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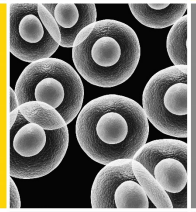
School of Medical Sciences

RESEARCH INFORMATION NIGHT

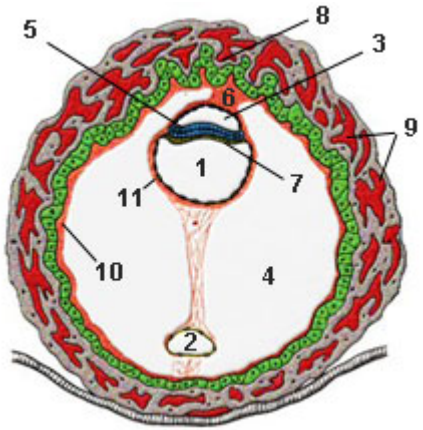
25th August 2017
5 - 7 pm

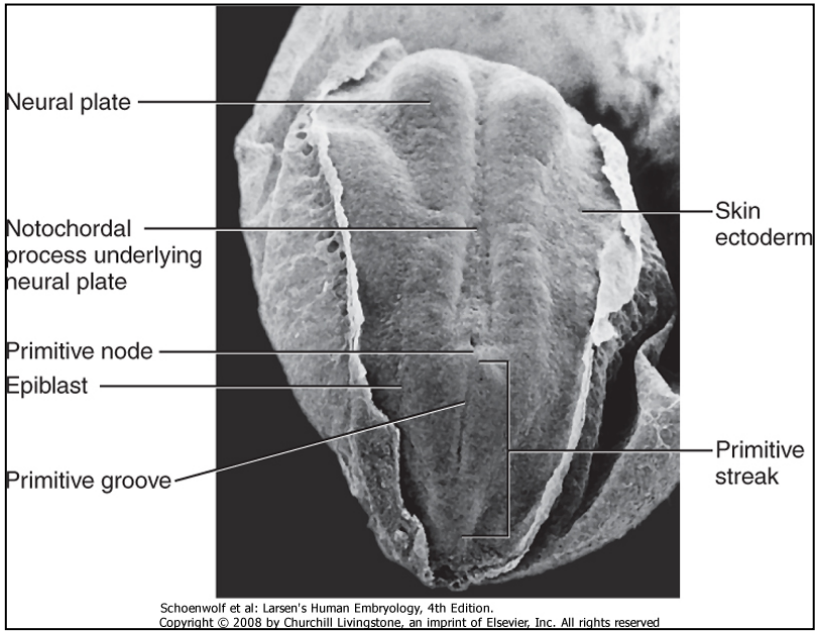


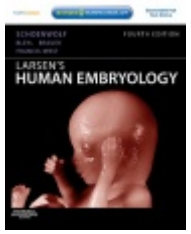
Wallace Wurth Atrium

Enrol for study in the School of Medical Sciences and other Schools, Centres, Institutes in the Faculty of Medicine

Mesoderm Development







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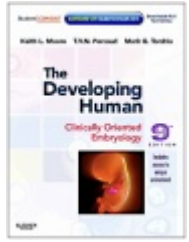

Dr Annemiek Beverdam – School of Medical Sciences, UNSW
Wallace Wurth Building Room 234 – A.Beverdam@unsw.edu.au

Week 3 Lecture overview

Gastrulation

Early Mesoderm Development

Notochord

Paraxial Mesoderm

Intermediate Mesoderm

Lateral Plate Mesoderm

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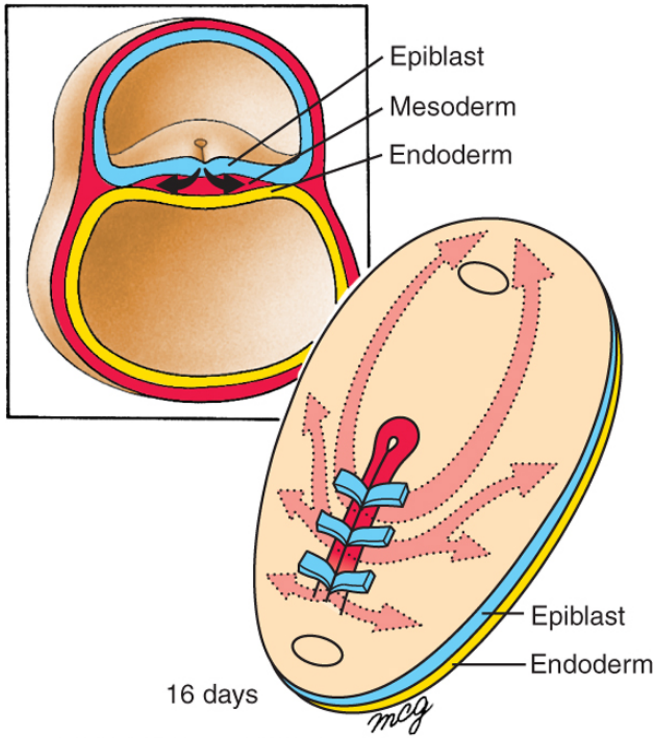
Gastrulation

Week 3

Ingression of epiblast cells: EMT transition
Generation of definitive endoderm
Generation of intra-embryonic mesoderm
Oropharyngeal and cloacal membrane
Embryonic ectoderm



http://php.med.unsw.edu.au/embryology/images/5/55/Mesoderm_001.mp4

End product gastrulation:

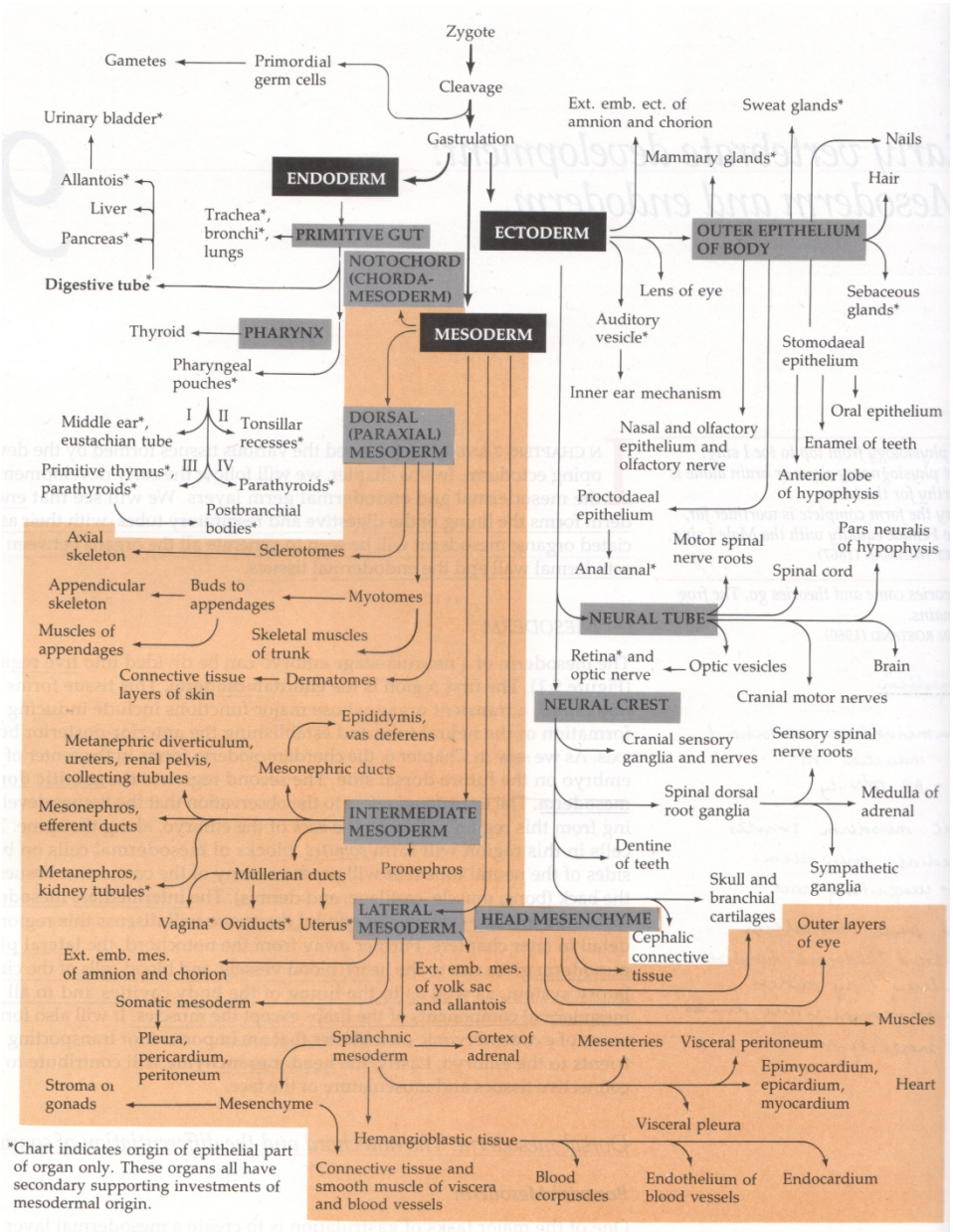
Trilaminar embryo

Ectoderm *(Neural crest)*
brain, spinal cord, eyes, *peripheral nervous system*
epidermis of skin and associated structures,
melanocytes, cranial connective tissues (dermis)

Mesoderm
musculo-skeletal system
limbs
connective tissue of skin and organs
urogenital system, heart, blood cells

Endoderm
epithelial linings of gastrointestinal and respiratory tracts

Embryonic development:



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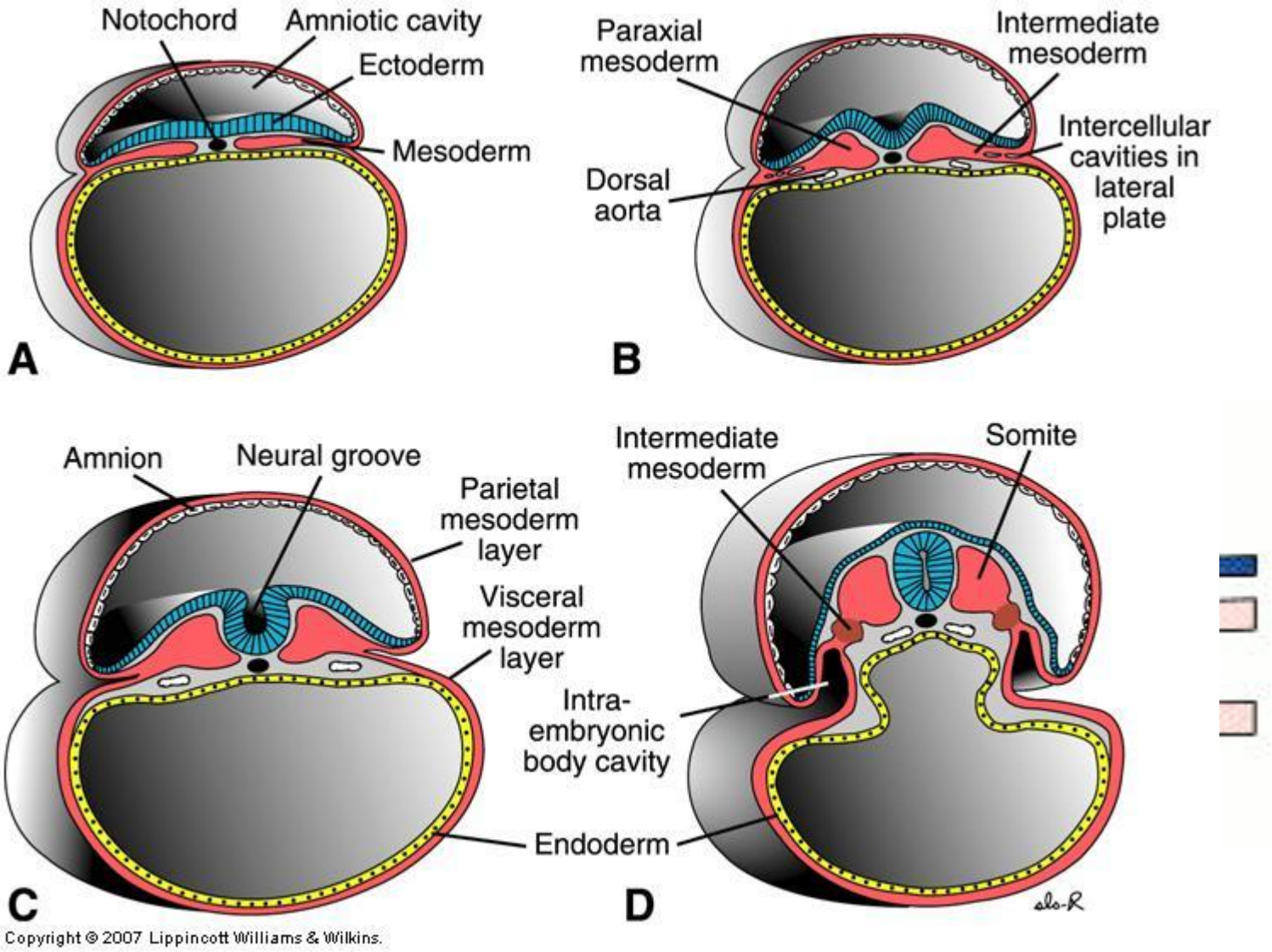
Early Mesoderm Development



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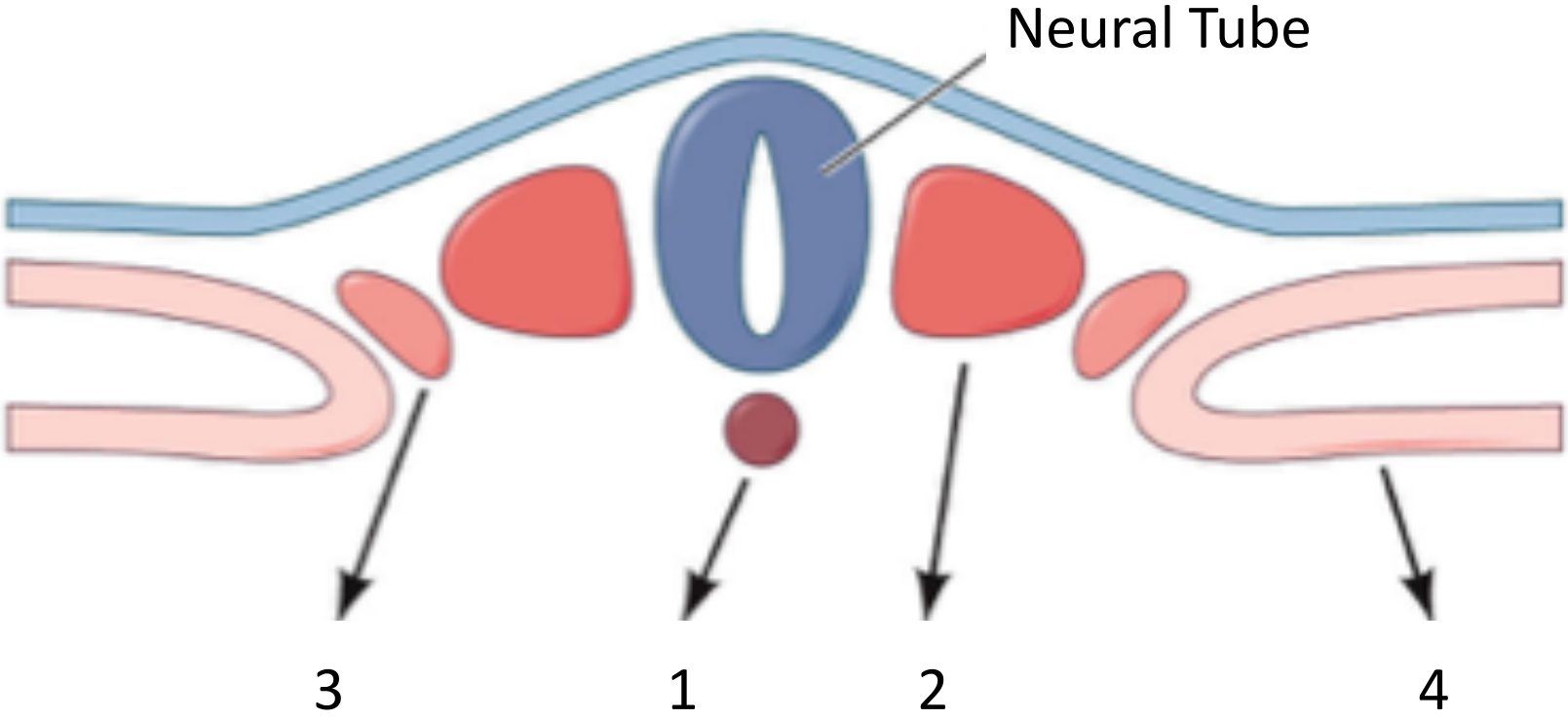

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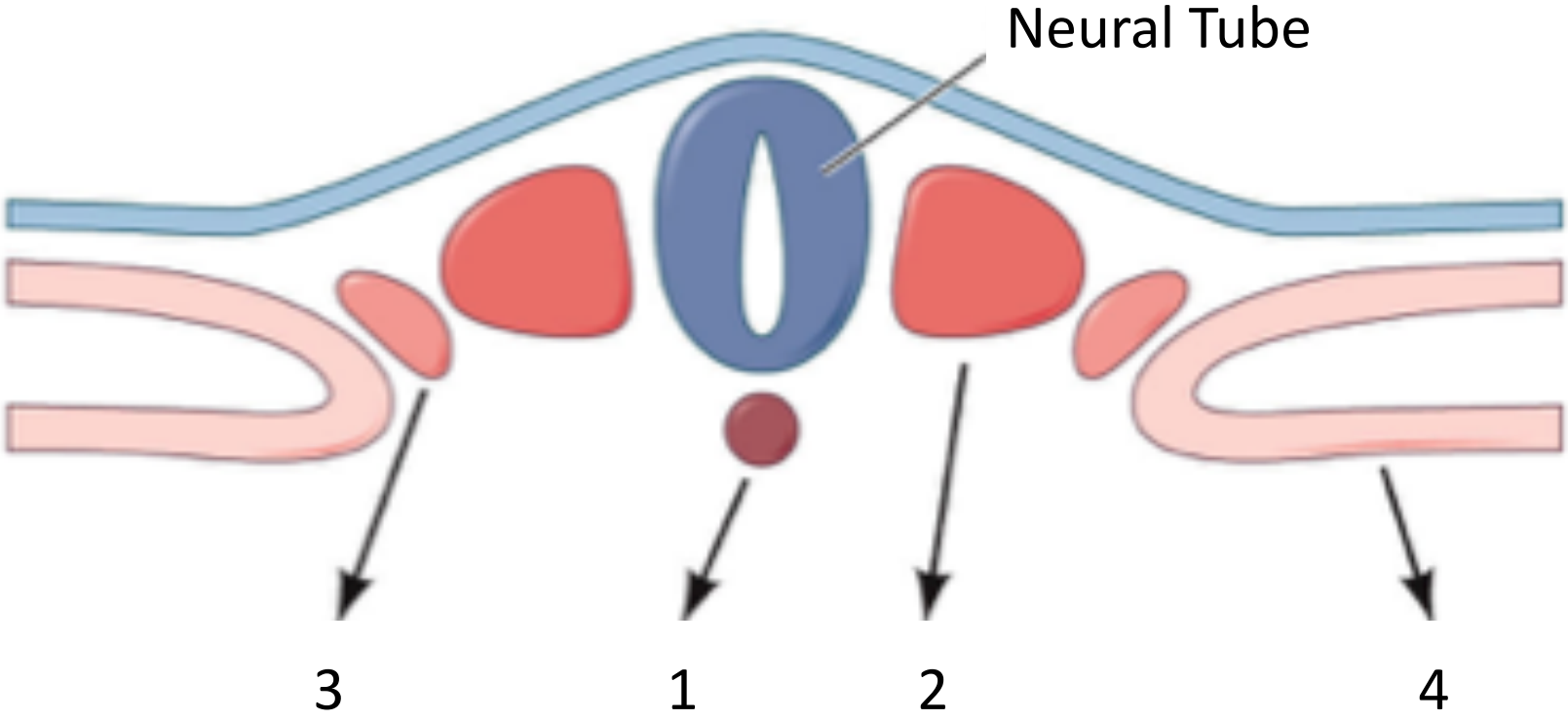
Early Mesoderm Development



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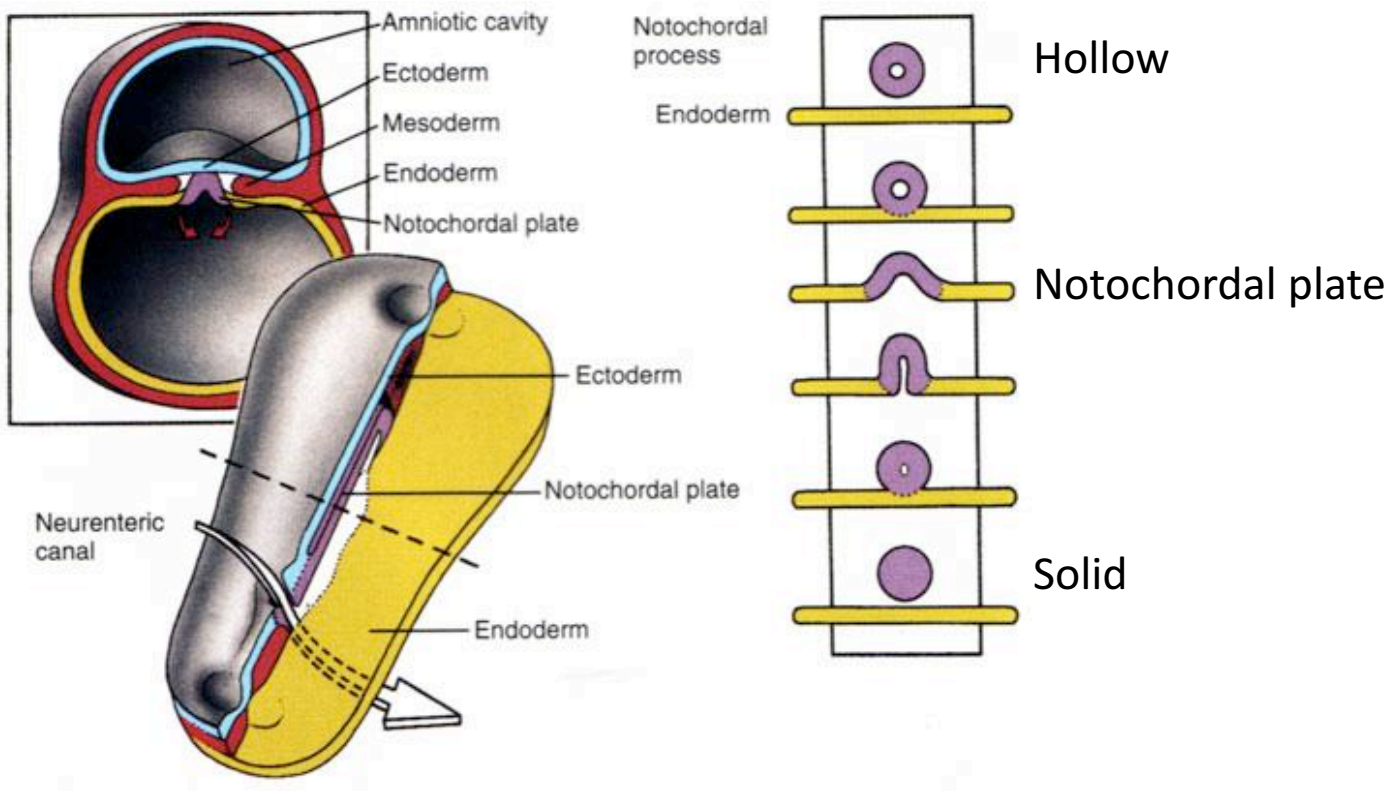
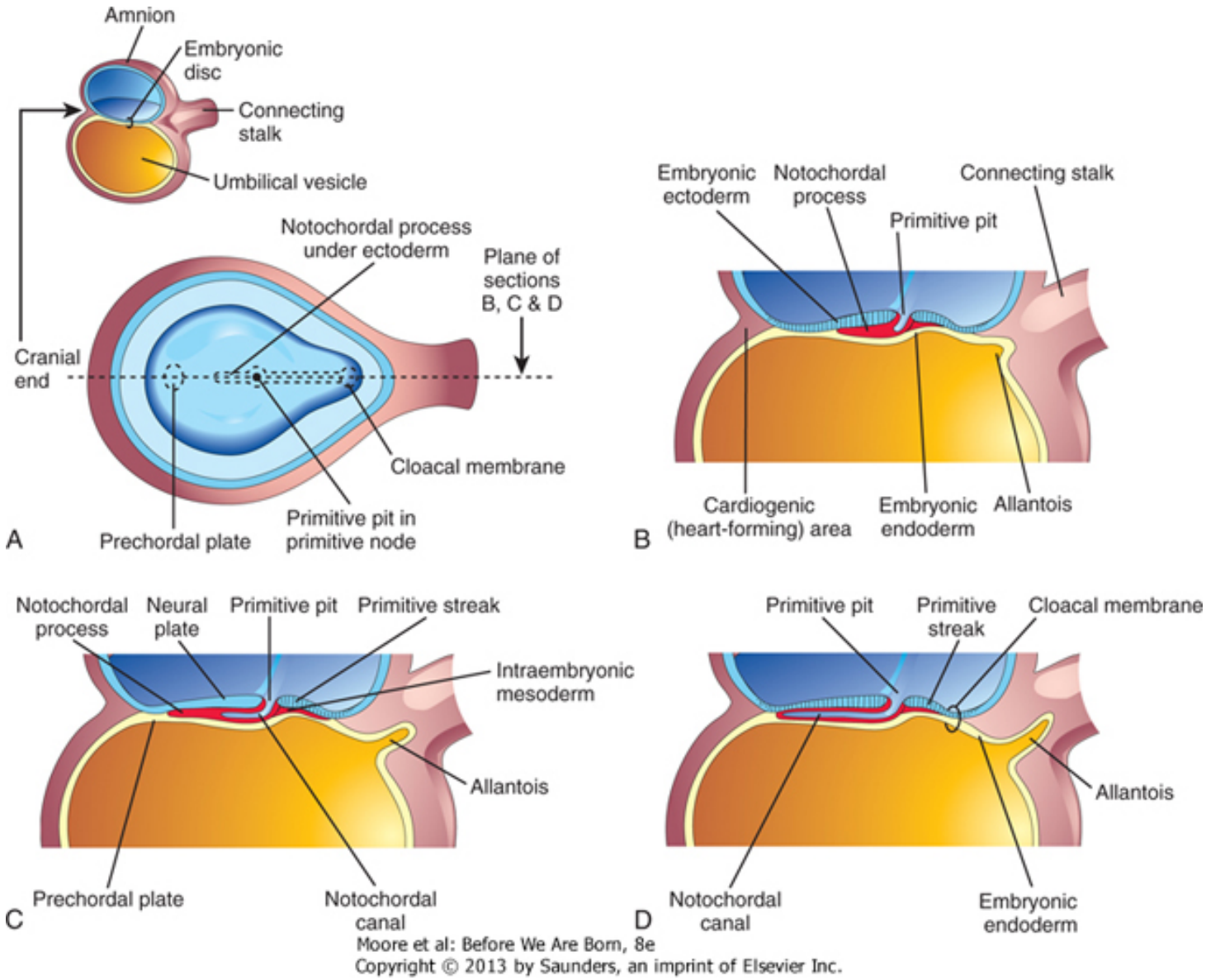
1: Notochord

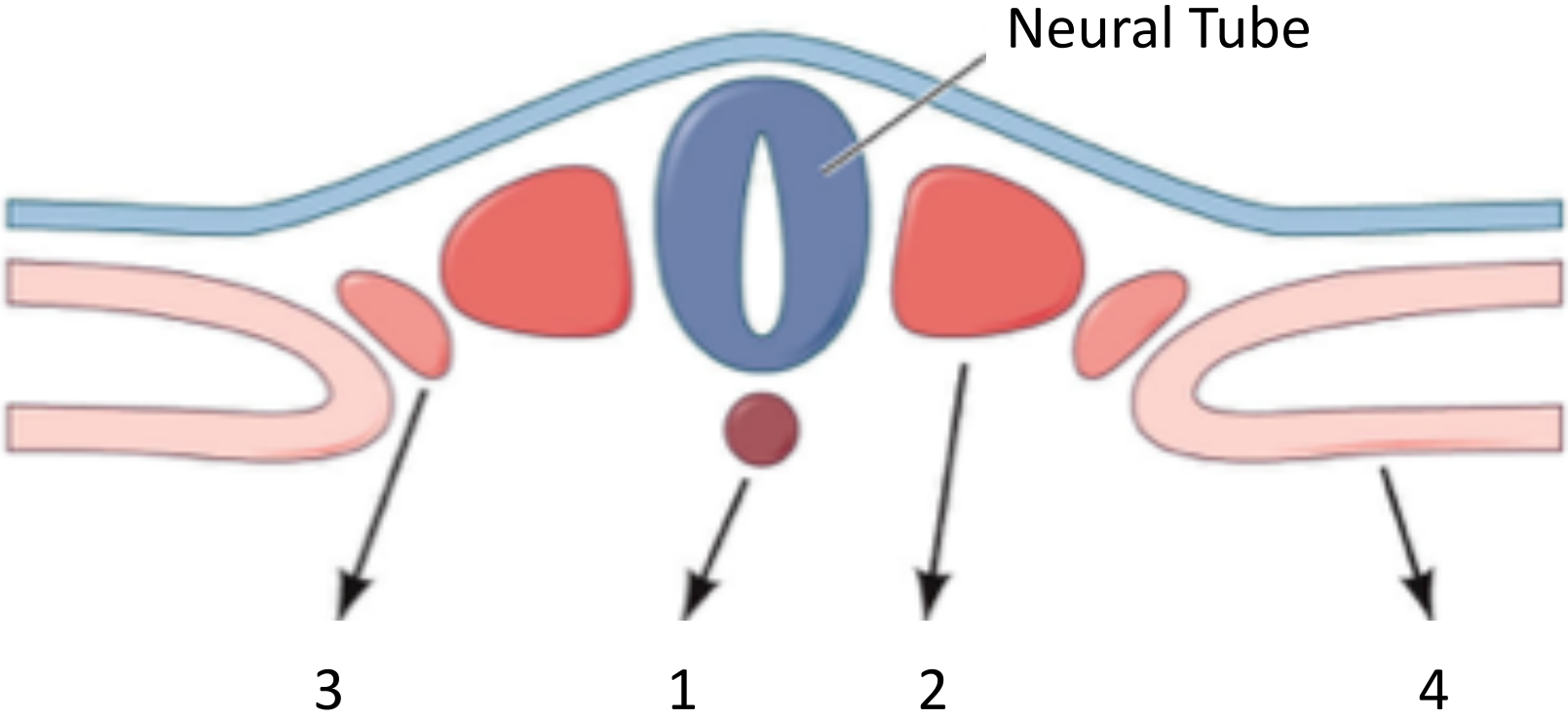


Axial mesoderm
Transient
Development
Neurenteric canal
Crucial signalling centre
Mechanical role in embryonic folding

1: Notochord



Early Mesoderm Development



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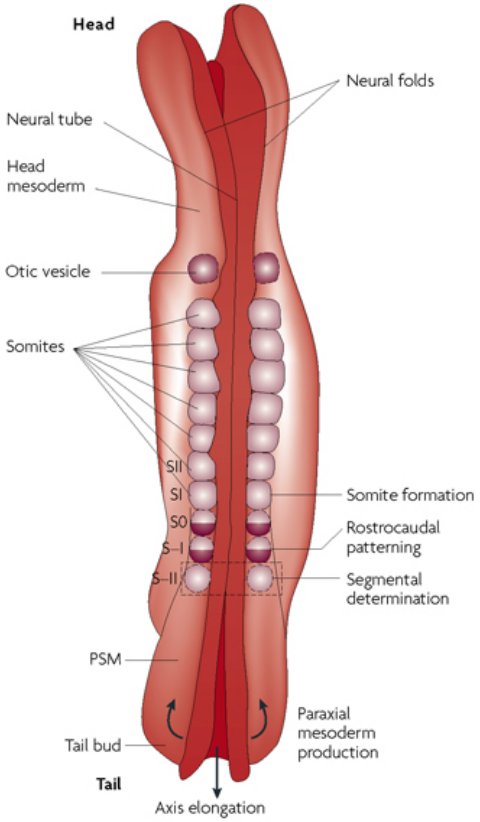
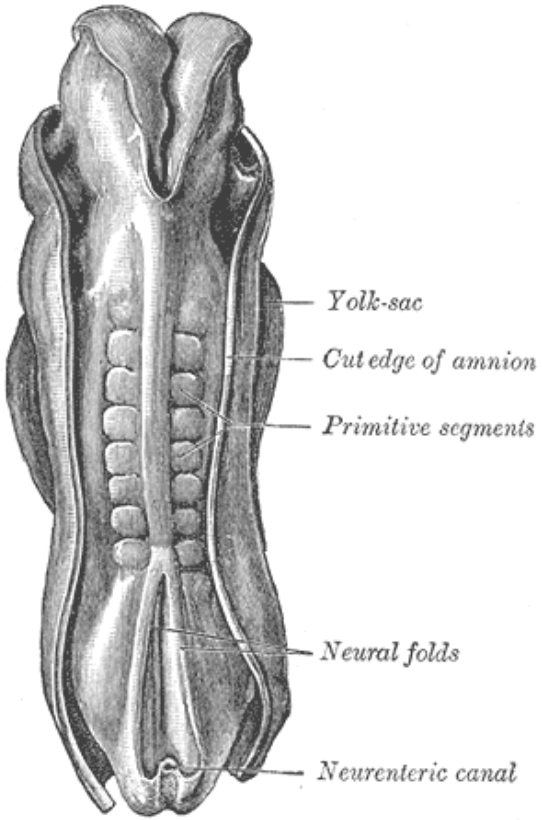
2: Paraxial Mesoderm

Cranial: Unsegmented paraxial mesoderm: head mesenchyme

Trunk: Segmented paraxial mesoderm: somites

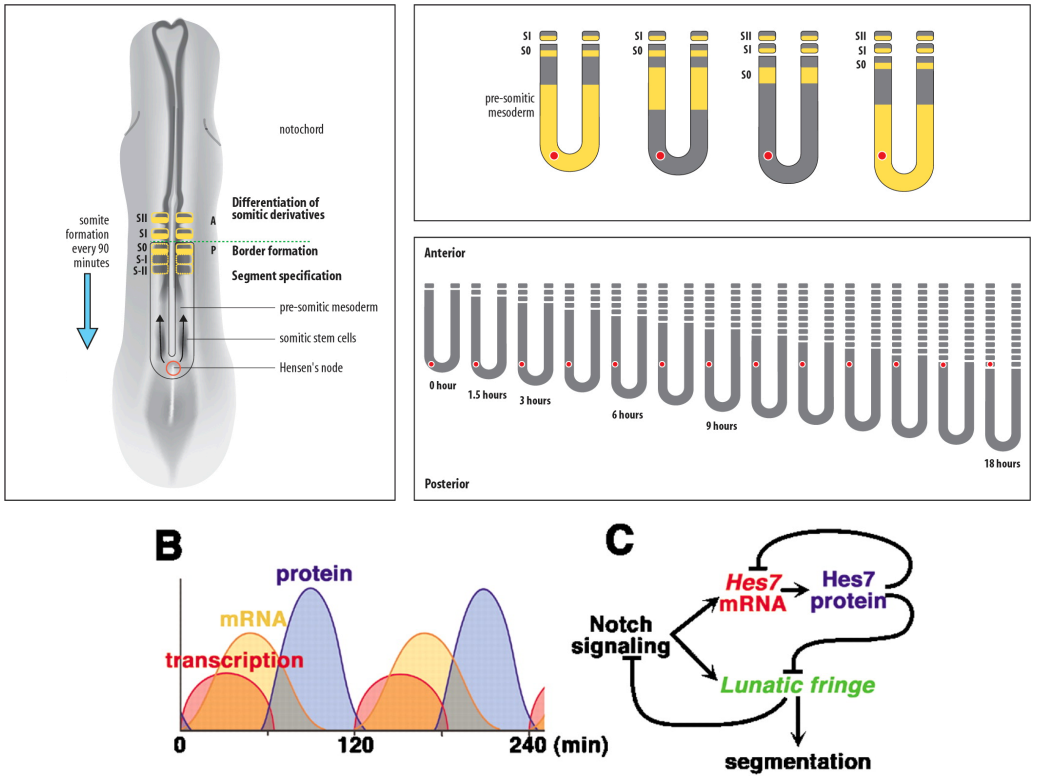




2: Paraxial Mesoderm

Somitogenesis

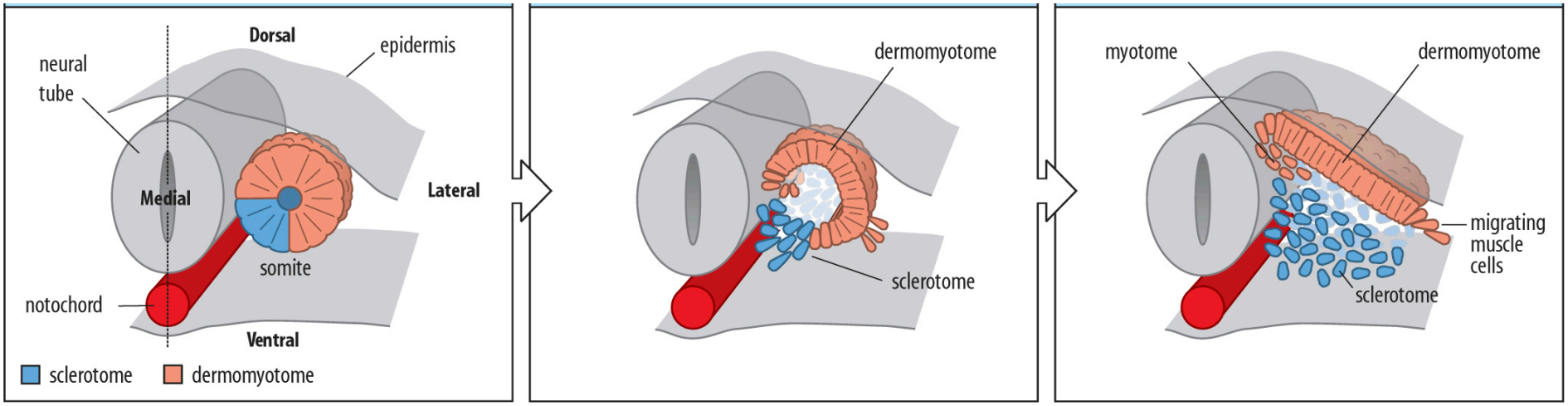
Segmentation clock depends on *Hes7* transcription/translation



Block-like bilateral condensations of the paraxial mesoderm
Form in a cranial to caudal direction (day 20 to day 30)
44 max are formed, 33 remain
Give rise to axial skeleton and musculature, dermis of the trunk

2: Paraxial Mesoderm

Somite Development



Somites develop into:

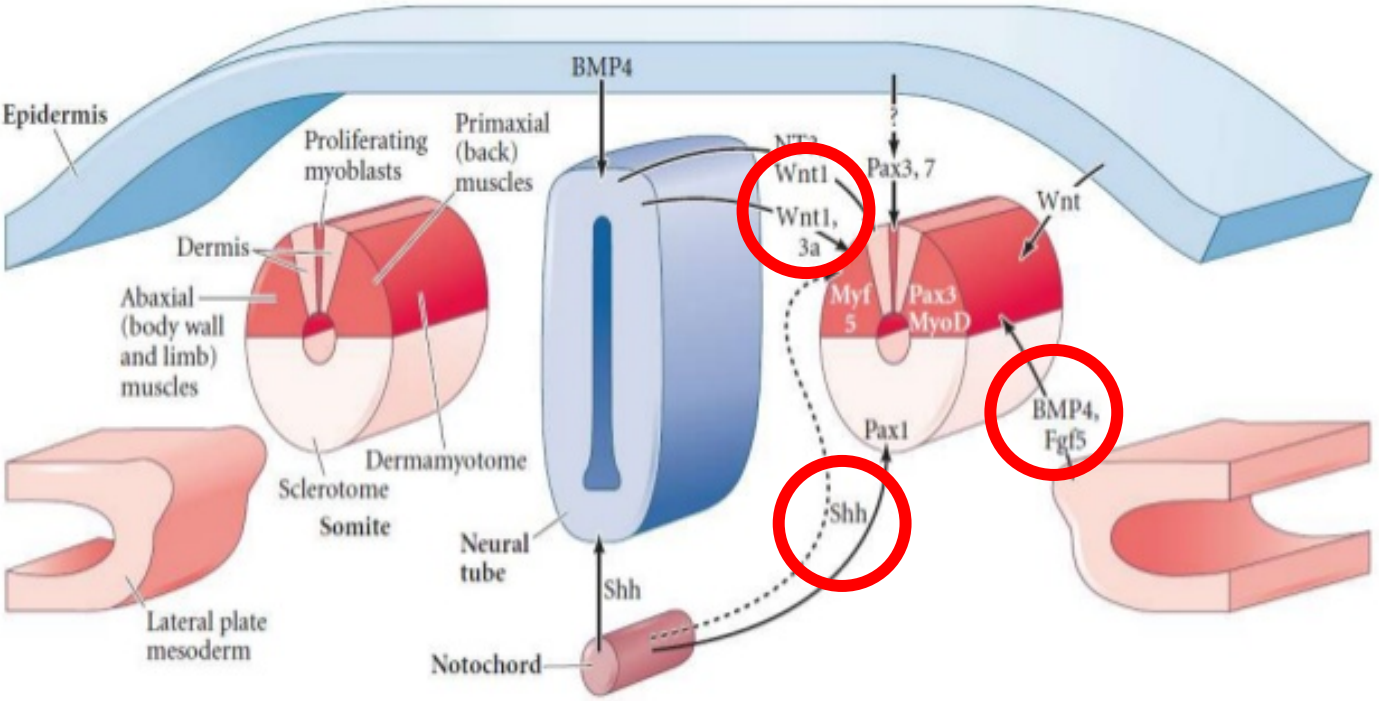
- Sclerotome: mesenchymal cells (vertebral body and intervertebral disk
- Dermomyotome: columnar epithelium

Dermomyotome develops into:

- Dermatome: dermis of the trunk
- Myotome: trunk musculature

2: Paraxial Mesoderm

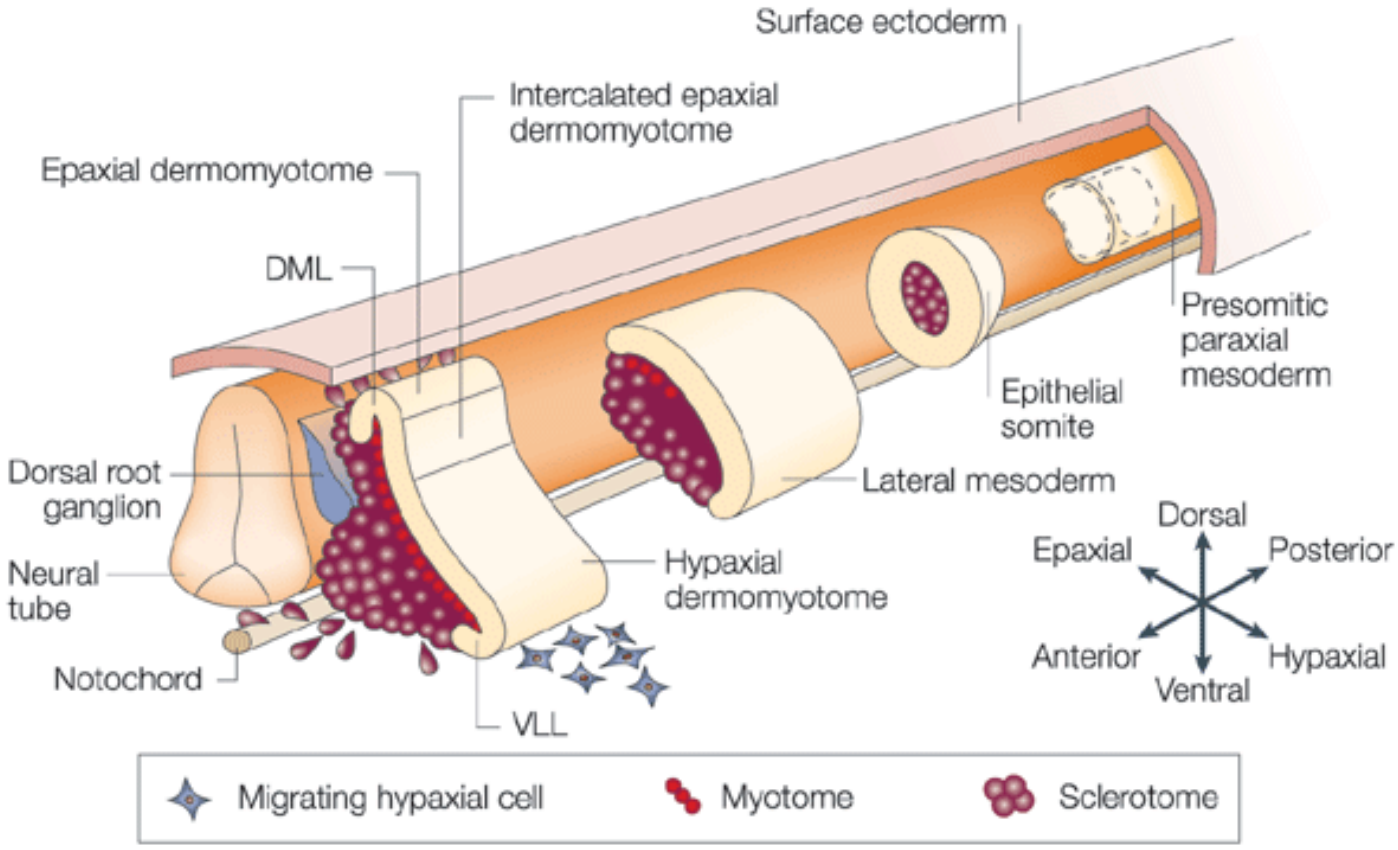
Somite Development



Sonic hedgehog (Shh) (notochord and floor plate): ventral somites.
BMP-4: lateral somites.
Wnt family proteins (roof plate): dorsal somites.

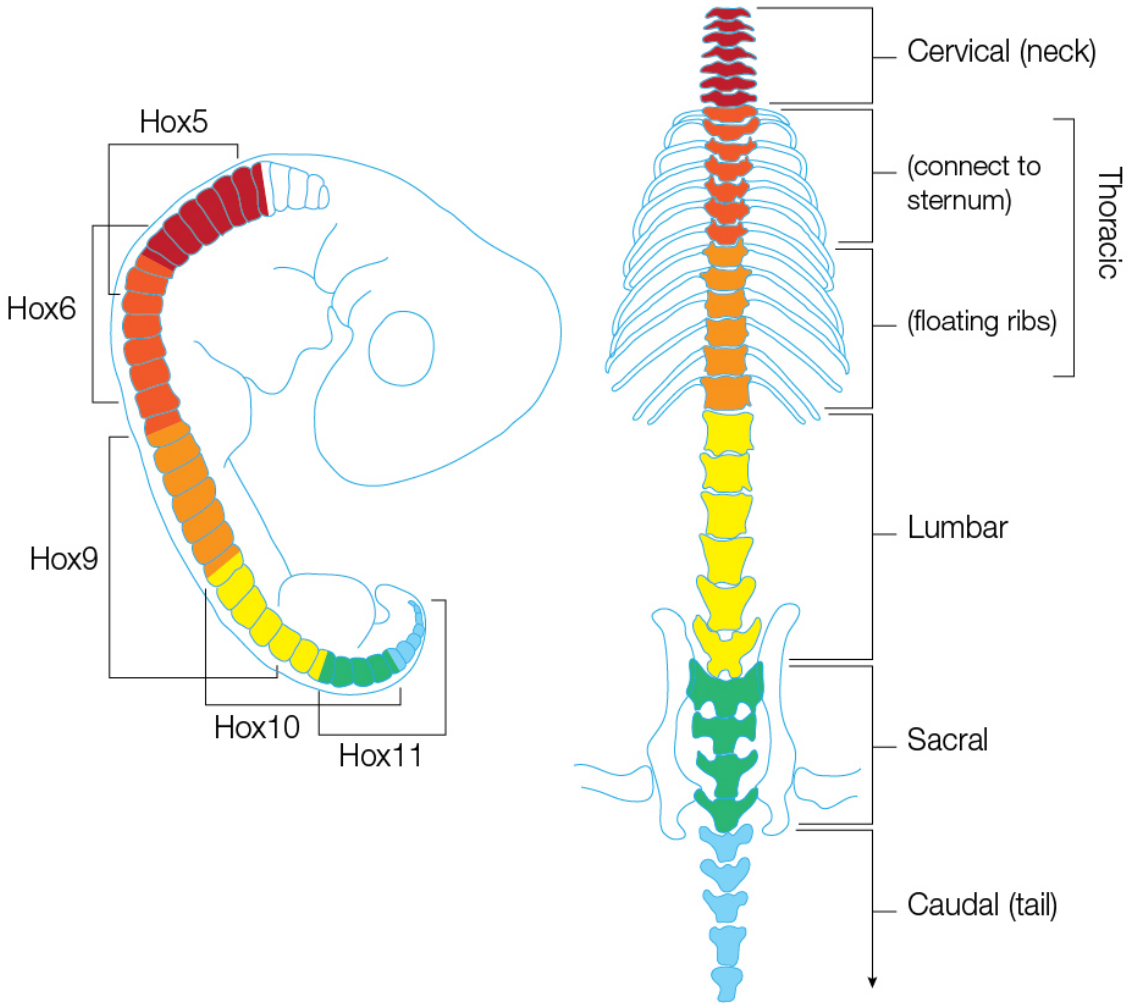
2: Paraxial Mesoderm

Somite Development



2: Paraxial Mesoderm

Somite Derivative Specification depends on AP level/*Hox* code



7: cervical region

12: thoracic region

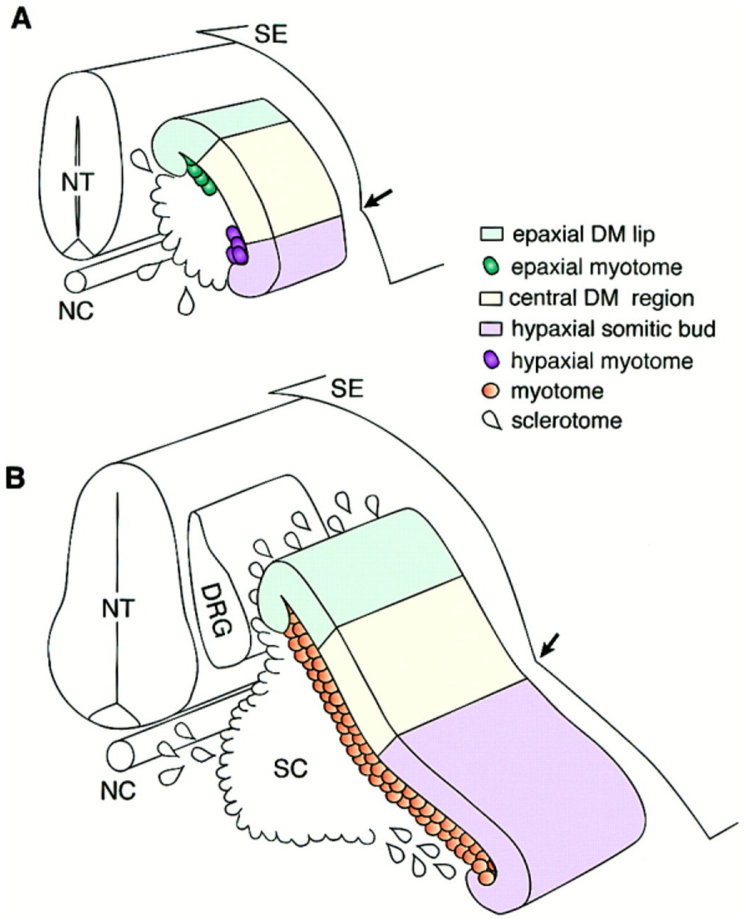
5: lumbar region

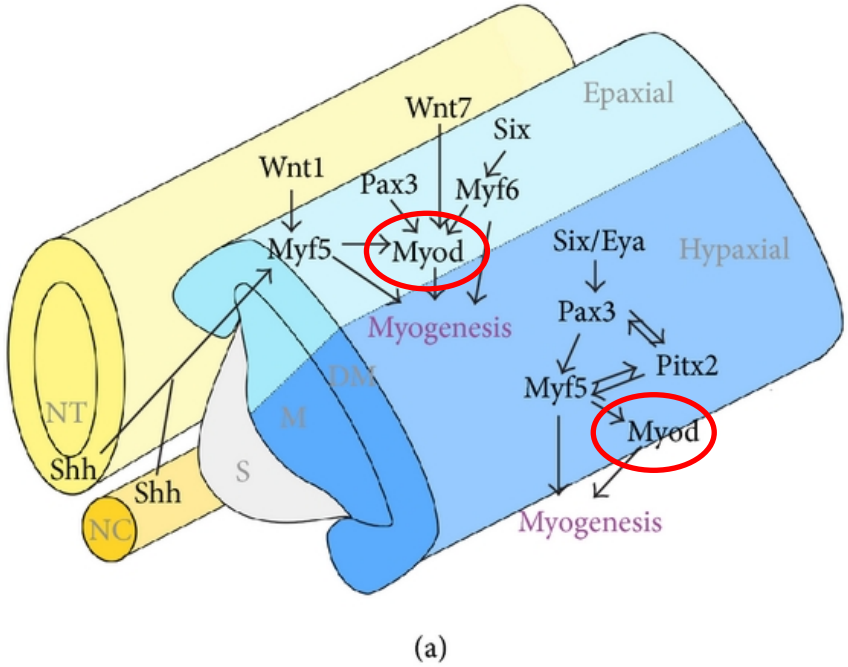
5: sacral region

4: caudal region (tail)

2: Paraxial Mesoderm

Myotome Development





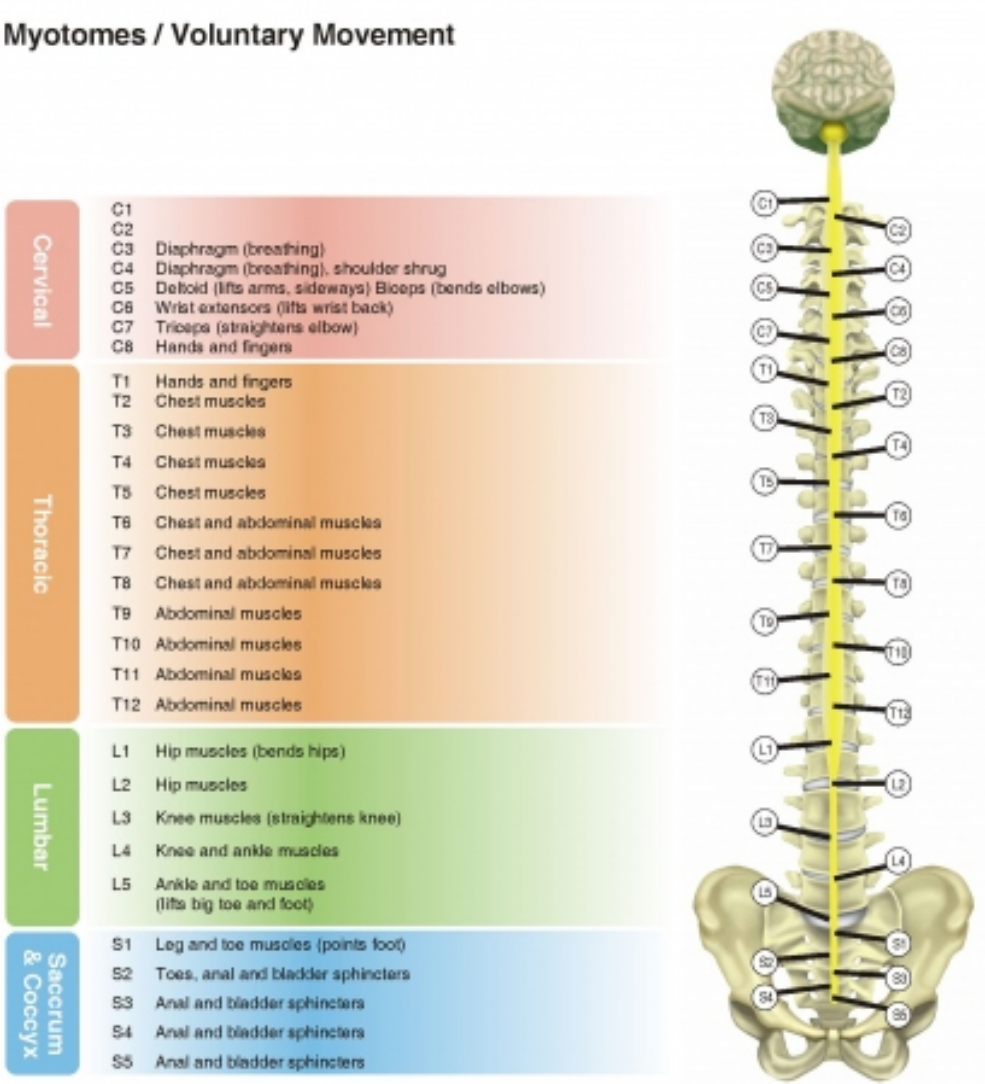
Epaxial myotome: epimere: erector spinae

Hypoaxial myotome: hypomere: 3 primary muscle layers

MyoD initiates myogenesis

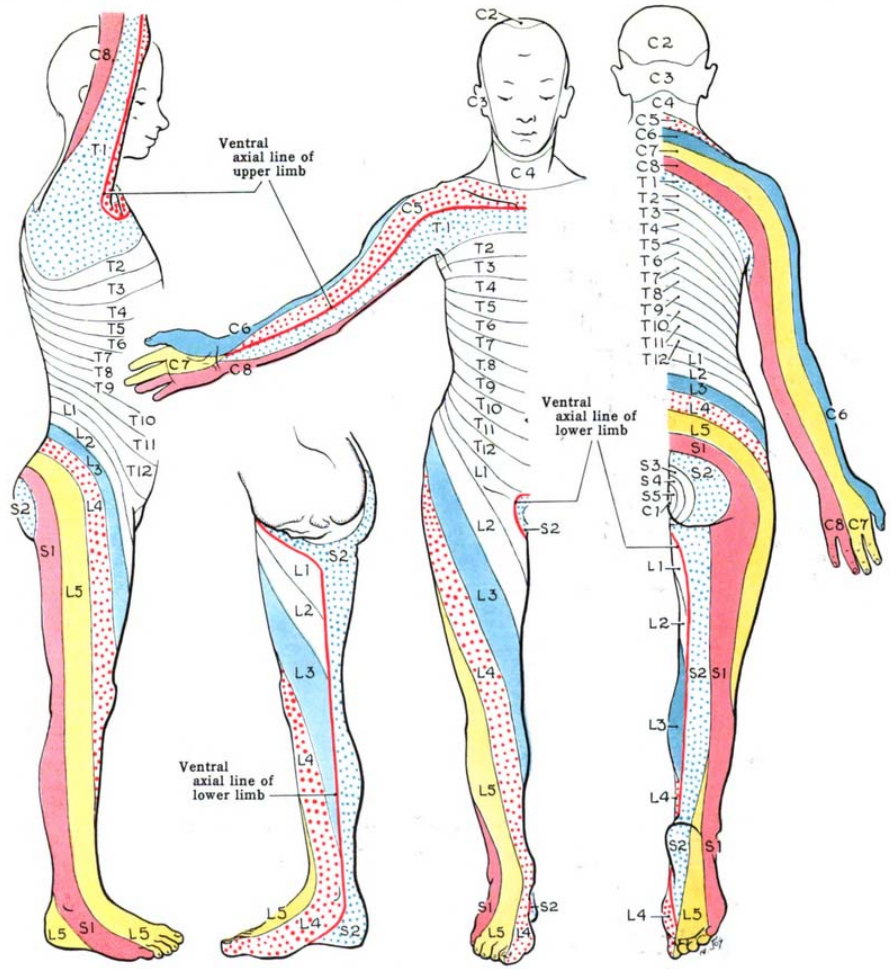
2: Paraxial Mesoderm

Myotome Development



2: Paraxial Mesoderm

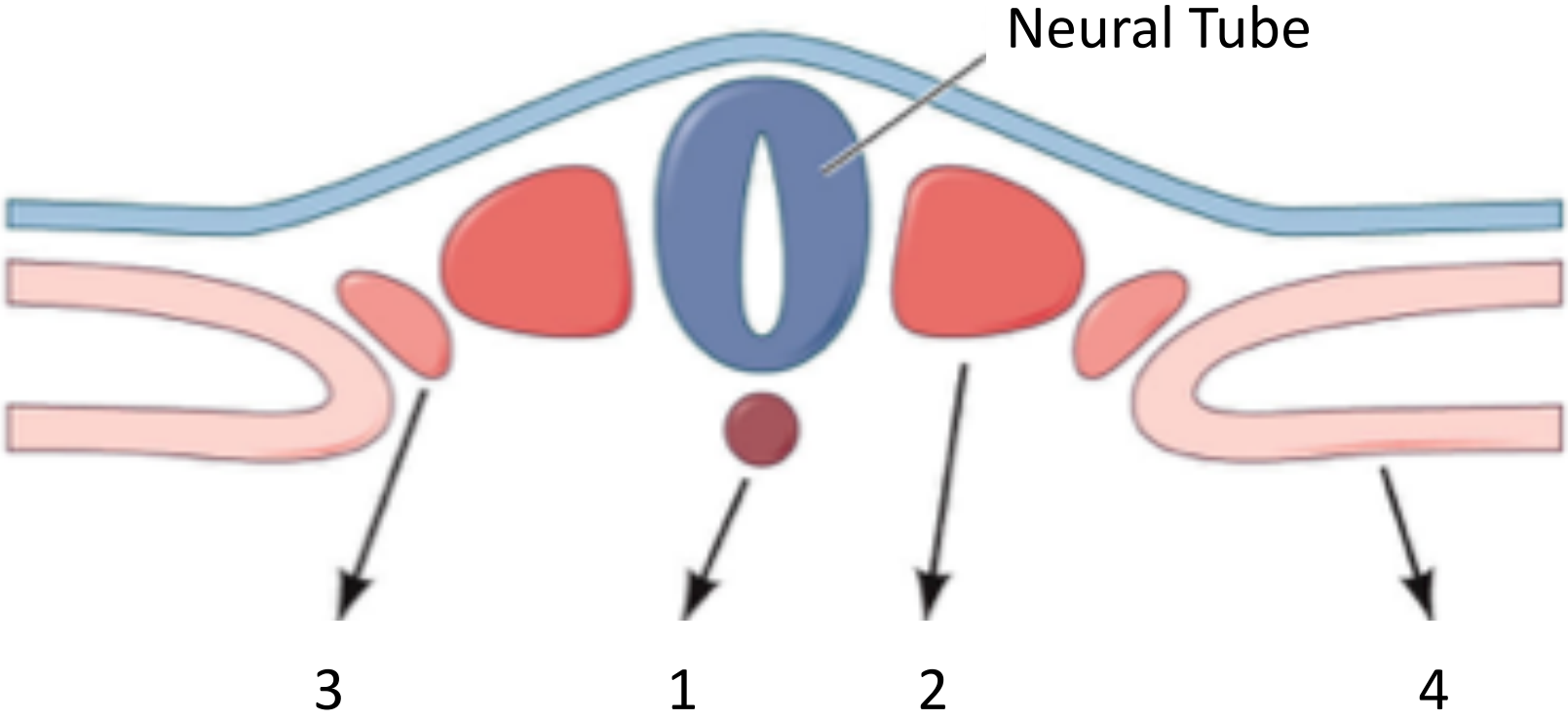
Dermatome Development



Embryonic dermatomes will form the dermis

Postnatal dermatome is a strip of skin innervated by a single spinal nerve

Early Mesoderm Development



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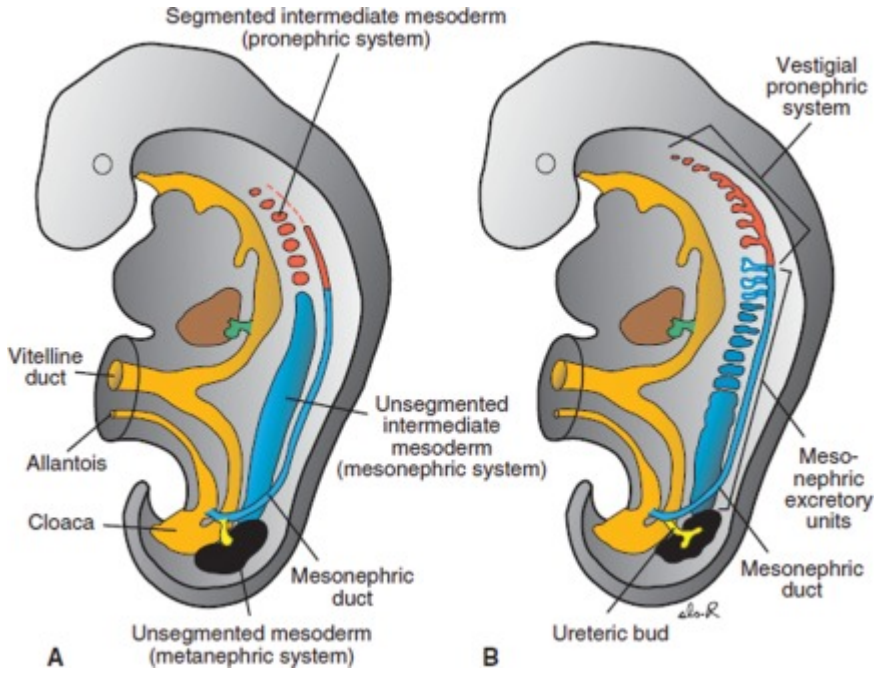
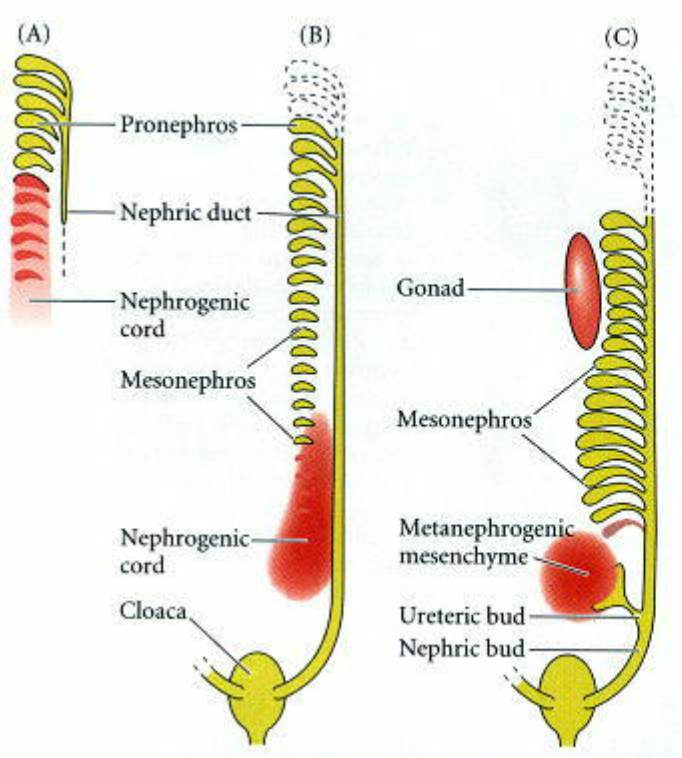
3: Intermediate Mesoderm

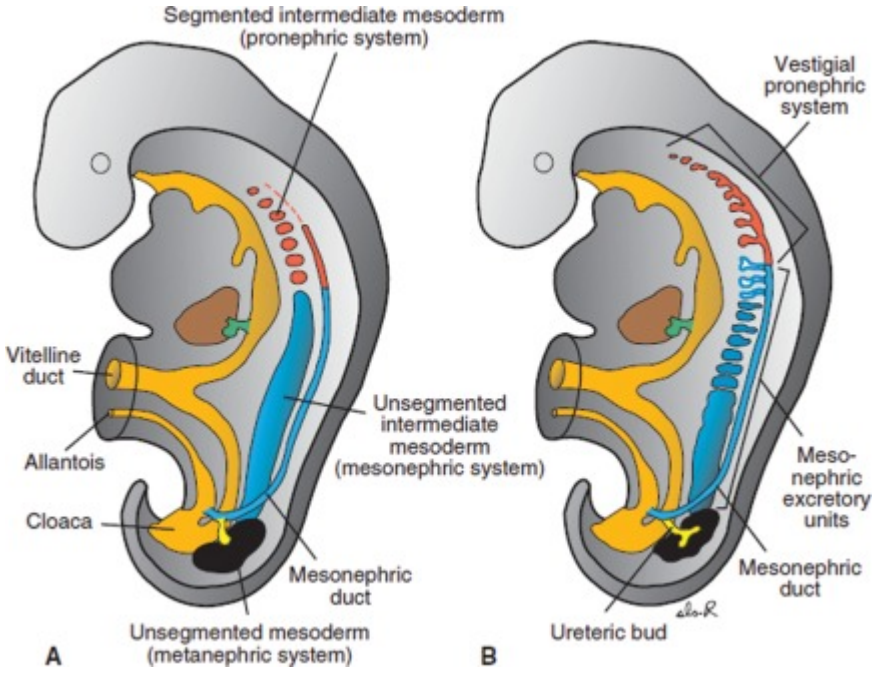
Segmented series of epithelial buds
Mesonephric duct
Urogenital sinus
Mesonephric tubules
Ureteric buds

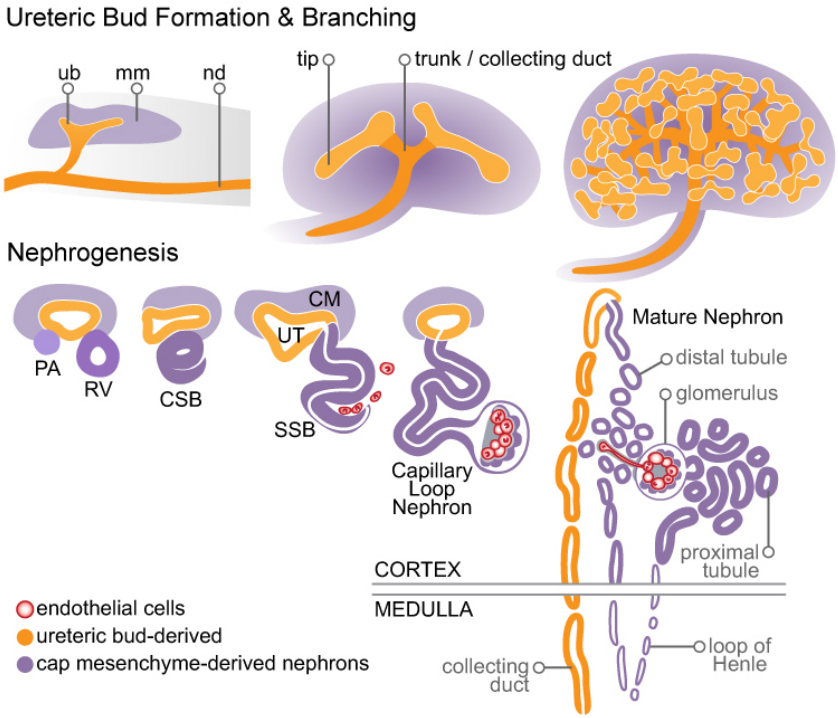




3: Intermediate Mesoderm

3 nephric systems:
- Pronephros: regress
- Mesonephros: reproductive system and collecting duct and tubules of the kidney
- Metanephros: nephrons of the kidney





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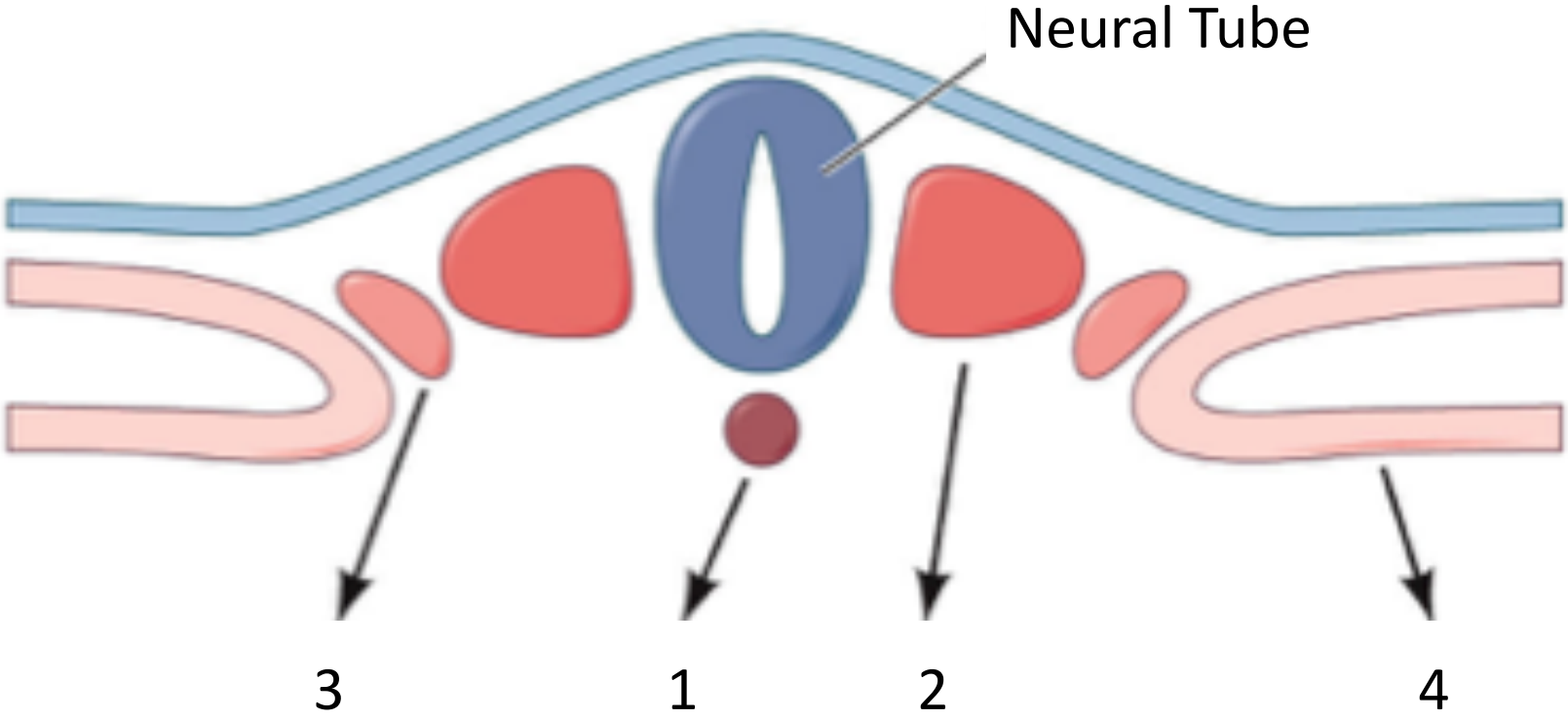

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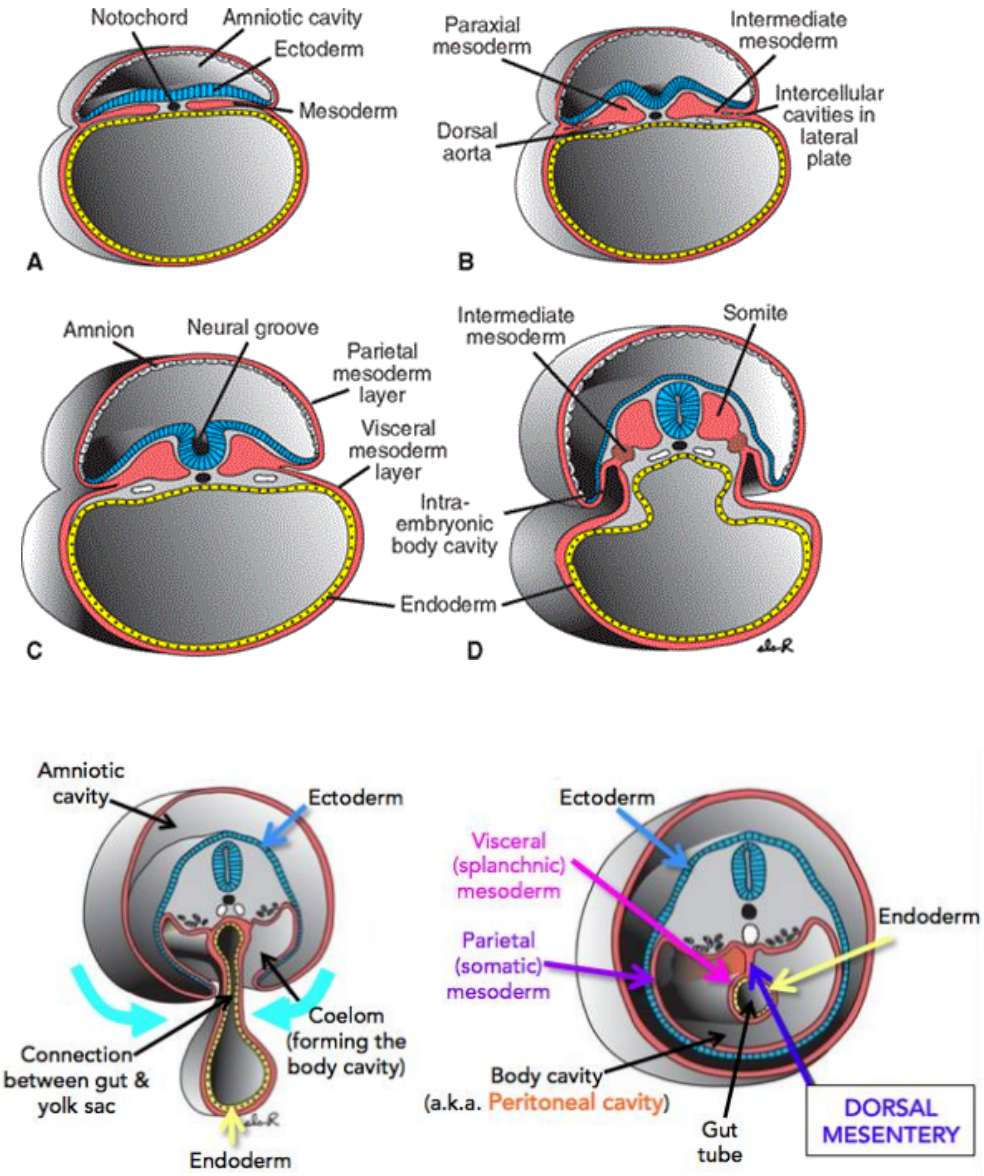
4: Lateral Plate Mesoderm



Lateral plate mesoderm develops into:

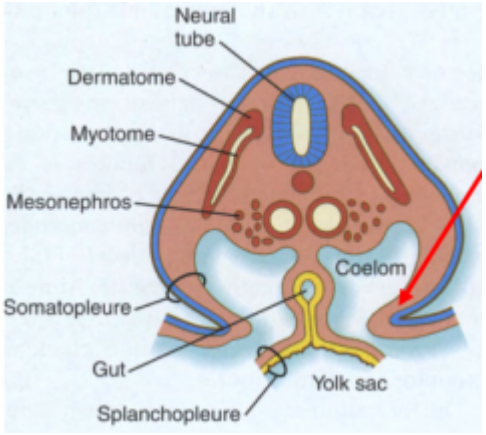
- Splanchnic/visceral mesoderm
- Somatic/parietal mesoderm

Intraembryonic coelom: 3 cavities:

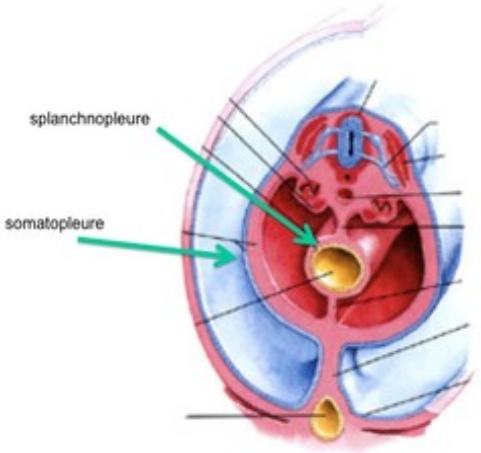
- Pericard
- Pleural
- Peritoneal

4: Lateral Plate Mesoderm

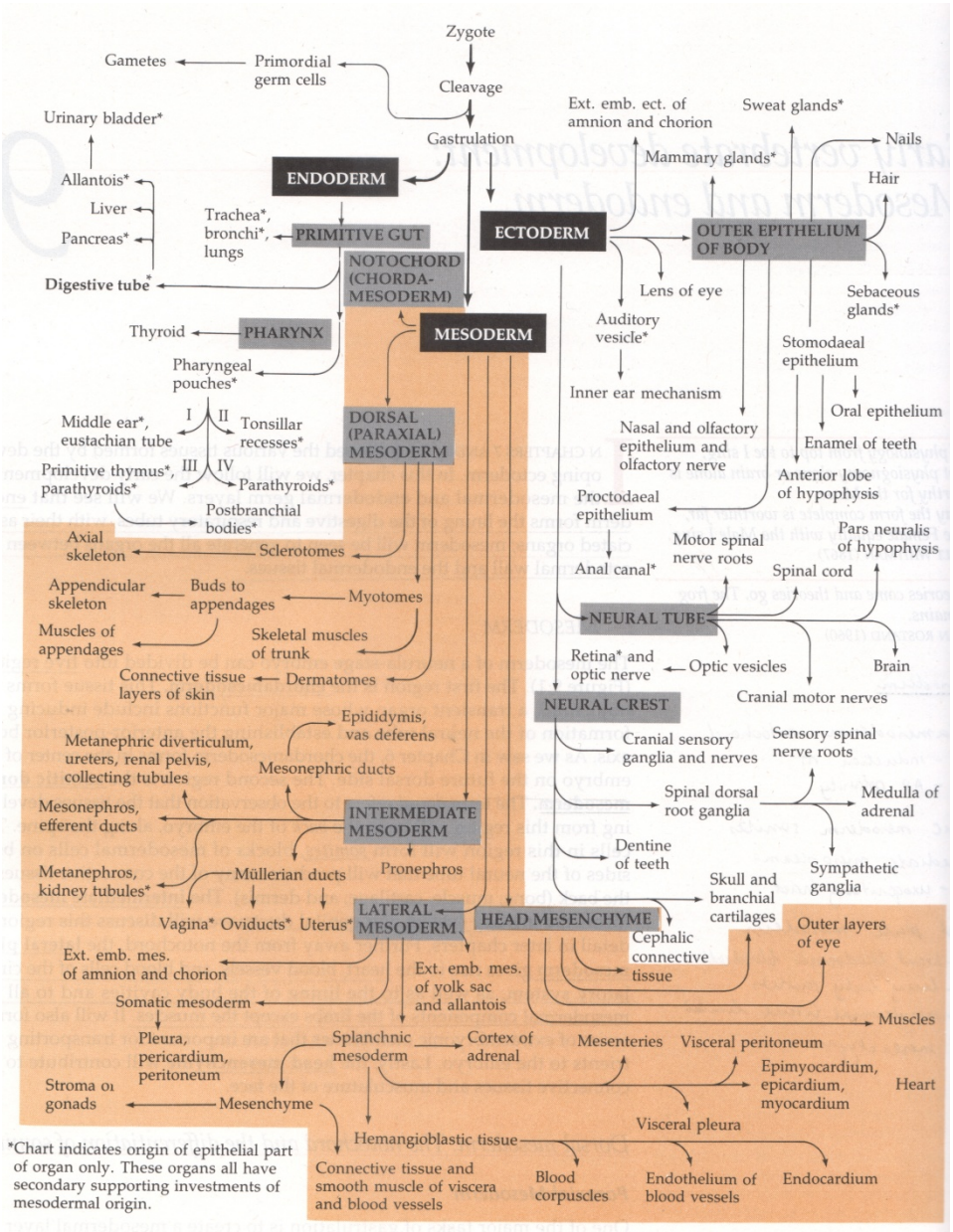
Somatic/parietal mesoderm: **somatopleure**
- Closest to ectoderm
- Gives rise to:
  - Connective tissue and lining of the body wall
  - Bones, ligaments and dermis of the limbs



Splanchnic/visceral mesoderm: **splanchnopleure**
- Closest to endoderm
- Gives rise to:
  - Cardiac mesoderm (prechordal splanchnic mesoderm)
  - Blood vessels
  - Smooth muscles of the gut



Embryonic development:



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Week 3 Lecture overview

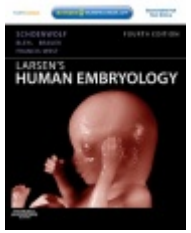
Placentation

Body axes

Gastrulation

Axis formation

Embryo folding



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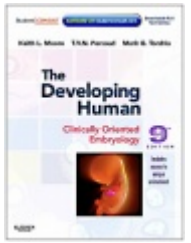

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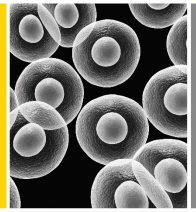

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