

"Somite Differentiation"

Somites are segmental structures derived from the paraxial mesoderm, essential for forming the axial skeleton, muscles, and dermis.

1. Introduction

- Week 3: Paraxial mesoderm organizes into segments (somitomeres) in the cephalic region, arranged cephalocaudally.
- Somitomeres later organize into somites from the occipital region downward.
- Somites initially appear as ball-like clusters of mesodermal fibroblast-like cells, then epithelialize.

- They adopt a donut-shaped structure around a small lumen.

Flowchart: Paraxial Mesoderm to Somite Formation

Paraxial mesoderm →

- Somitomeres (cephalic region) → Cephalocaudal arrangement
 - Somites (occipital → caudal) → Ball of mesodermal cells → epithelialization → donut-shaped somite
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2. Sclerotomes

- Begin forming at week 4.
- Ventromedial cells of somites lose epithelial traits → become mesenchymal again.
- Surround notochord and neural tube.
- Form skeletal structures:

- Tendons
- Cartilage
- Bones (vertebrae and ribs)

Flowchart: Somite to Sclerotome

Somite → Ventromedial cells → Mesenchymal cells
→ Surround notochord & neural tube → Tendons,
cartilage, bones

3. Myotomes

- Cells from dorsomedial and ventrolateral edges of the upper somite.
 - Differentiate into muscle precursors (myotomes).
 - Form segmental muscles of the body.
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4. Dermatomes

- Cells between dorsomedial and ventrolateral groups
→ dermatomes.
 - Form dermis of the back.
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5. Dermomyotome

- Some cells from dorsomedial + ventrolateral groups revert to mesenchymal state → migrate beneath dermatome → dermomyotome.
- Derivatives:
 - Dermis of the back
 - Muscles of the back
 - Muscles of the body wall (intercostal muscles)
 - Some limb muscles

Flowchart: Somite Differentiation

Somite

→ Ventromedial cells → Sclerotome → Bone, cartilage, tendon

→ Dorsomedial & ventrolateral edges → Myotome → Segmental muscles

→ Cells between edges → Dermatome → Dermis of back

→ Cells migrating beneath dermatome →

Dermomyotome → Dermis + muscles (back, body wall, limbs)

6. Migration into Lateral Plate Mesoderm

- Cells from ventrolateral edge of somite migrate into somatic layer of lateral plate mesoderm.
- Form muscles of:

- Body wall (external/internal oblique, transversus abdominis)
 - Limbs (majority of limb muscles)
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7. Innervation

- Each myotome and dermatome retains innervation from its original segment.
- Each has a segmental nerve supplying it.

Flowchart: Innervation

Myotome & Dermatome → Segmental nerve from original somite → Functional muscle & dermis innervation

High-Yield Takeaways

1. Sclerotome → vertebrae, ribs, tendons, cartilage

2. Myotome → segmental muscles; ventrolateral cells migrate to form limb & body wall muscles
 3. Dermatome → dermis of the back
 4. Dermomyotome → intermediate population; forms back, body wall, and some limb muscles
 5. Innervation → segmental; important for dermatome mapping clinically
 6. Timeline:
 - Week 3 → somitomeres & somite formation
 - Week 4 → sclerotome formation begins
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-> The End <-