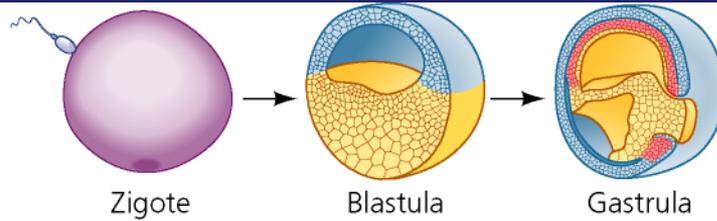


Derivati dei foglietti embrionali



Zigote

Blastula

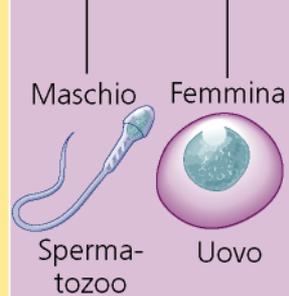
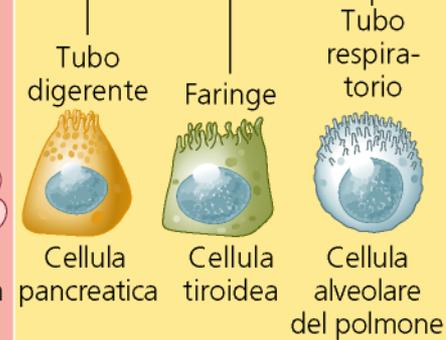
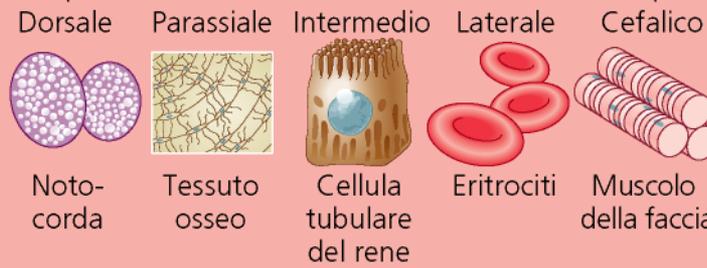
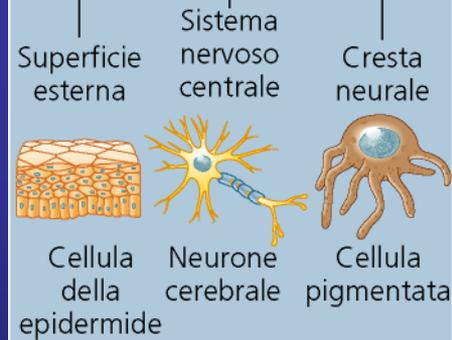
Gastrula

Ectoderma (foglietto esterno)

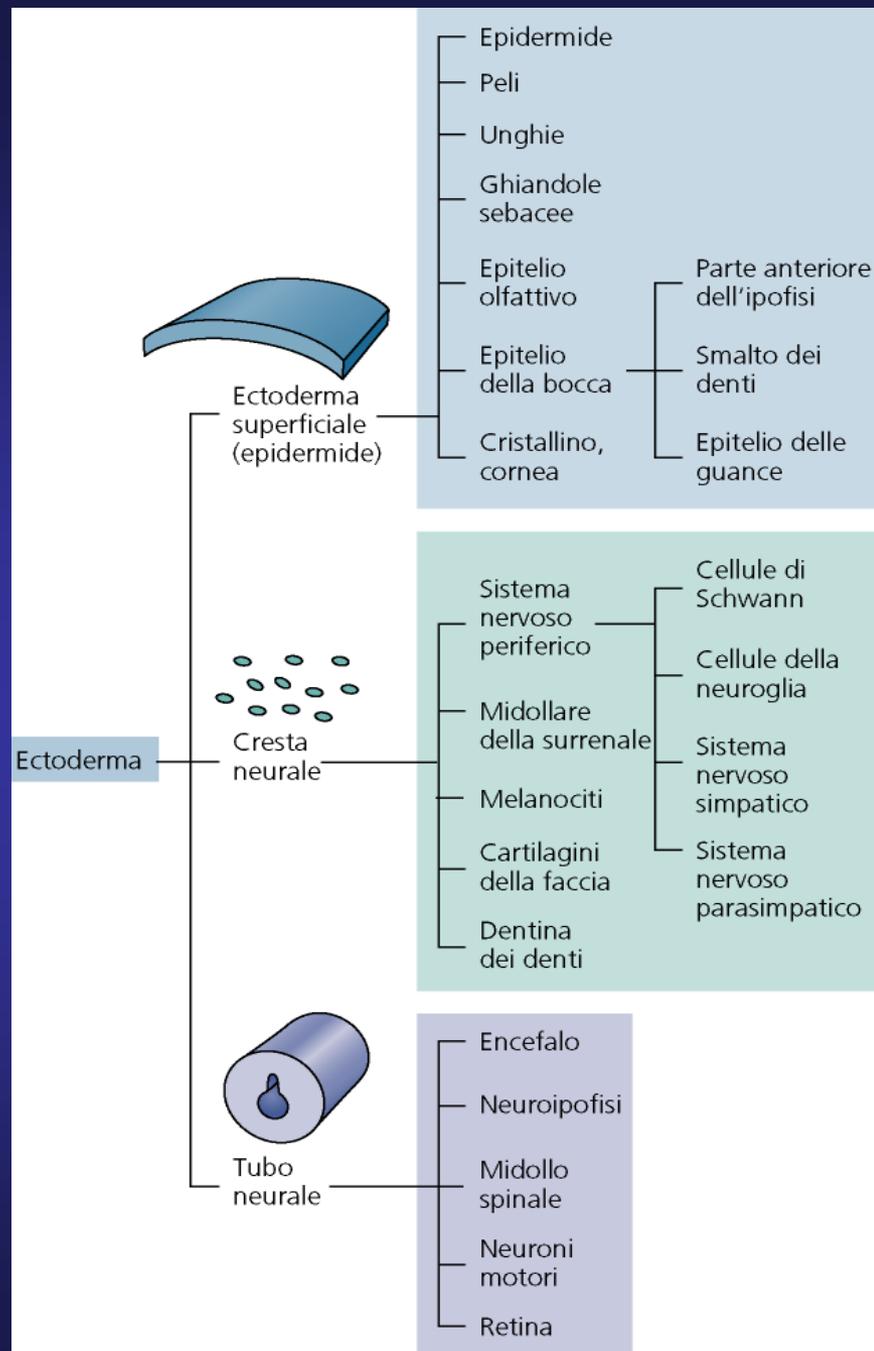
Mesoderma (foglietto intermedio)

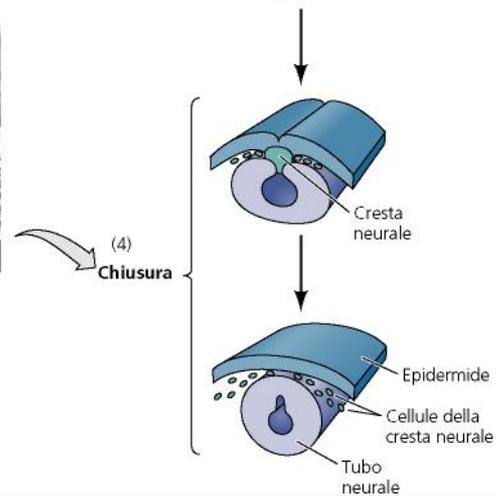
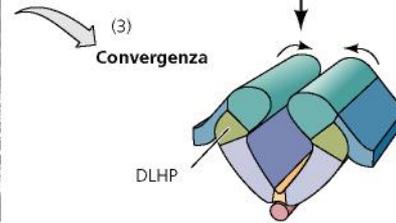
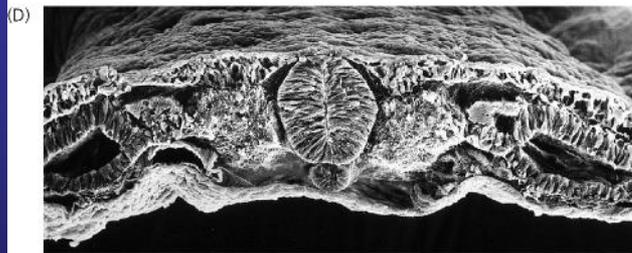
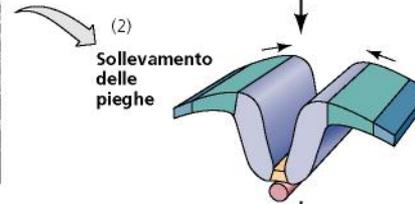
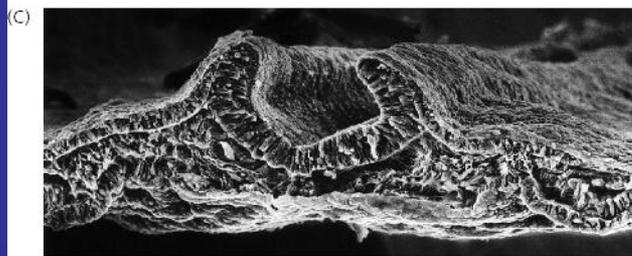
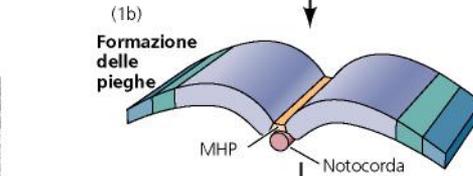
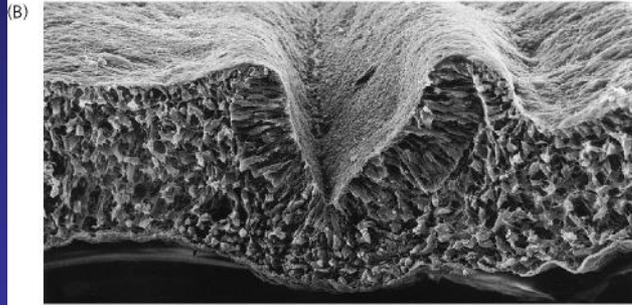
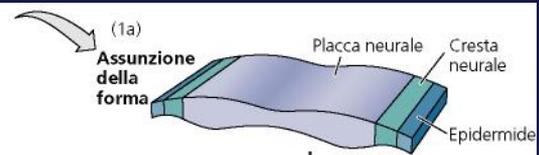
Endoderma (foglietto interno)

Cellule germinali



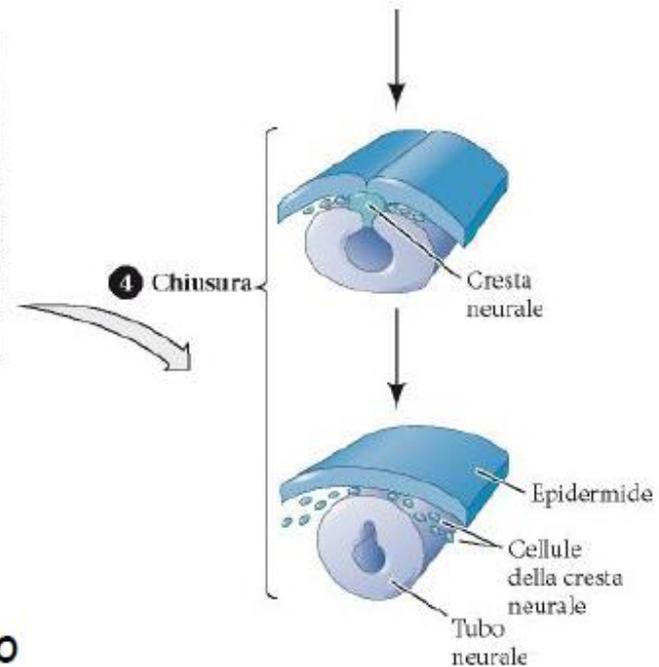
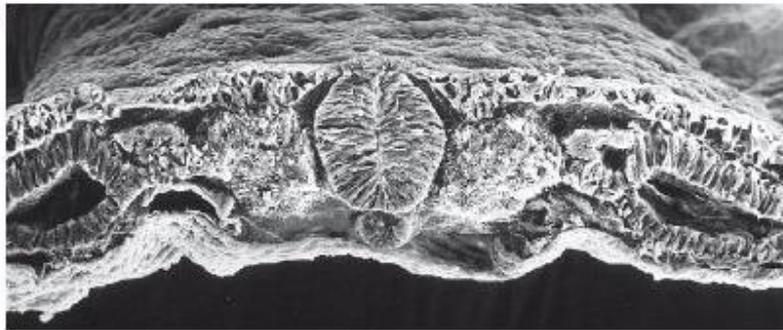
Ectoderma e suoi derivati





Comparsa delle cellule della cresta neurale

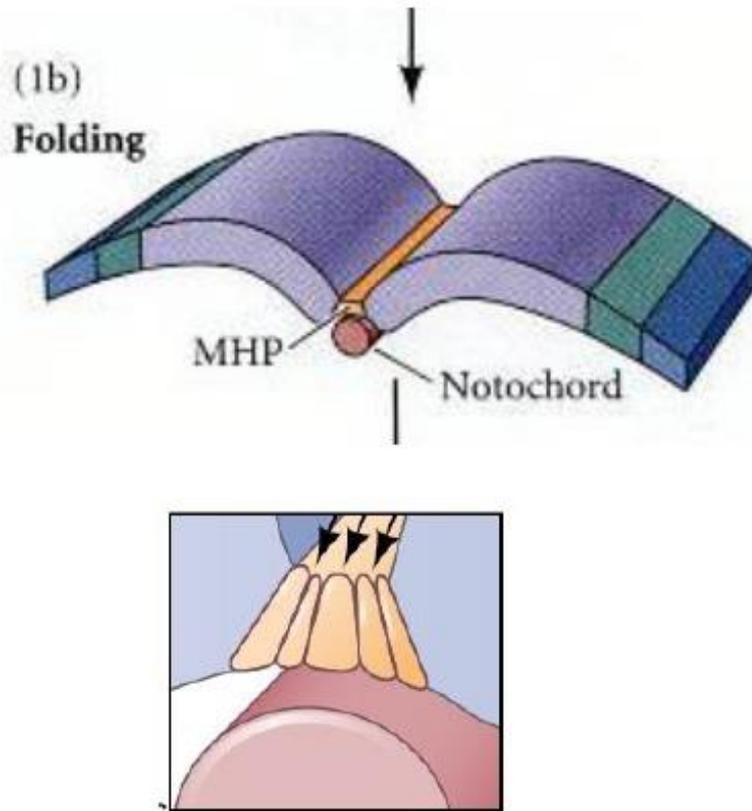
(D)



Nei mammiferi, le cellule della **cresta neurale** migrano nella parte dorsale

- **prima** della chiusura del tubo neurale nella parte **cefalica**,
- **dopo** la chiusura nella parte del **midollo spinale**

Punti cardine per la neurulazione



MHP: cellule del punto cardine mediale.

Cellule posizionate sopra la notocorda che acquisiscono una forma a cuneo (modificazioni del citoscheletro)

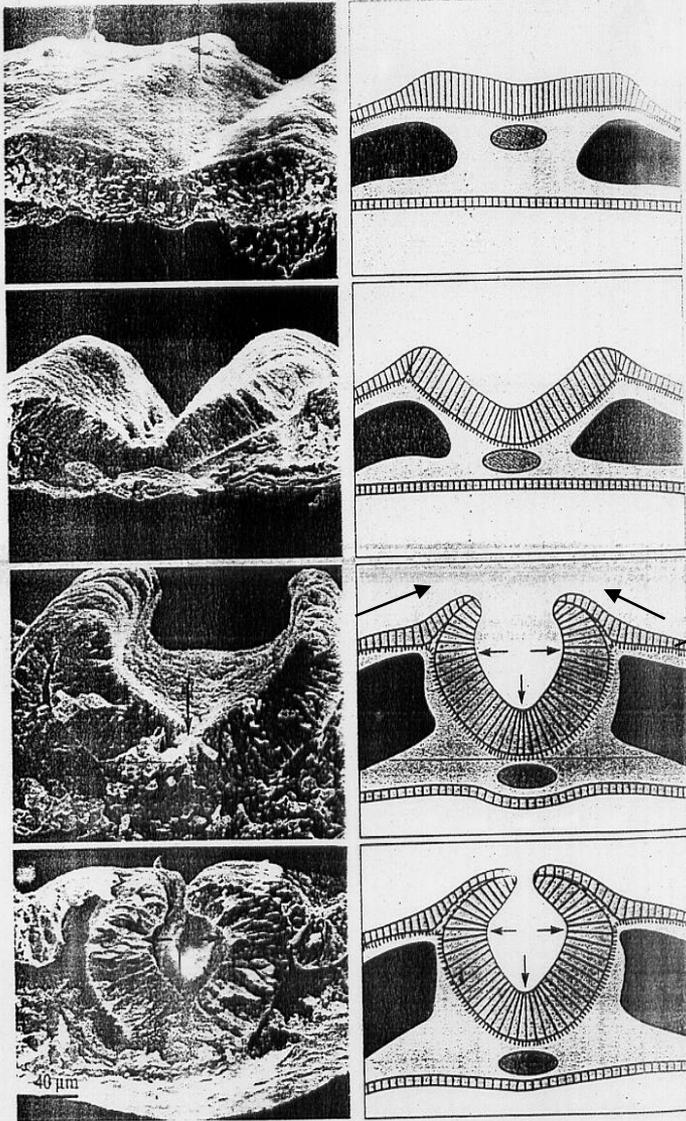
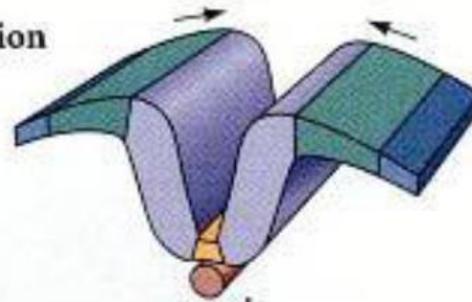
Forze intrinseche: Modificazioni del citoscheletro → Microtubuli
Microfilamenti actina

Forze estrinseche: Spinta dell'ectoderma

Ruolo dell'ectoderma prossimale nella neurulazione

Spinta dell'ectoderma verso la linea mediale
aiuta a far piegare la piastra neurale

Elevation



A

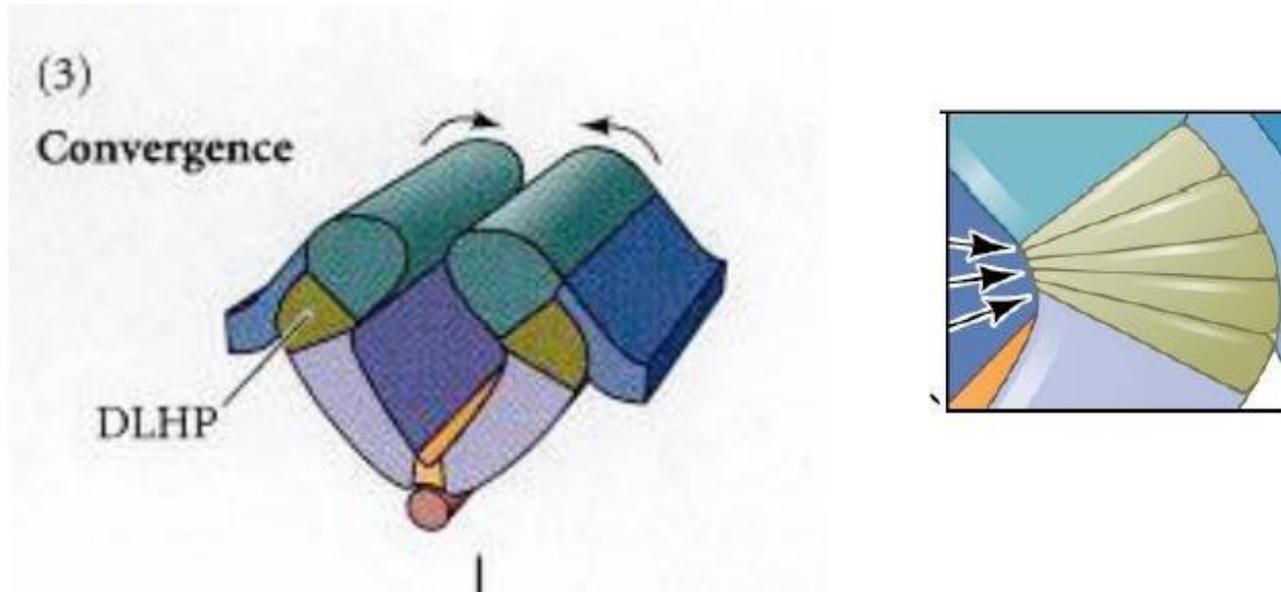
B

Punti cardine per la neurulazione

DLHP: **cellule del punto cardine dorsolaterale.**

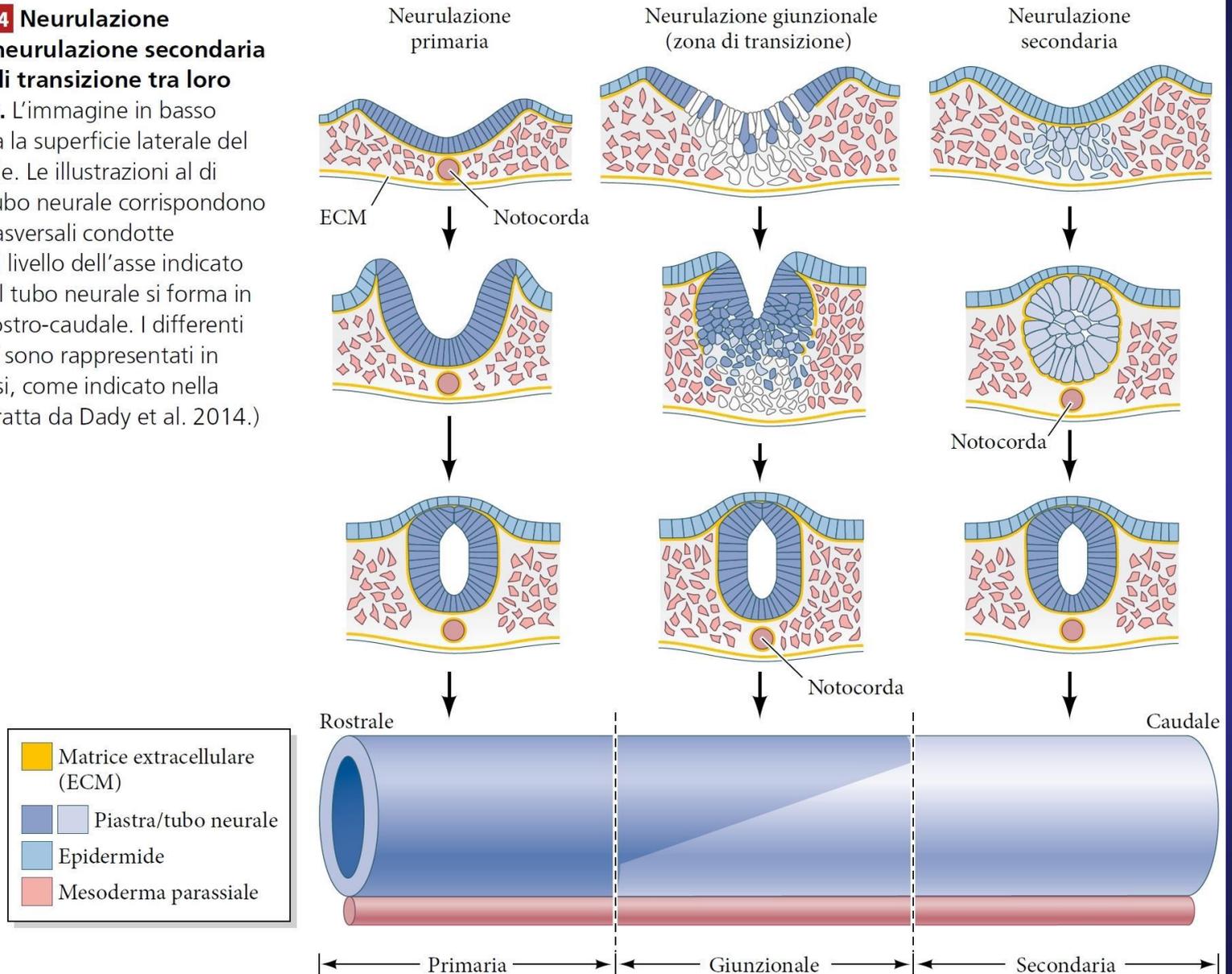
Cellule posizionate ai lati della piastra neurale che acquisiscono una forma a cuneo (modificazioni del citoscheletro)

Maggiore proliferazione nella porzione dorsale delle pliche neurali



Neurulazione primaria e secondaria

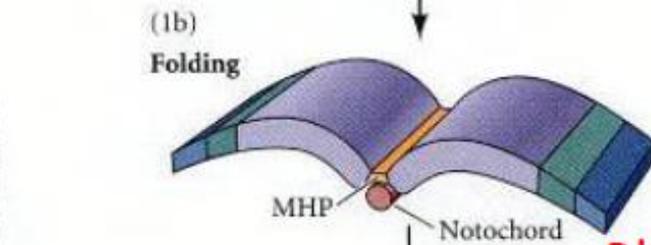
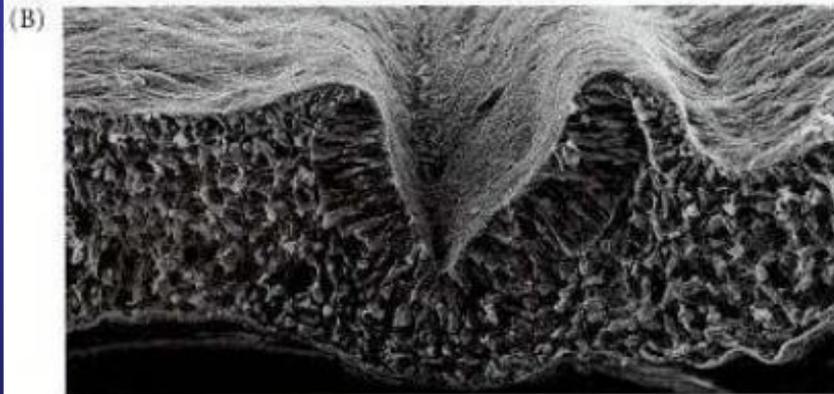
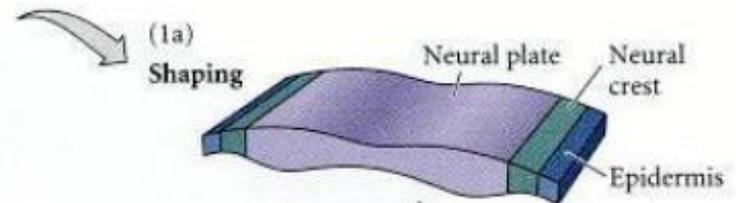
FIGURA 13.4 Neurulazione primaria, neurulazione secondaria e le zone di transizione tra loro interposte. L'immagine in basso rappresenta la superficie laterale del tubo neurale. Le illustrazioni al di sopra del tubo neurale corrispondono a sezioni trasversali condotte attraverso il livello dell'asse indicato via via che il tubo neurale si forma in direzione rostro-caudale. I differenti tipi cellulari sono rappresentati in colori diversi, come indicato nella legenda. (Tratta da Dady et al. 2014.)



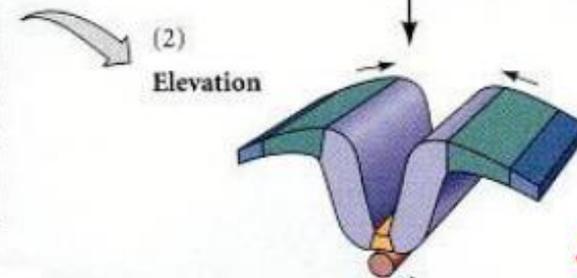
La neurulazione primaria

Avviene nelle regioni anteriori dell'embrione

Piastra neurale

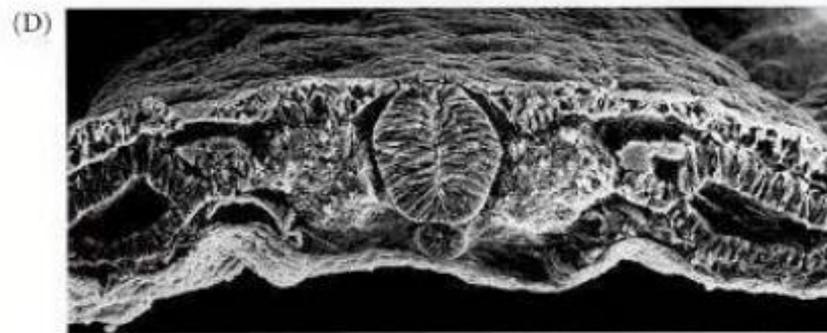
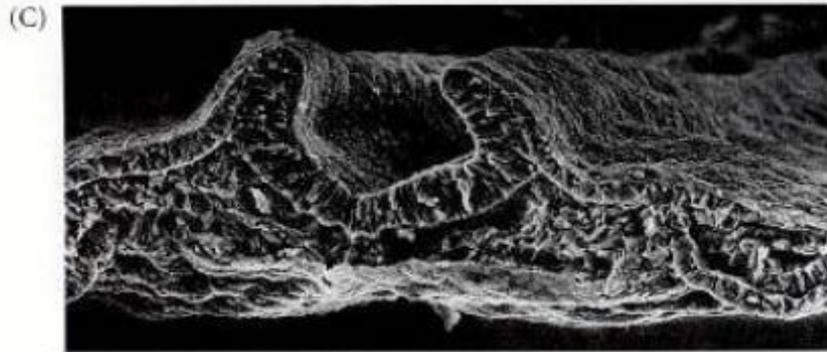


Pliche neurali

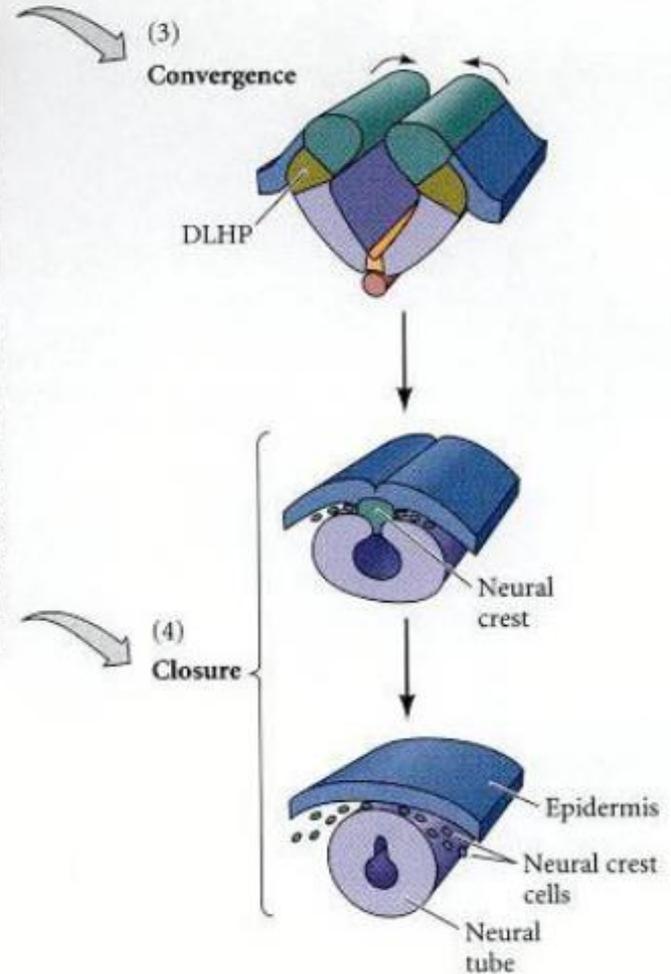


Solco neurale

La neurulazione primaria



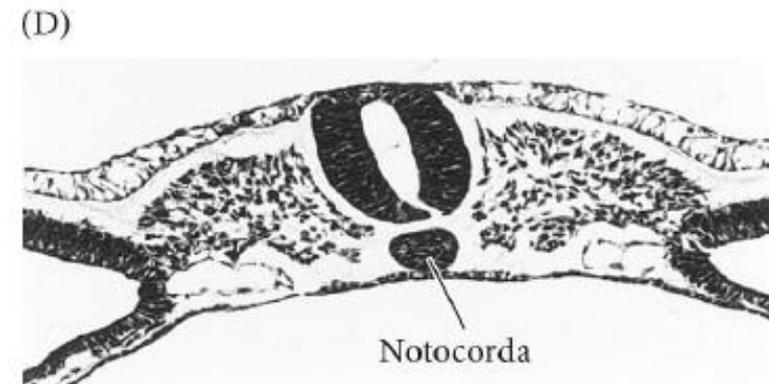
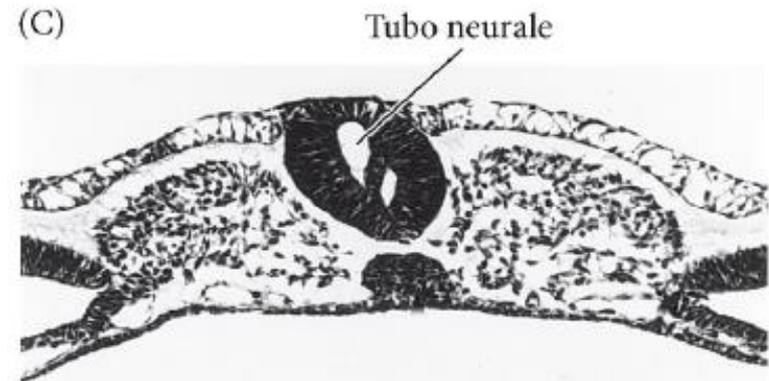
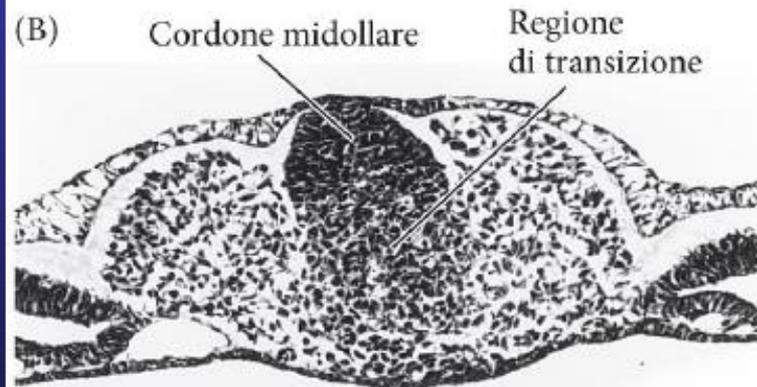
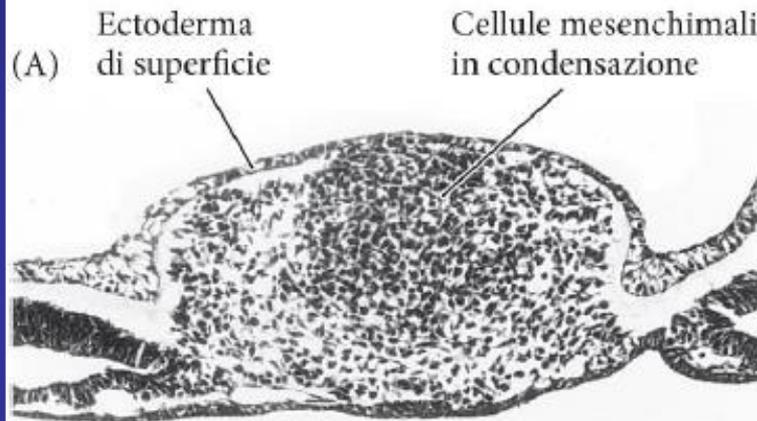
Chiusura del Tubo neurale



La neurulazione secondaria: condensazione e cavitazione

- Avviene nelle regioni posteriori dell'embrione a partire da cellule di natura mesenchimale

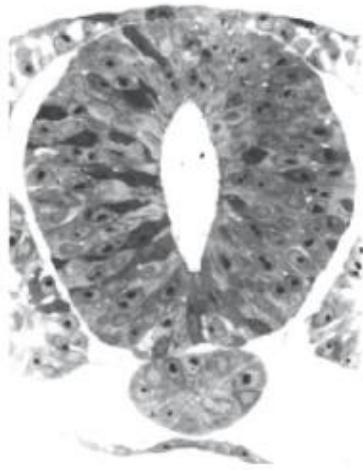
- Processo di transizione mesenchima-epitelio



(A)



(B)



(C)

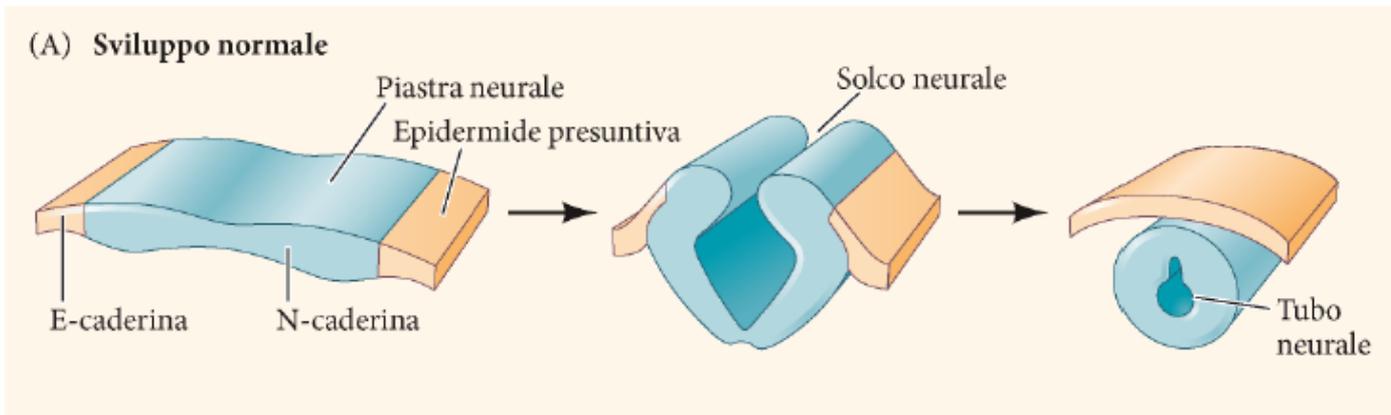


(D)

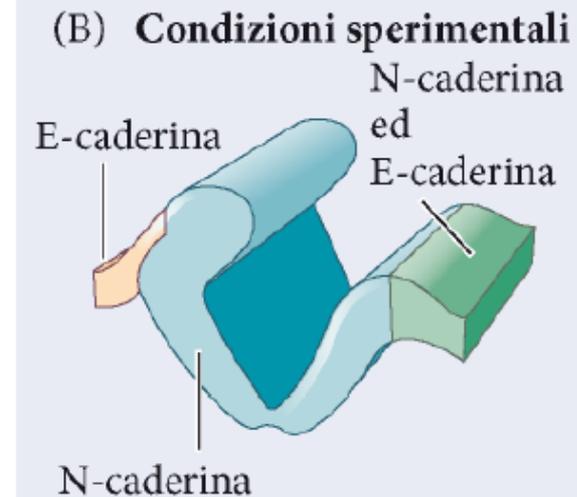


Modificata espressione di molecole di adesione

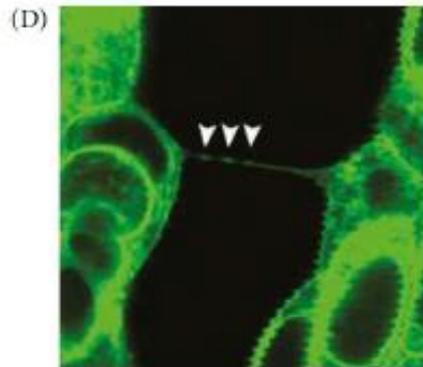
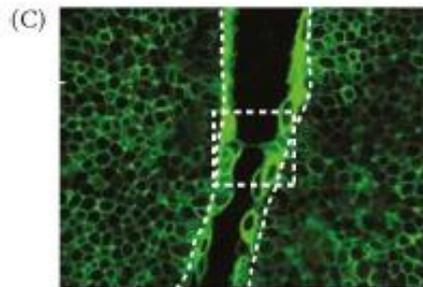
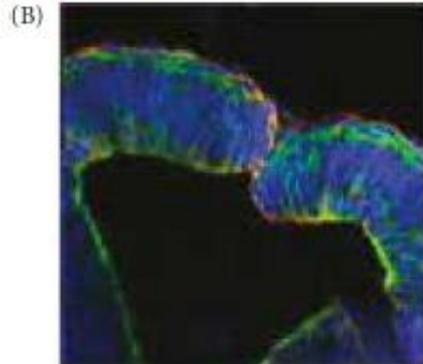
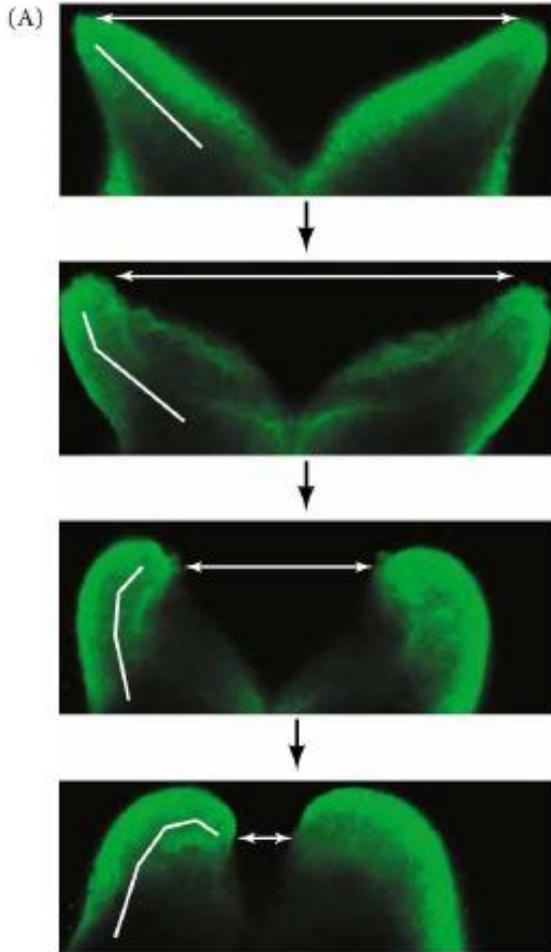
Chiusura del tubo neurale



L'espressione di N-caderina o E-caderina permettono l'adesione differenziale tra cellule

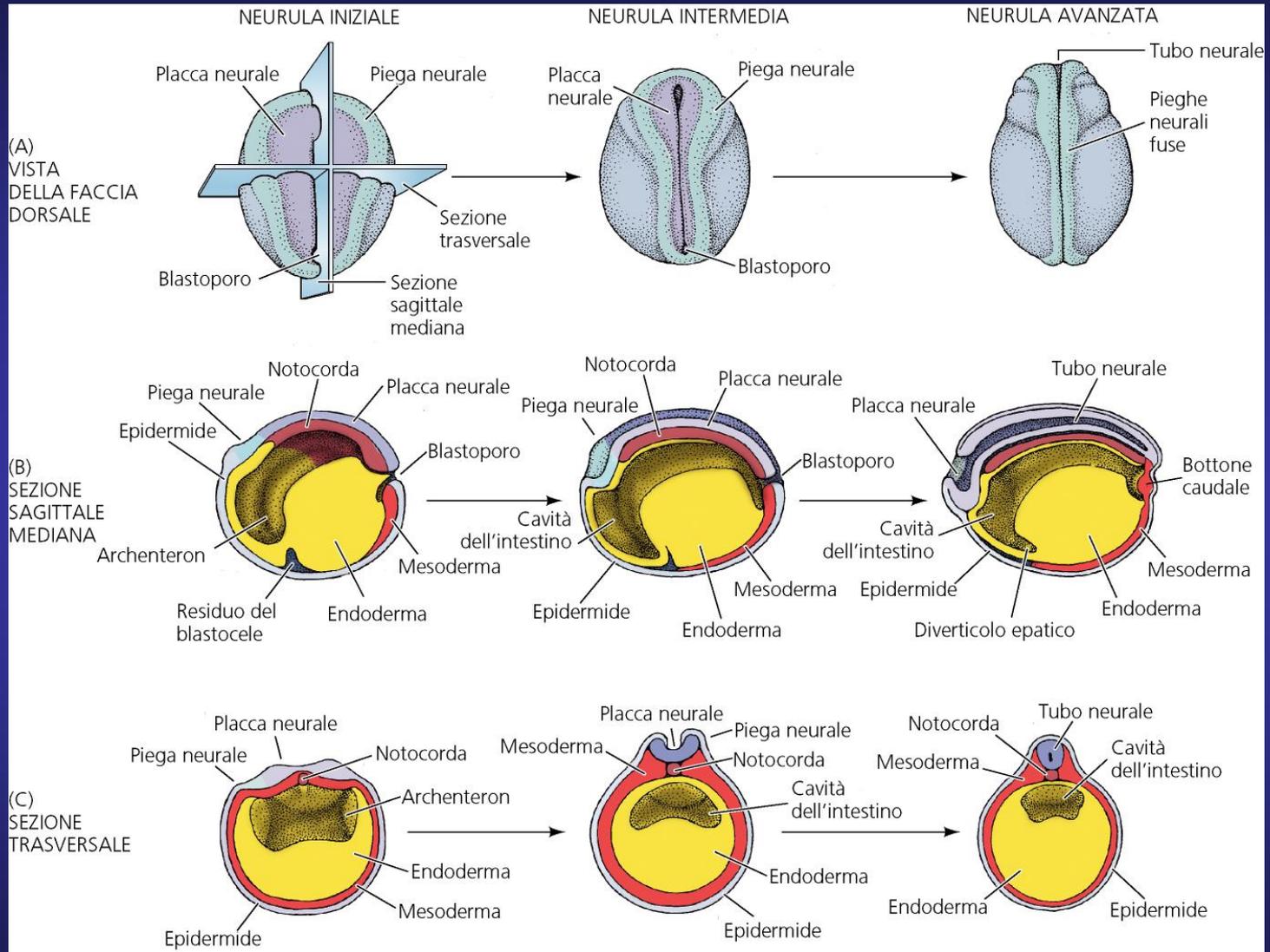


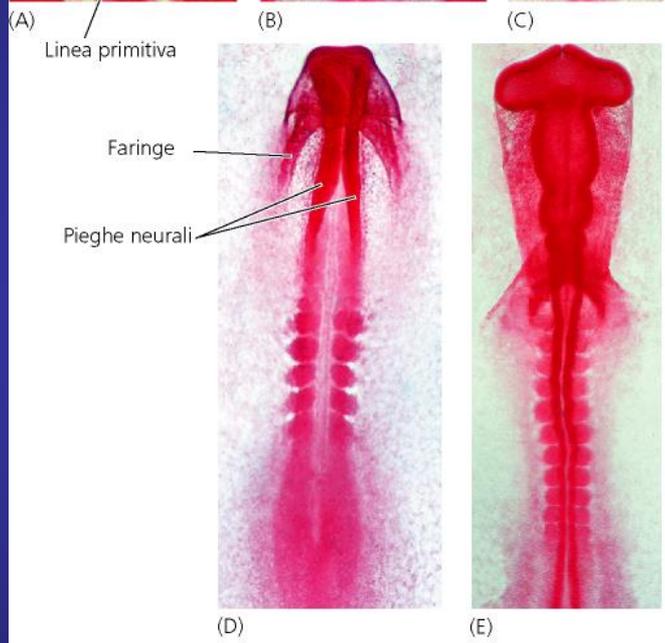
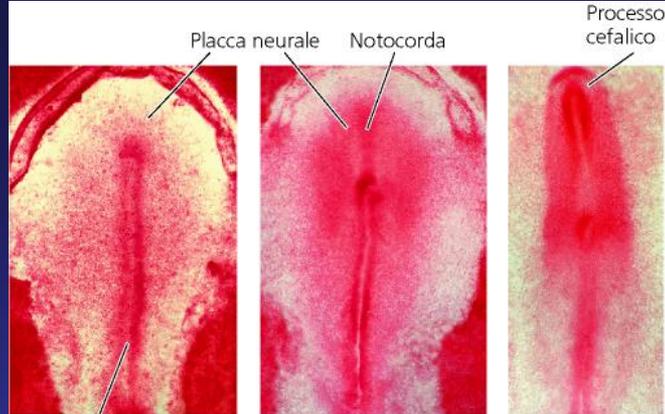
Avvicinamento per la chiusura del tubo neurale



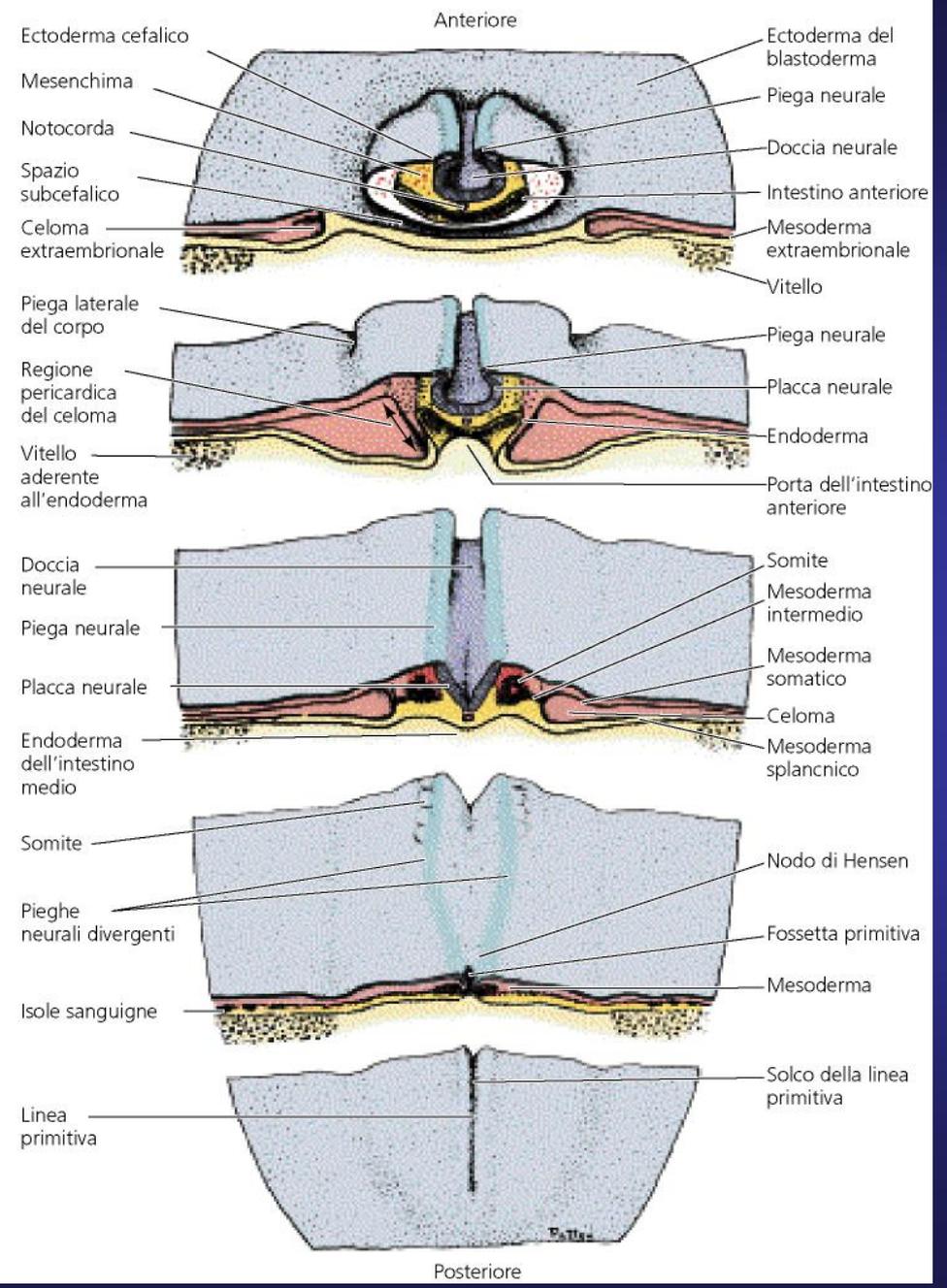
Presenza di filopodi
"ponte" tra
l'ectoderma non
neuronale ai due
lati delle pliche

MODALITA' DI CHIUSURA

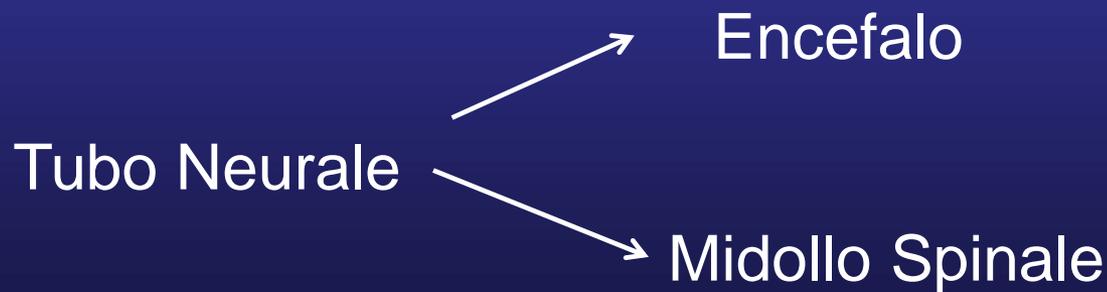
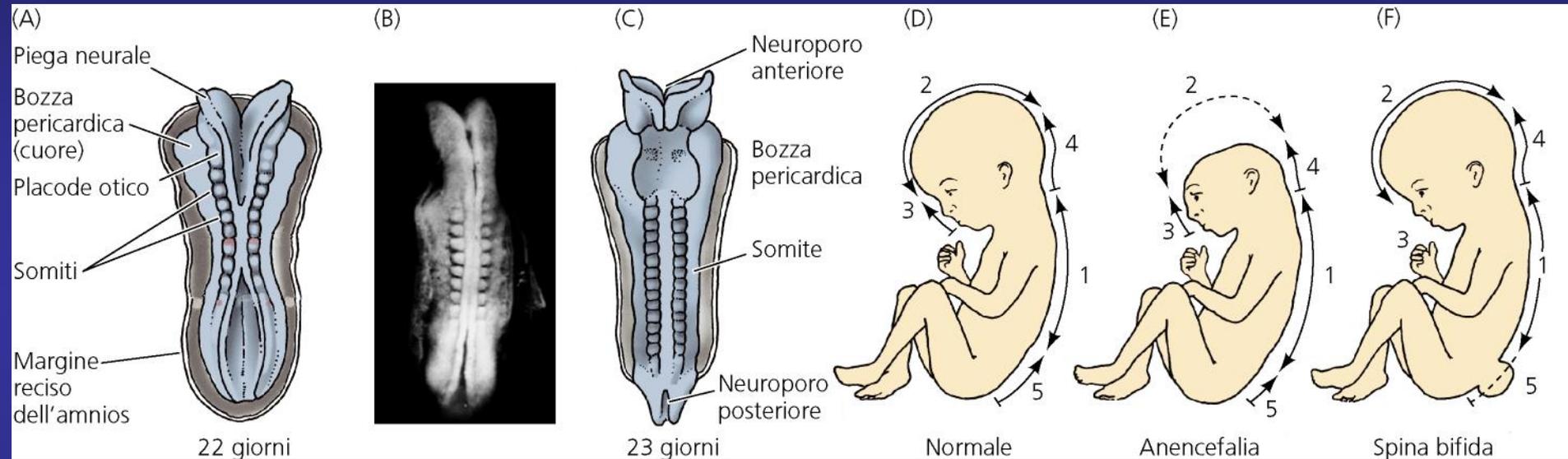




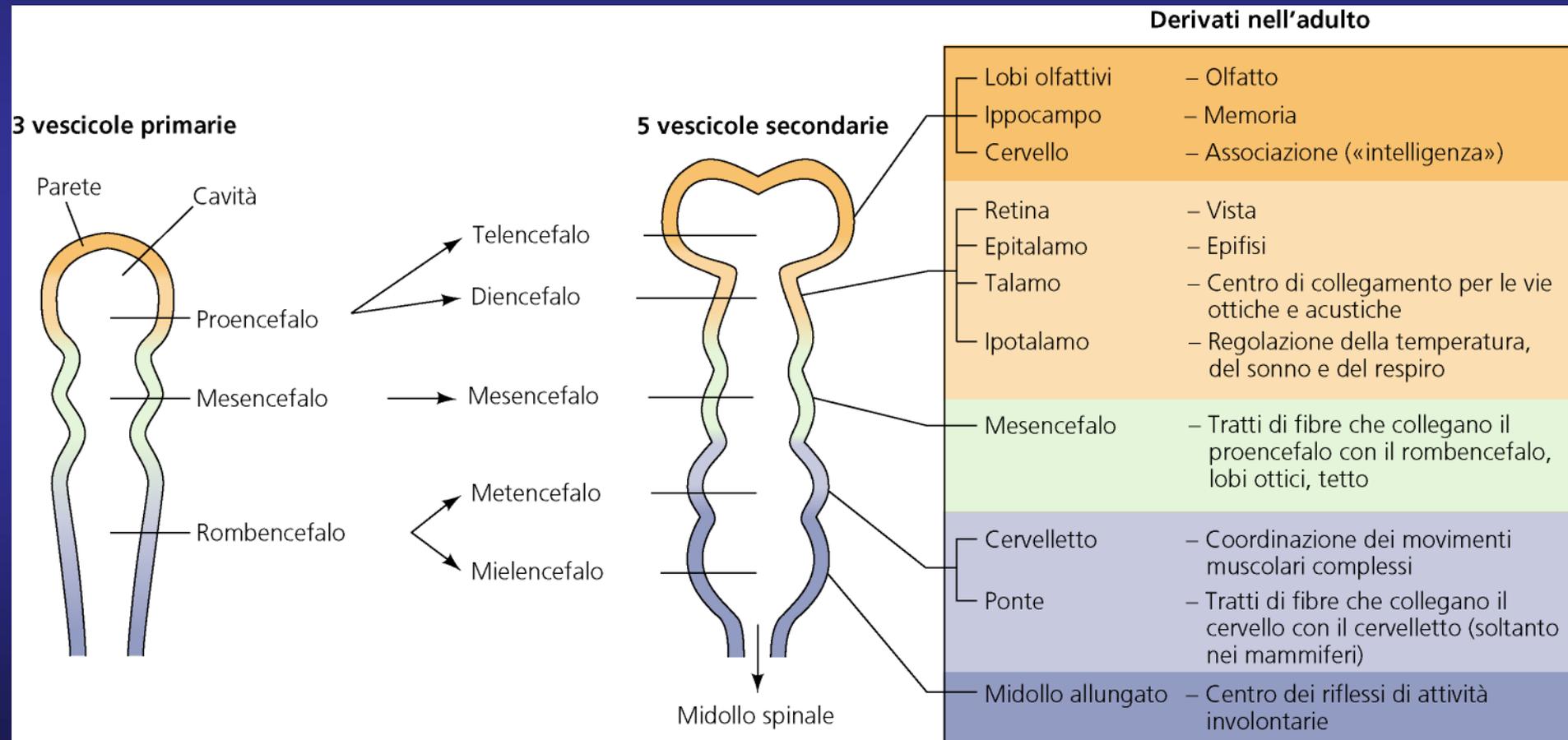
(F)



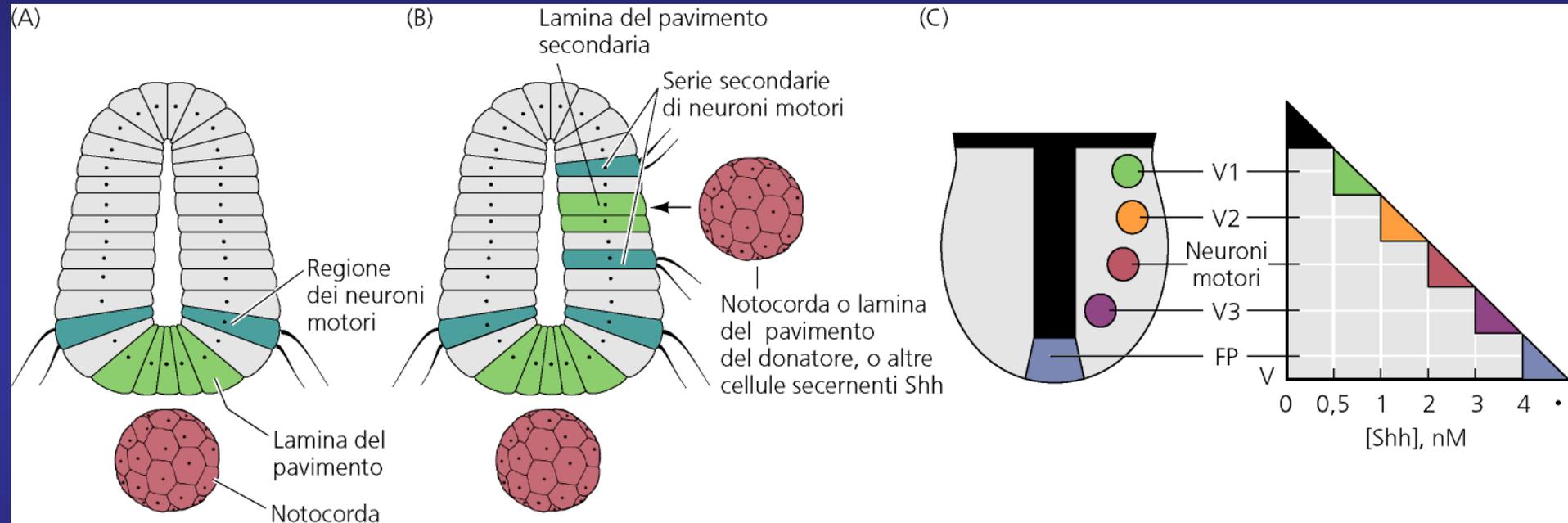
Chiusura del tubo neurale



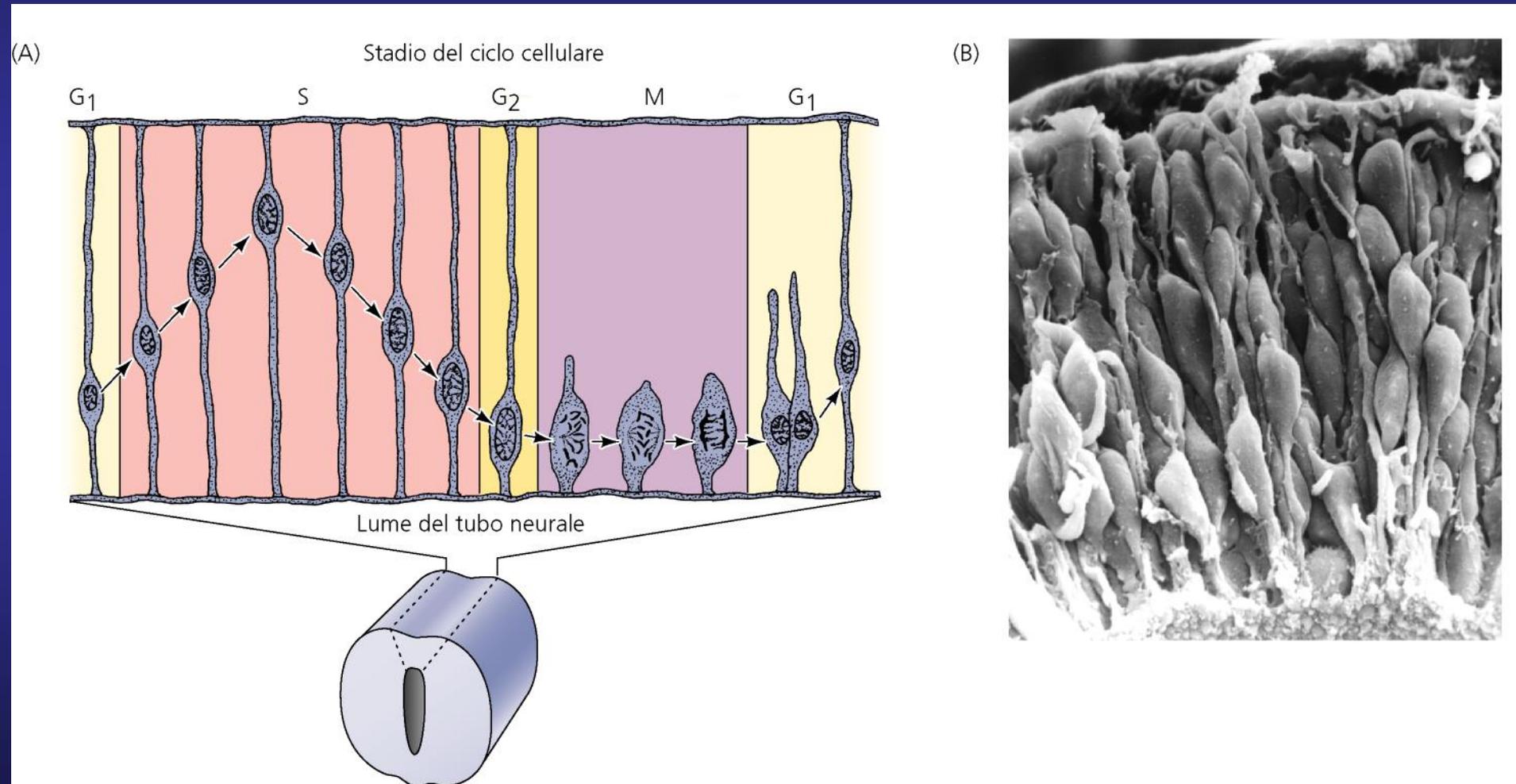
Regionalizzazione del tubo neurale antero-posteriore



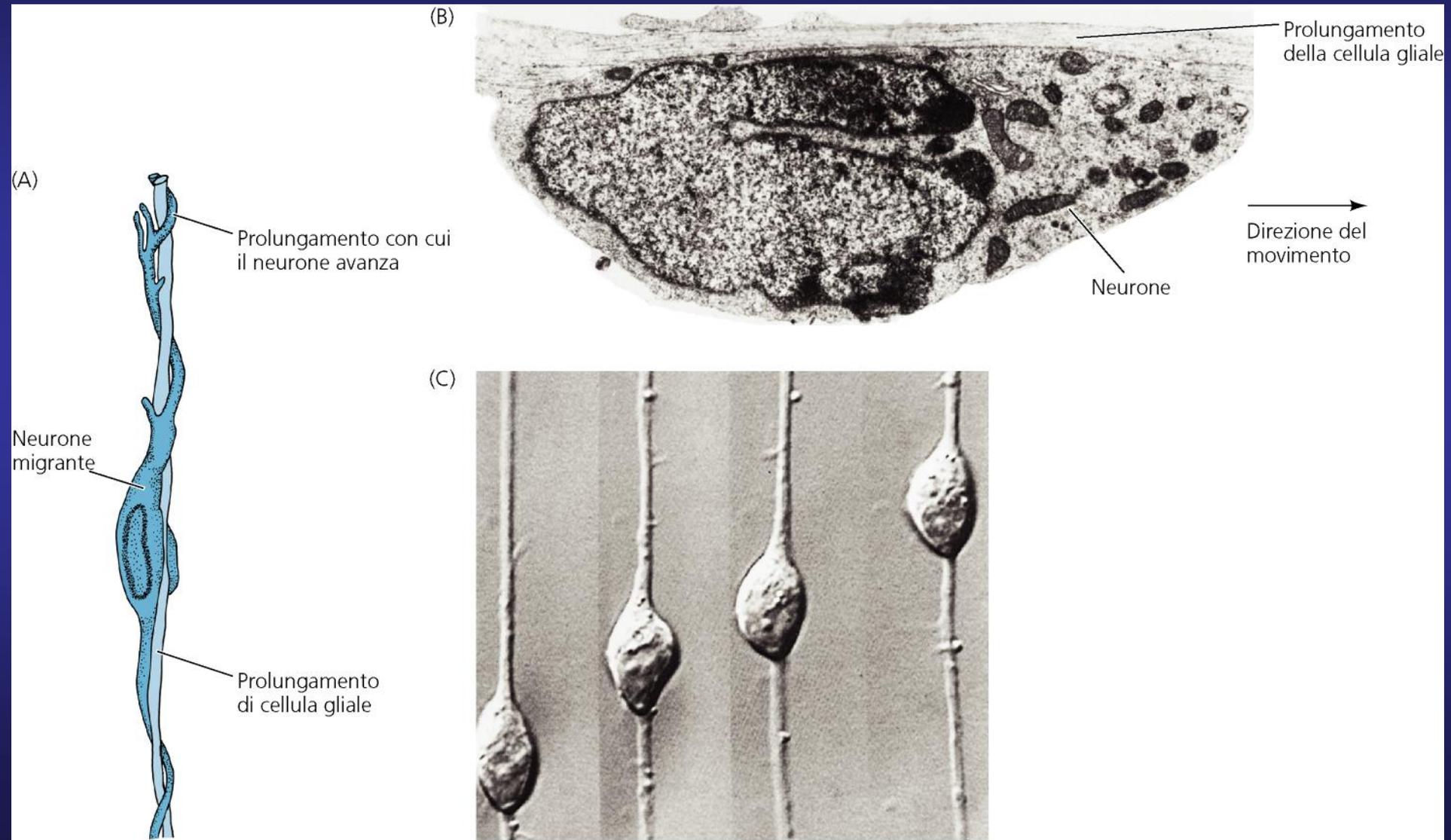
Regionalizzazione del tubo neurale dorso ventrale



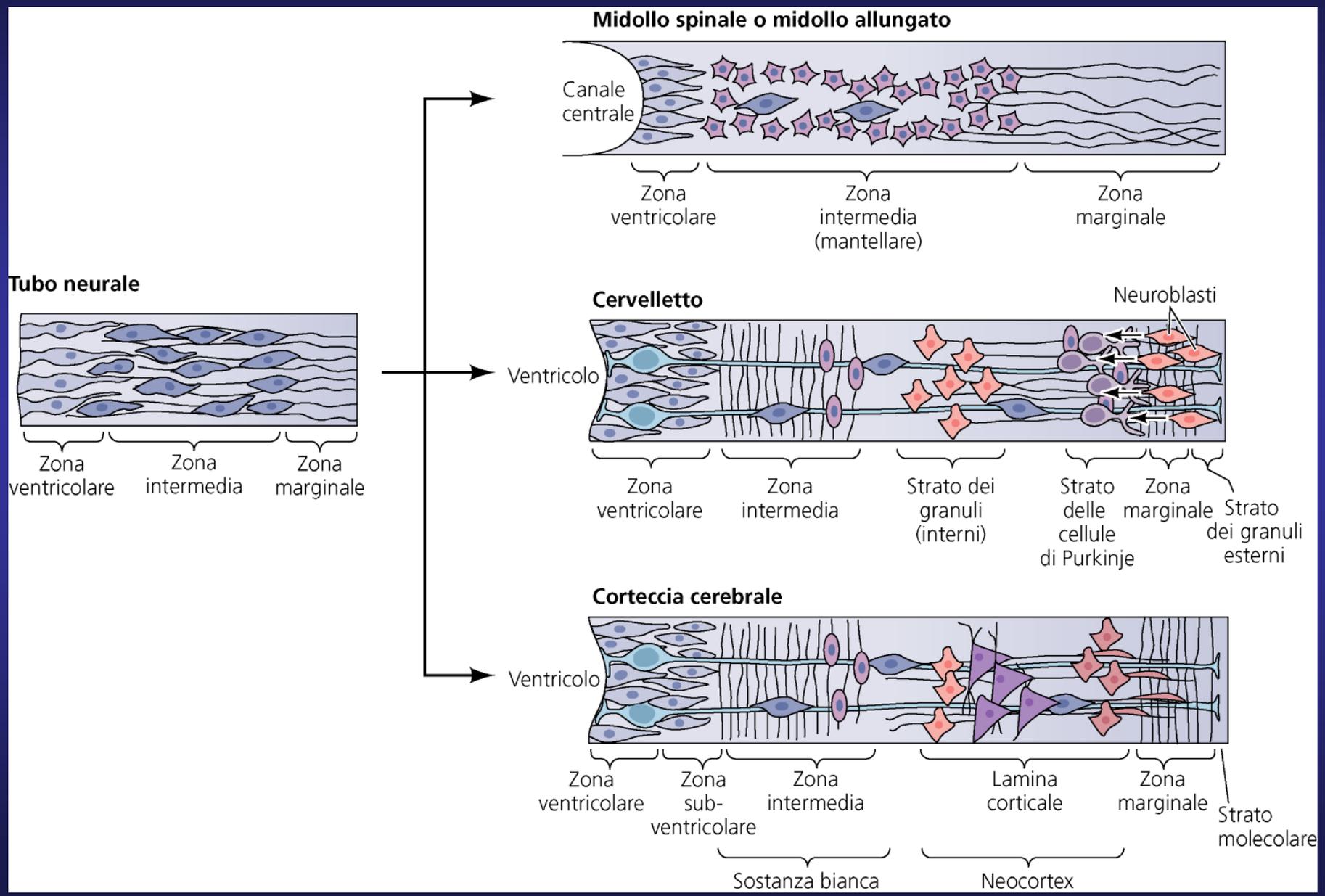
Proliferazione



Migrazione

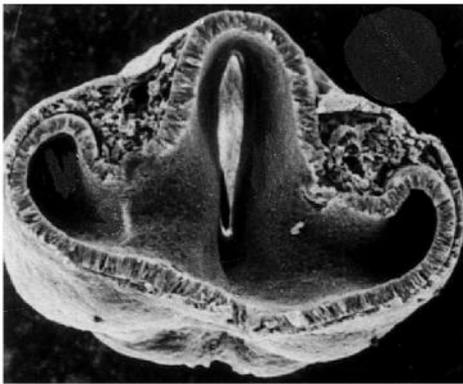


Stratificazione

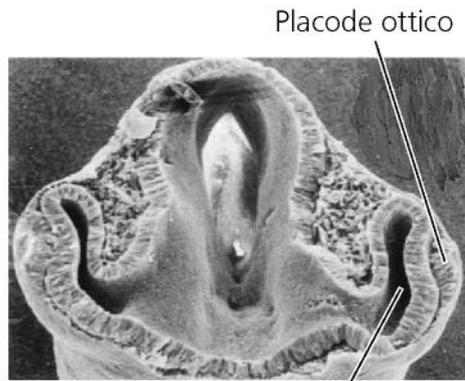


Formazione del cristallino

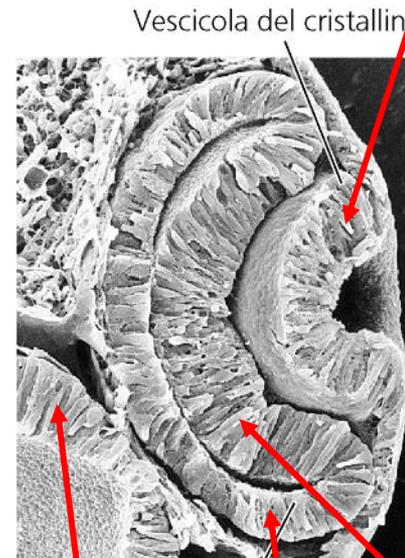
(A) Embrione di 4 mm



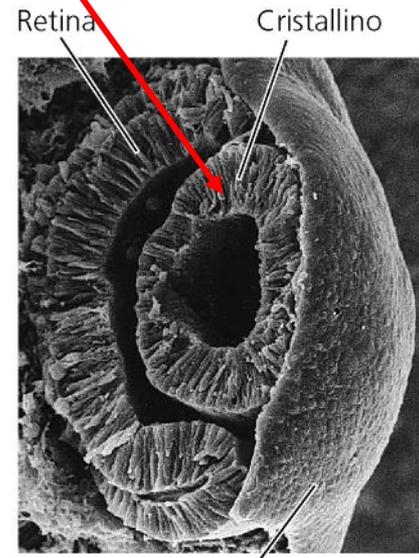
(B) Embrione di 4,5 mm



(C) Embrione di 5 mm



(D) Embrione di 7 mm



Cristallino

Nervo ottico

Retina nervosa

Retina pigmentata