Skeletal/cranial development and axial skeleton

The skeletal system is made up of:

- **paraaxial mesoderm** - from the sclerotome → mesenchyme (at the end of the 4th week) - mesenchyme cells capable of migration → fibroblasts, chondroblasts, osteoblasts,
- **mesoderm of the lateral plate** - skeleton of the limbs,
- **neural crest cells** - part of the skull skeleton.

Ossification

- **desmogenous** - bone tissue are created directly from mesenchyme,
- **chondrogenic** – a cartilaginous model of bone is created first.

Skull

Neurocranium

It surrounds the brain and sense organs,

- division according to the method of ossification:
  - desmocranium,
    - neural crest cells + paraaxial mesoderm → mesenchyme surrounds the brain → spicules (islets of bone tissue) form in the mesenchyme → spicules expand radially,
  - chondrocranium,
    - each bone consists of several cartilaginous foundations → fusion → individual bones,
    - connections between bones → growth centers of the skull base,
    - prechordal chondrocranium = bones that are derivatives of the neural crest (in front of the sella turcica),
      - os ethmoidale, ala minor ossis sphenoidalis, ala major ossis sphenoidalis,
    - chordal chondrocranium = bones originating from occipital sclerotomes,
      - corpus ossis sphenoidalis, bassis ossis occipitalis, os petrosum.

Splanchnocranium

The facial part of the skull,

- from gill arches:
  - 1st gill arch:
    - maxillary valva → premaxilla, maxilla, os zygomaticum, os palatinum, incus,
    - mandibular valance → Meckel's cartilage (the mandible desmogenously ossifies around it), malleus, lig. sphenomandibular,
  - 2nd gill arch → stapes, proc. styloid, lig. stylohyoideum, part of os hyoideum,
  - 3rd gill arch → rest of lingual.

Newborn skull

🔎 *For more information see Newborn skull.*

- Bones separated by fibrous bands → they form sutures,
- at the point of contact of several bones there are fibrous membranes = fontanelles,
  - the largest is the fonticulus anterior,
  - these fibrous structures allow the skull to change shape during birth.

Vertebrae

- 4th week – sclerotome cells travel to the periphery of the spinal cord and chordae → connection with the bilateral sclerotome,
- resegmentation – the caudal half of the sclerotome of each somite joins the cranial half of the next somite,
- myotomes do not divide → muscles begin and attach to adjacent vertebrae → movement of the spine is enabled,
- the chorda dorsalis forms the nucleus pulposus of the intervertebral discs.

Ribs and Sternum

- Ribs – arising by lengthening the processus costales of the thoracic vertebrae → originate from sclerotomes,
- sternum – from the mesenchyme of the somatopleura, from a paired cartilaginous model.