Embryology: Segmentation and Formation of the Gut Tube

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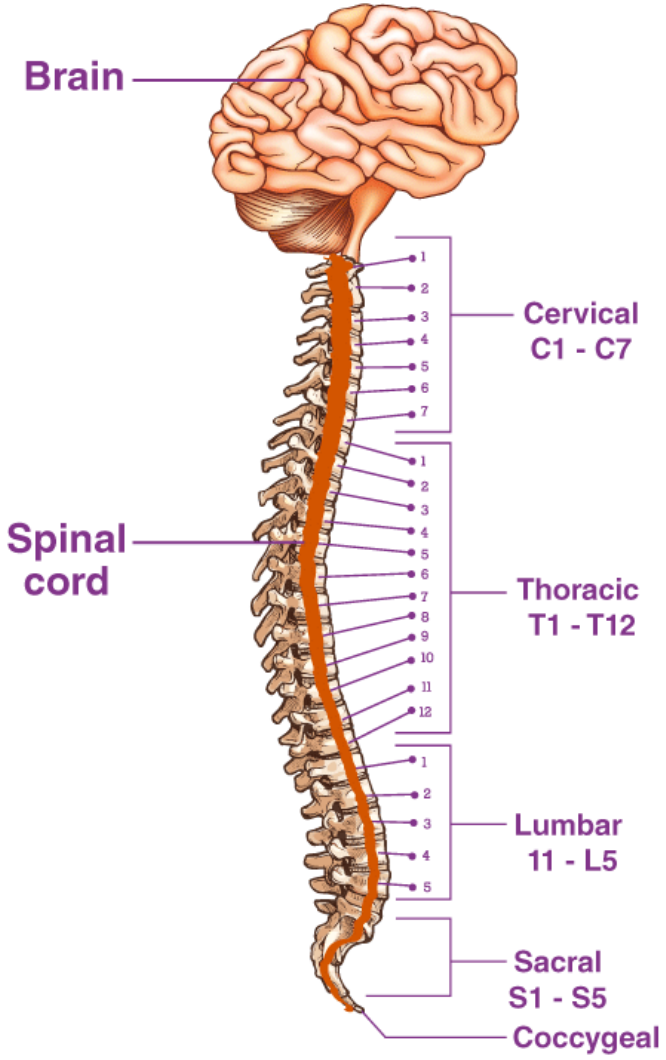
What we'll talk about…

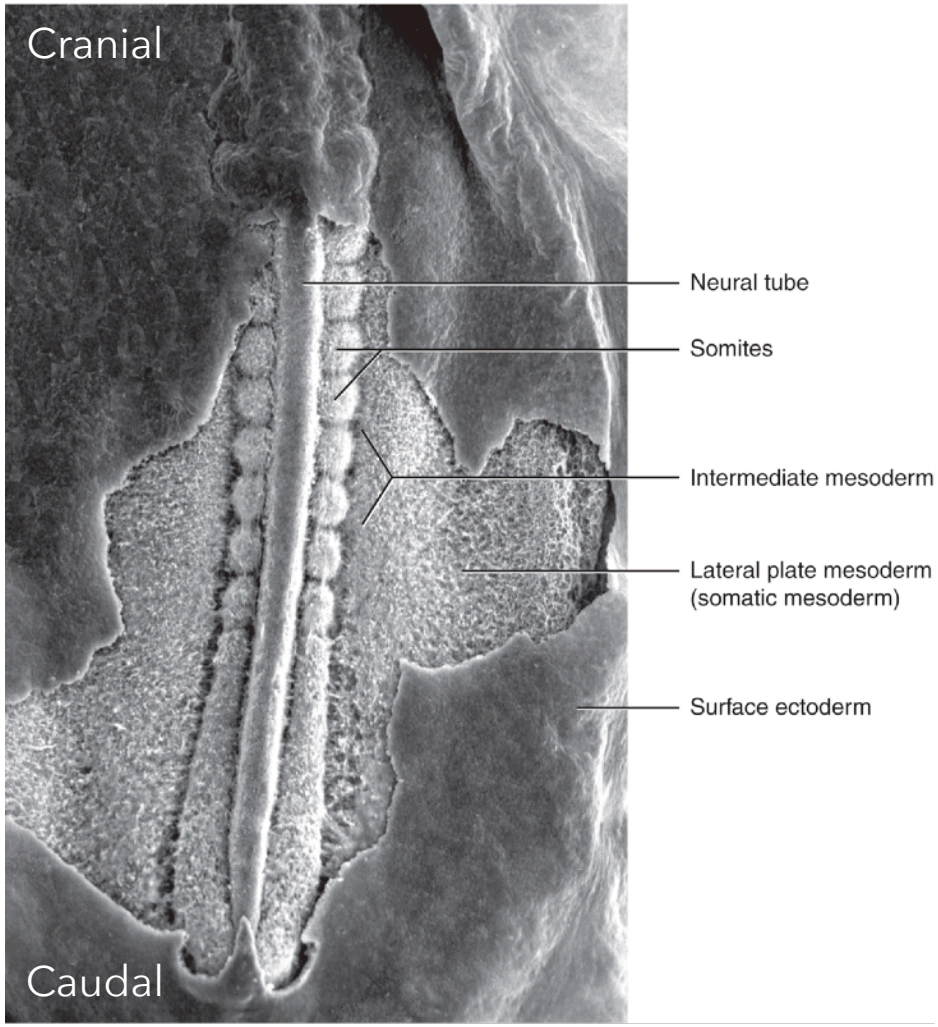
- Segmentation of the embryo
- Differentiation of somites
- Segmentation of the neural tube
- Formation of the gut

Segmentation

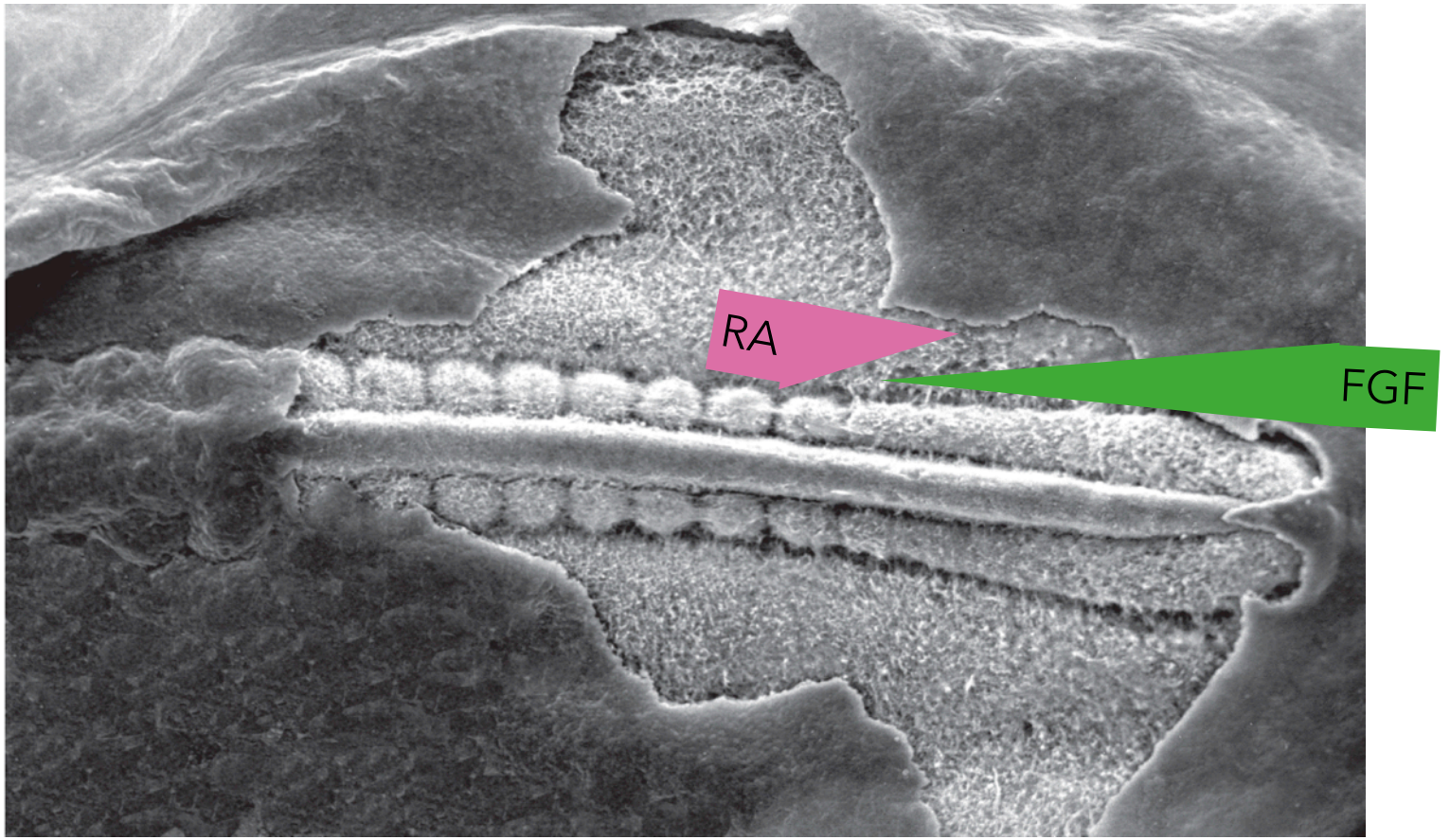
The spinal cord is segmented into a series of vertebrae.



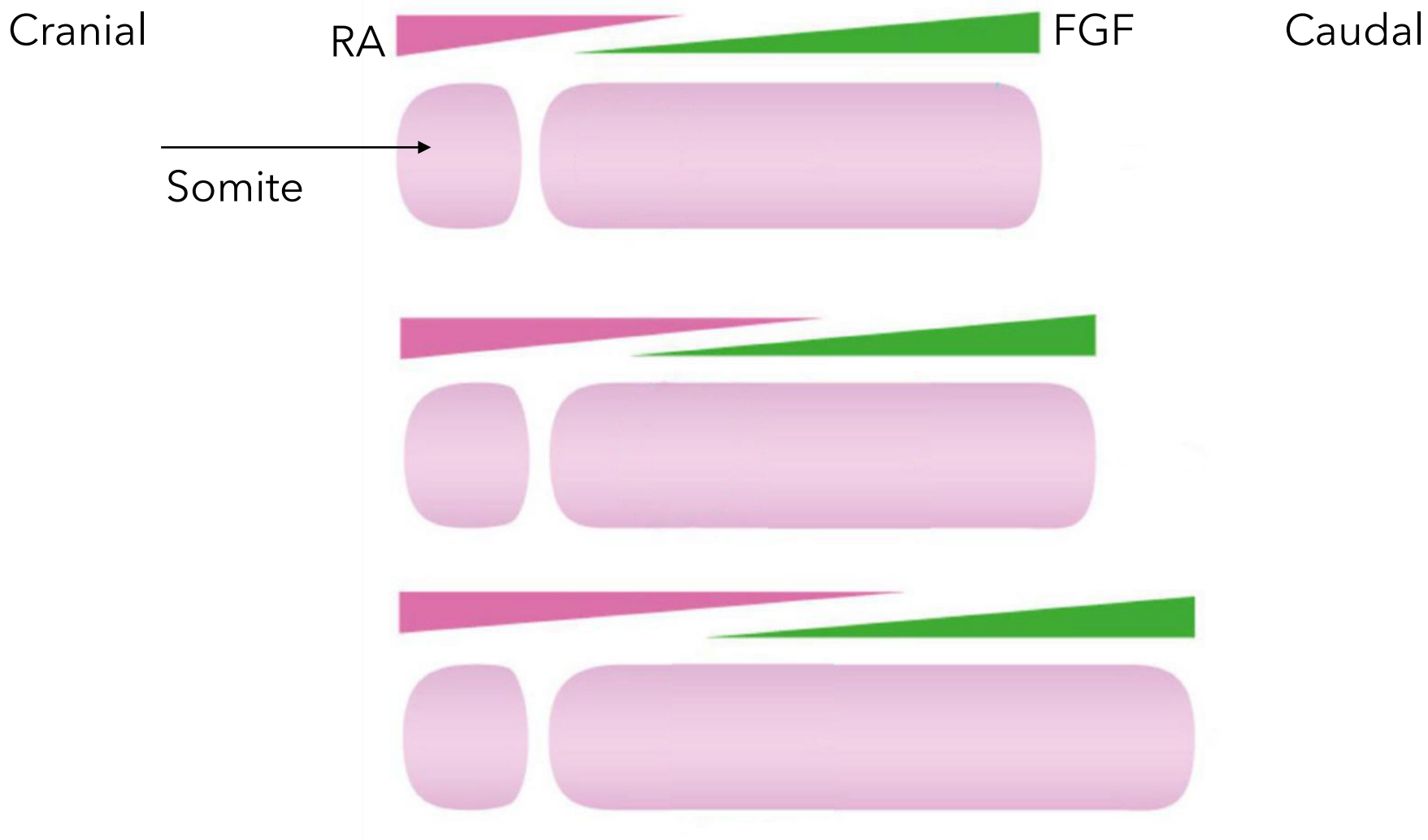
Somites are a mesoderm-derived structure that generates segmentation along the cranial-caudal axis.



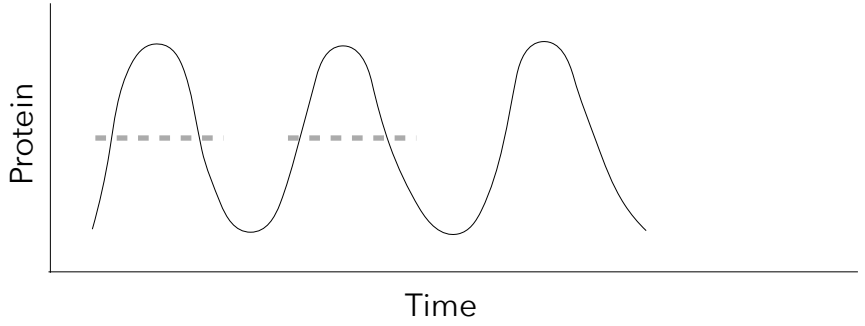
Opposing gradients of retinoid acid and FGF exists along cranial-caudal axis.

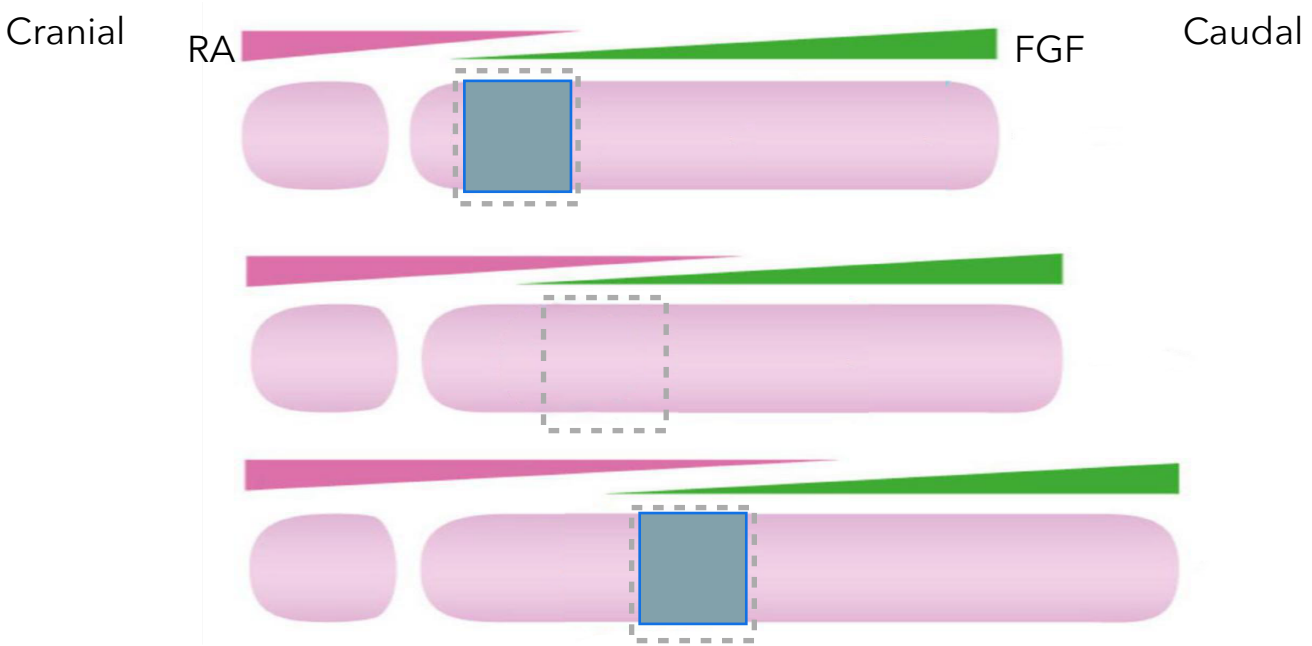


Gradients move in a caudal direction as embryo grows.

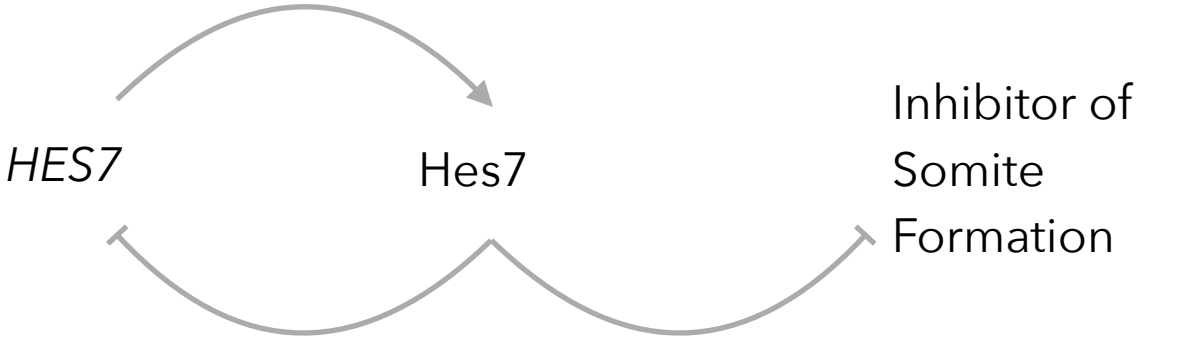


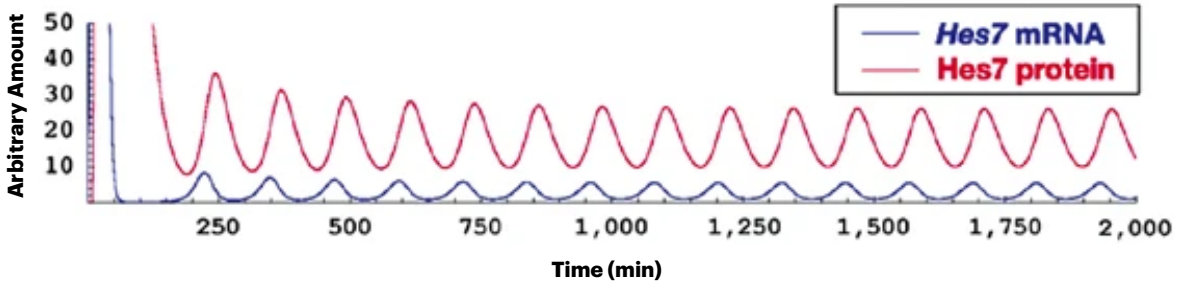
Gradients and a timer are needed to generate distinct somites.



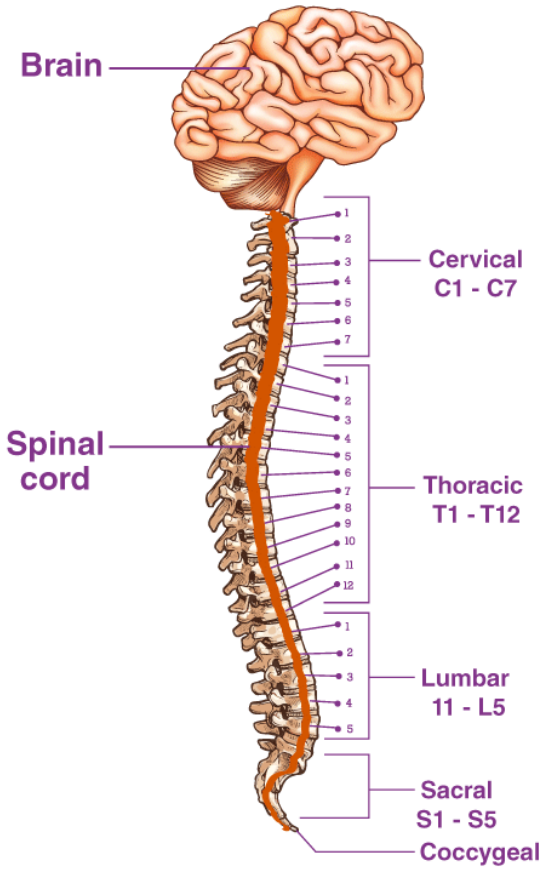


Timer is generated through negative feedback of gene expression.

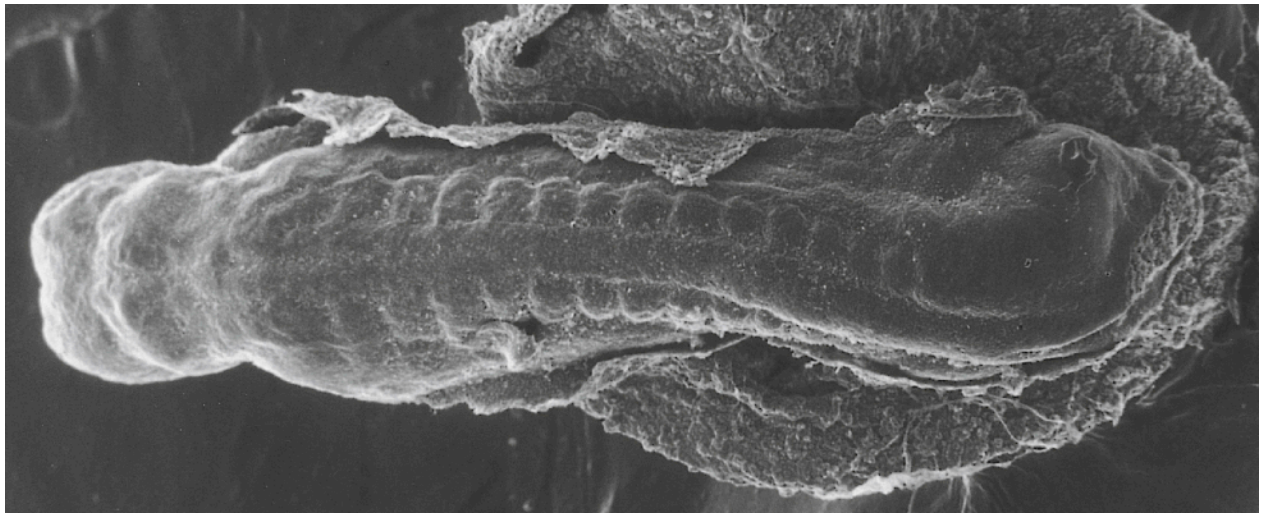




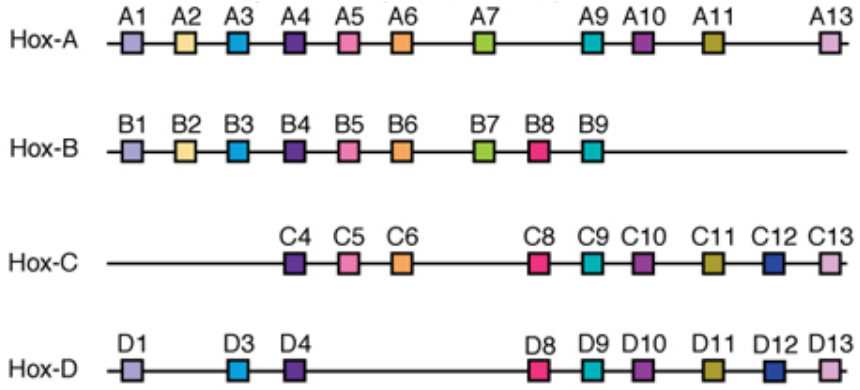
Differential expression of Hox genes generate pattern difference between somites.



Cranial

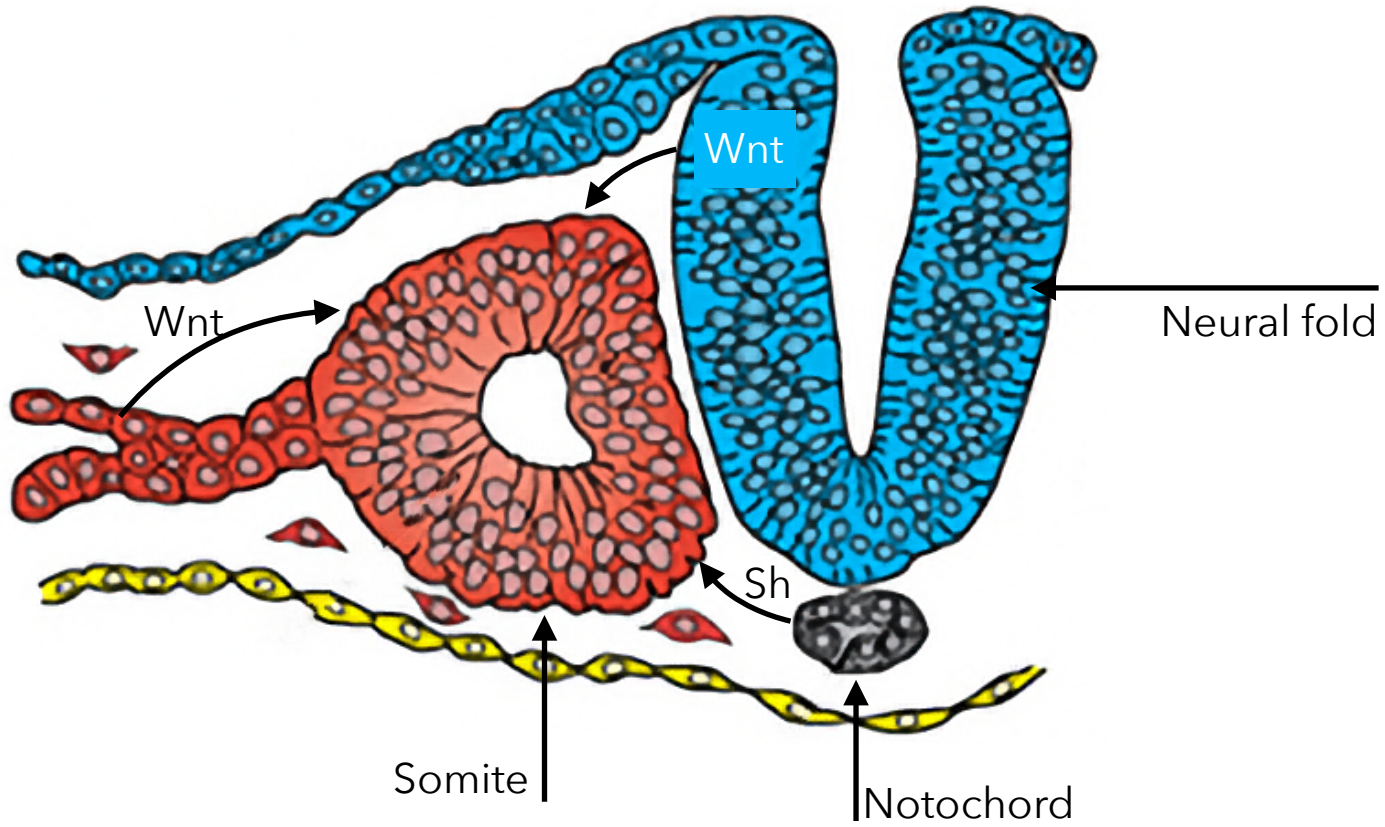


Caudal

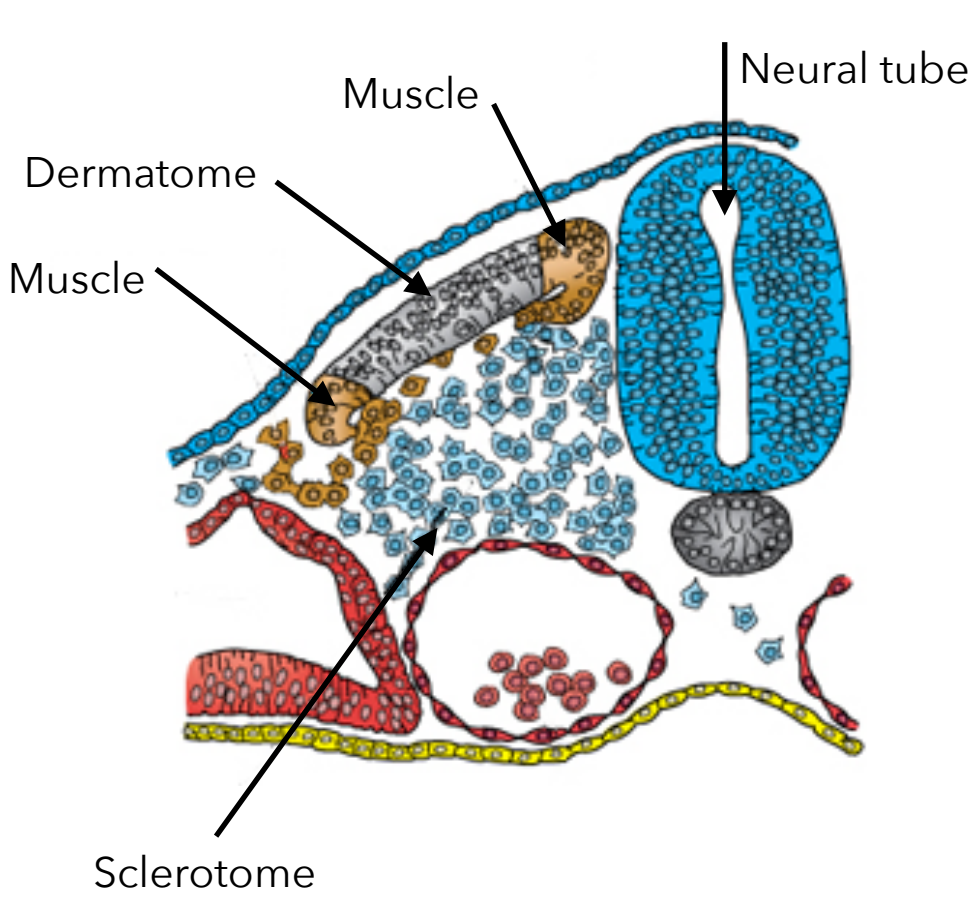


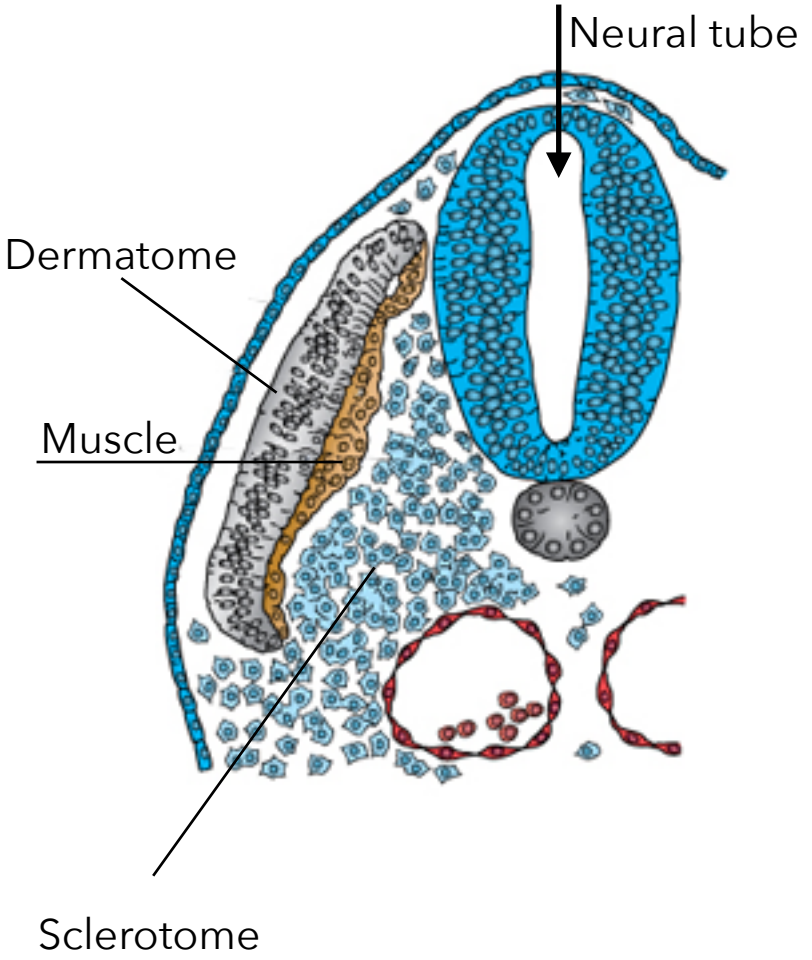
Differentiation of somite cells

Signaling molecules from surrounding tissues affect fate of cells in somites.



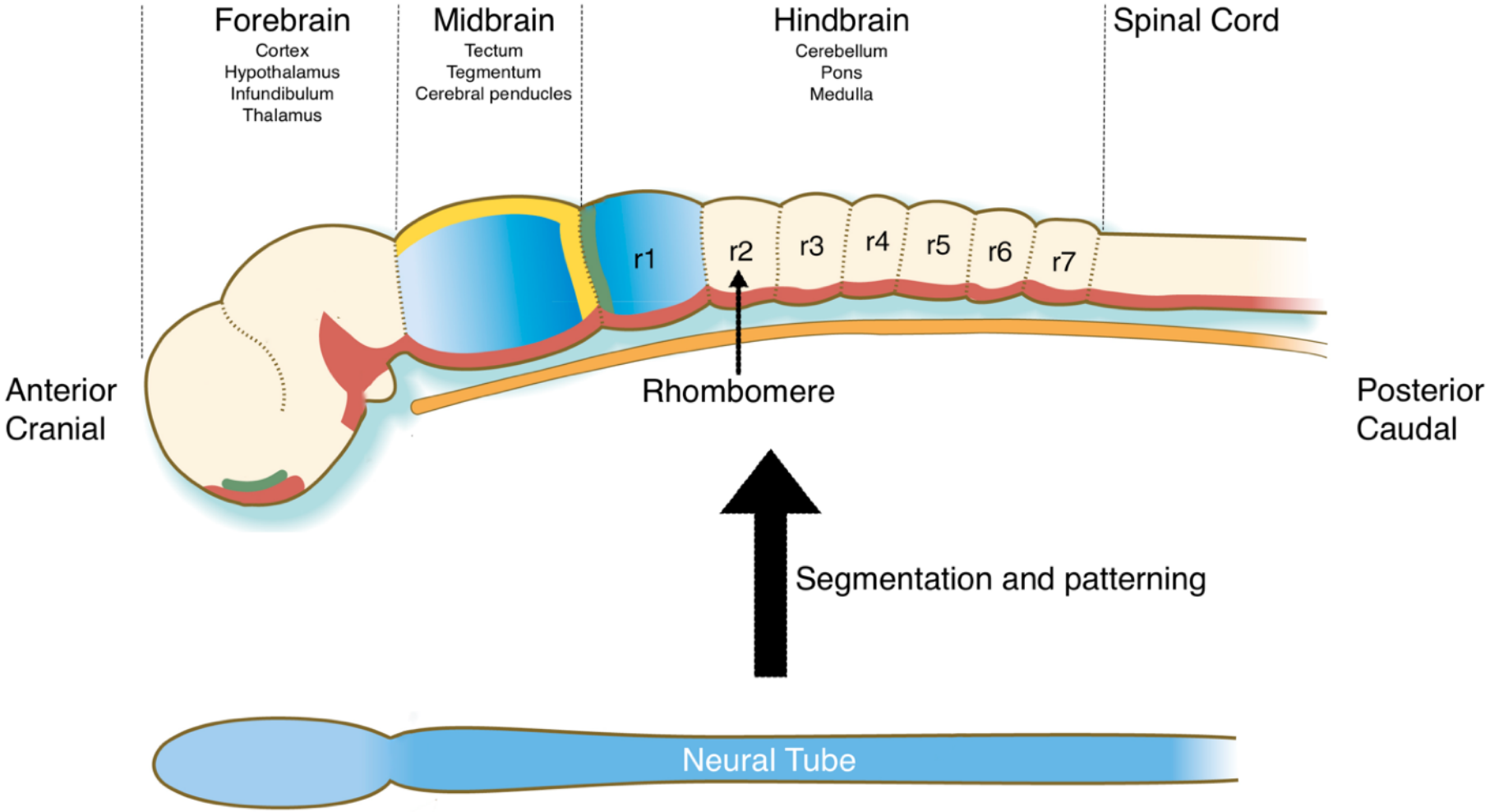
Cells in somites differentiate into bone, muscle and dermis.



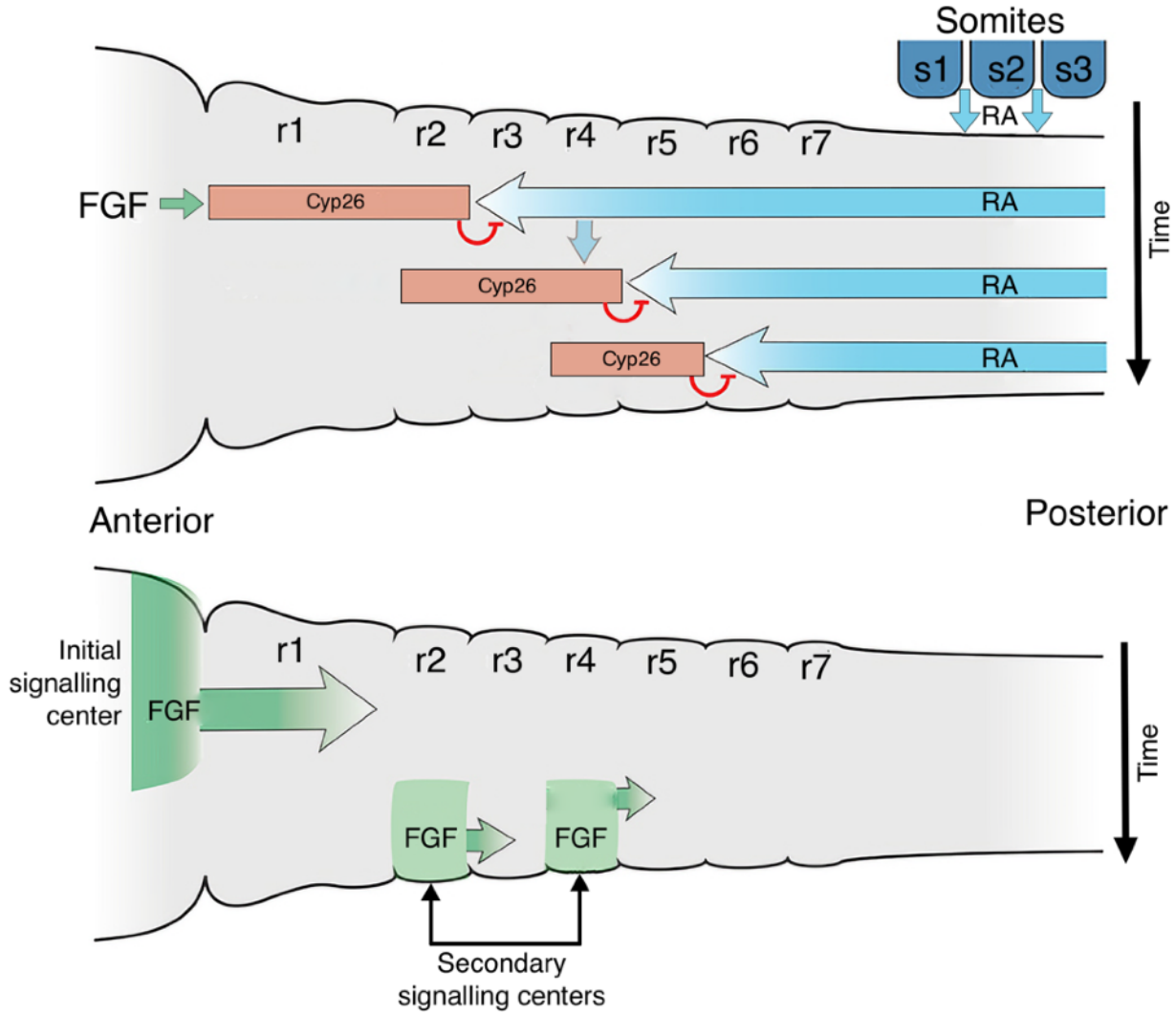


Patterning of the Neural Tube

The neural tube is segmented and patterned into different structural and functional regions.



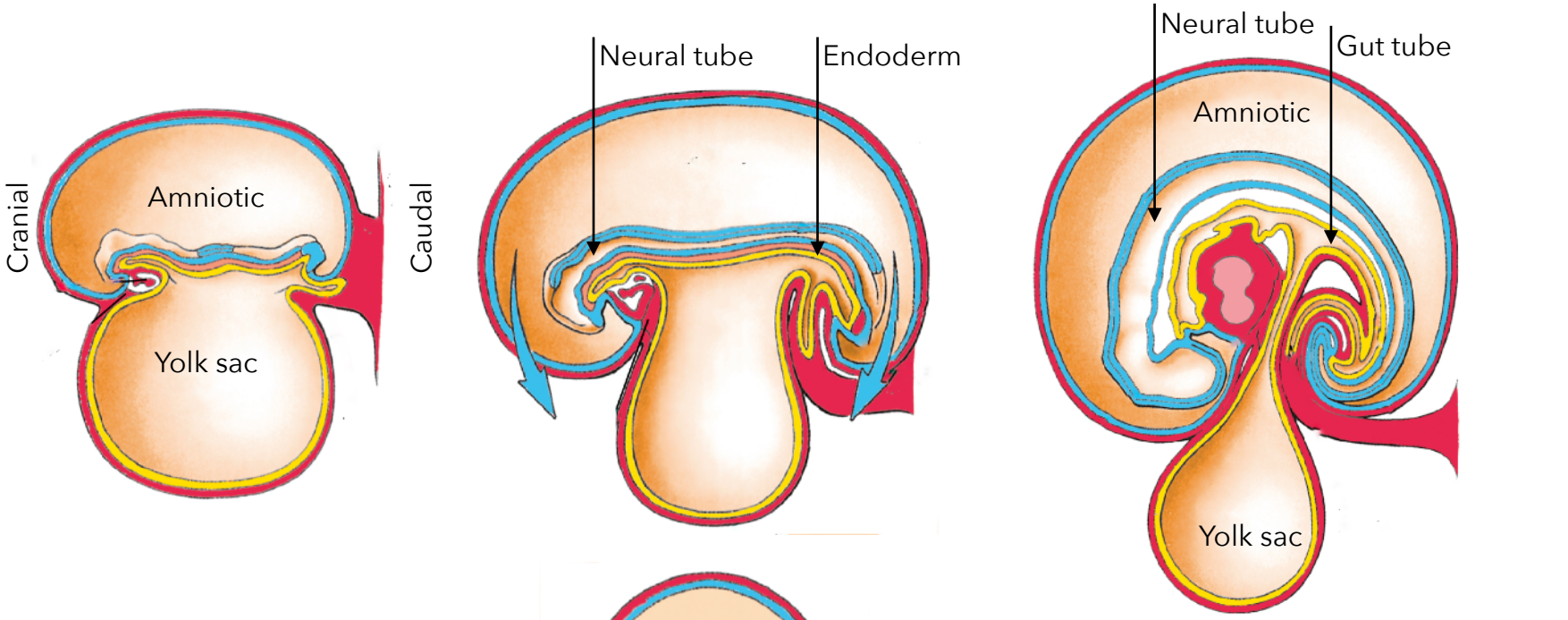
Gradients of retinoid acid and FGF pattern the hindbrain into rhombomeres.



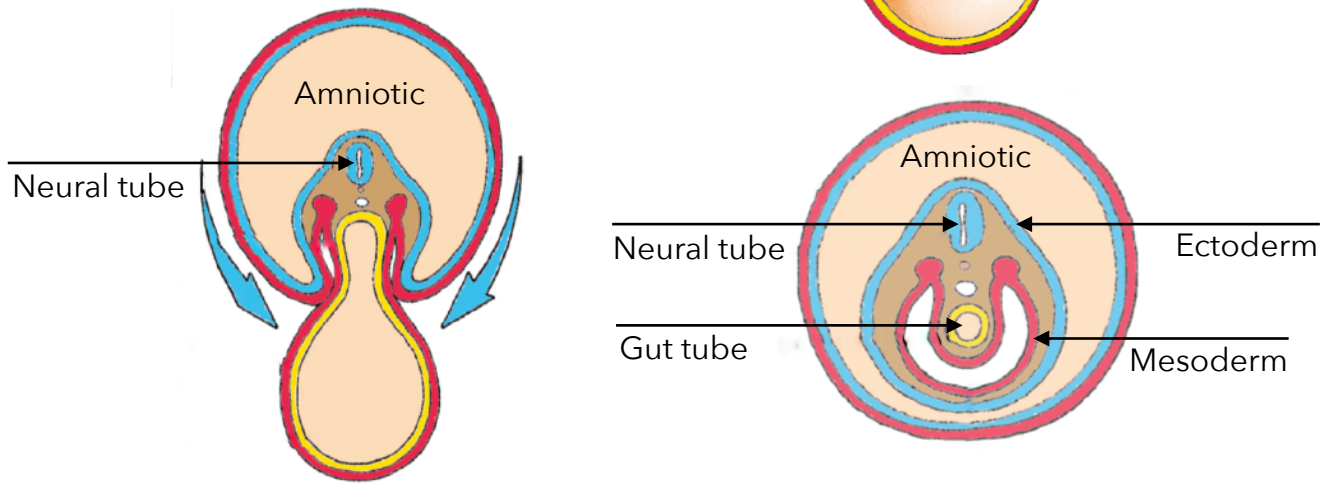
Formation of the gut tube

Inward folding of embryo generates gut tube from endoderm.

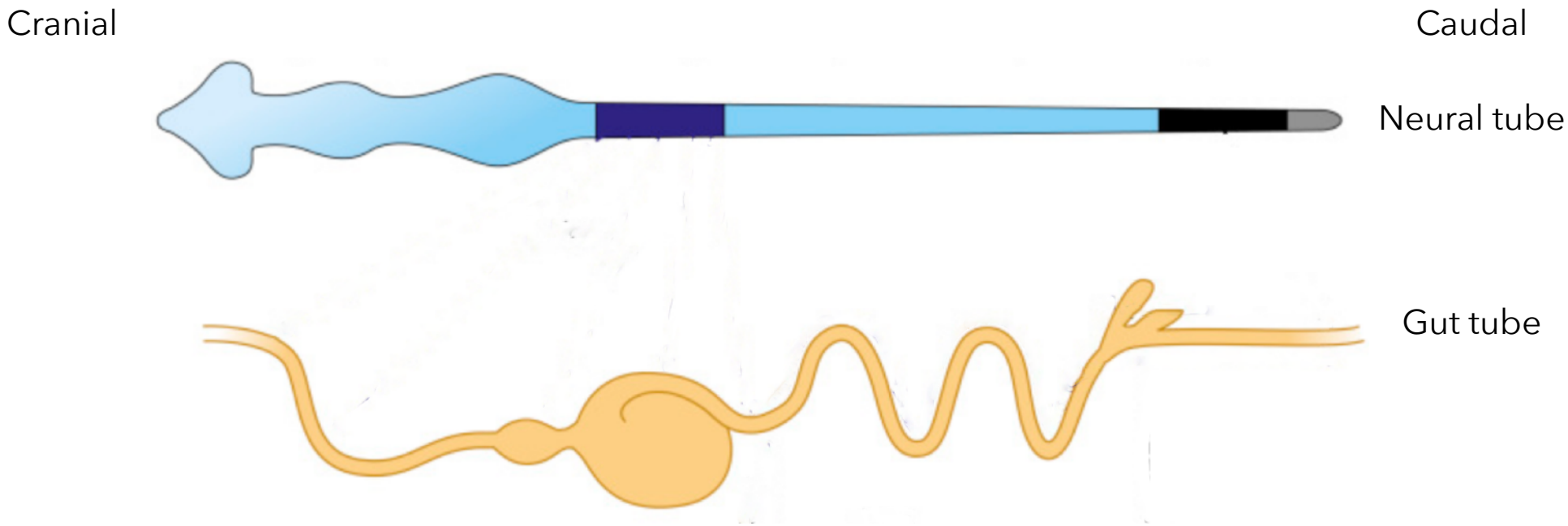
View from side



View from rear



Neural and gut tubes run in parallel from cranial to caudal in the embryo.



Take home messages…

- Gradients of FGF and retinoid acid generate polarity and facilitate segmentation of somites and hindbrain
- Somites give rise to vertebrae, muscle and dermis.
- Cells from rhombomeres mediate formation of structures in the head and neck
- Folding of the embryo generates the gut tube.