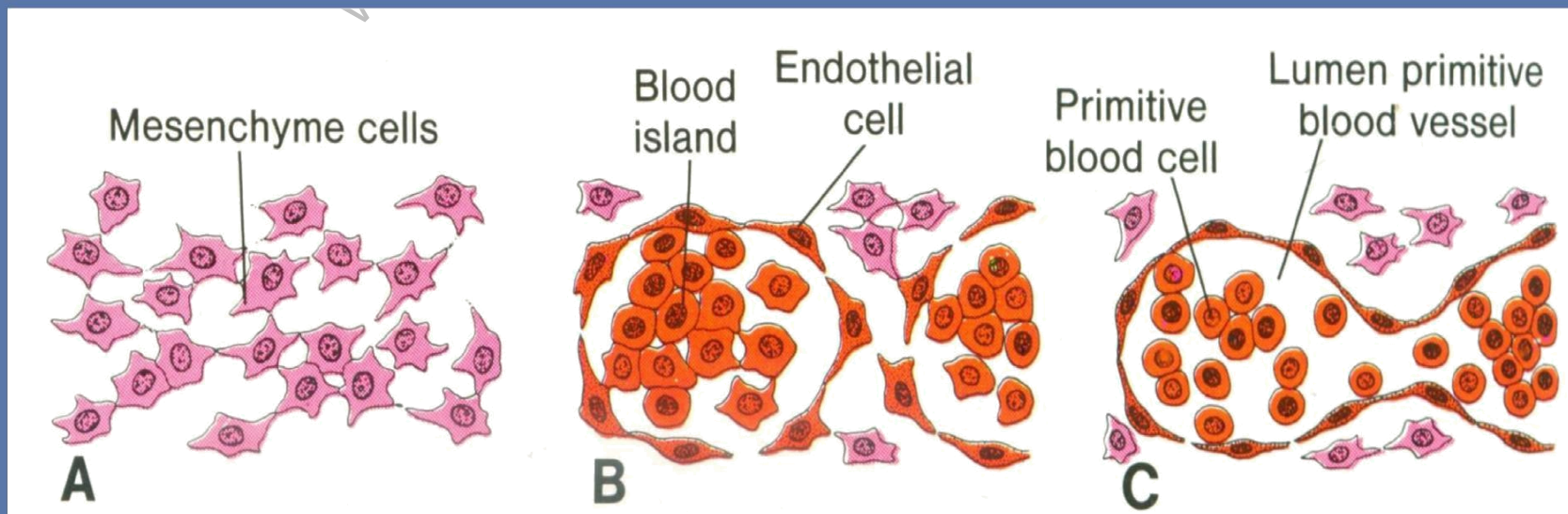
- ▮ Blood vessels form by sprouting from existing vessels.

- During 3rd week of development blood islands derived from mesodermal cells, appear first in the mesoderm surrounding the **yolk sac** and later in the **lateral plate mesoderm**.
- These islands are induced by FGF to form **hemangioblast**, the common precursor for vessel and blood cell formation.



Vasculogenesis(Regulated by VEGF):

- Hemangioblasts in the centre of blood island form **hematopoietic stem cells** (precursors of all blood cells) whereas peripheral hemangioblasts differentiate into **angioblast** (precursor to blood vessel). These cells become endothelial & coalesce to form vessels.



Angiogenesis (Regulated by VEGF):

- ▮ Once the process of vasculogenesis establishes a primary bed, additional vasculature is added by angiogenesis which induces proliferation of endothelial cells at points where new vessels will sprout from existing ones.
- ▮ Final modeling & stabilization of vasculature is mediated by PDGF and TGFb

SITES OF HAEMOPOESIS

- Blood islands of yolk sac (Transitory)
- Aorta-Gonad-Mesonephros region (AGM)
- Liver (2nd 7th month)
- Bone marrow (7th month onwards)

MESODERMALDERIVATIVES

- ▮ SUPPORTING TISSUE-
CONNECTIVE
TISSUE,CARTILAGE & BONE
- ▮ STRIATED & SMOOTH MUSCULATURE
- ▮ BLOOD & LYMPH CELLS, WALLS OF
HEART, BLOOD & LYMPH VESSELS
- ▮ KIDNEYS, GONADS & THEIR
CORRESPONDING DUCTS
- ▮ CORTICAL PORTION OF ADRENAL
GLAND

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CLINICAL CORRELATES

▣ Capillary hemangiomas



MCQS

1.The ectoderm overlying the notochord

- becomes thickened to form the neural plate
- develops into the epidermis
- is in direct communication with the yolk sac cavity
- forms the spinal cord and somites
- none of the above

2. At the 4th week (28 days) the embryo

- shows no indication of limb bud development
- contains approximately 25 somites and has recognizable lens and otic placodes
- has open communications between the central nervous system and the amniotic cavity via the anterior and posterior neuropores.

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3. Splitting of the lateral plate mesoderm forms the

- amniotic cavity
- yolk sac cavity
- somites
- paraxial and intermediate mesoderm
- intra- embryonic coelomic cavity

4. Intermediate mesoderm is responsible for formation of the

- ☐ somites
- ☐ bone and muscle
- ☐ excretory units of the urinary system
- ☐ dermis and subcutaneous tissue of the skin
- ☐ none of the above

5. Intraembryonic blood and blood vessels

- ▢ are derived from mesoderm
- ▢ initially consist of isolated clusters and cords of cells known as angioblasts
- ▢ make contact with extra-embryonic vessels via continuous budding of cells from the extra-embryonic vessels
- ▢ all of the above
- ▢ none of the above

7. All of the following are derivatives of the mesodermal germ layer except:

- cartilage and bone
- striated and smooth musculature
- segmented ganglia of spinal nerves
- blood and lymph cell
- walls of the heart , blood and lymph vessels

THANK YOU

