

Ectoderma e suoi derivati

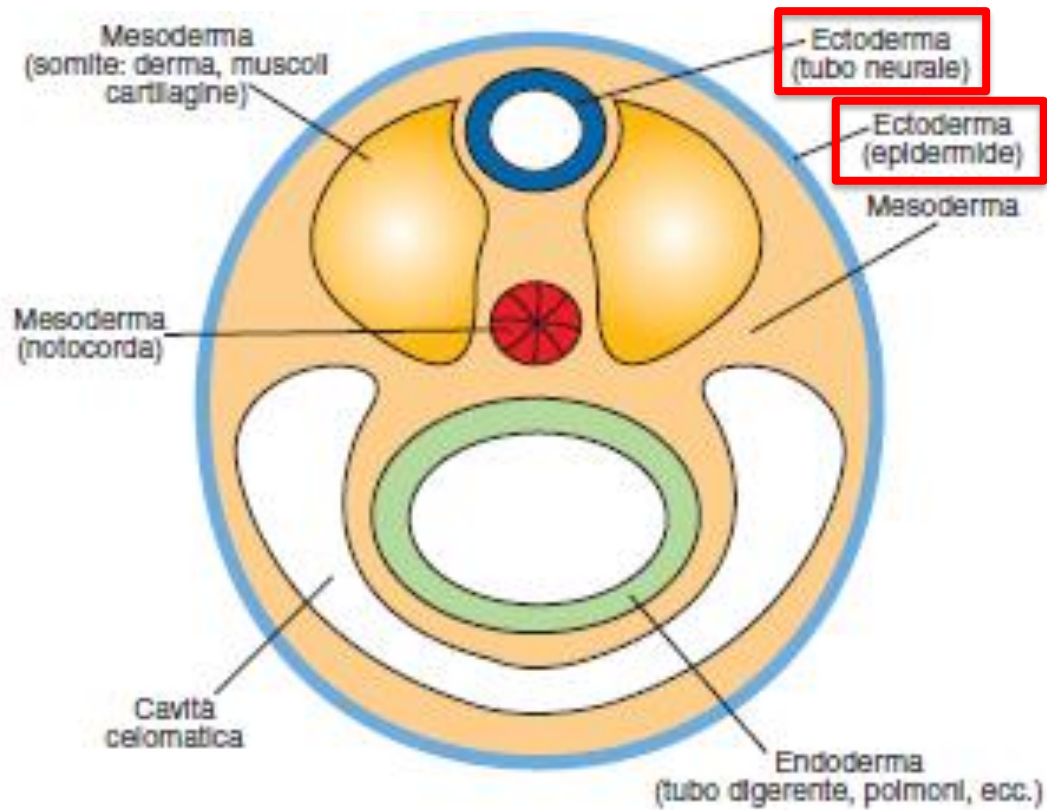
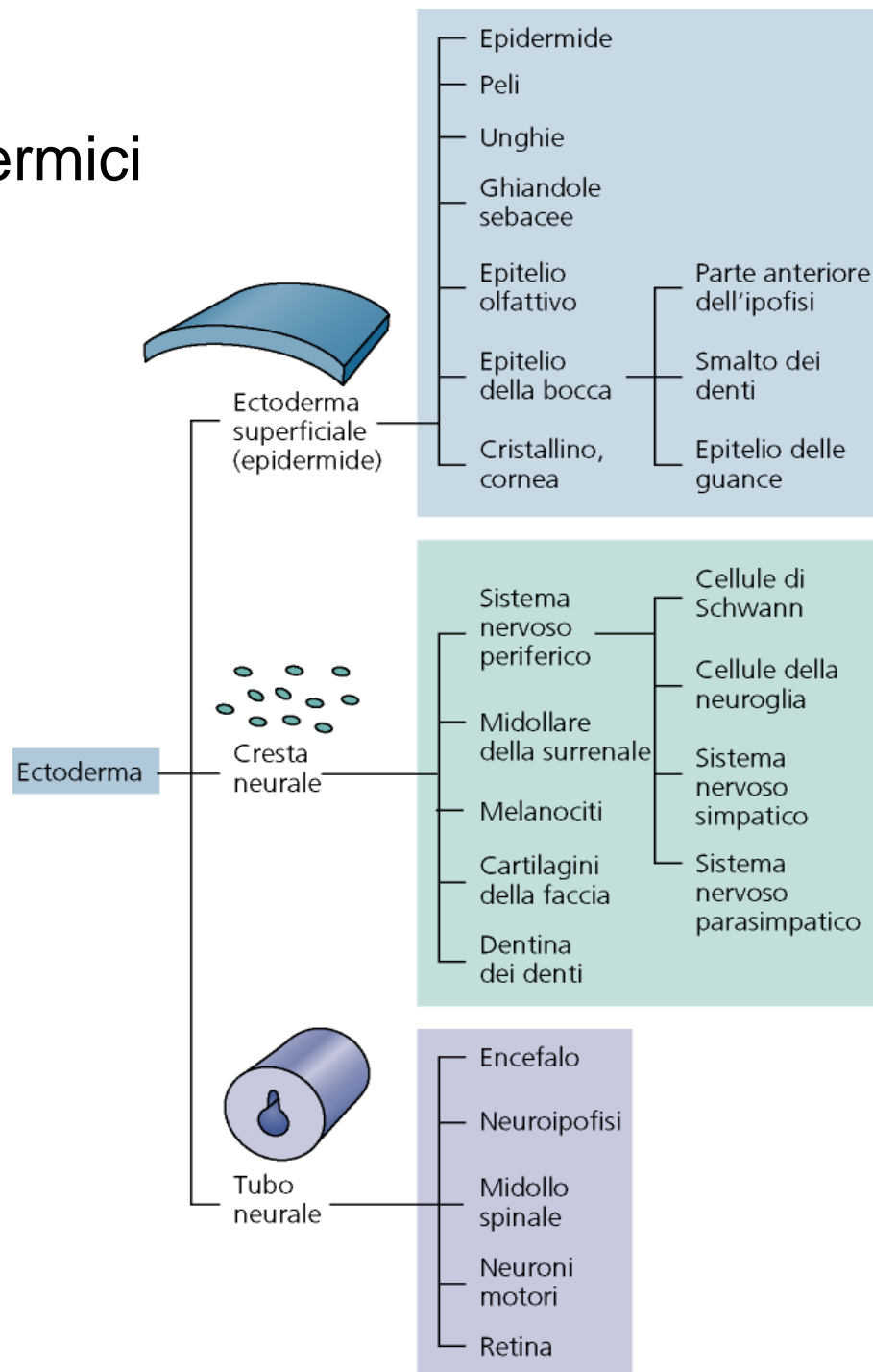


Figura 10

Derivati ectodermici



Neurulation primaria

Le cellule della piastra neurale si invaginano e si staccano dall'ectoderma superficiale formando un tubo cavo.

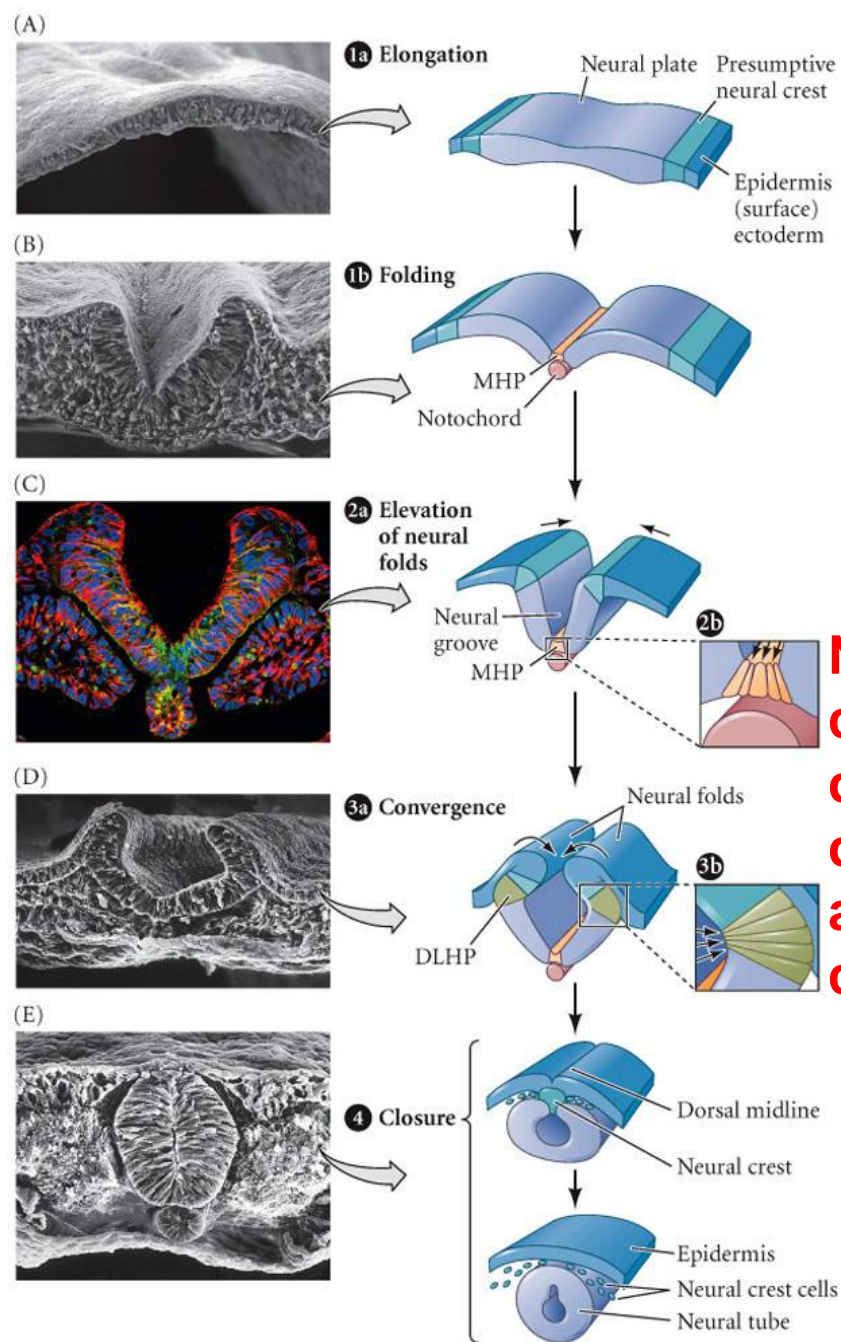
Avviene in quattro fasi: formazione della doccia neurale, formazione delle pliche neurali, convergenza delle pliche, fusione delle pliche e distacco del tubo neurale.

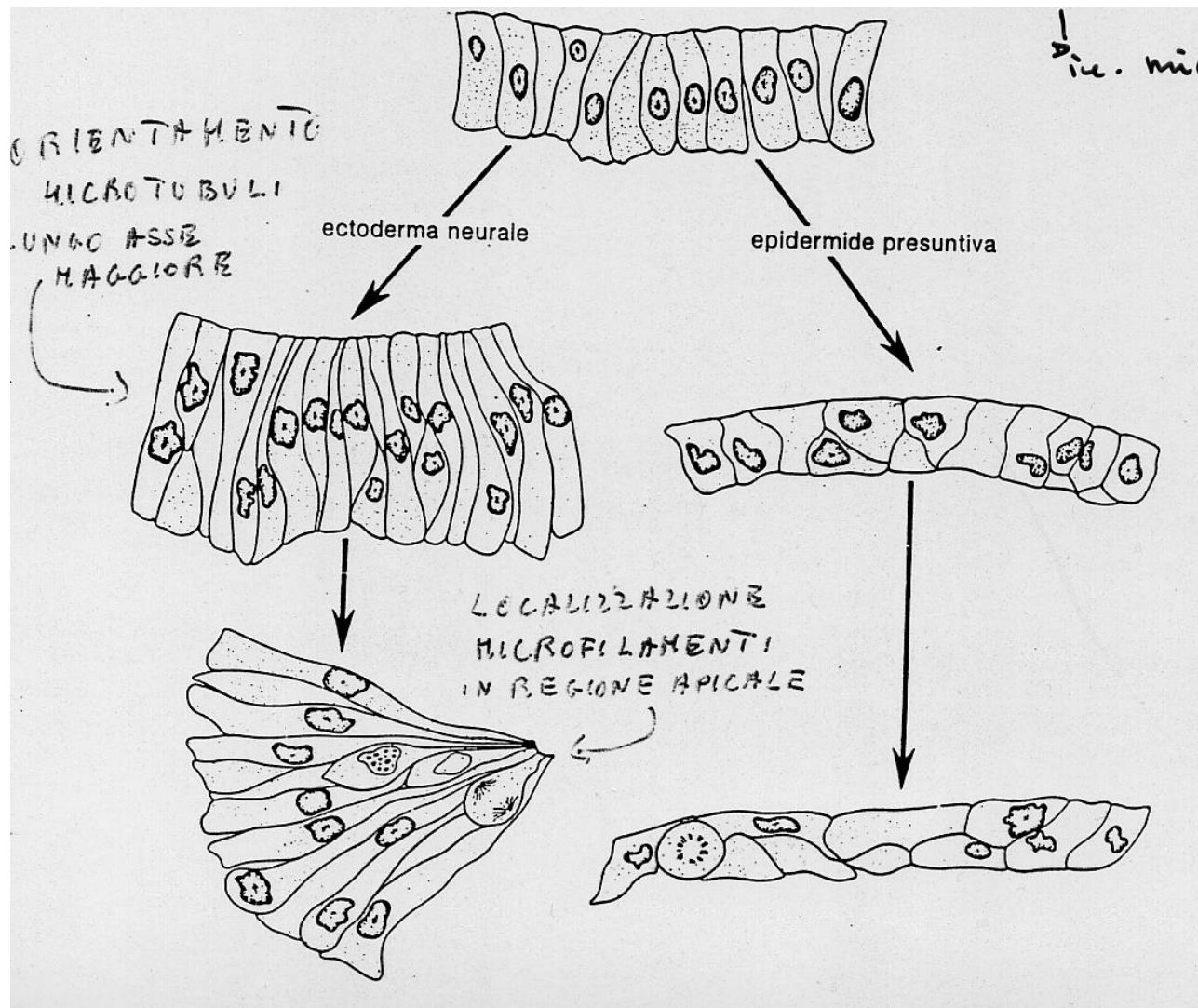
Il ripiegamento della piastra neurale avviene mediante formazione di cardini in cui il neuroectoderma contatta i tessuti circostanti che inducono cambiamenti morfologici cellulari e tissutali.

Notare i cambiamenti di forma delle cellule al livello dei cardini!

- Cardine mediale: contatto neuroectoderma-notocorda
- Cardini dorso-laterali: contatti neuroectoderma-epidermide

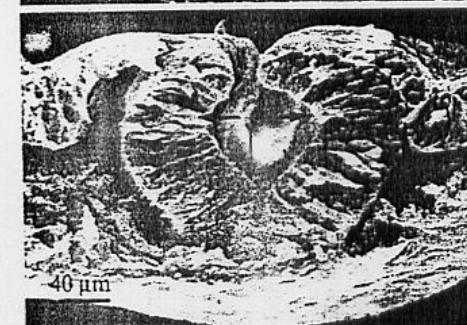
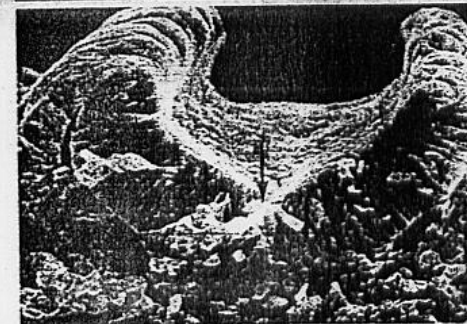
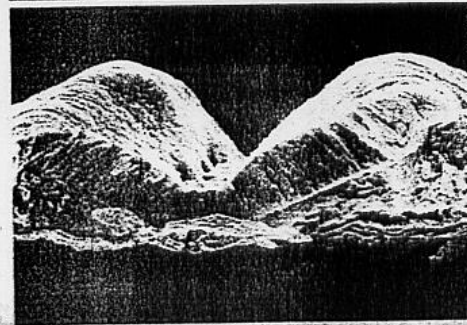
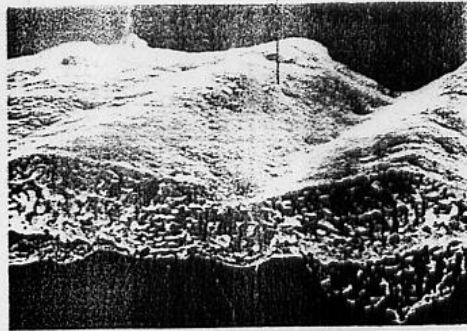
I cardini agiscono come perni che dirigono i movimenti di rotazione del tessuto



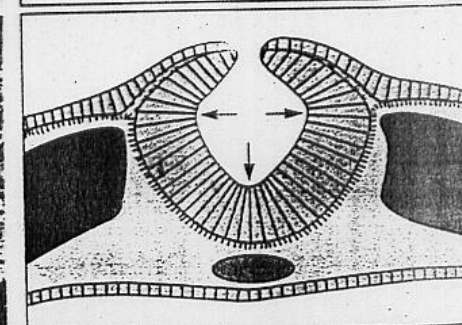
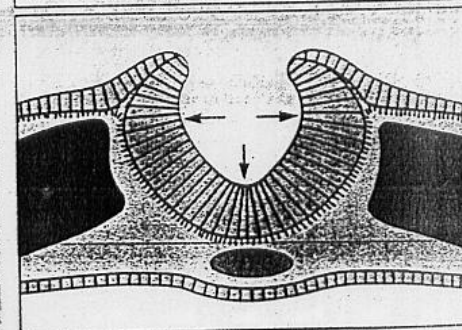
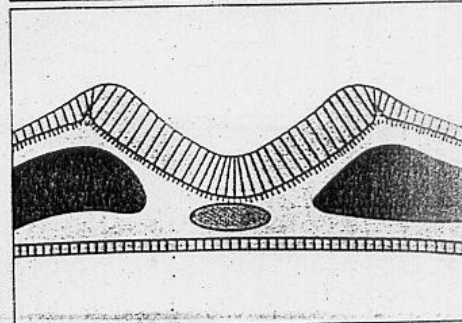
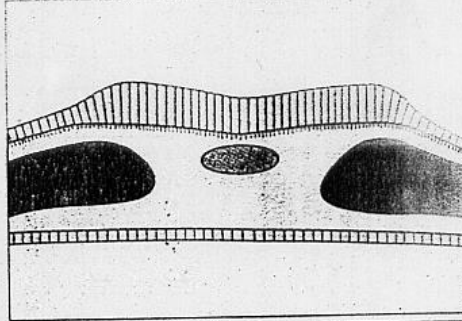


Forze intrinseche: Modificazioni del citoscheletro —————> **Microtubuli**
Microfilamenti actina

Le cellule a livello dei cardini si allungano e assumono una forma a cuneo



A



B

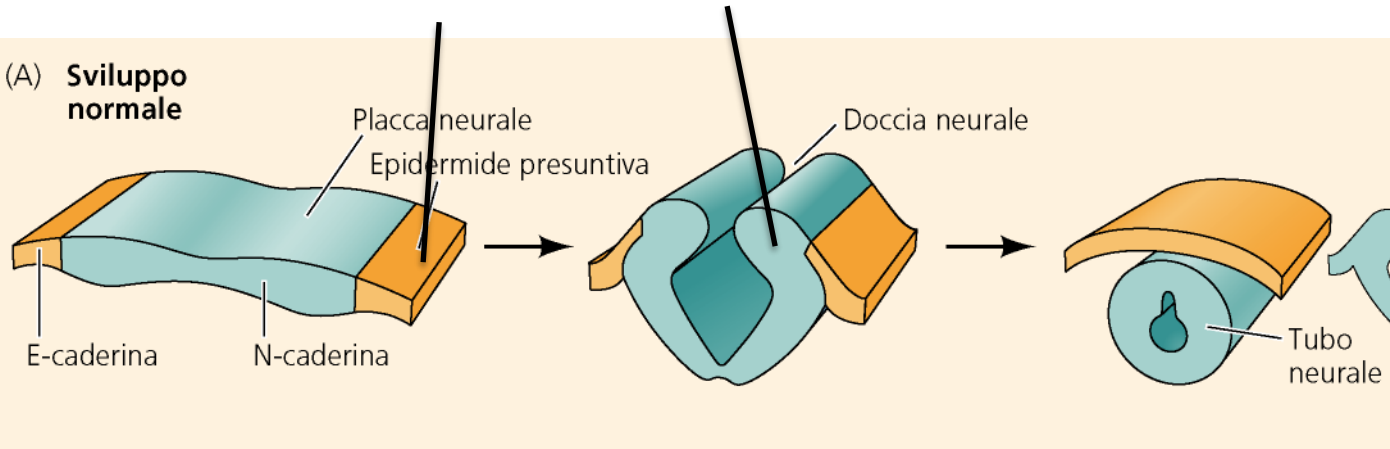
**Forze estrinseche:
spinta dell'ectoderma
non neurale**

Il distacco del tubo neurale dall'ectoderma superficiale è mediato da modificazioni nell'espressione di molecole di adesione

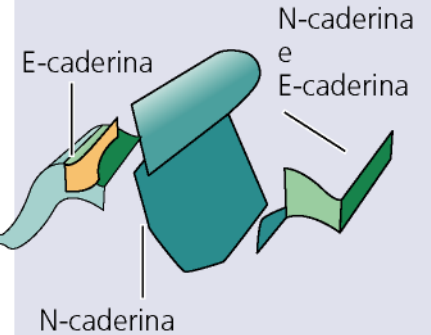
E-Caderina

N-Caderina

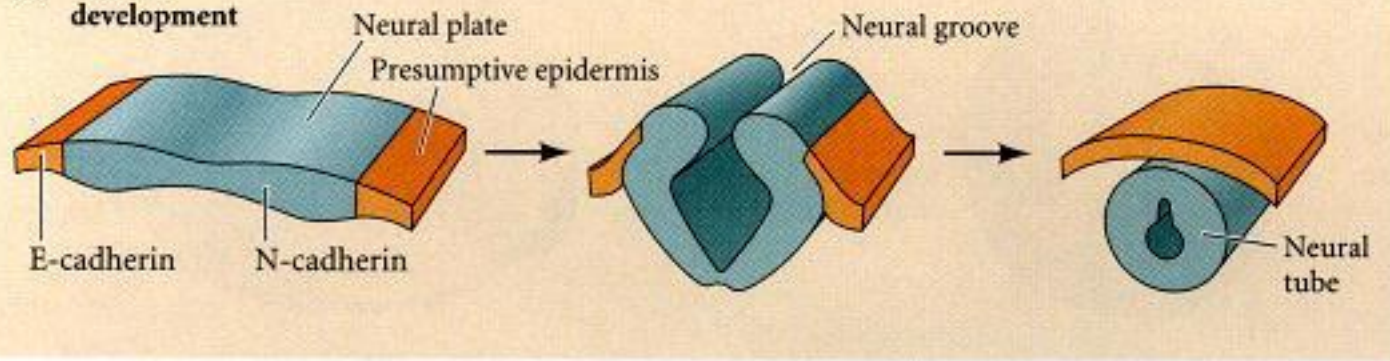
(A) Sviluppo normale



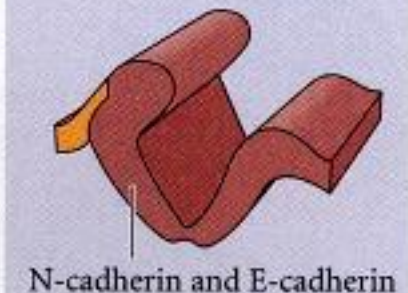
(B) Esperimento

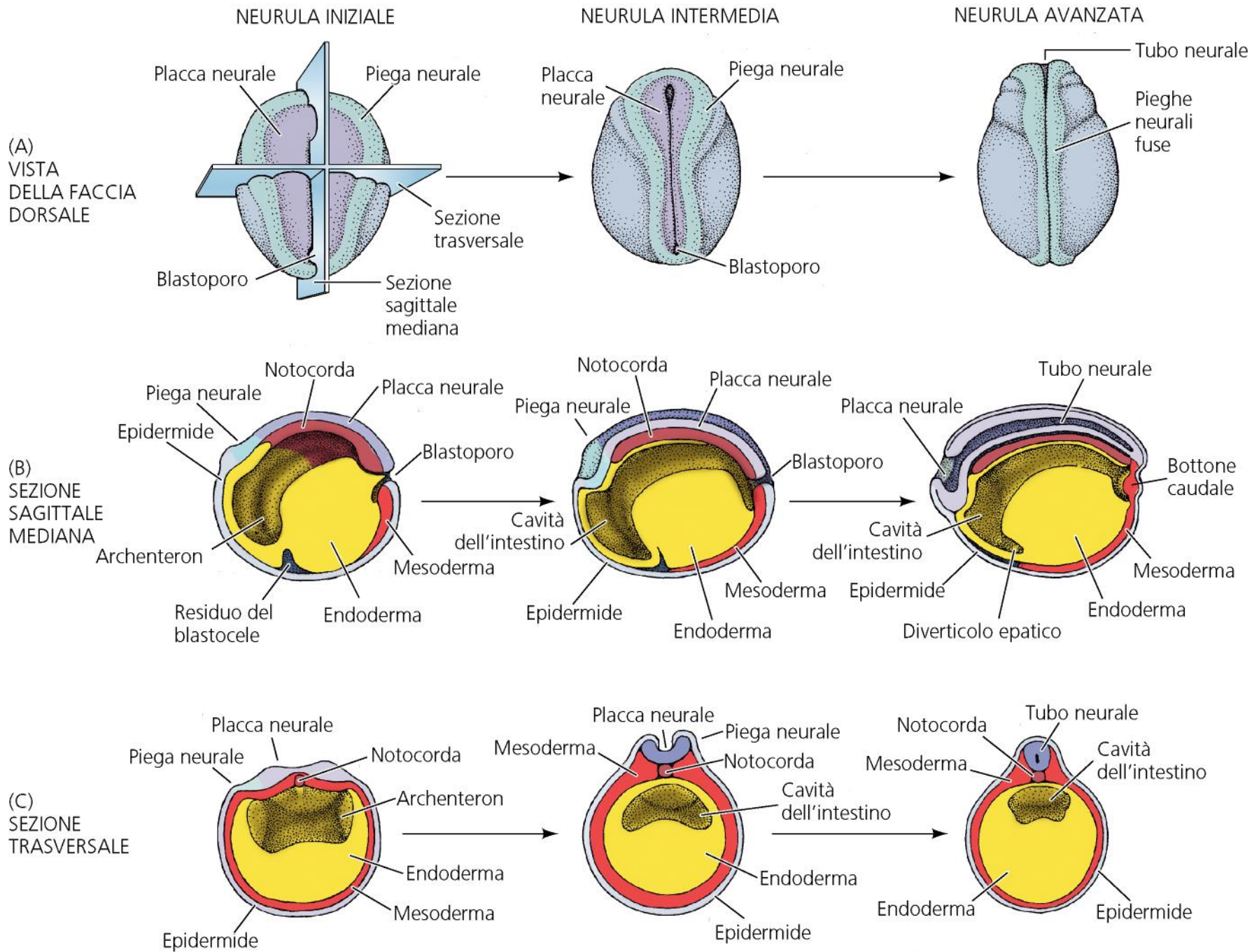


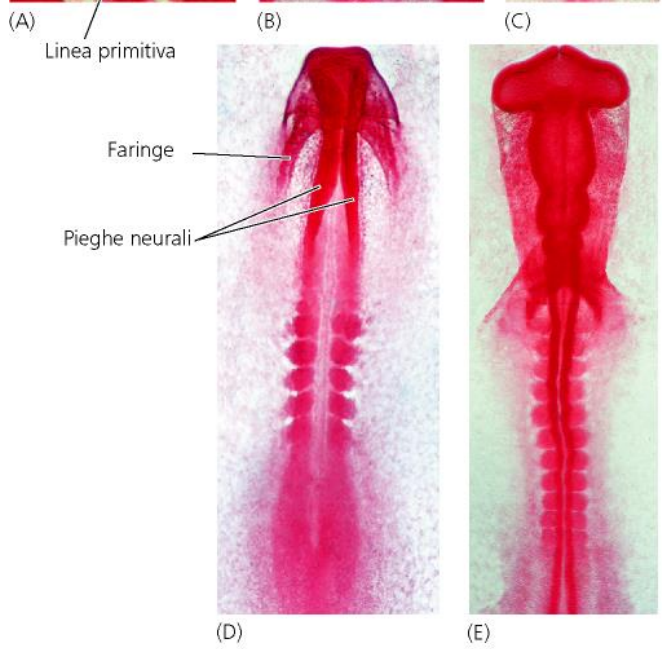
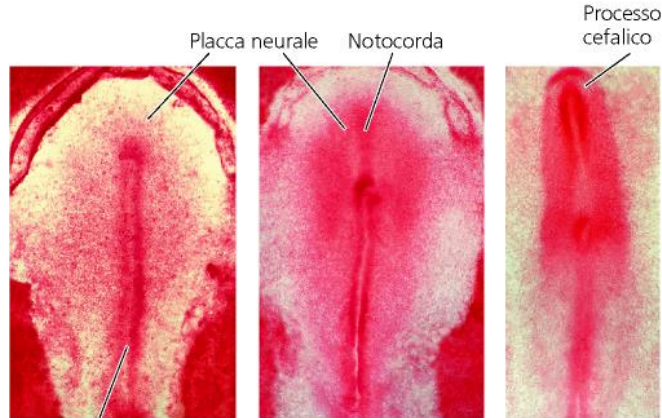
(A) Normal development



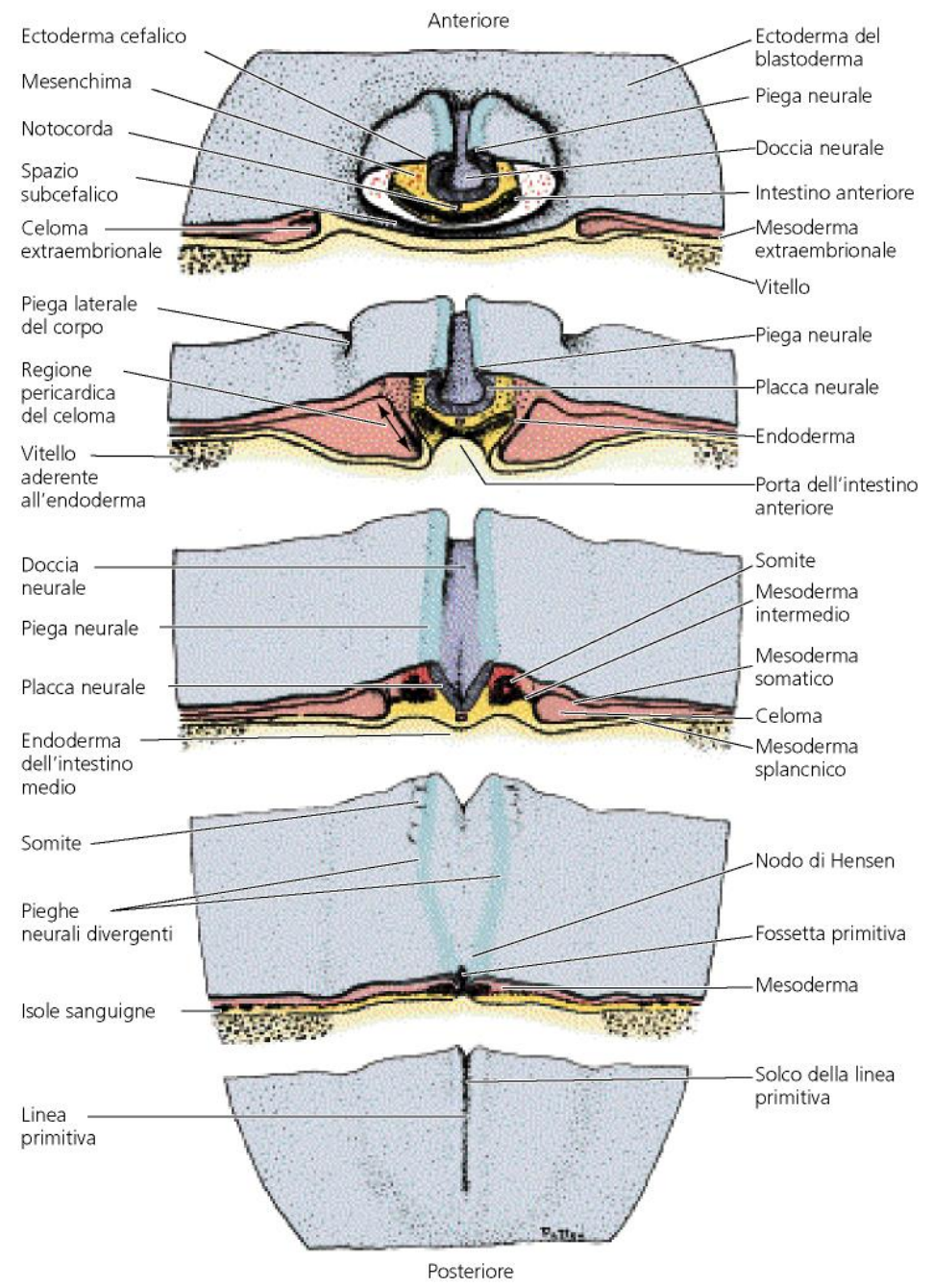
(B) Experimental

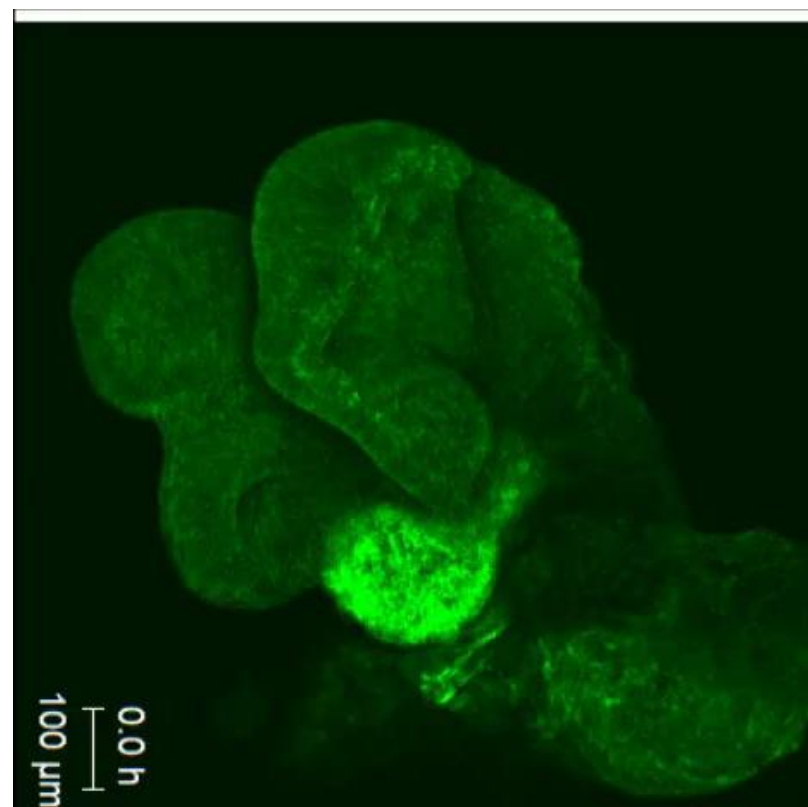
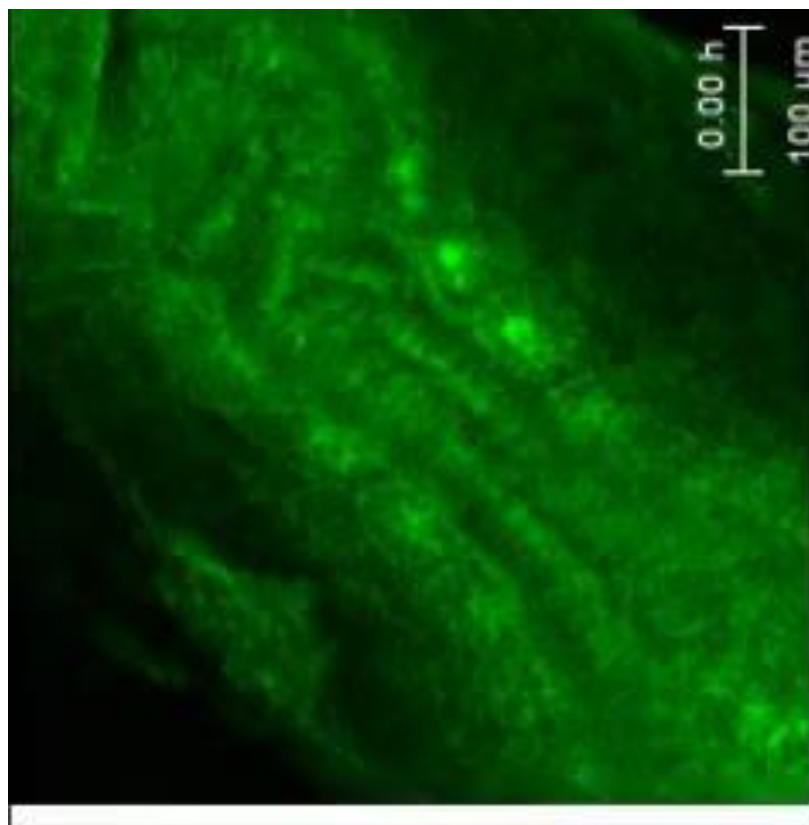
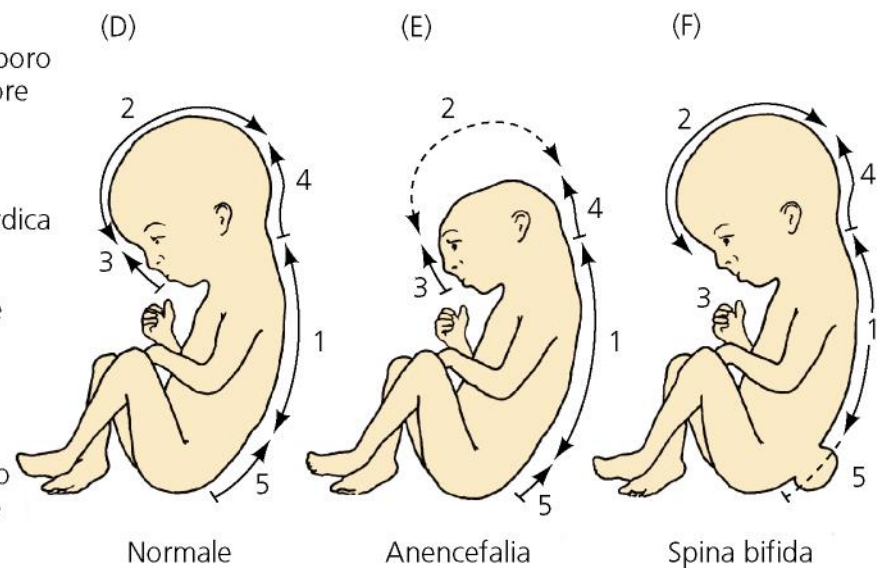
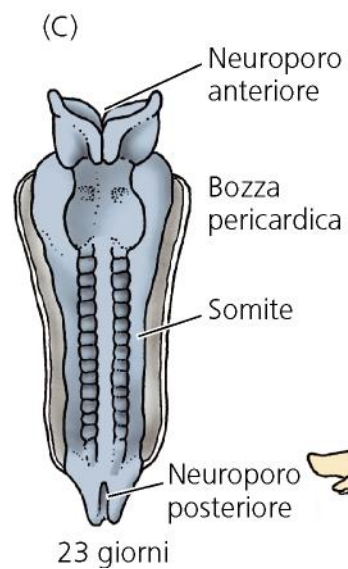
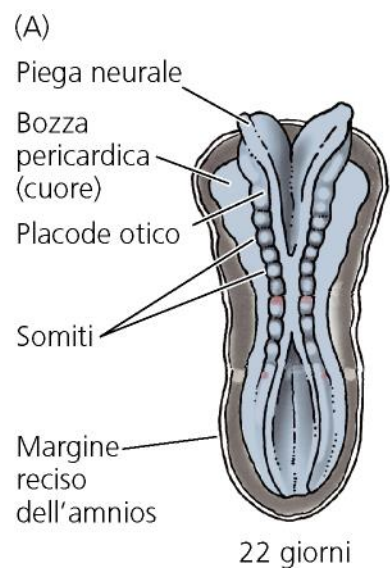






(F)





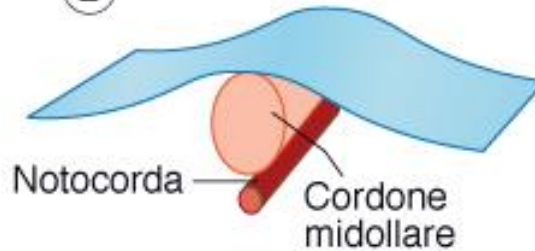
Neurulazione secondaria

Si verifica nelle regioni caudali dei vertebrati, ma è assente nei cefalocordati e negli urocordati. È caratterizzata dall'aggregazione, epitelizzazione e successiva cavitazione di un cordone di cellule mesenchimatiche.

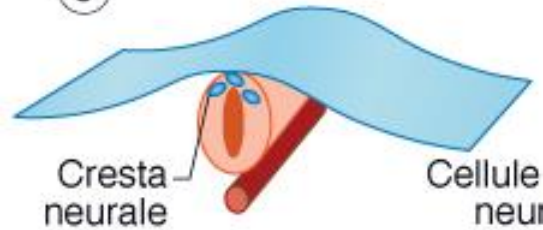
1



2



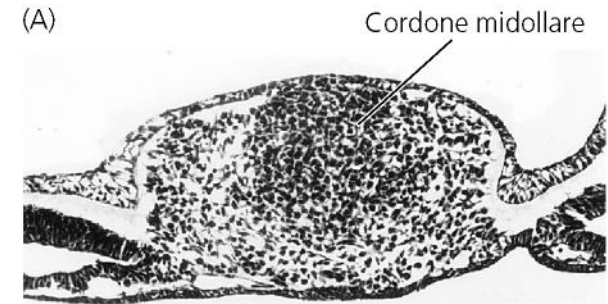
3



4



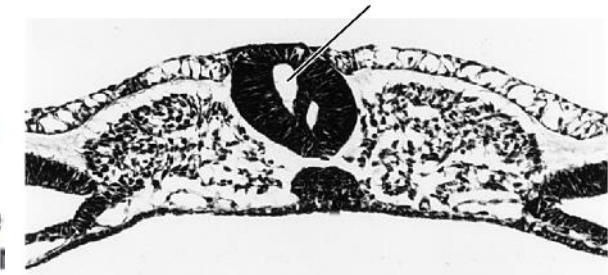
(A)



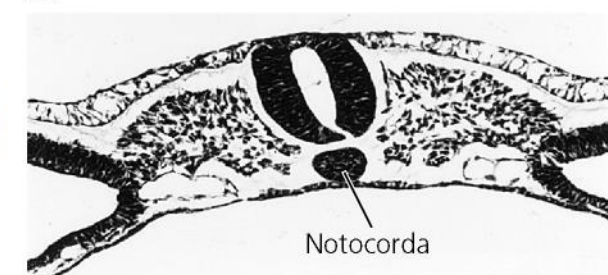
(B)

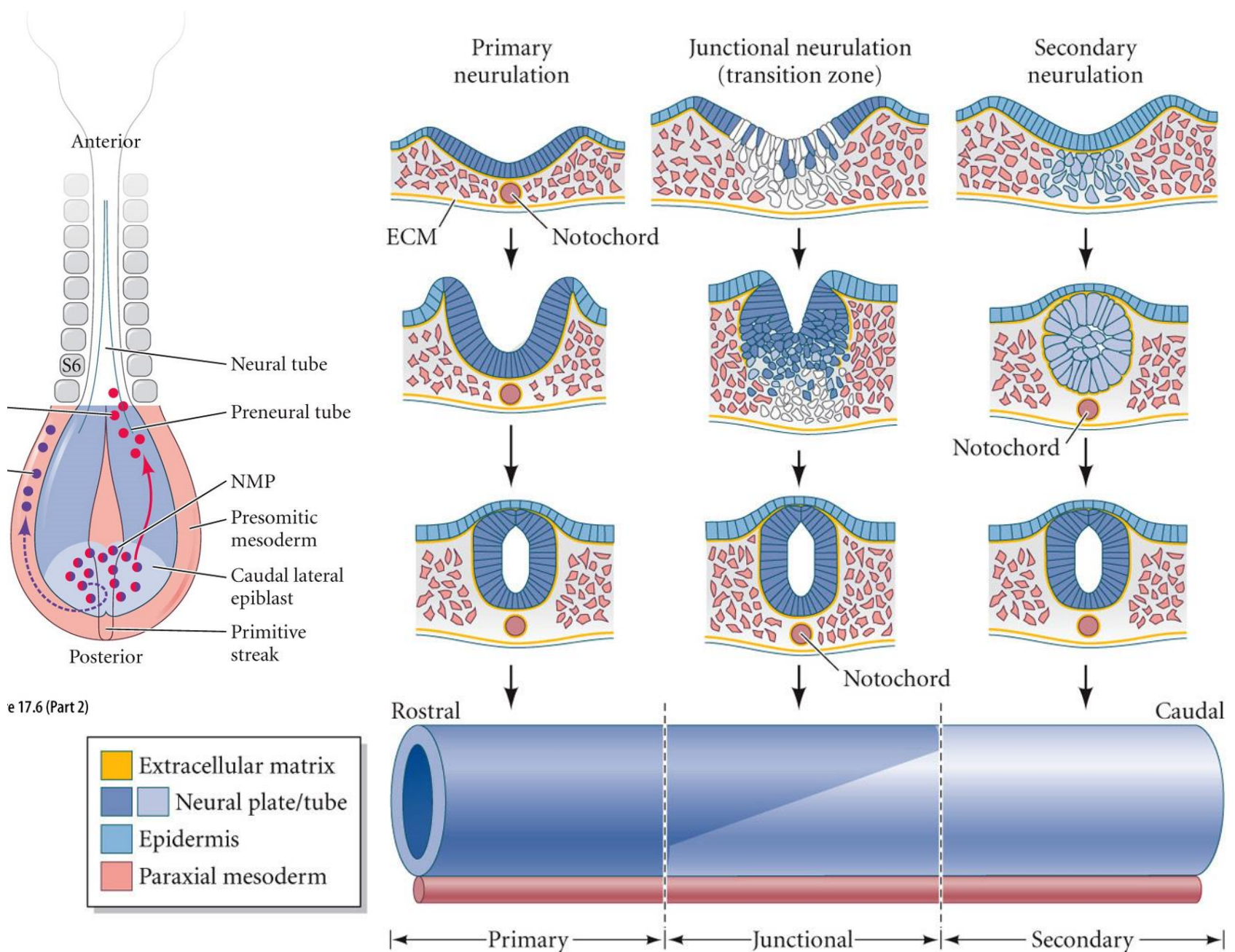


(C)



(D)





e 17.6 (Part 2)

FORMAZIONE DELLE VESCICOLE ENCEFALICHE

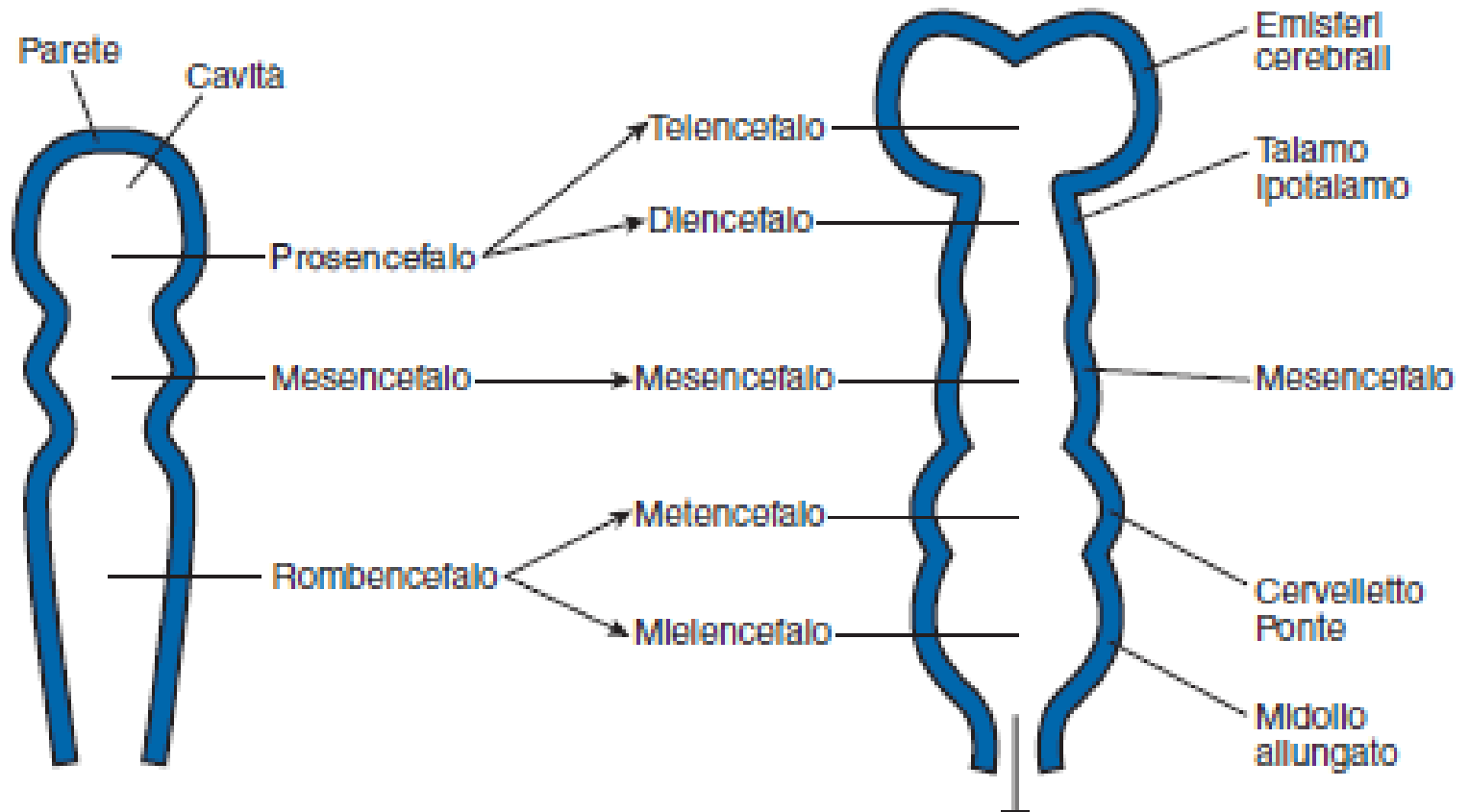


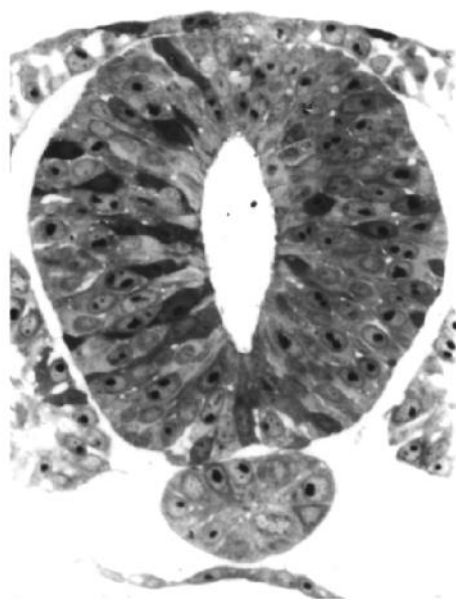
Figura 9

L'aumento del volume cerebrale e la formazione delle vescicole encefaliche sono dovuti alla pressione esercitata dai fluidi interni al tubo neurale

(A)



(B)



(D)

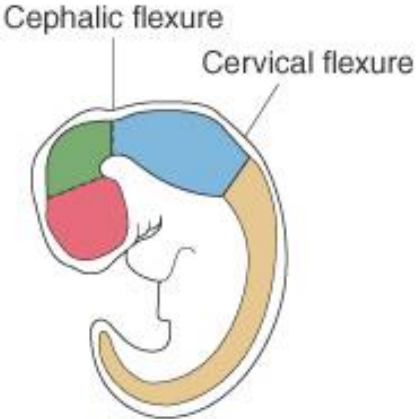


(C)

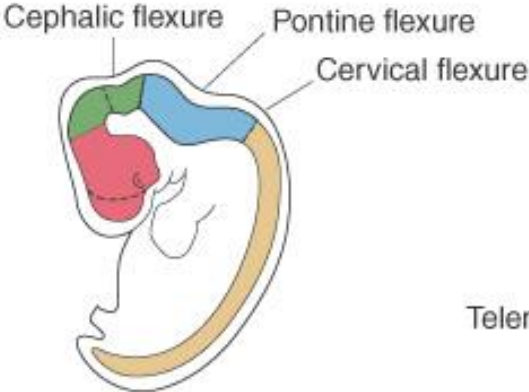


REGIONALIZZAZIONE ANTERO-POSTERIORE DEL SISTEMA NERVOSO

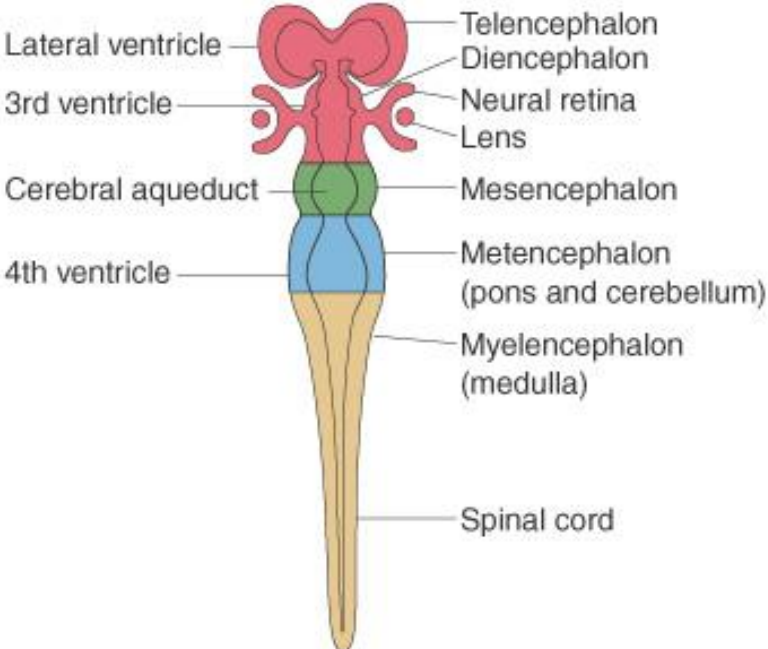
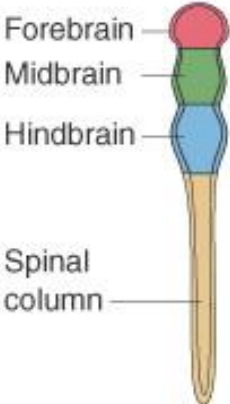
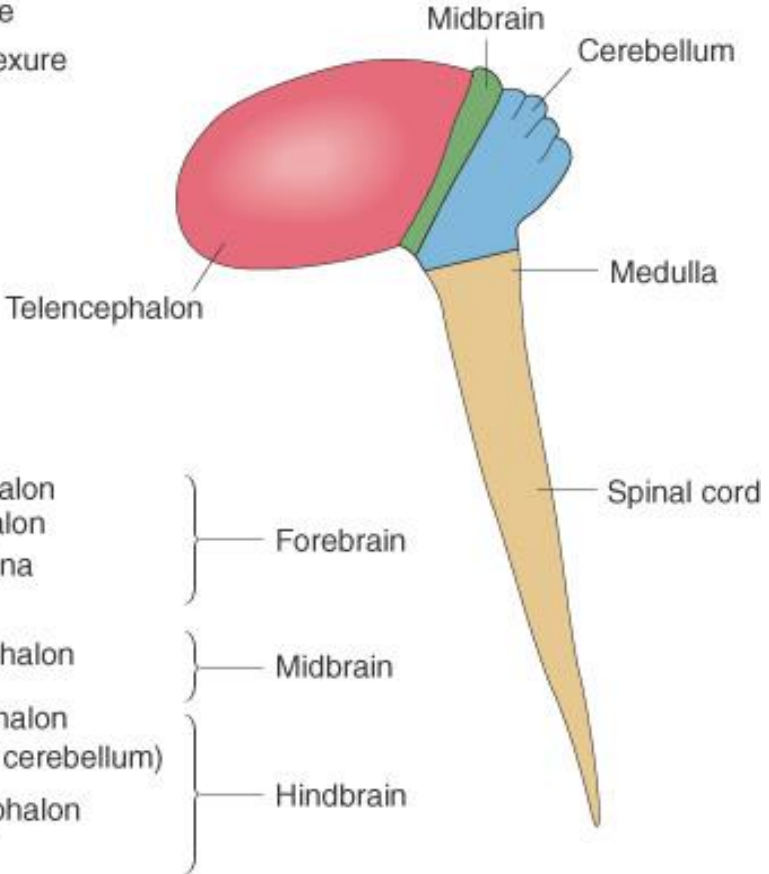
A



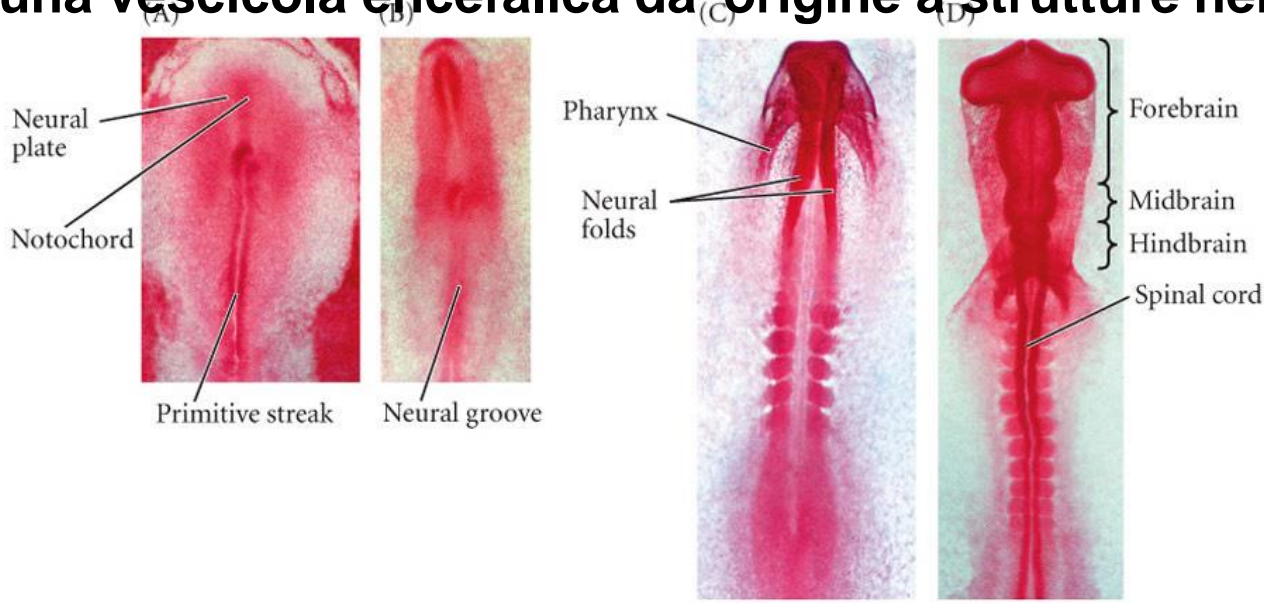
B



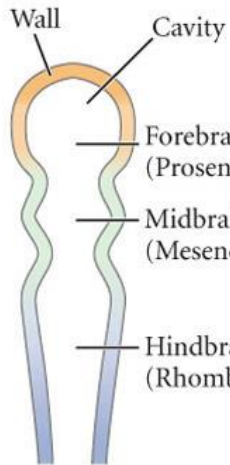
C Adult brain



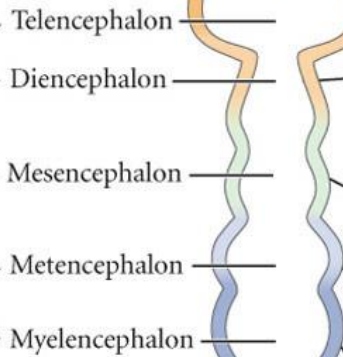
Ciascuna vescicola encefalica da' origine a strutture nervose specifiche



(E) Primary vesicles



Secondary vesicles



Spinal cord

Adult derivatives

Olfactory lobes	- Smell
Hippocampus	- Memory storage
Cerebrum	- Association ("intelligence")
Optic vesicle	- Vision (retina)
Epithalamus	- Pineal gland
Thalamus	- Relay center for optic and auditory neurons
Hypothalamus	- Temperature, sleep, and breathing regulation
Midbrain	- Temperature regulation, motor control, motivation, and emotional control
Cerebellum	- Coordination of complex muscular movements
Pons	- Fiber tracts between cerebrum and cerebellum
Medulla	- Reflex center of involuntary activities



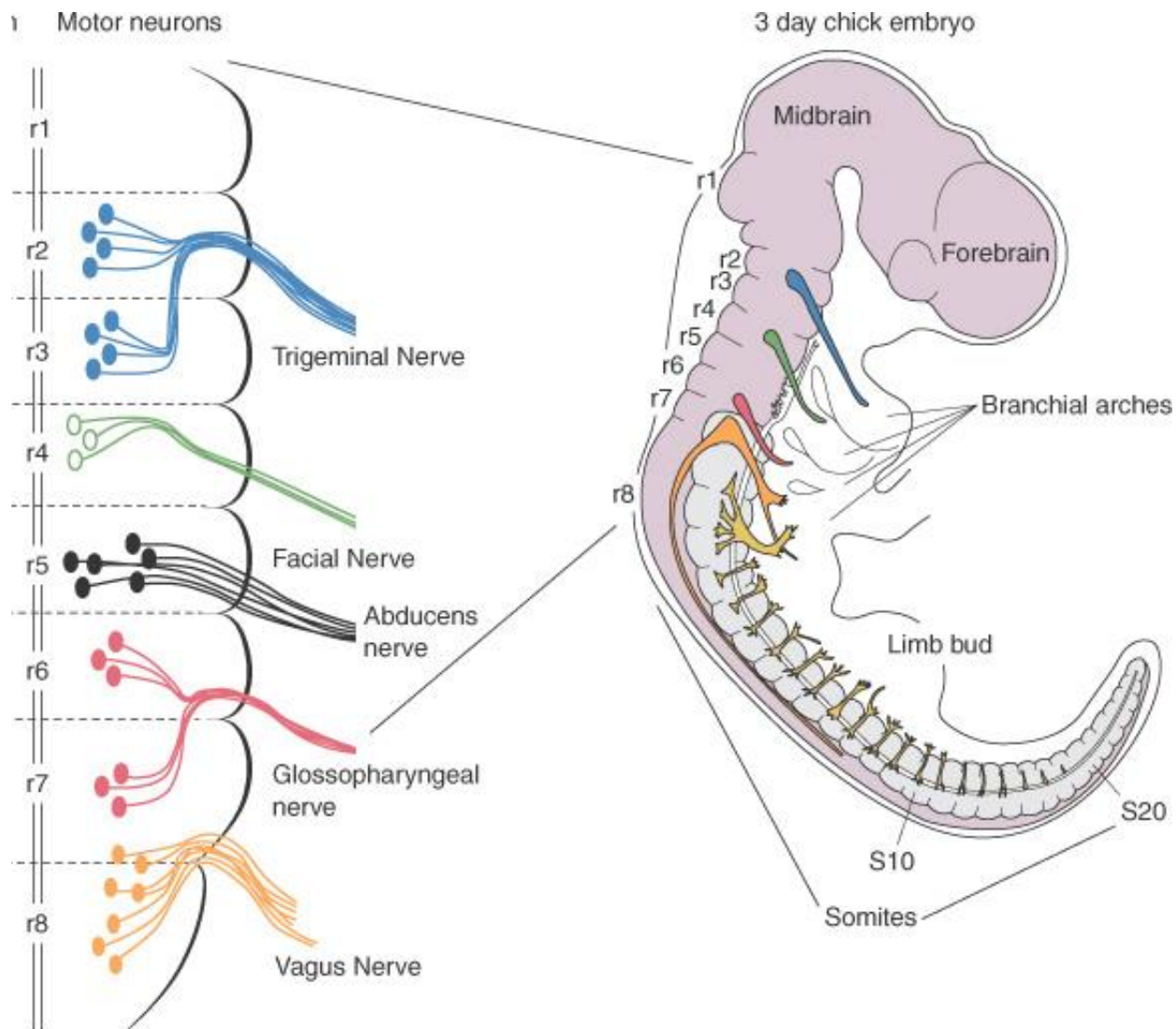
Rombomero 2

A black and white micrograph showing a vertical section of a vertebral column. The image displays three distinct vertebrae, each with a central body and a surrounding neural arch. The vertebrae are arranged in a slightly curved, descending order from top to bottom. The texture of the bone is visible, showing a porous, trabecular structure. Three white lines with black outlines point from text labels on the right to the corresponding vertebrae.

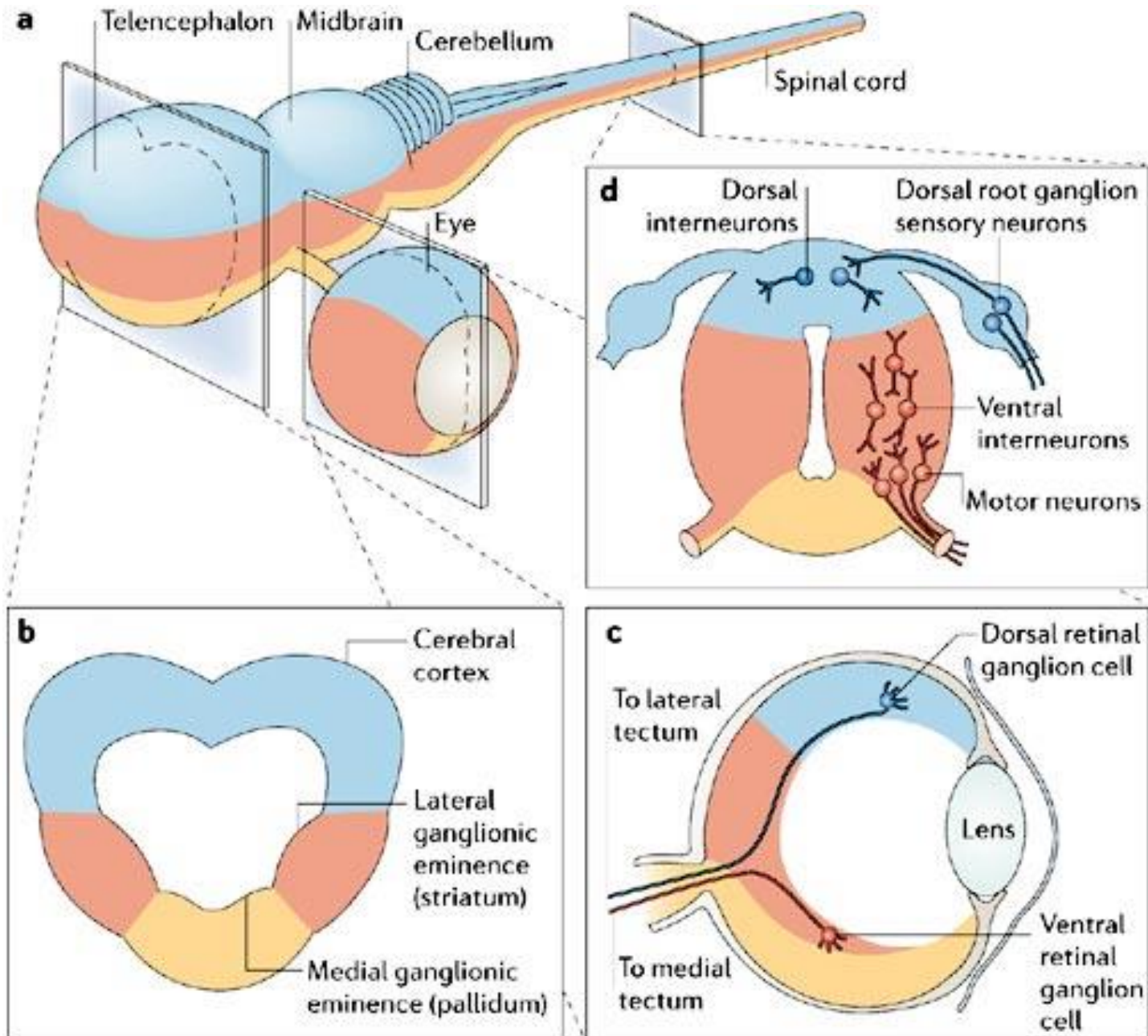
Rombomero 4

Rombomero 6

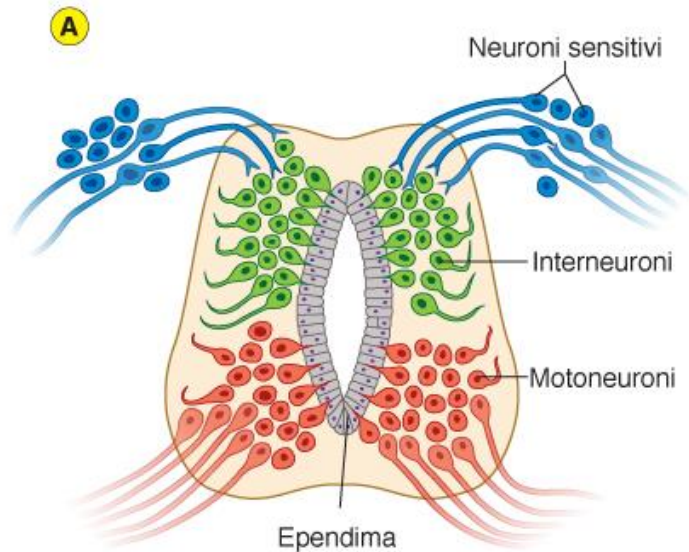
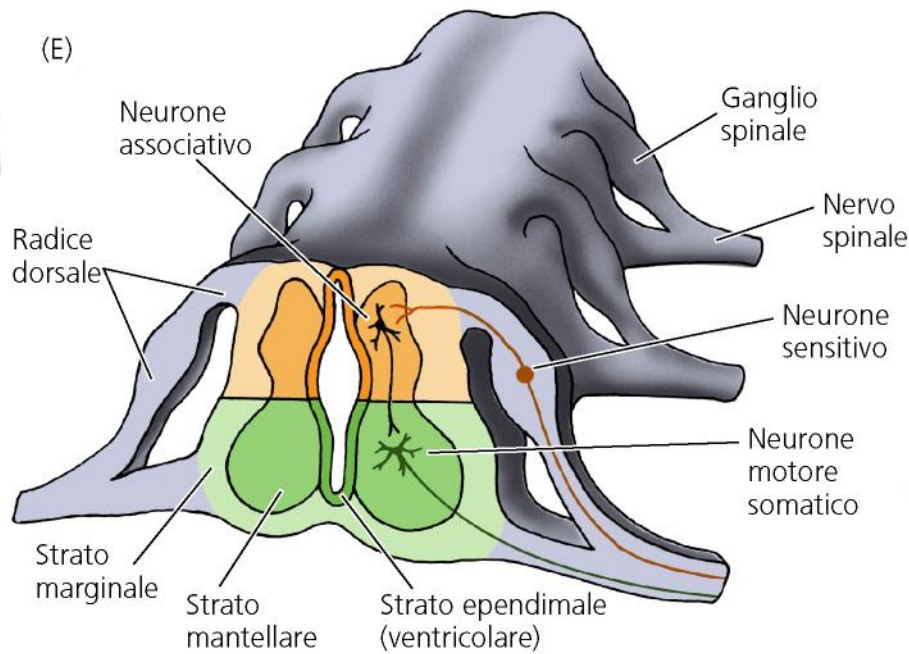
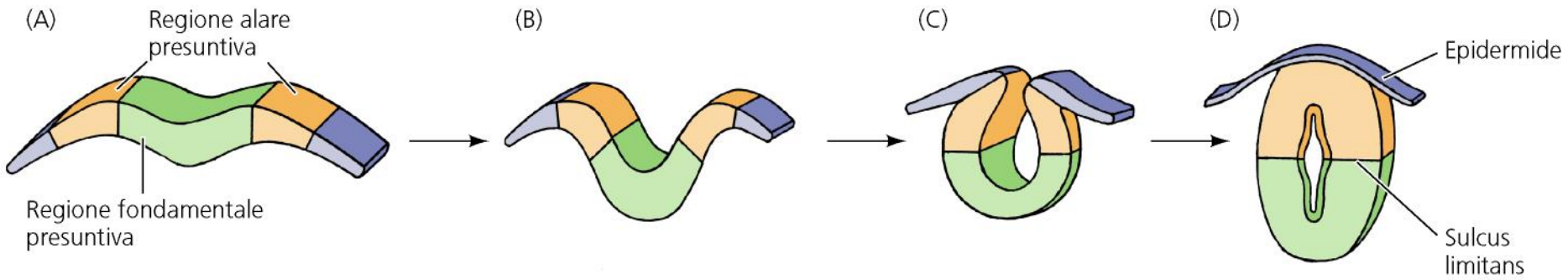
ORGANIZZAZIONE SEGMENTALE DEL ROMBOENCEFALO



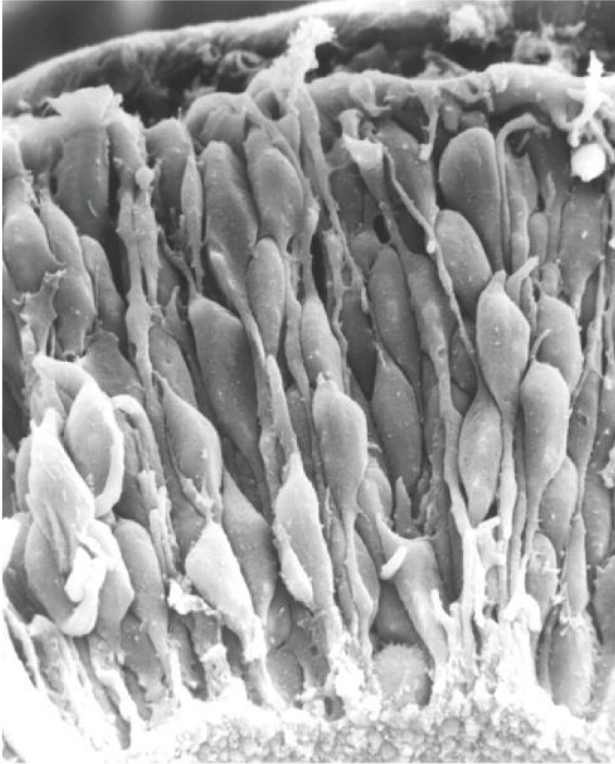
ORGANIZZAZIONE DORSO-VENTRALE DEL SISTEMA NERVOSO



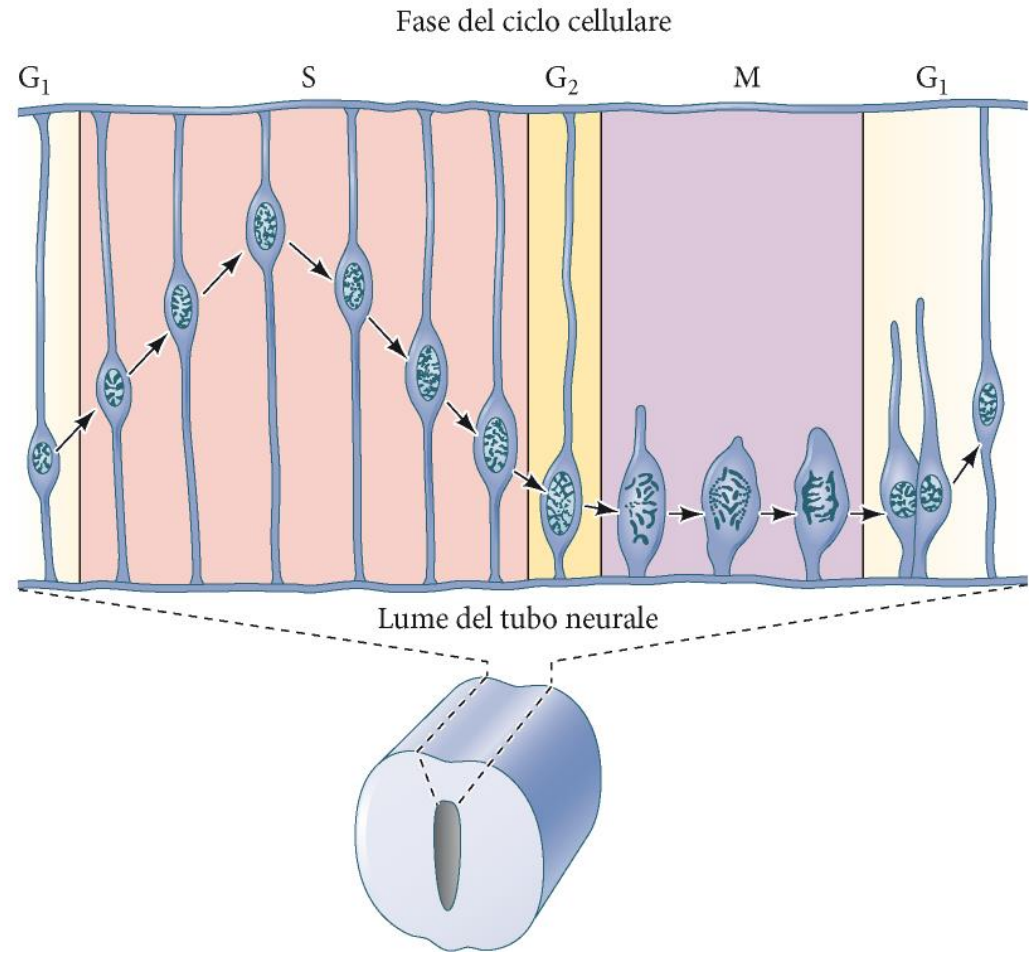
ORGANIZZAZIONE DORSO-VENTRALE DEL MIDOLLO SPINALE

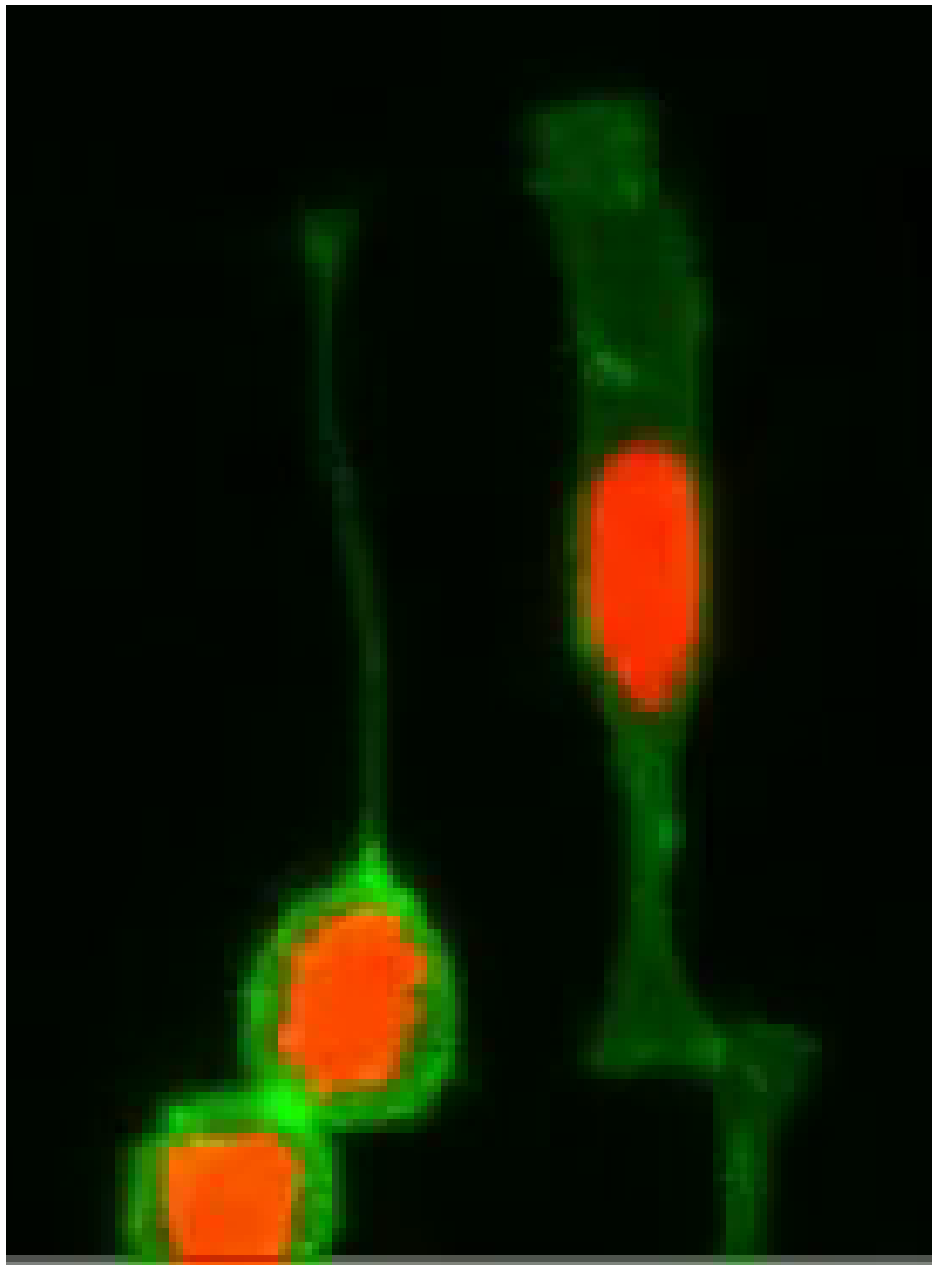


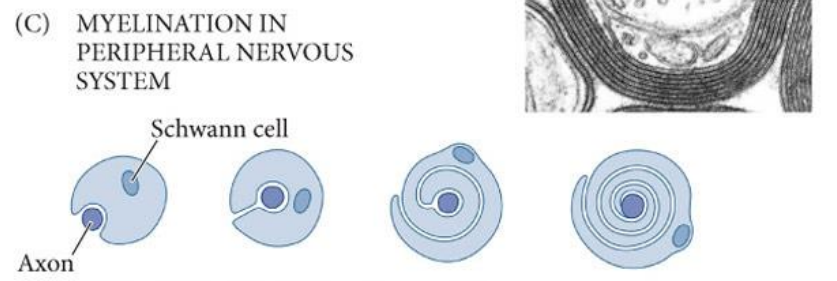
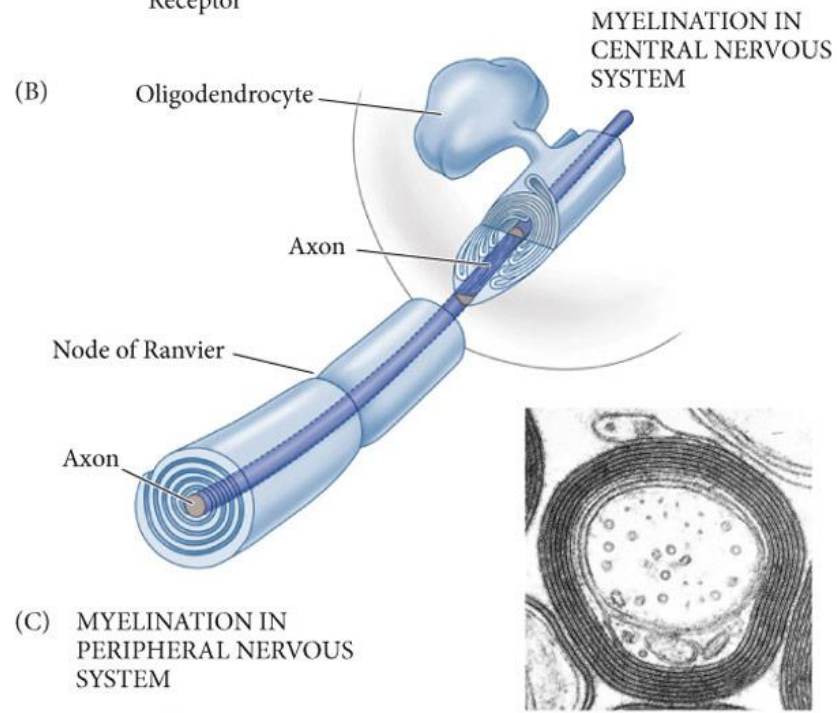
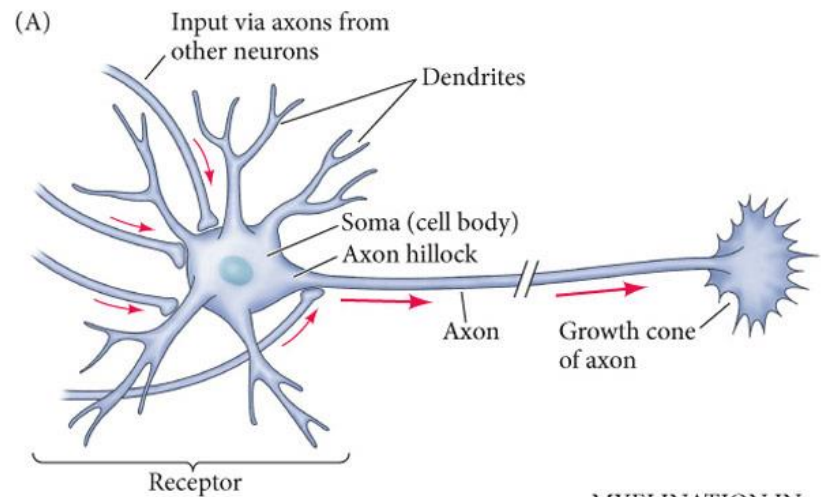
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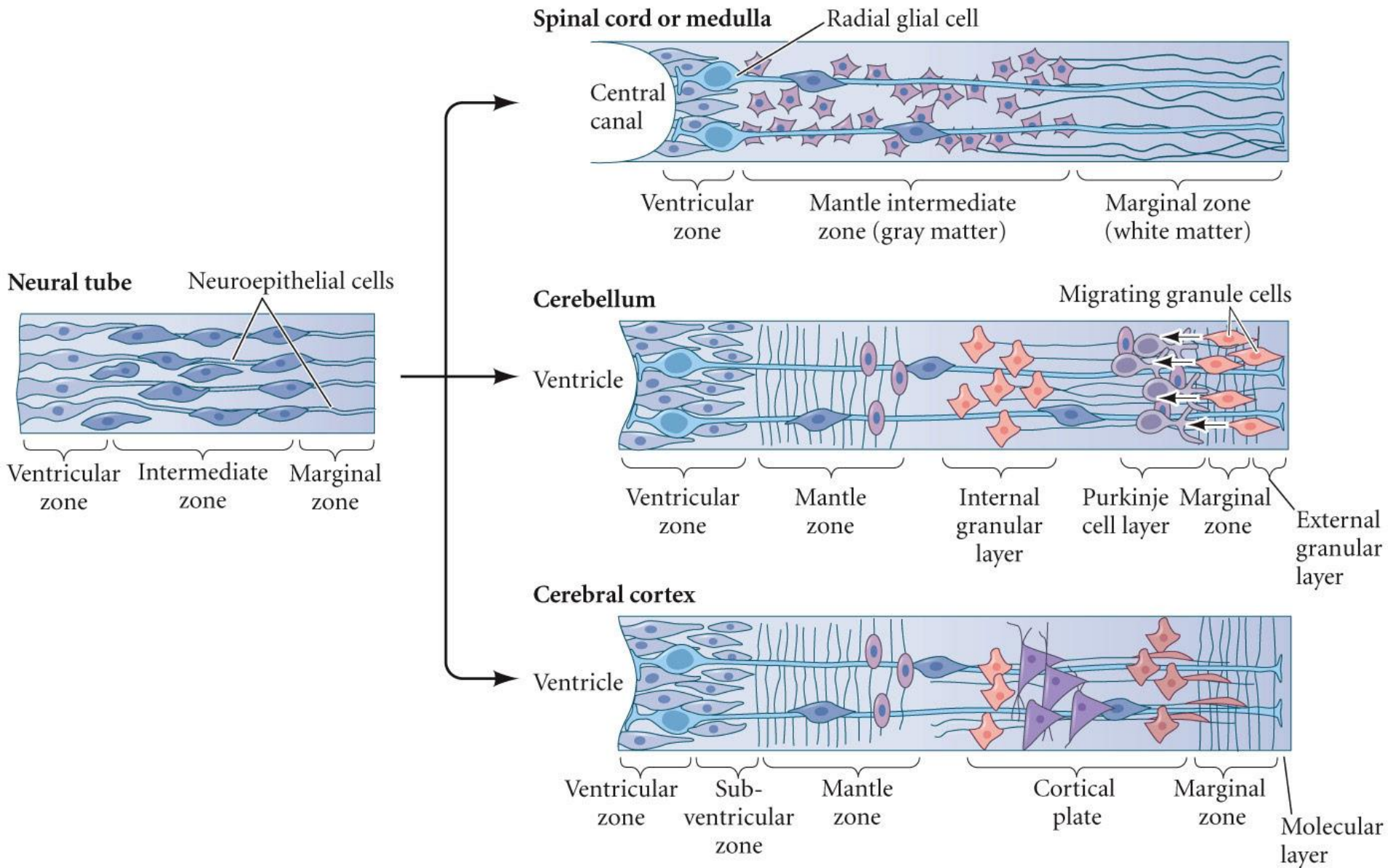


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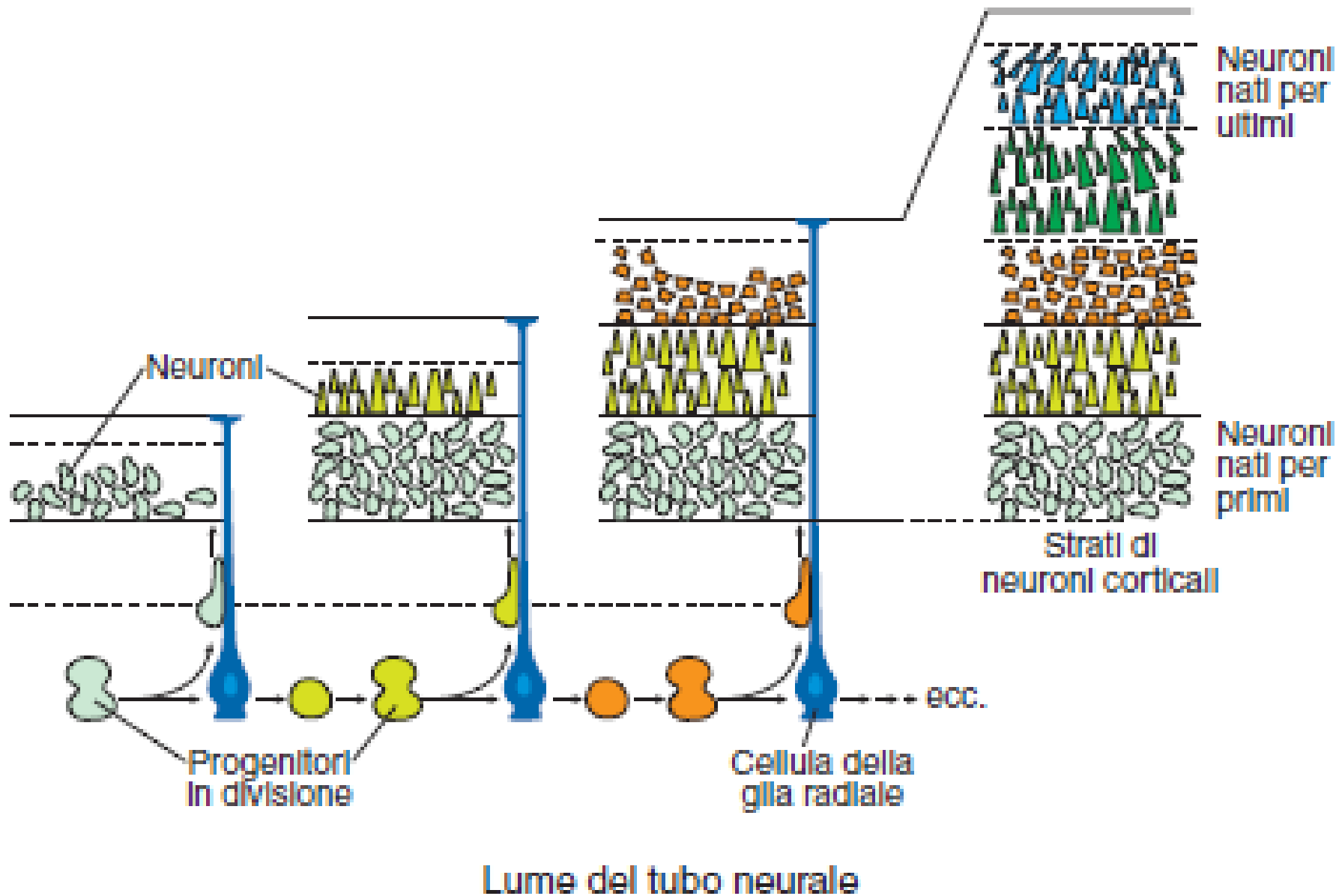




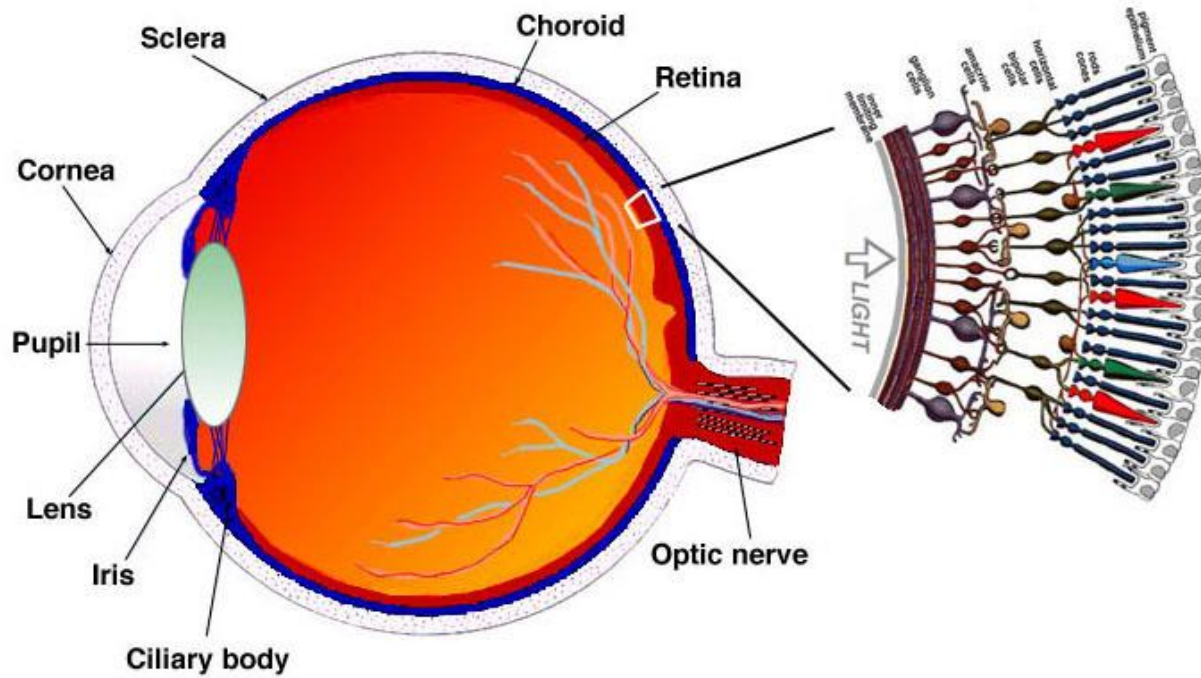




DEVELOPMENTAL BIOLOGY 11e, Figure 14.3
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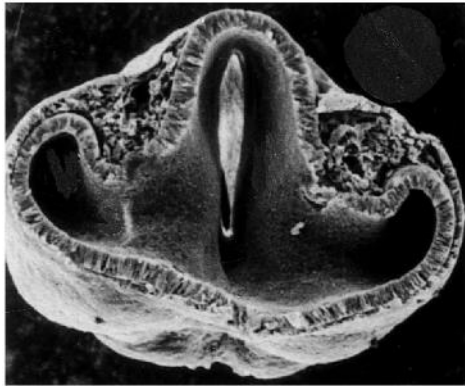


STRUTTURA ANATOMICA DELL'OCCHIO UMANO

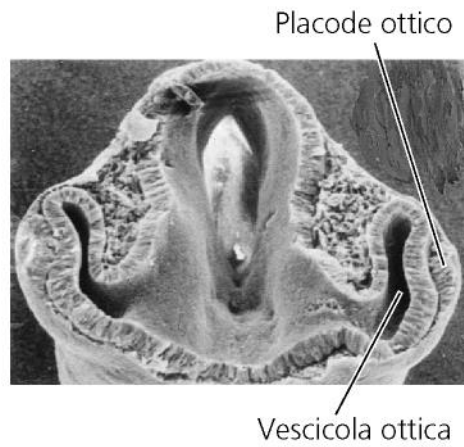


SVILUPPO DELL'OCCHIO

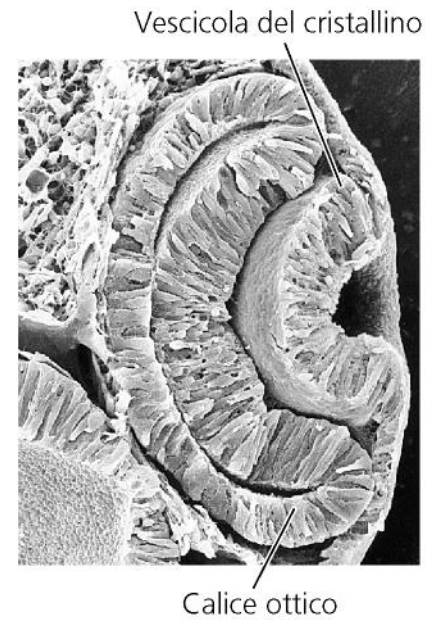
(A) Embrione di 4 mm



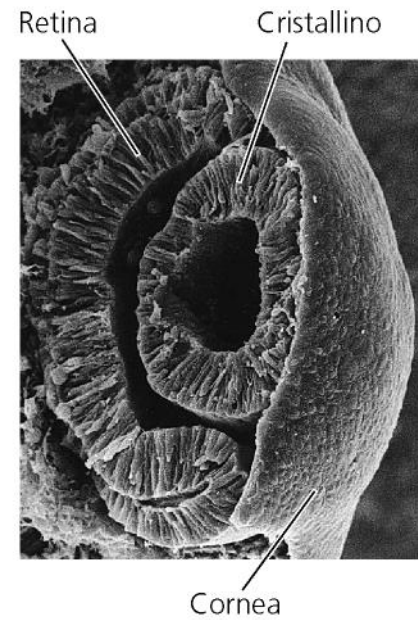
(B) Embrione di 4,5 mm



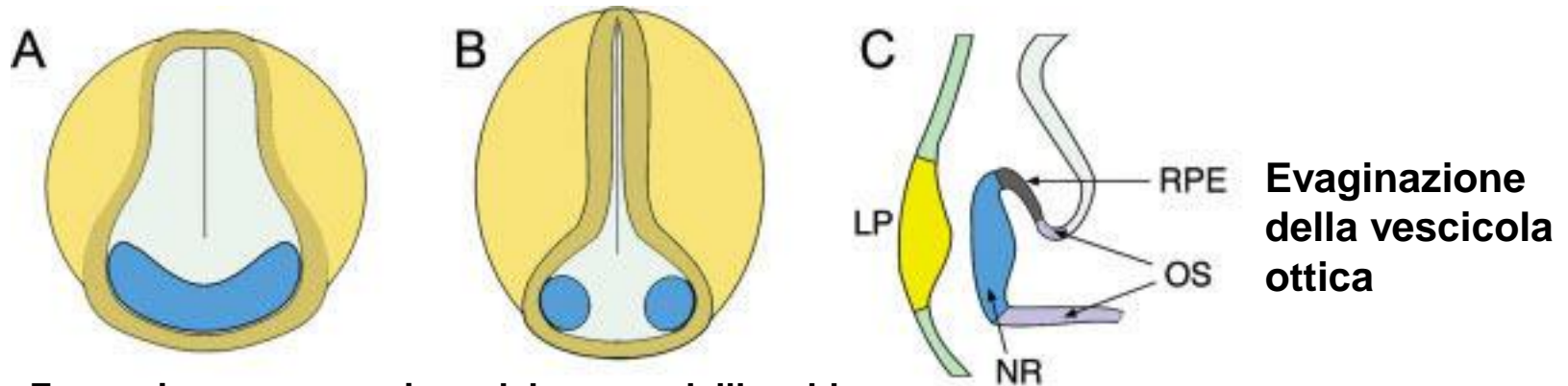
(C) Embrione di 5 mm



(D) Embrione di 7 mm

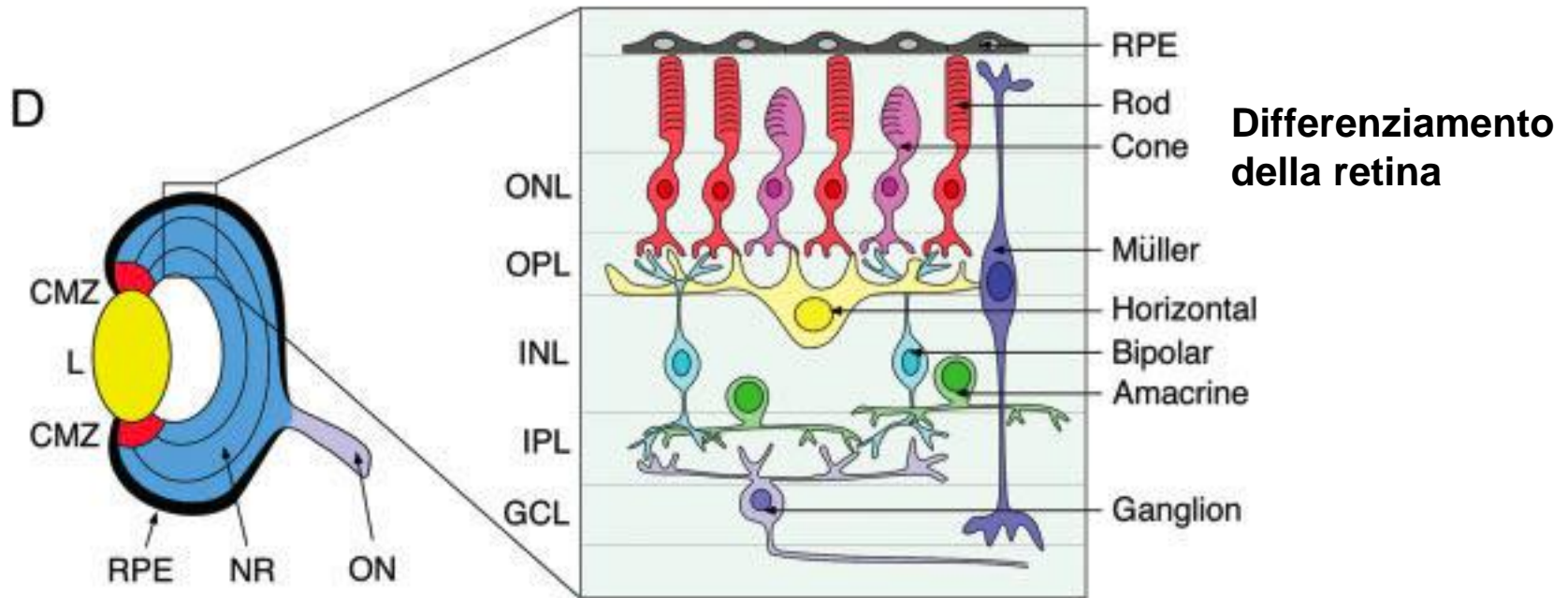


TAPPE FONDAMENTALI NELLO SVILUPPO DELL'OCCHIO



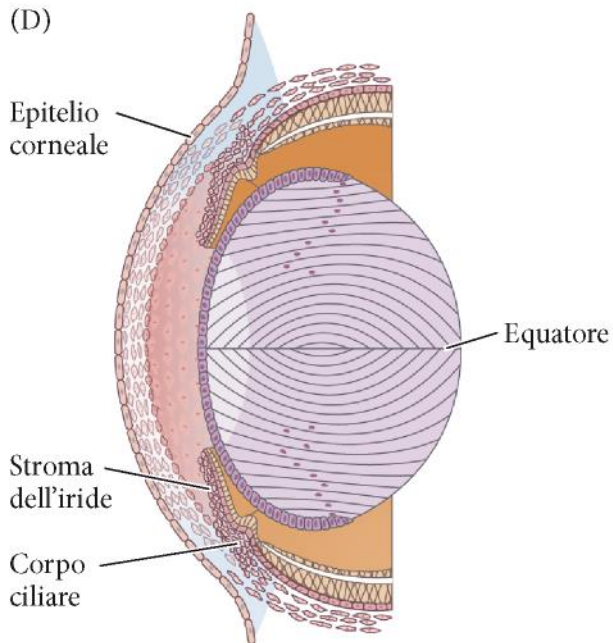
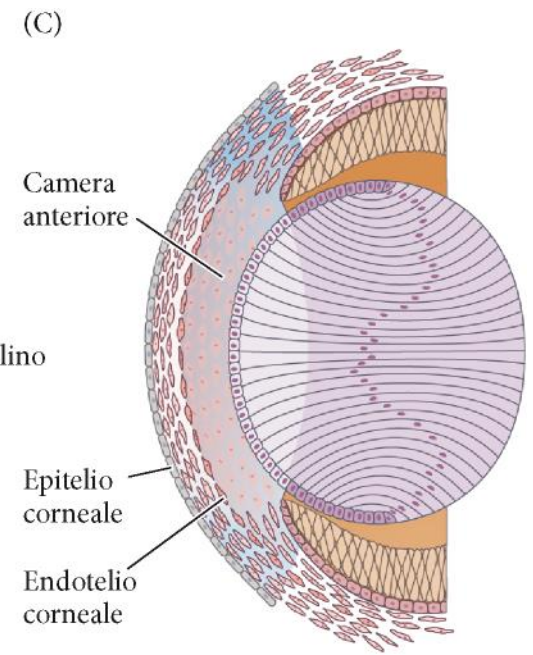
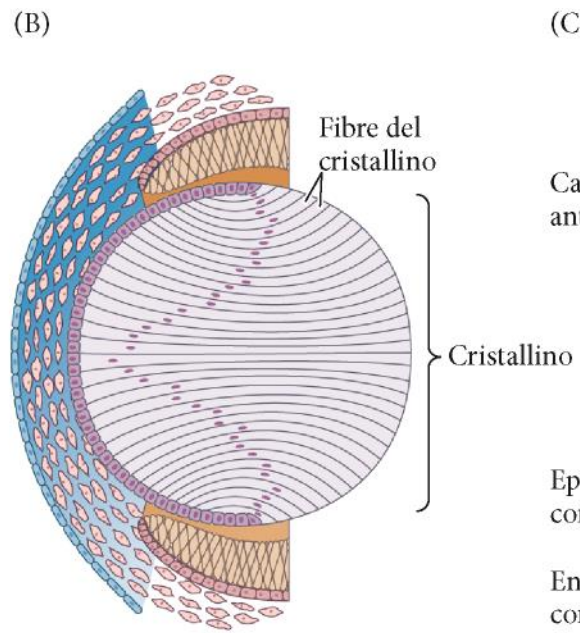
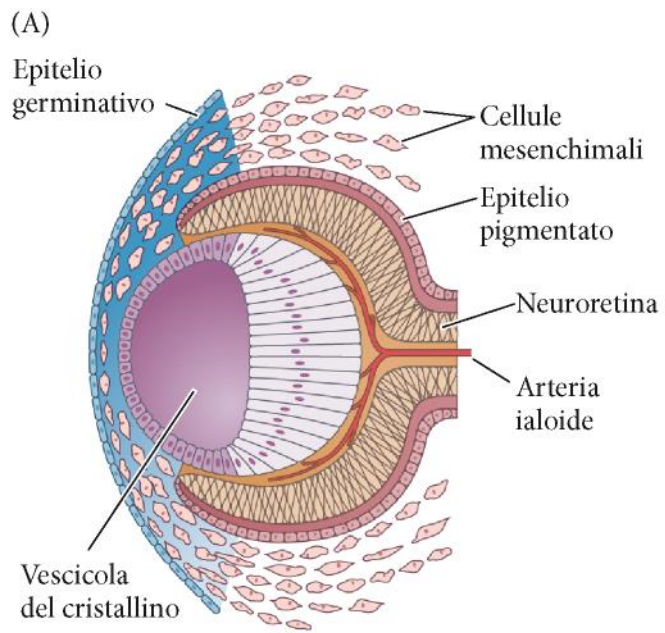
Evaginazione della vescicola ottica

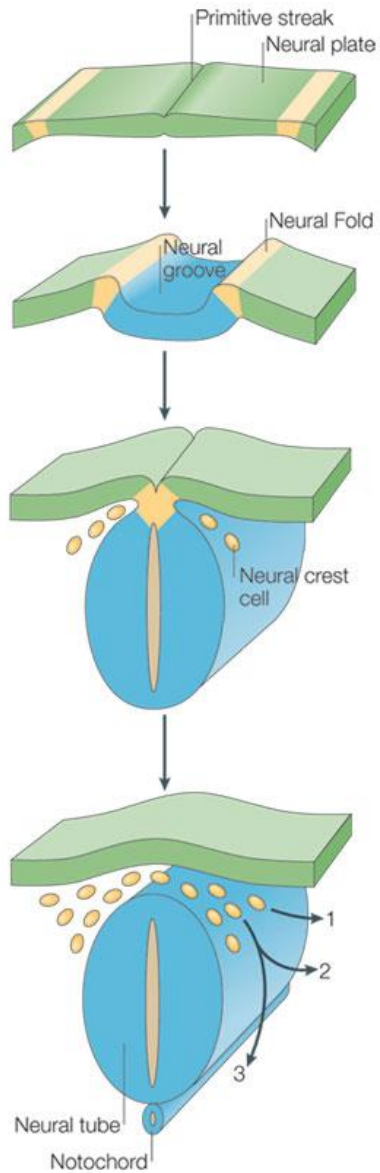
Formazione e separazione del campo dell'occhio



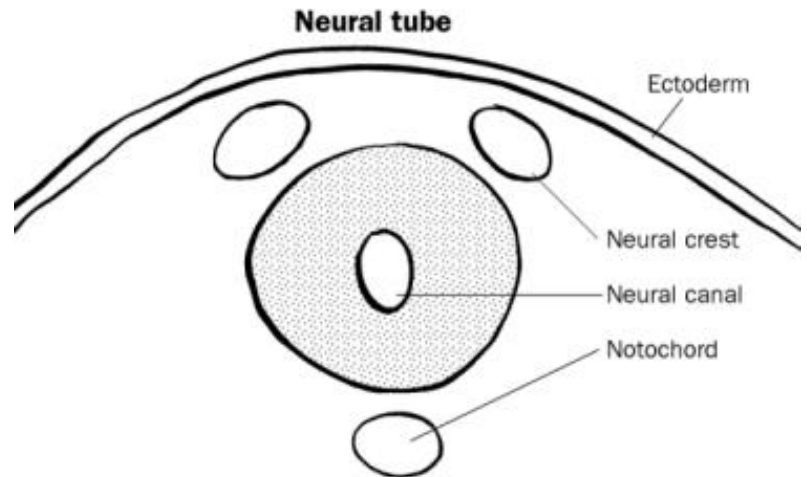
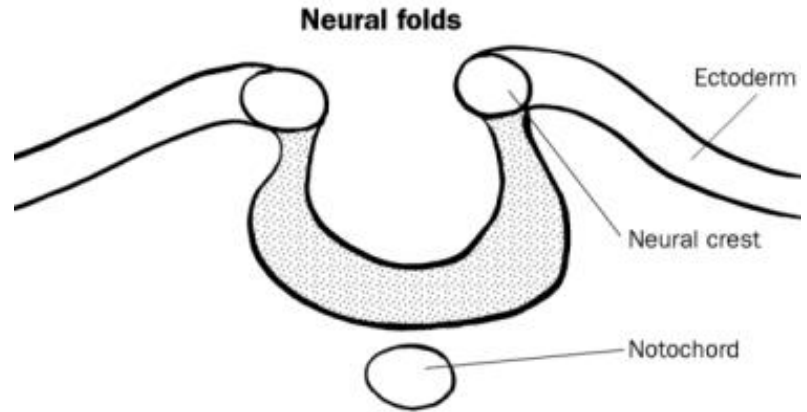
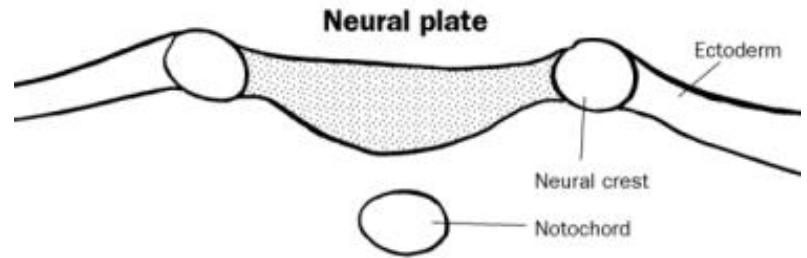
Differenziamento della retina

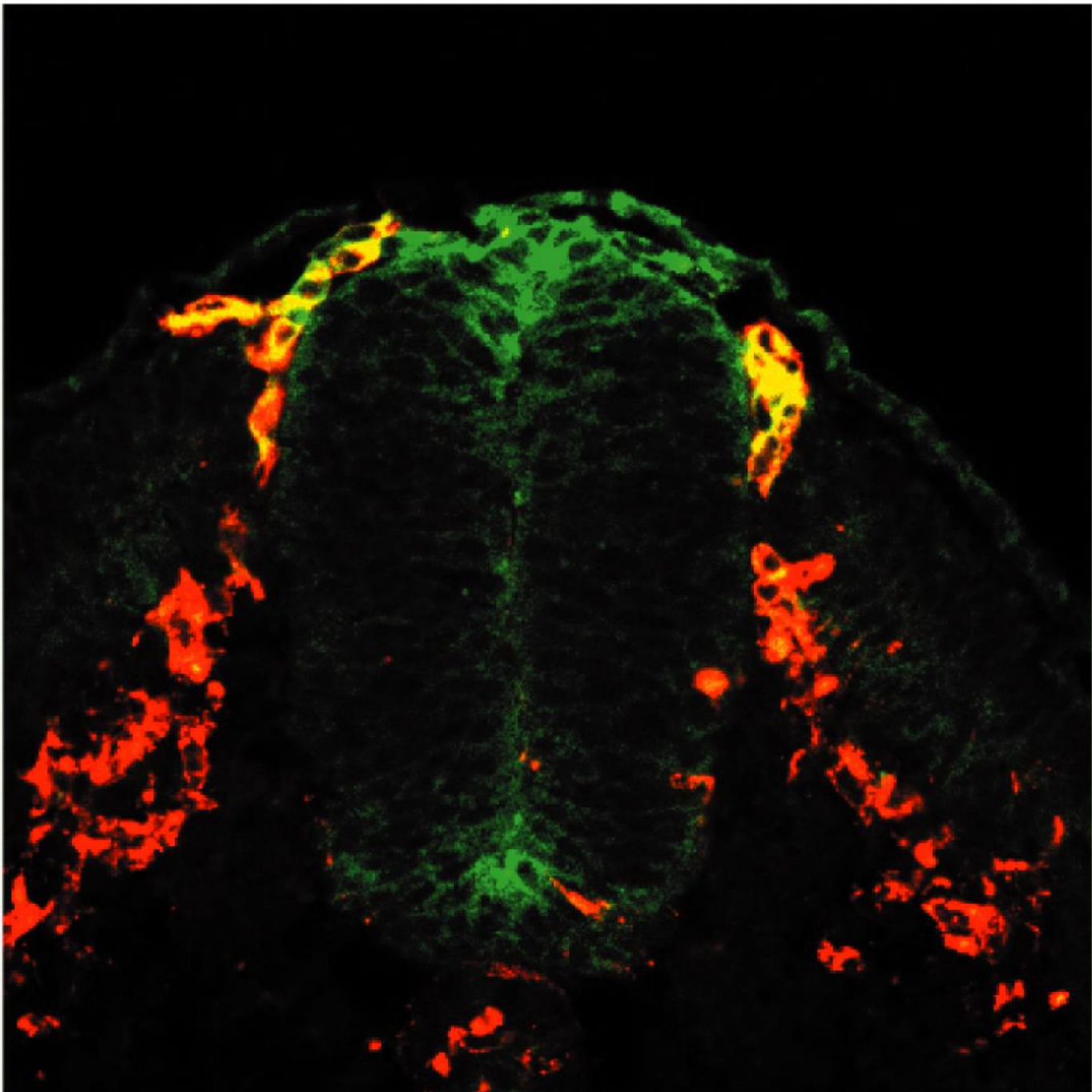
Invaginazione della coppa ottica



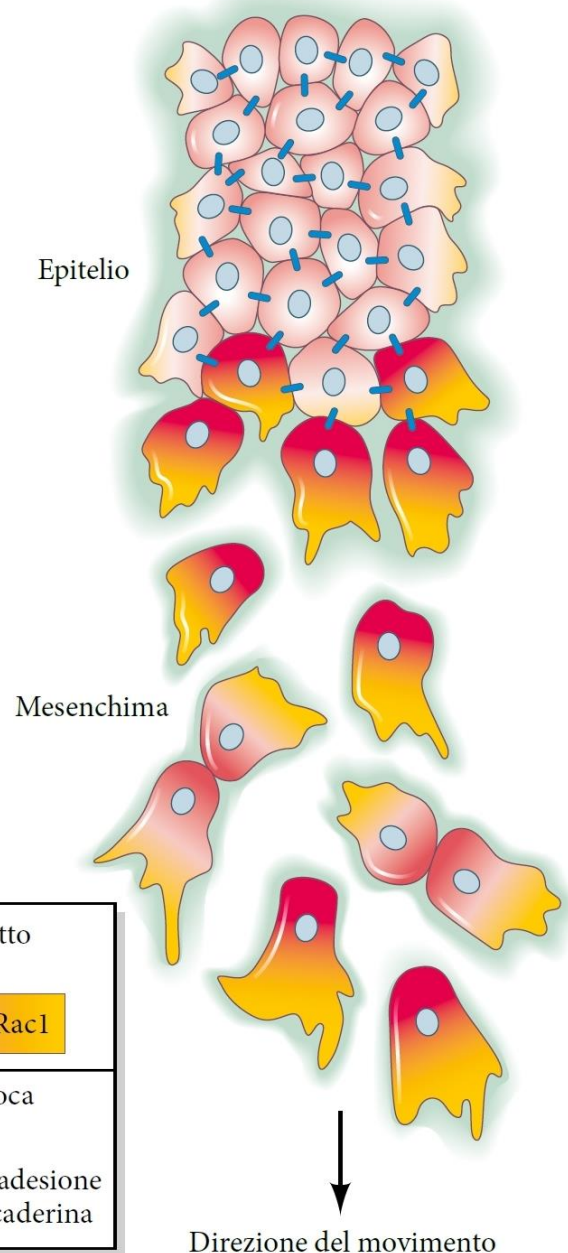
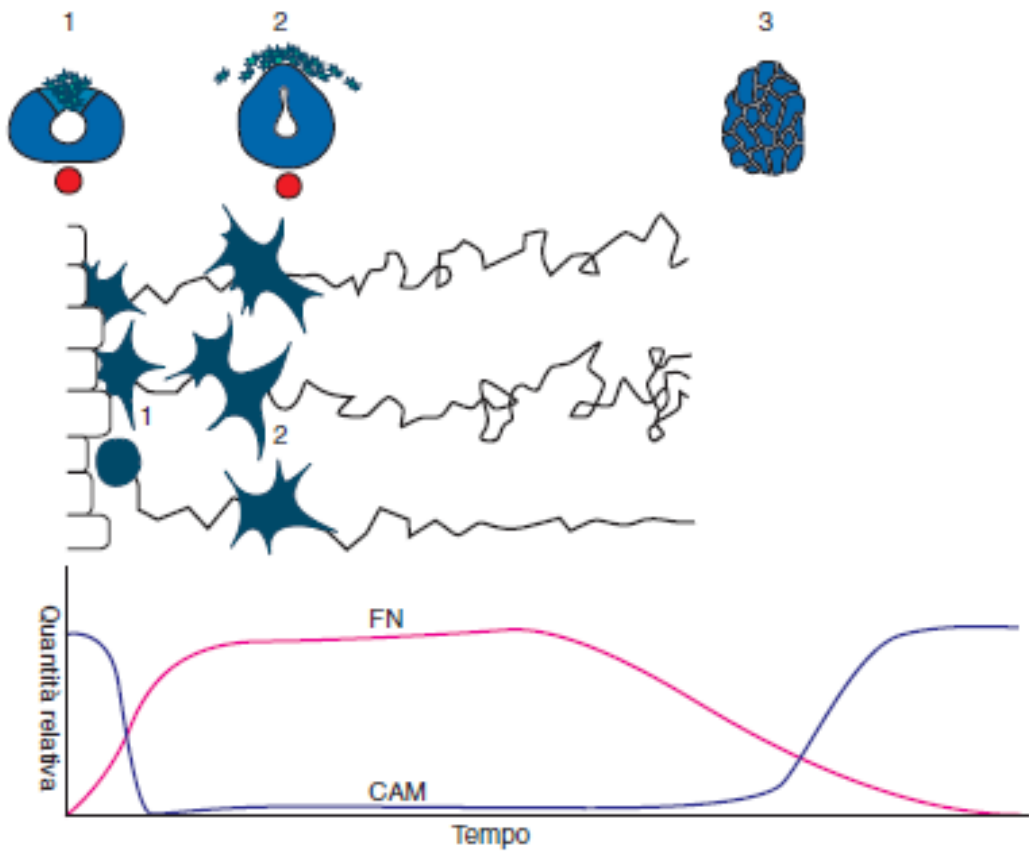


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La migrazione delle creste neurali e' modulata da cambiamenti nell'espressione di molecole di adesione, da segnali chemiotattici, dalla matrice extra-cellulare e da interazioni fra le cellule delle creste



I derivati cellulari delle creste neurali

TABELLA 1

Principali derivati della cresta neurale

Gangli spinali	Neuroni sensoriali peptidergici
Gangli simpatici	Neuroni adrenergici,
Gangli parasimpatici	Neuroni colinergici
Cellule gliali	Satelliti e cellule di Schwann
Strutture endocrine	Cellule cromaffini della midollare del surrene Cellule secernenti calcitonina
Tegumento	Melanociti
Scheletro craniofacciale	Condroblasti ed osteoblasti
Derivati connettivali	Connettivo di timo, tiroide e paratiroide
Papille dentarie	Odontoblasti
Connettivo e muscolatura di grandi arterie	

- Sistema nervoso periferico:
 - gangli spinali
 - gangli simpatici
 - gangli parasimpatici
 - Cellule di Schwann
- Cellule pigmentate:
 - melanociti
- Derivati endocrini:
 - midollare del surrene
- Derivati mesenchimali:
 - cartilagine ed ossa della faccia
- Derivati connettivali:
 - connettivo e muscolatura delle arterie
 - connettivo della cornea

SISTEMA NERVOSO PERIFERICO

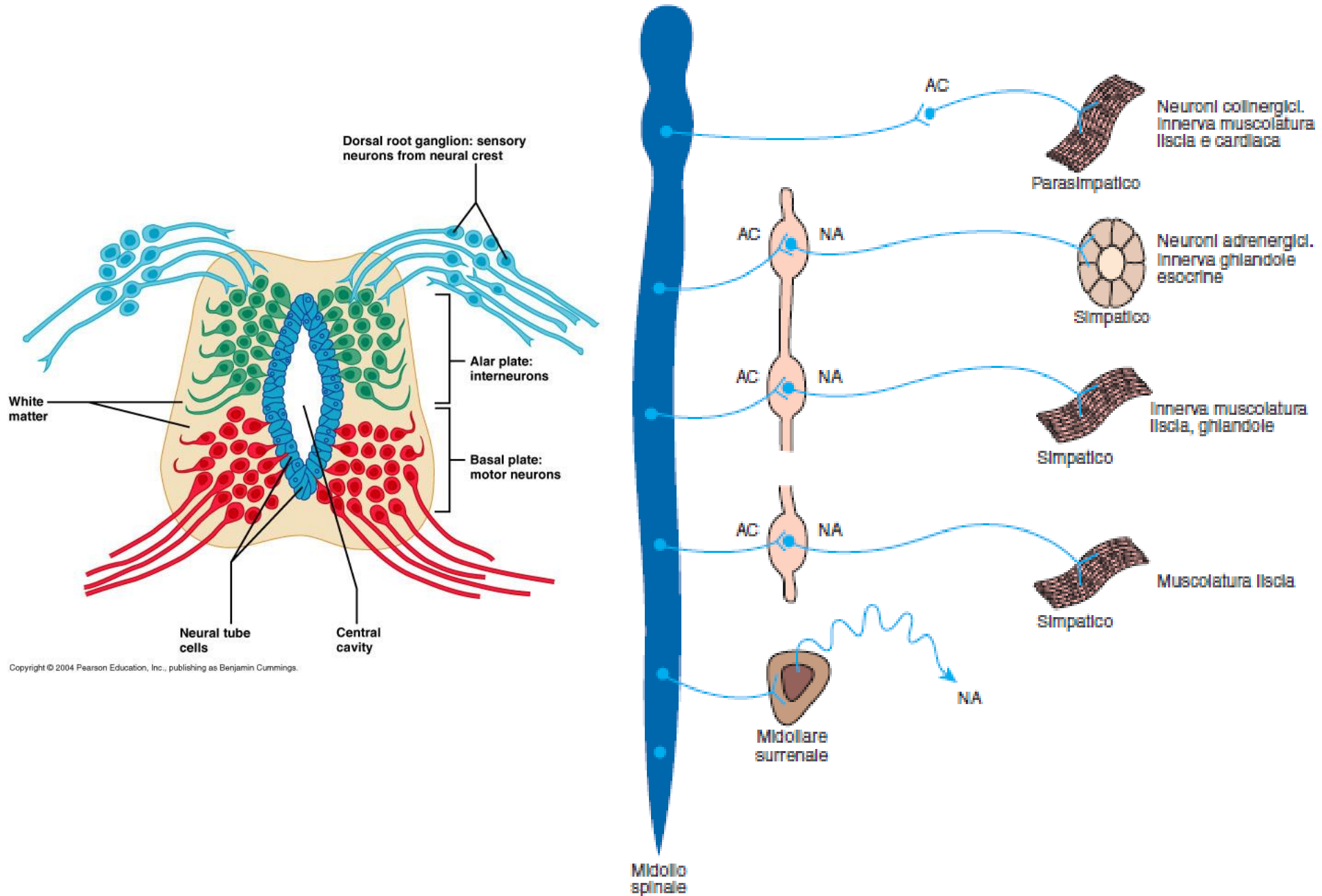
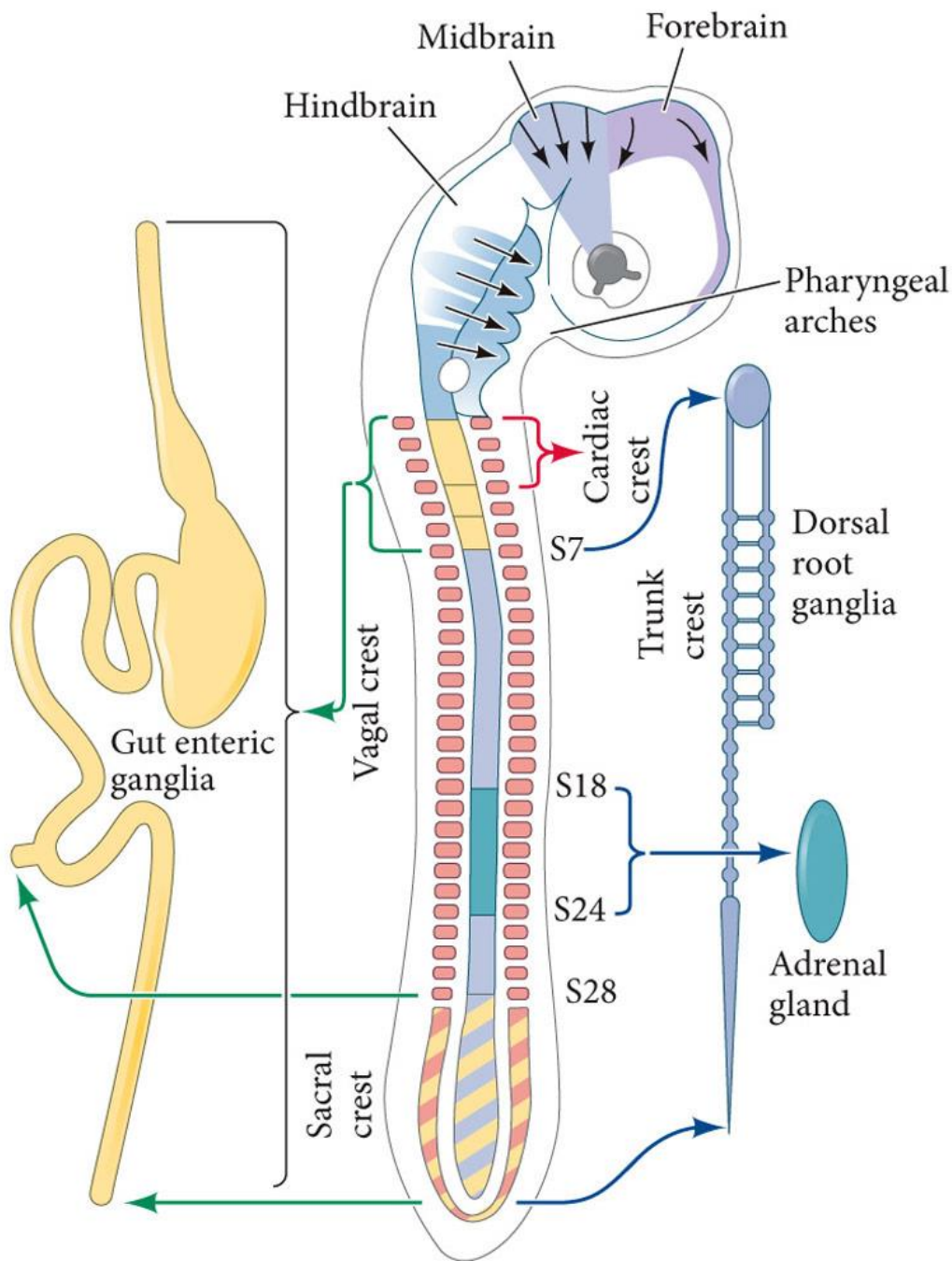


Figura 1



Cresta cefalica – mesenchima craniofacciale, gangli dei nervi cranici

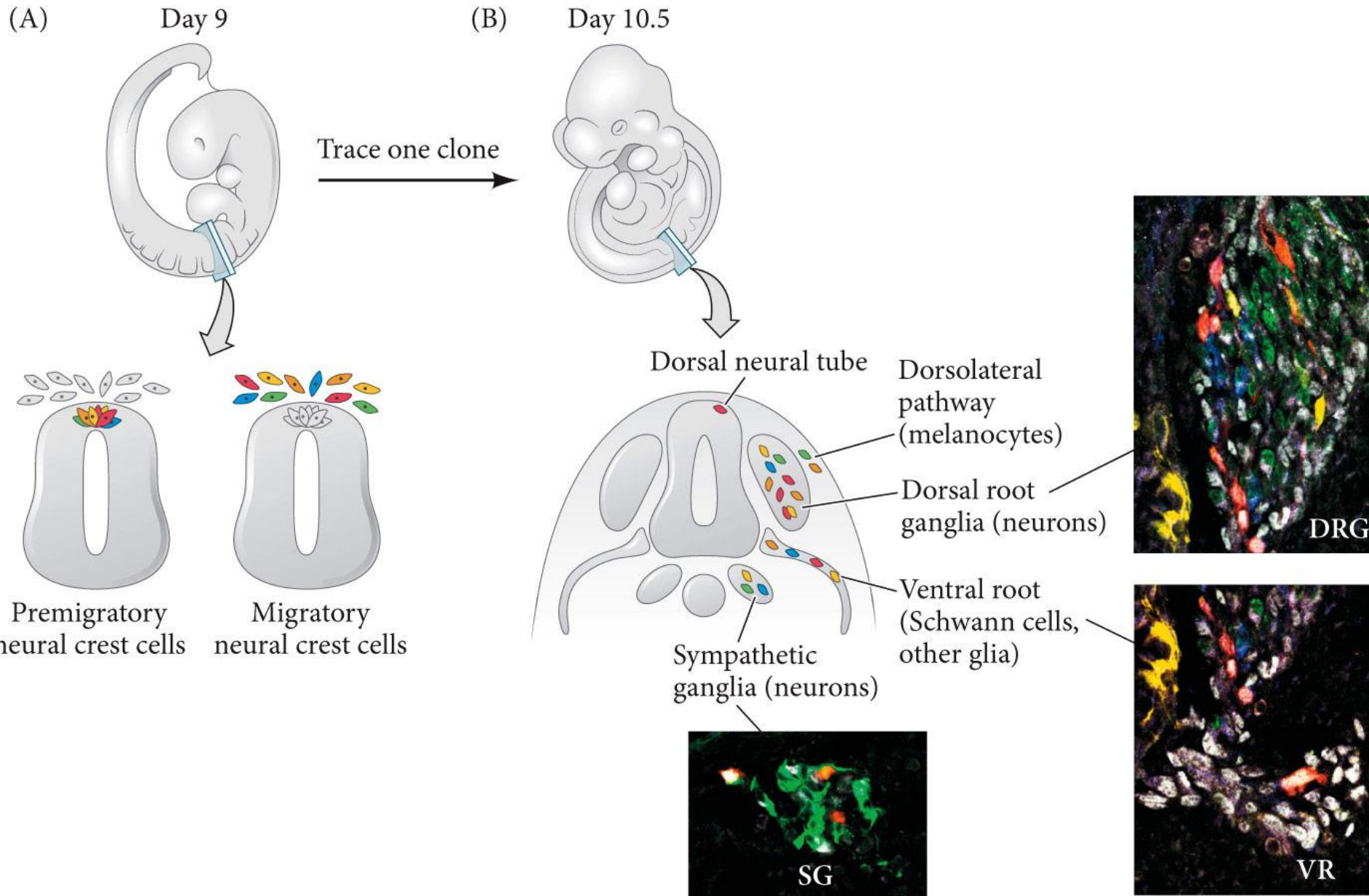
Cresta vagale – gangli parasimpatici

Cresta cardiaca – melanociti, tessuto muscolo-connettivale delle grandi arterie

Cresta del tronco – melanociti, gangli simpatici e spinali

Cresta sacrale – gangli parasimpatici

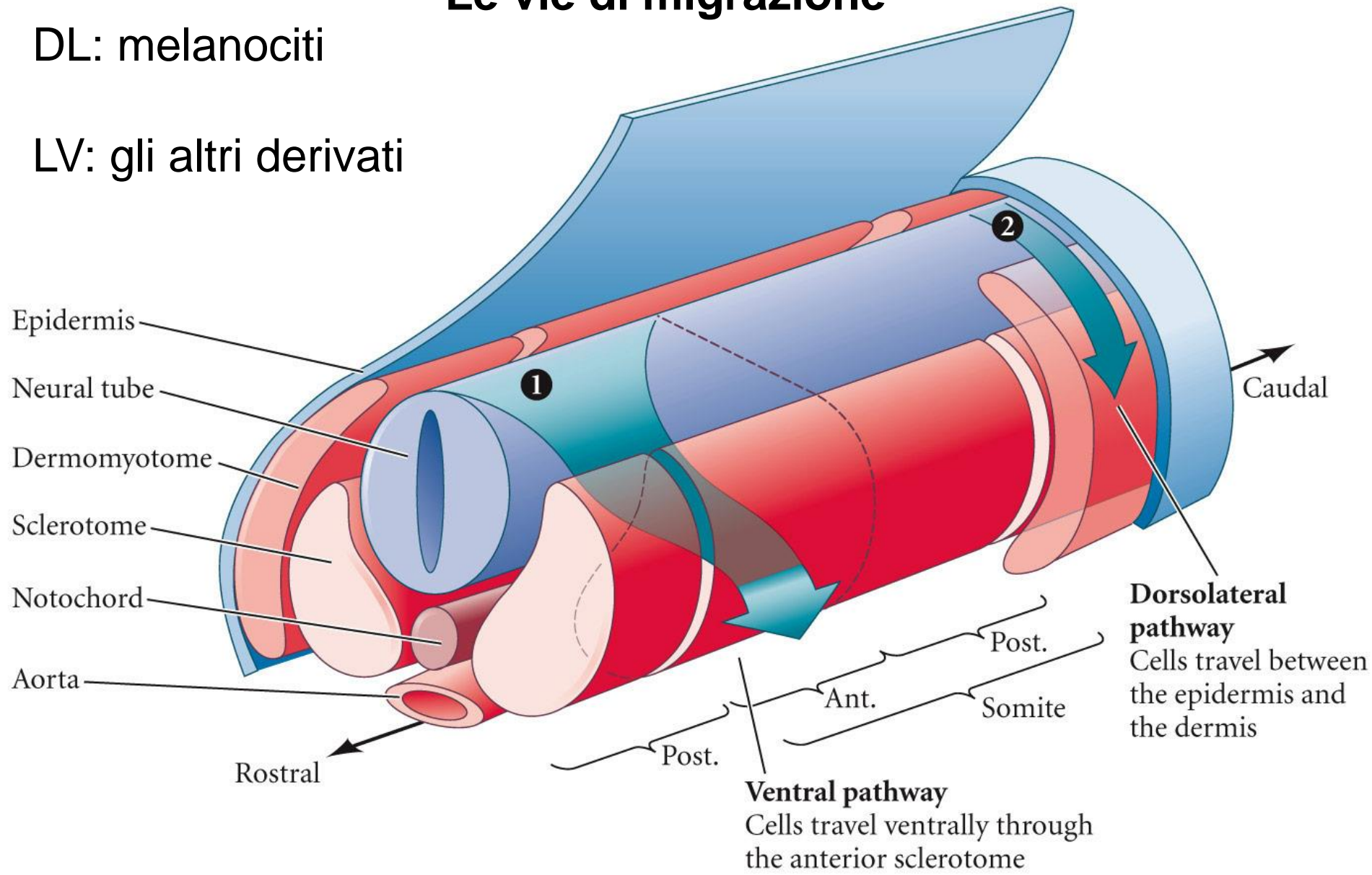
MULTIPOTENZA DELLE CELLULE DELLE CRESTE NEURALI



Le vie di migrazione

DL: melanociti

LV: gli altri derivati



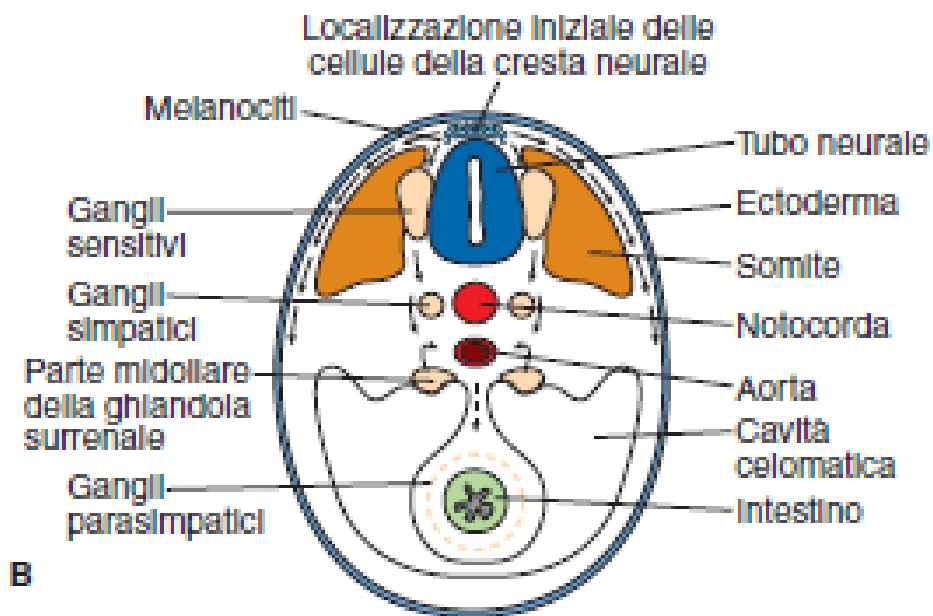
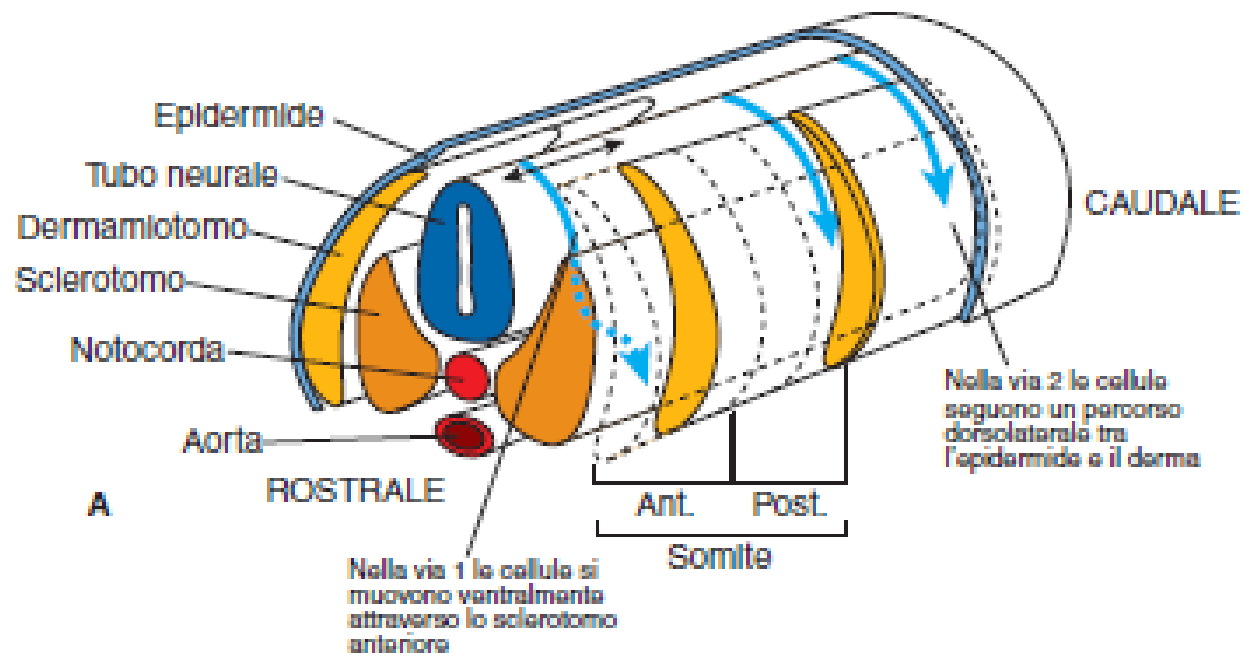


Figura 14

Physical barriers Long-range guidance cues

Pathfinding axon

Growth substrate

Collective migration of neural crest cells

Individually migrating neural crest cell

Growth substrate

Local guidance cue

