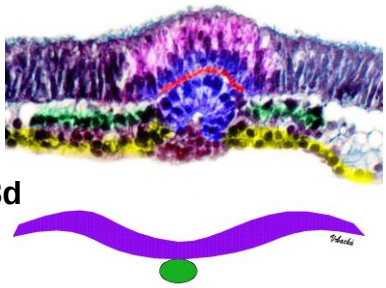
DEVELOPMENT OF THE NERVOUS SYSTEM

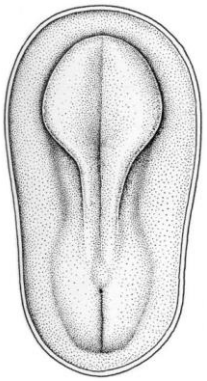
begins in the 3 W from a thickened area of the ectoderm



18d

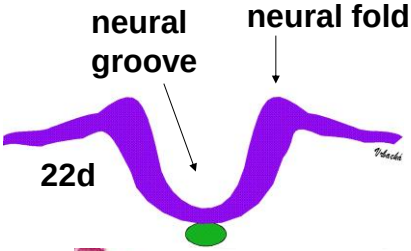
The underlying notochordal process and primitive (Hensen's) node induce the overlying ectoderm to differentiate into the neural plate.

The neural plate = primordium of the central nervous system.



19d

NEUROECTODERM



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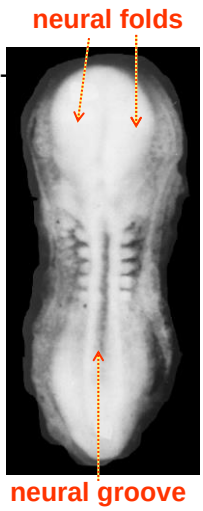
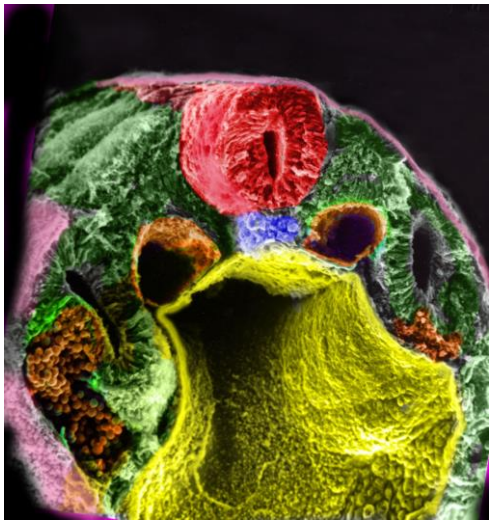
NEURULATION

= Lateral folding of the embryonic neural plate (elevation of each site along a midline, neural groove) and its transformation into the neural tube.

= The process by which the vertebrate neural tube is formed.



NEURULATION



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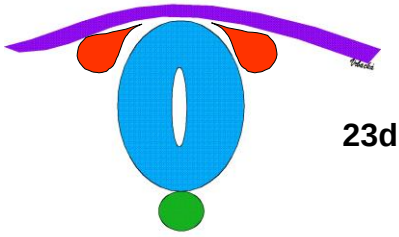

Neural folds fuse (22-23 d) in the region of the 4-6 pairs of somites → neural tube that detaches from the surface ectoderm. Some neuroectodermal cells remain between the n. tube and the surface ectoderm as the neural crest.

NEURAL CREST, NEURAL CREST STEM CELLS

- a transient structure formed during the process of neurulation

- NCSCs: multipotent highly plastic cells
- epithelial to mesenchymal transition
- BM breaks down allowing cells to escape
- downregulation of adhesive junctions
- migrate as individuals
- ↑ integrins: junction with ECM

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• Cells migrate along the ECM (along nerve fibres etc.) to their final destinations where they proliferate and stop to migrate.

DERIVATIVES OF THE NEURAL CREST

1) PNS - derivatives:

- neurons:

sensory ganglia of the spinal and cranial nerves (V, VII, IX, X)
ganglia and plexuses of the autonomic nervous system
adrenal medulla
paraganglia (carotid body type I cells)

- glia: Schwann cells, satellite cells

2) MESENCHYMAL derivatives:

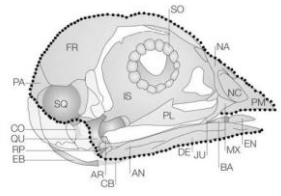
incl. cranial mesenchyme of neural crest origin
(mesectoderm or ectomesenchyme)

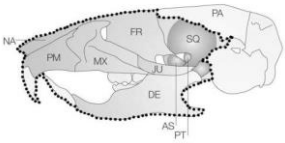
3) OTHER derivatives:

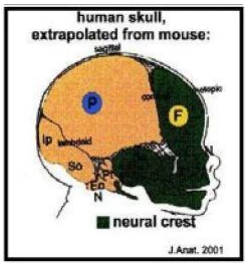
parafolicular cells (thyroid gl.), neurosecretory cells (lungs, heart, GIT)

MESENCHYMAL DERIVATIVES OF THE NC

Leptomeninges (prosencephalon/mesencephalon)
Chondrocranium; Pharyngeal arches and their derivatives (incl. cartilages); middle ear bones
Viscerocranium and anterior ventral skull bones (nasal, orbital, palatal, maxillary, otic capsule, parts of sphenoid.
CT components: adipose tissue, smooth muscle, stroma of salivary, gl., lacrimal gl, thymus, thyroid, (para)thyroid, pituitary
Skin components: dermis (face, neck), dermal smooth m., pigment cells (melanocytes), Merkel cells
Eye: cornea of the eye, ciliary (smooth) muscle
Tooth papilla, odontoblasts; parafollicular (C) cells
Cardiovascular components: cardiac semilunar valves, conotruncal region of the heart, septum truncus arteriosus, wall of aorta and aortic, arch-derived arteries, vascular smooth m. (of the face, prosencephalon) + pericytes
Skin skeleton: scales (in fish), bird's beak, dorsal fins in lower vertebrates







Because the neural crest *contributes so many cells to the body, it is often called the 4th germ layer.*

MALFORMATIONS – major neurocristopathies

Cranial NC	**Retinoic acid syndrome**
	DiGeorge syndrome
	Hemifacial microsomia
	Cardiac aorticopulmonary septation defects
	Cleft lip/cleft palate (facial malformations)
	Anterior chamber defects of eye
Trunk NC	**Hirschprung's disease** (megacolon congenitum)
Tumors	**Malignant melanoma, neurofibroma, Ewing sarcoma, PNET** (primitive neuroectodermal tumour**), pheochromocytoma, neurofibromatosis**