

Le varie modalita' di segmentazione

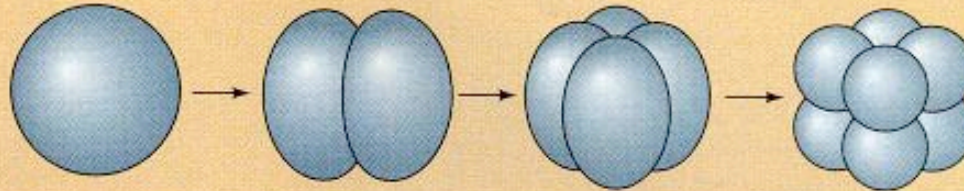
I. HOLOBLASTIC (COMPLETE CLEAVAGE)

A. Isolecithal

(Sparse, evenly distributed yolk)

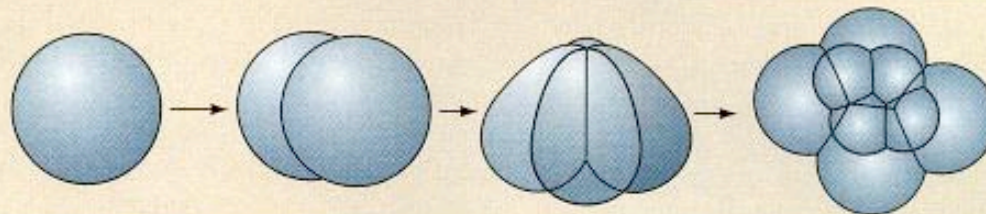
1. Radial

Echinoderms, amphioxus



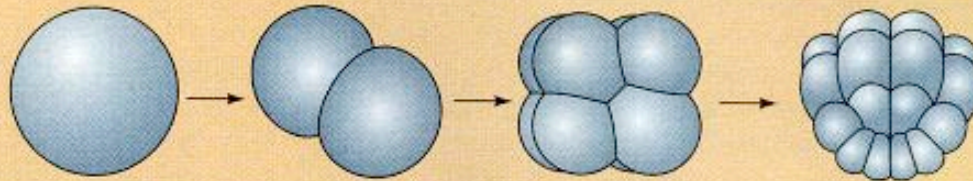
2. Spiral

Annelids, molluscs,
flatworms



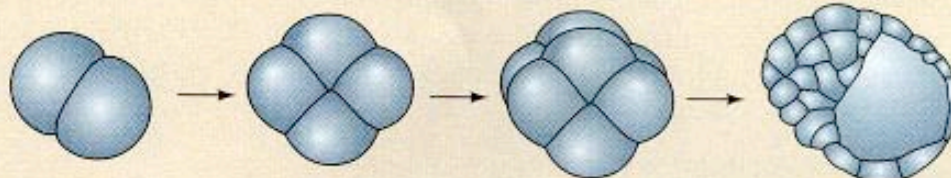
3. Bilateral

Tunicates



4. Rotational

Mammals, nematodes

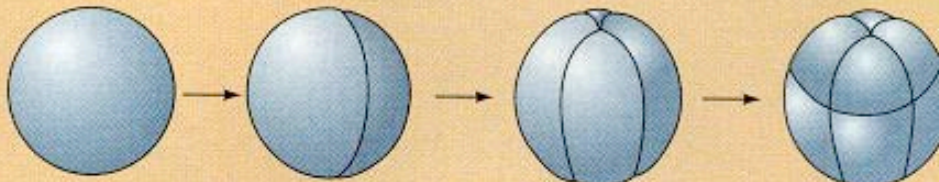


B. Mesolecithal

(Moderate vegetal yolk disposition)

Radial

Amphibians



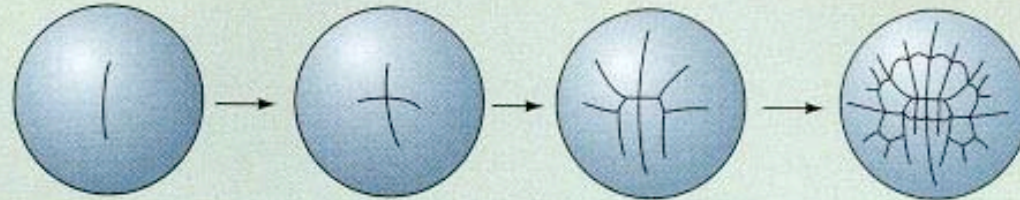
Le varie modalita' di segmentazione

II. MEROBLASTIC (INCOMPLETE CLEAVAGE)

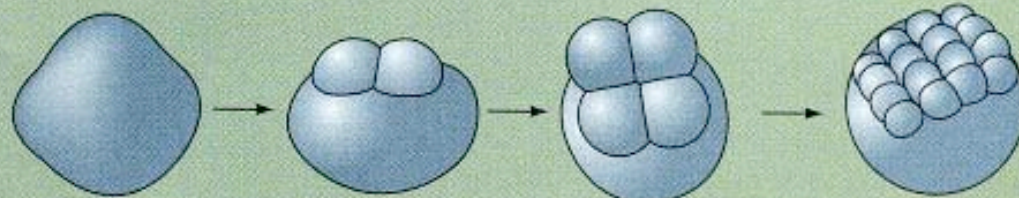
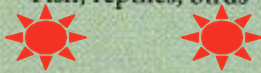
A. Telolecithal

(Dense yolk throughout most of cell)

1. Bilateral
Cephalopod molluscs



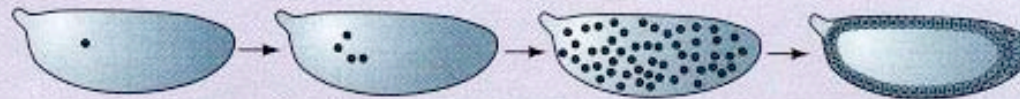
2. Discoidal
Fish, reptiles, birds



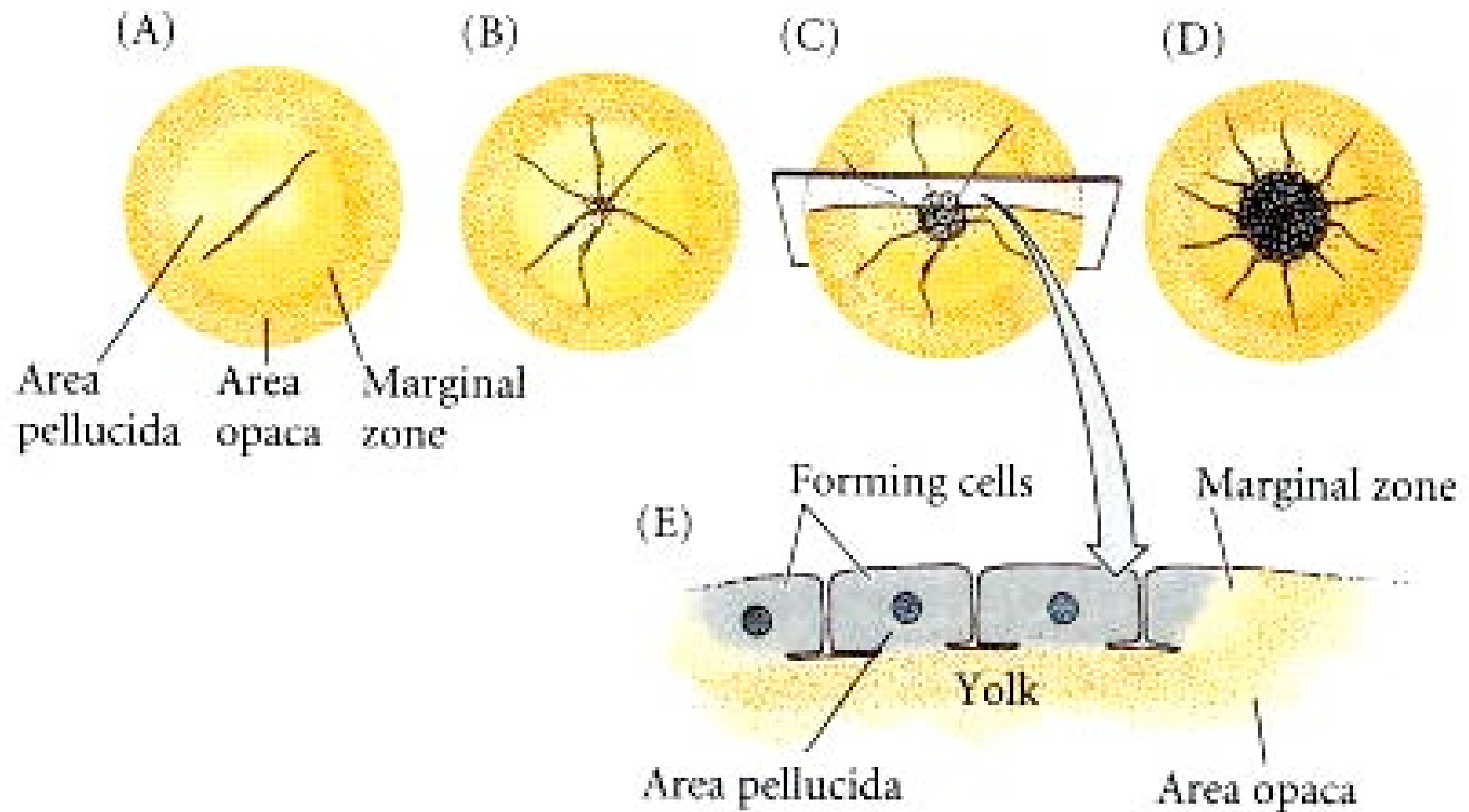
B. Centrolecithal

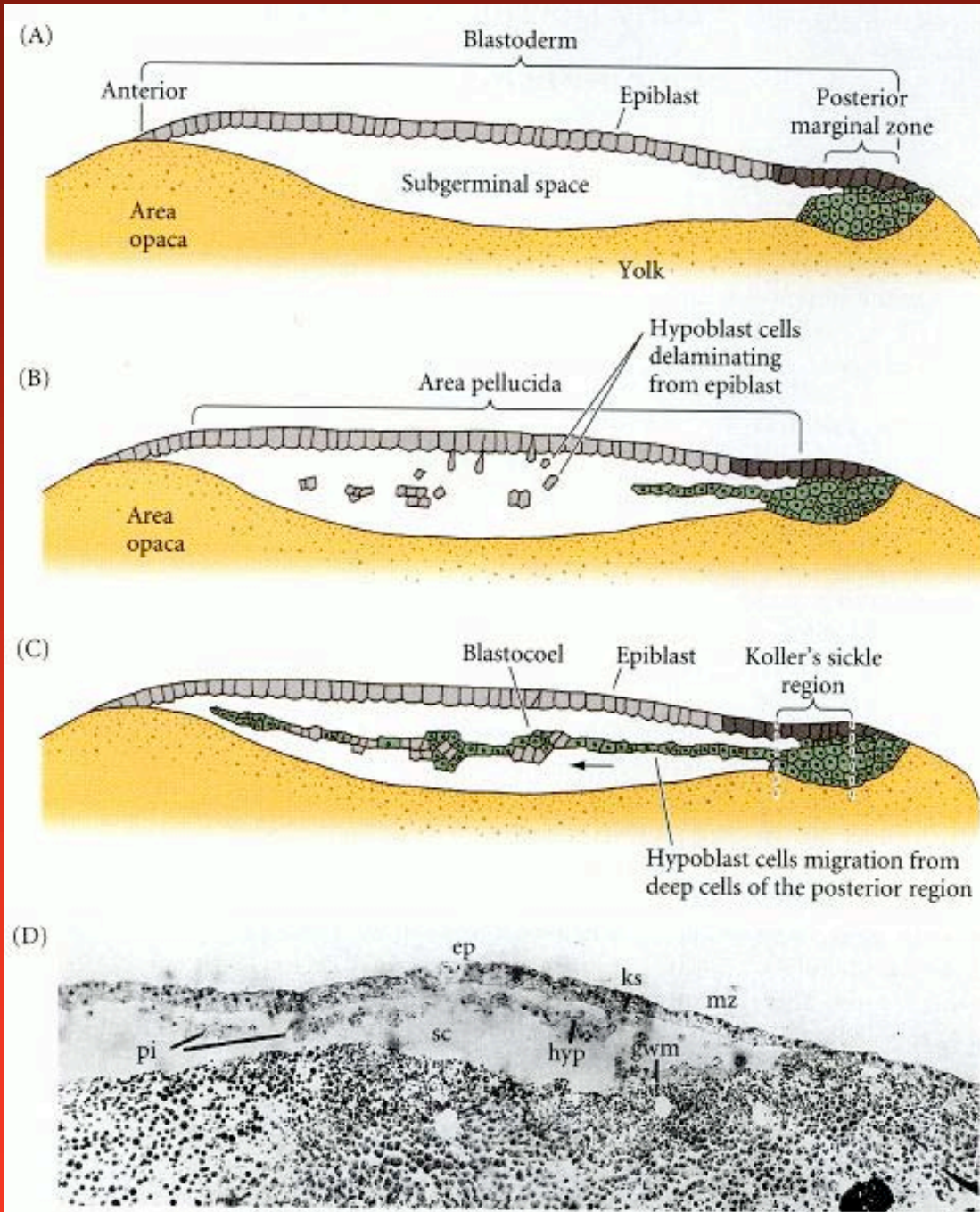
(Yolk in center of egg)

- Superficial
Most insects



La segmentazione meroblastica discoidale di pollo





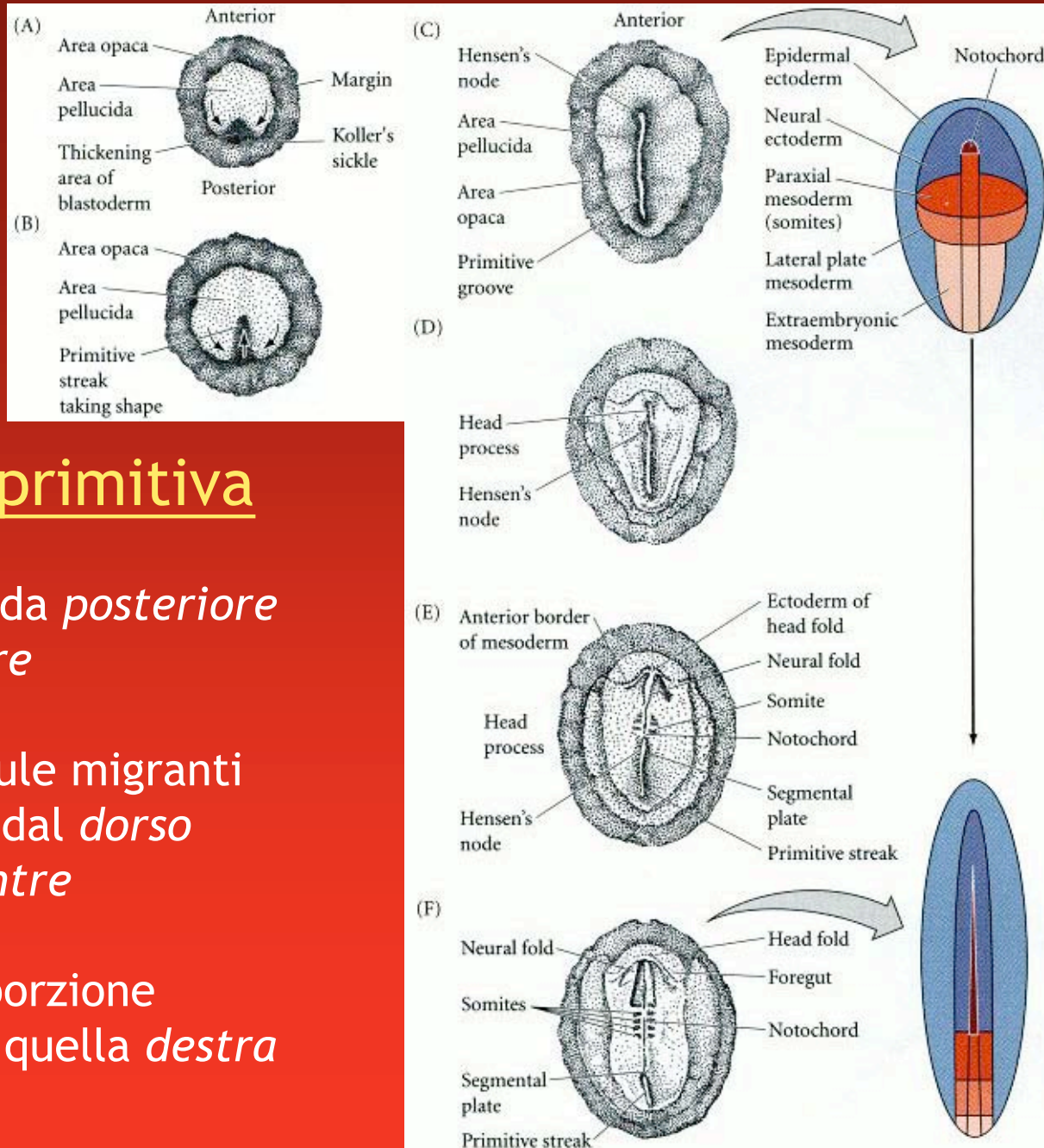
Formazione del blastoderma a doppio strato in pollo
(delaminazione e migrazione)

RUOLO DI EPIBLASTO ED IPOBLASTO

L'embrione si origina unicamente dall'**epiblasto**

L'**ipoblasto** forma porzioni delle membrane esterne, quali il *sacco del tuorlo* e il tratto che unisce la massa del tuorlo al tubo digerente endodermico

I movimenti cellulari della **stria primitiva**



La **stria primitiva**

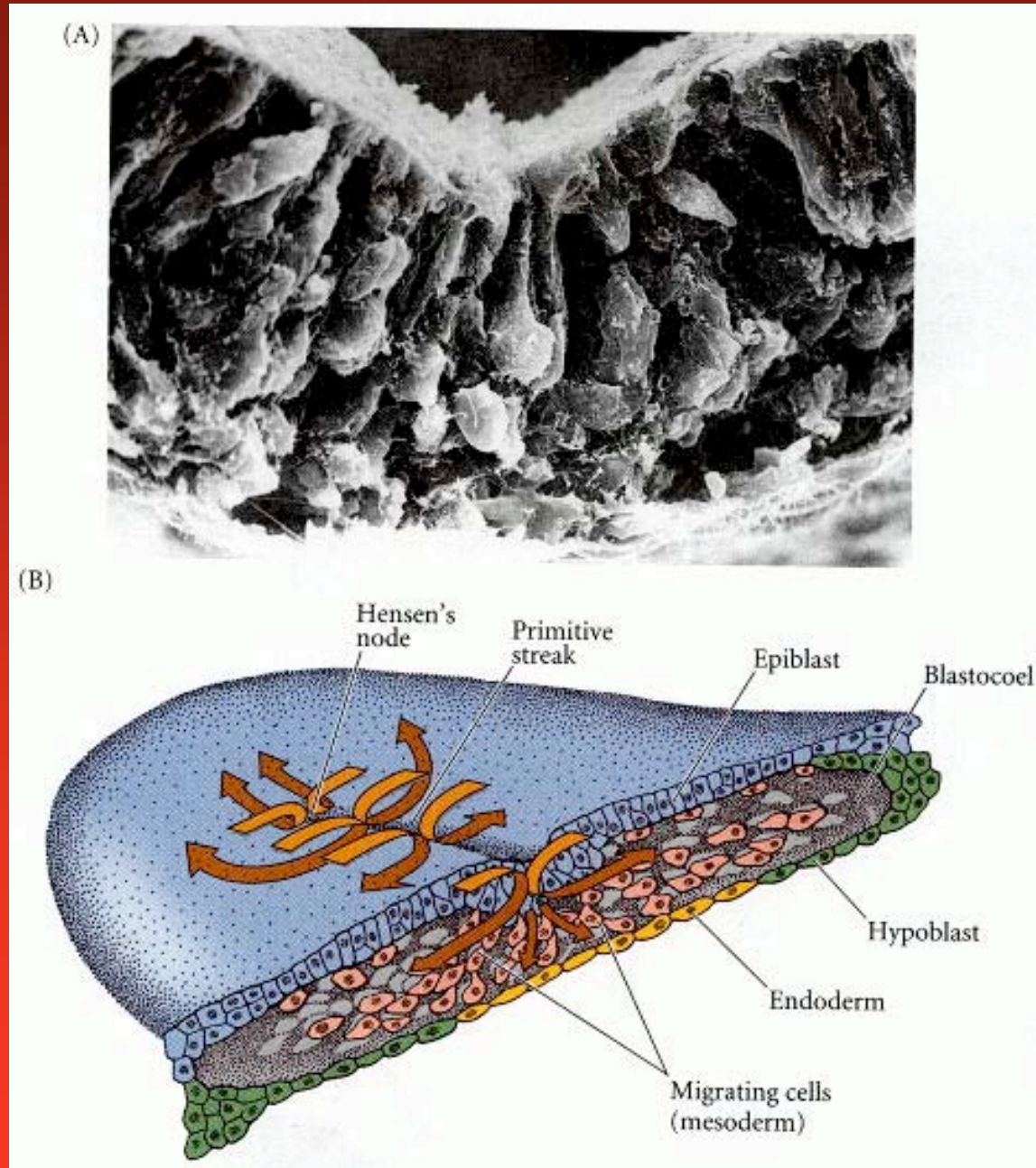
Si estende da *posteriore* ad *anteriore*

Le sue cellule migranti gastrulano dal *dorso* verso il *ventre*

Separa la porzione *sinistra* da quella *destra*

Migrazione di endo- e mesoderma attraverso la **stria primitiva**

Il solco
primitivo



Ordine di migrazione attraverso la stria primitiva a livello del nodo di Hensen

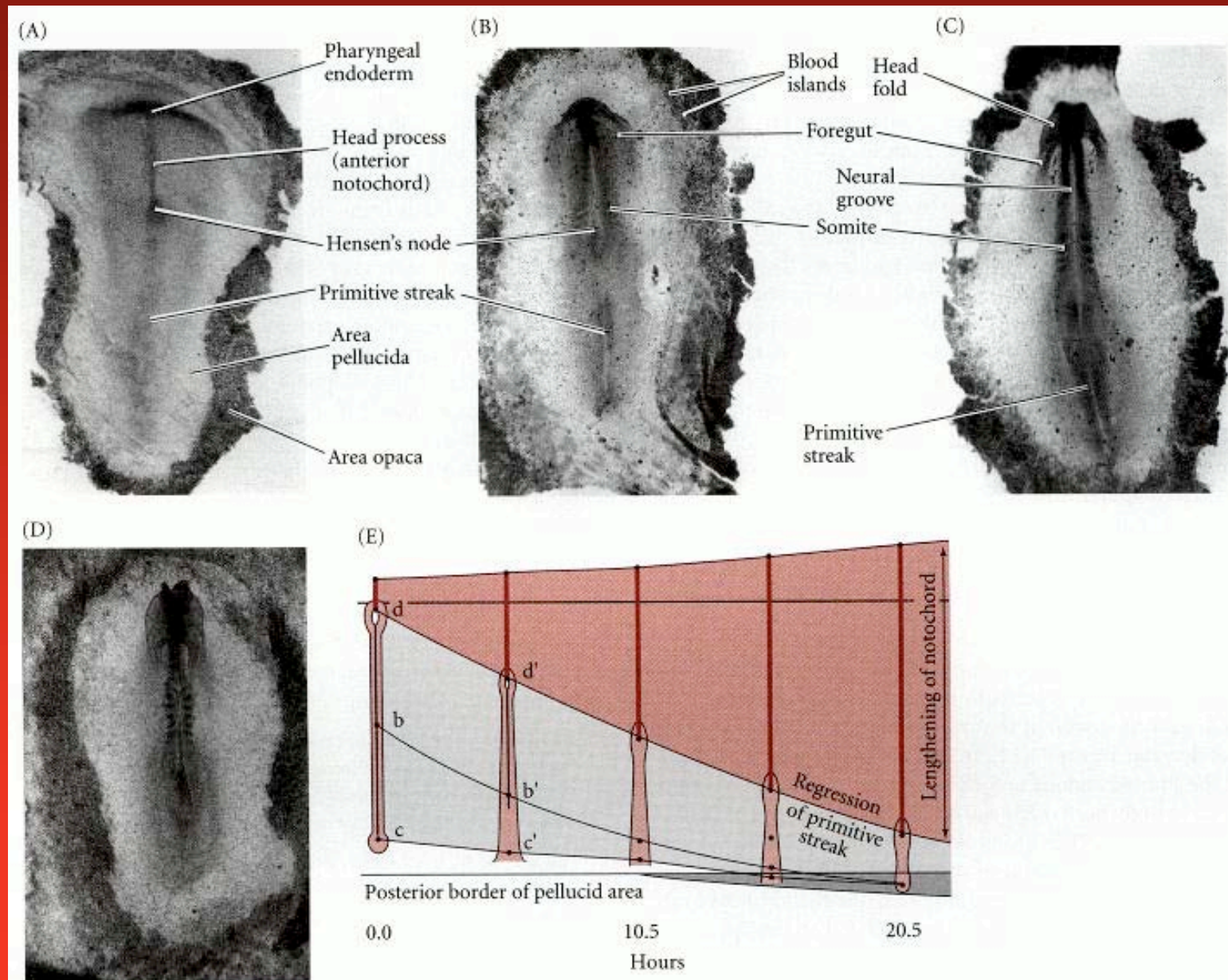
1) destino: endoderma faringeo della parte anteriore del tubo digerente

2) destino: Mesenchima della testa e mesoderma della placca precordale; processo della testa

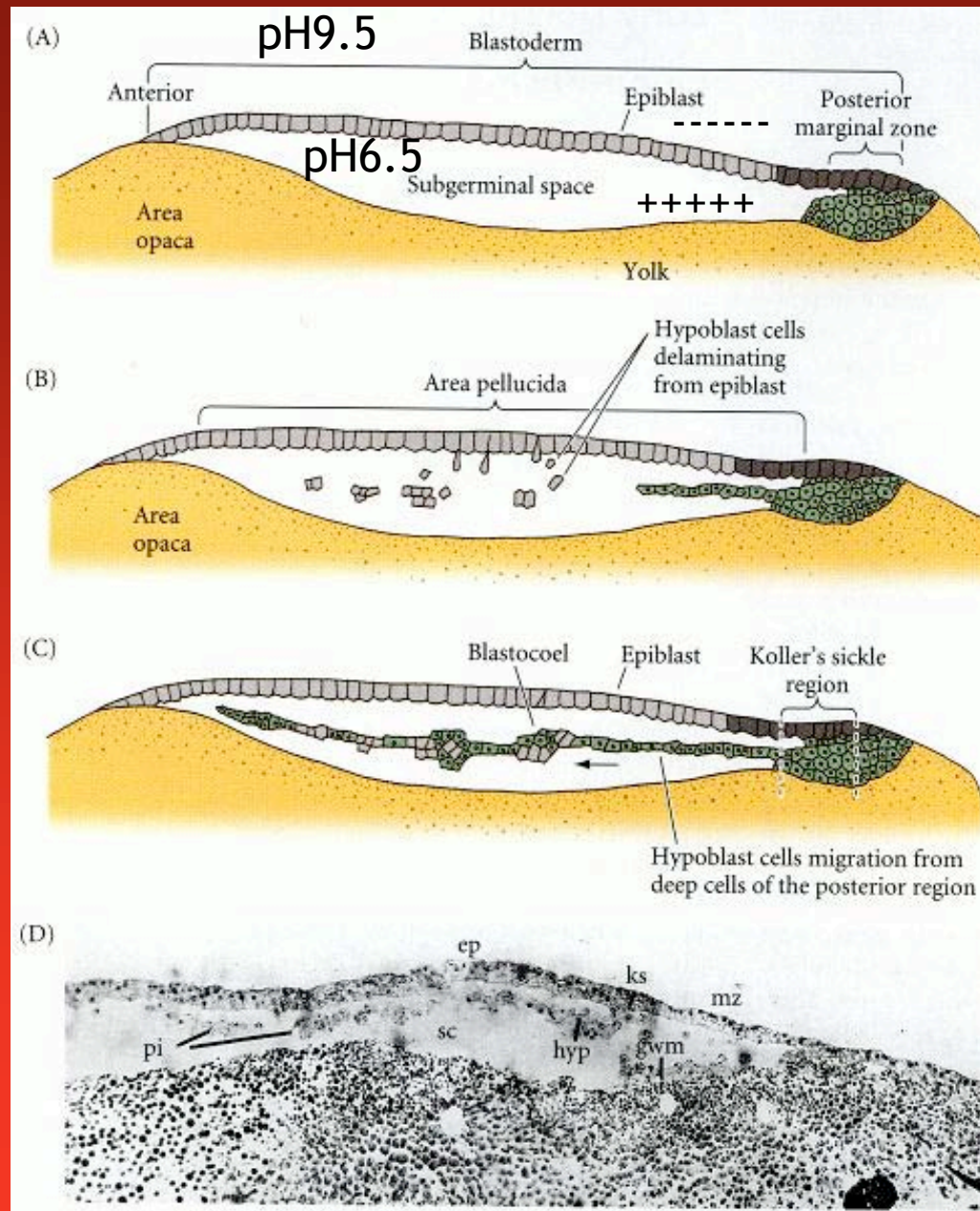
3) destino: Cordomesoderma (notocorda)

Contemporaneamente, le cellule della stria continuano a migrare verso l'interno del blastocele lateralmente e si separano in 2 strati, uno profondo **endodermico**, uno intermedio che darà **mesoderma** e annessi **extraembrionali**

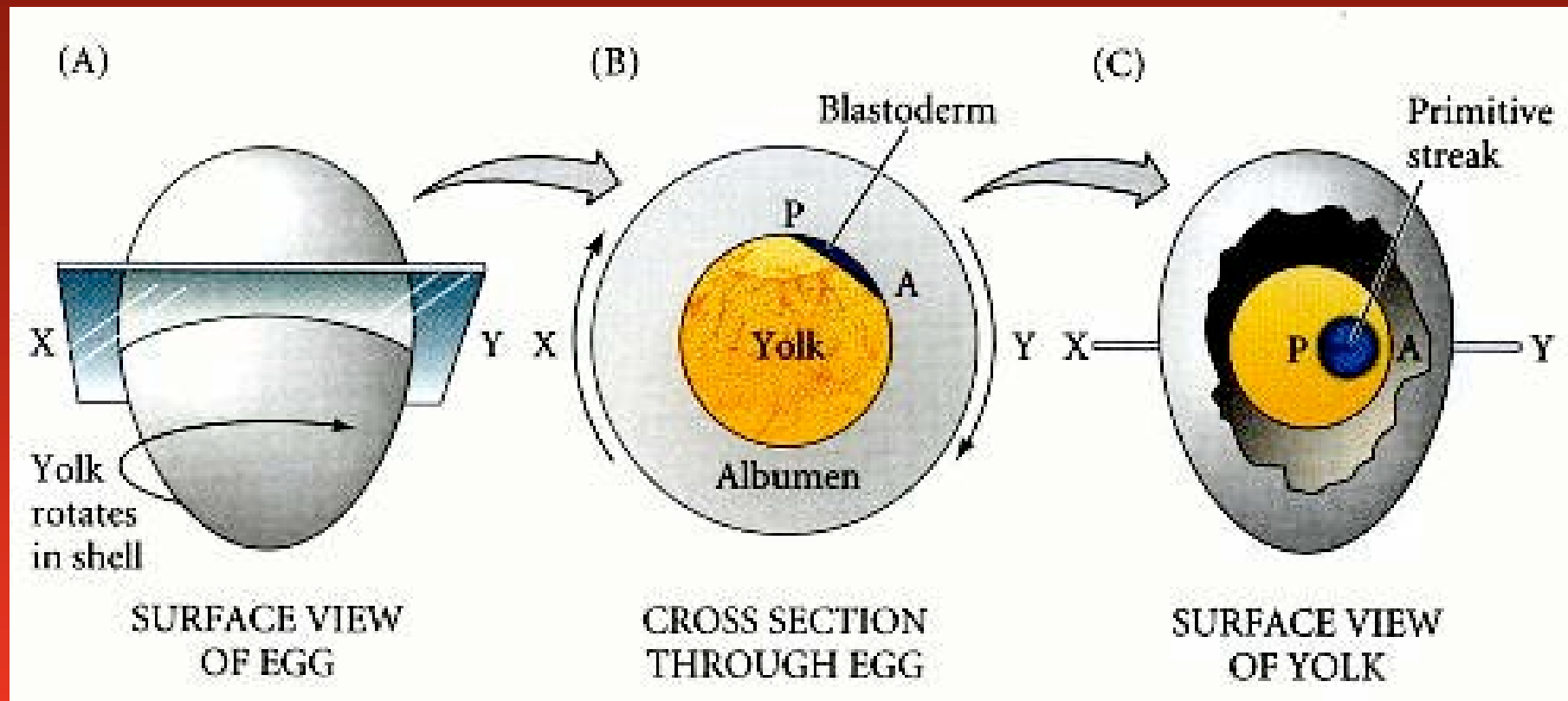
Gastrulazione tra le 24 e le 48 ore (fase II: regressione della stria)



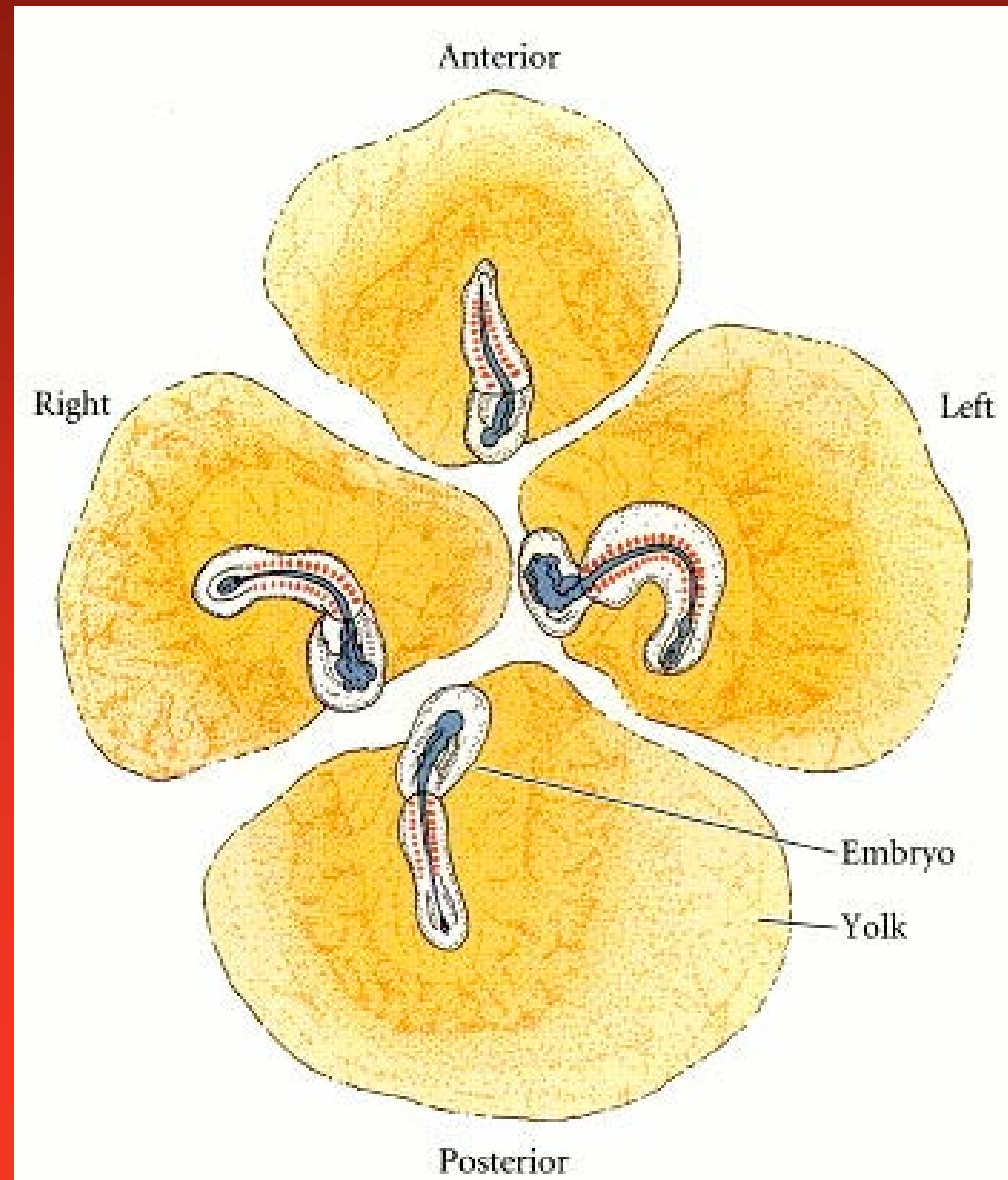
Il ruolo del pH nella formazione dell'asse dorso-ventrale



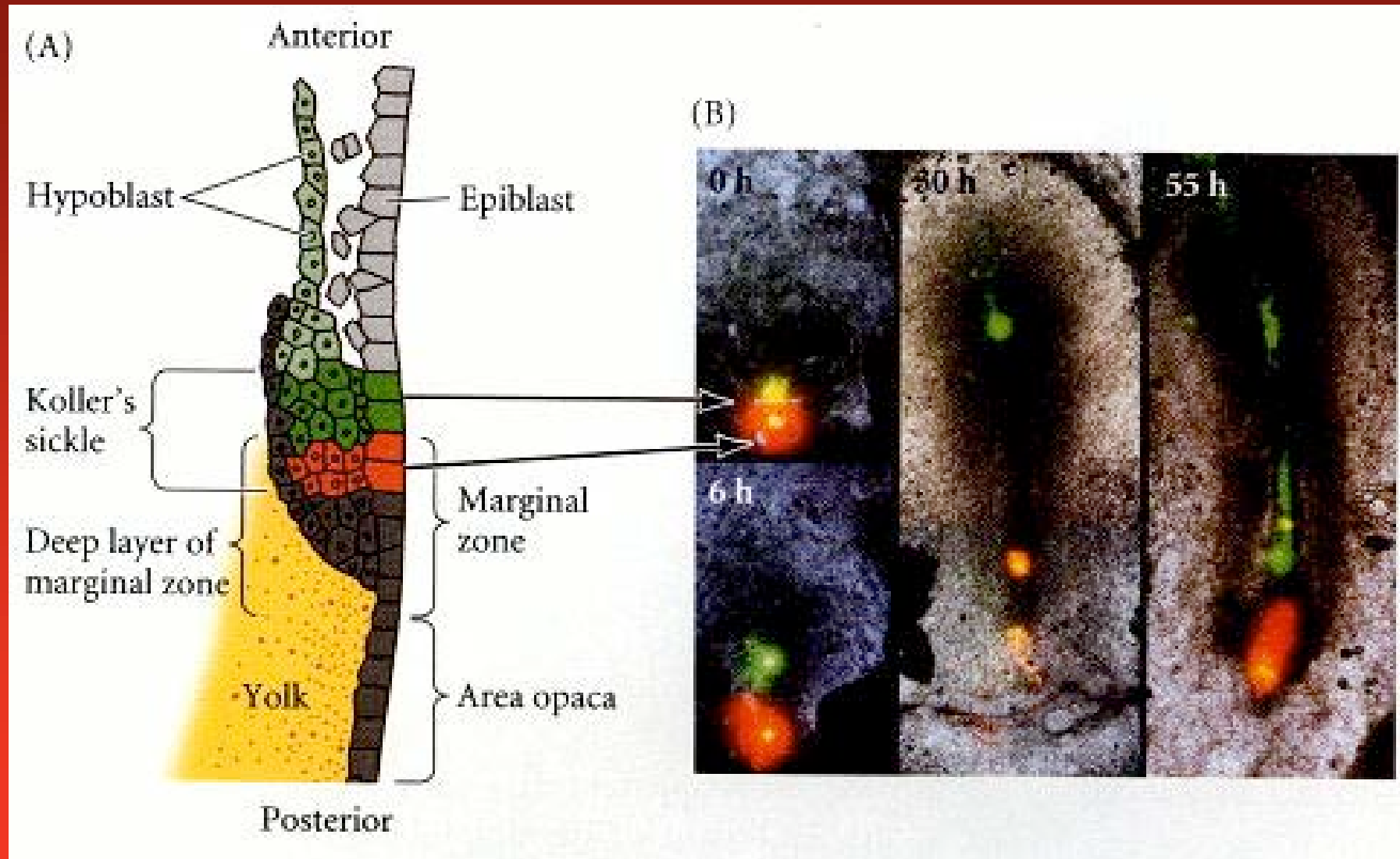
Specificazione gravitazionale dell'asse antero-posteriore



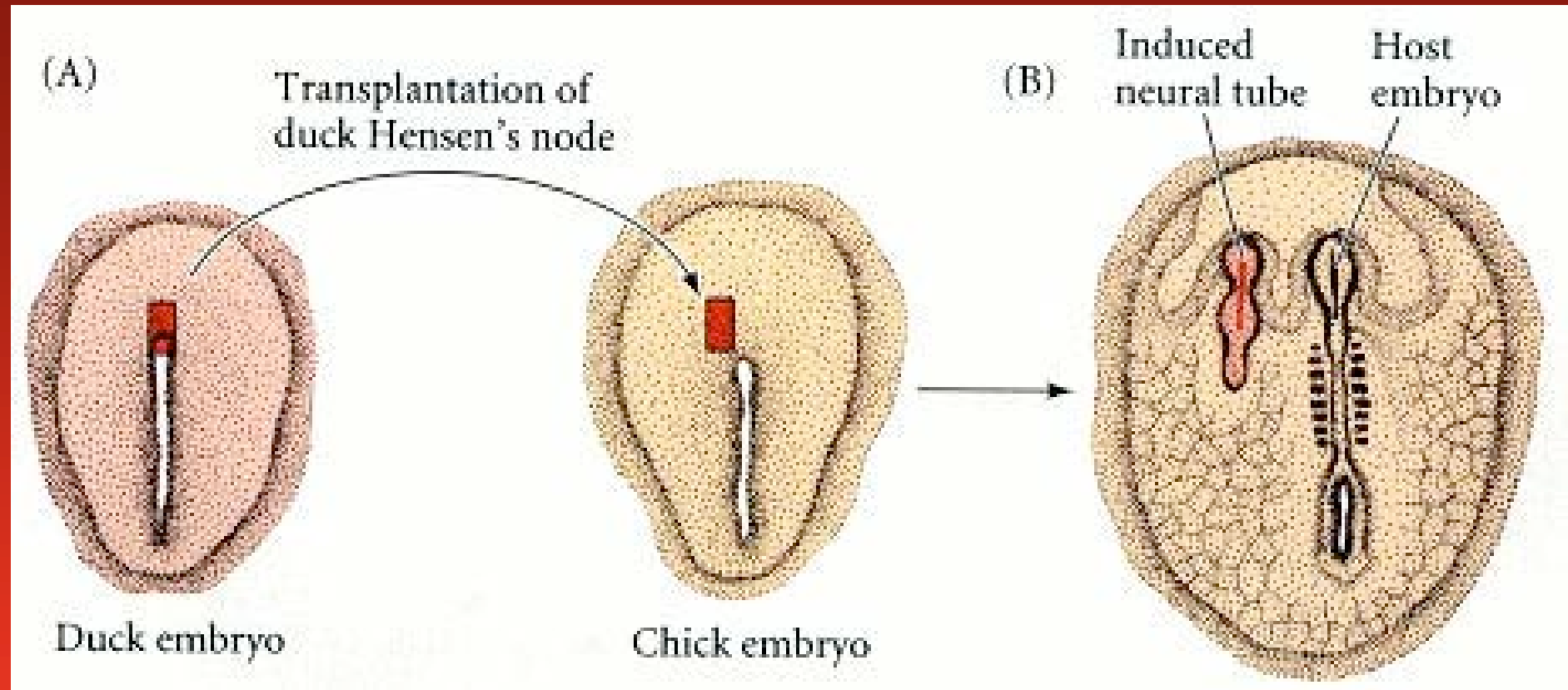
La regolazione del blastoderma: PMZ e' l'equivalente del centro di Nieuwkoop negli anfi



La formazione del nodo di Hensen a partire dalla falce di Koller



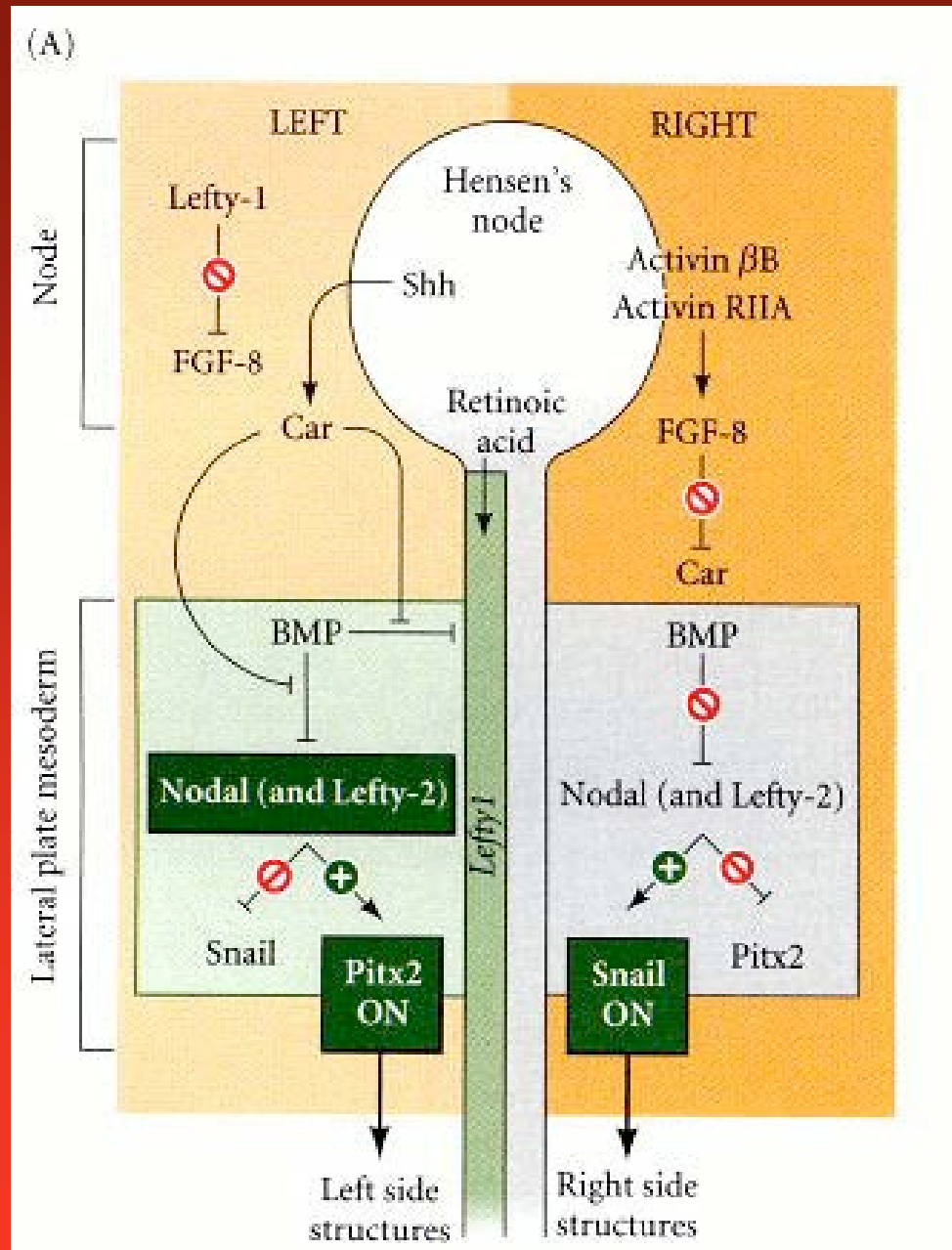
L'induzione di un embrione da parte del nodo di Hansen: l'esperimento di Waddington, 1933



Il nodo di Hensen e' l'equivalente del labbro dorsale del blastoporo

1. Il sito d' inizio della gastrulazione
2. La regione le cui cellule diverranno cordomesoderma
3. La regione le cui cellule possono organizzare un asse embrionale aggiuntivo se trapiantate

Simmetria destra-sinistra nell'embrione di pollo



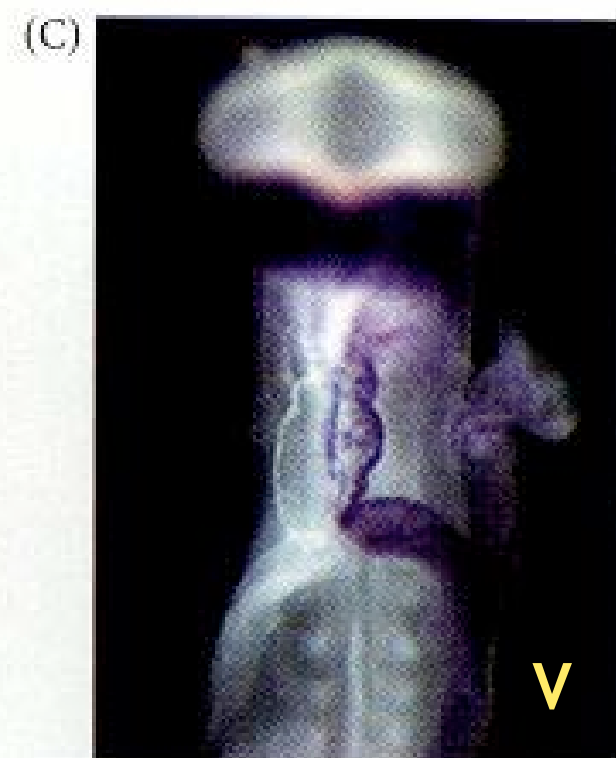
Il segnale “lato sinistro” viaggia dal nodo di Hensen al mesoderma della piastra laterale



caronte



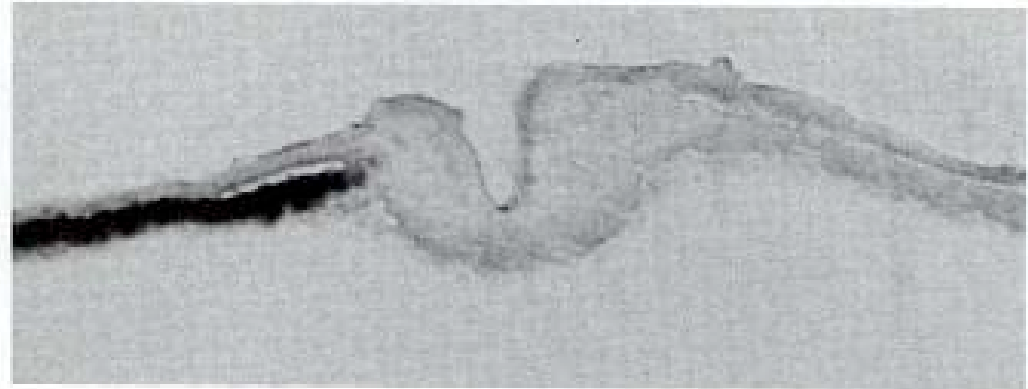
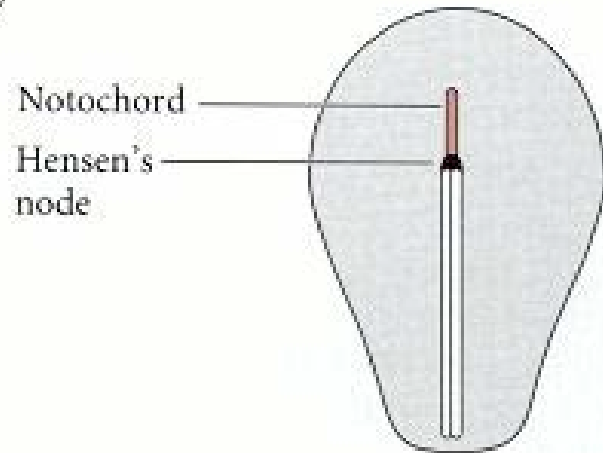
nodal



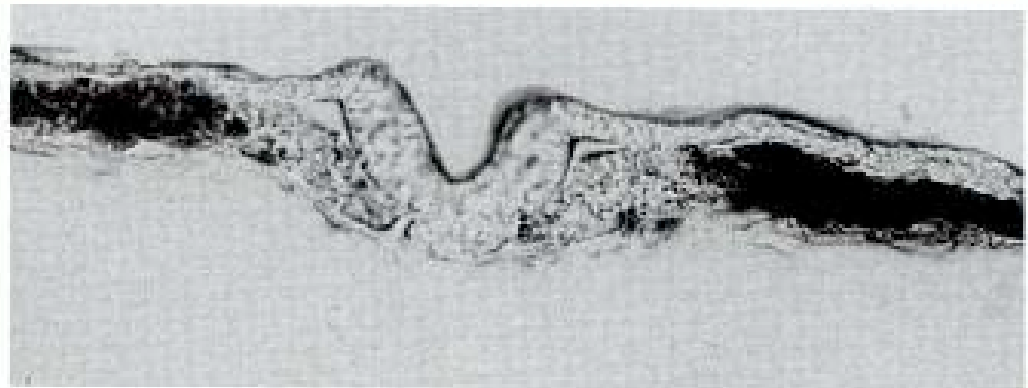
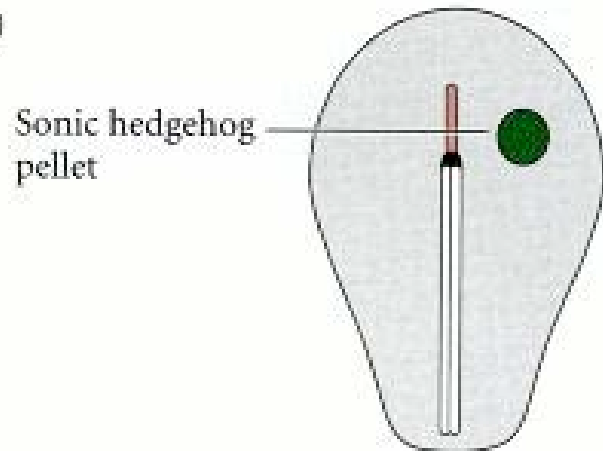
pitx2

Il gene *sonic hedgehog* induce l'espressione simmetrica del gene *nodal*

(A)



(B)



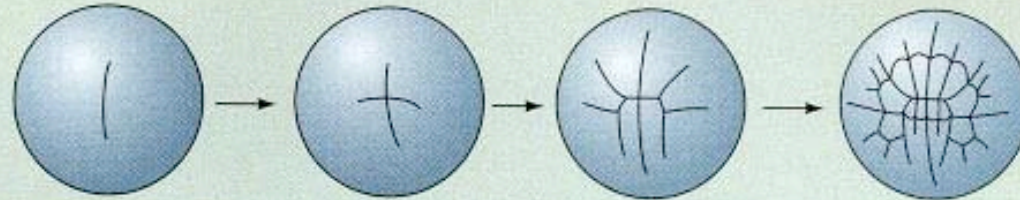
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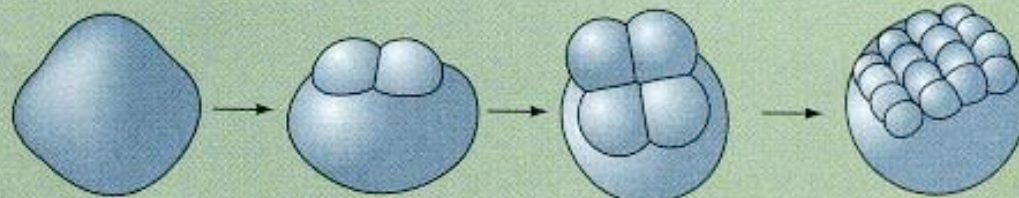
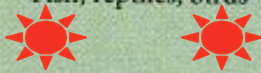
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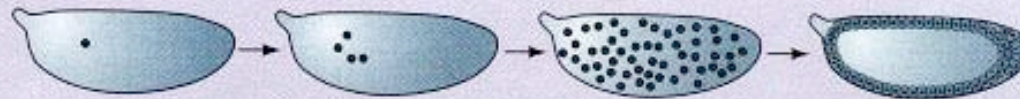
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Most insects



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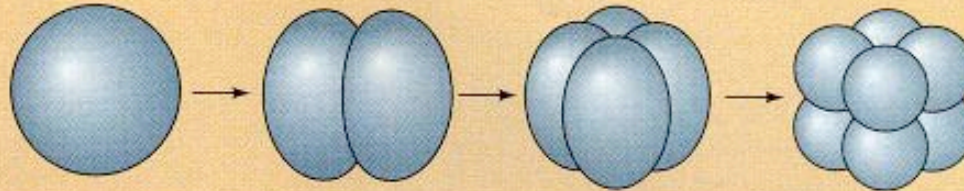
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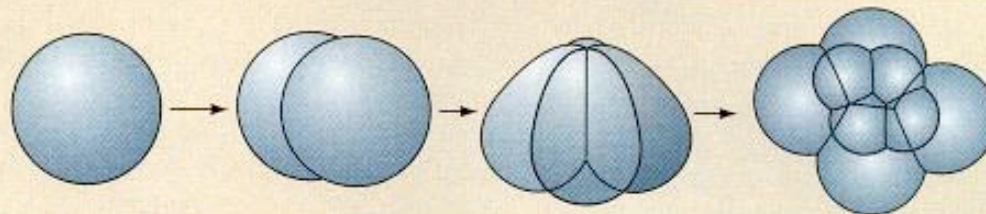
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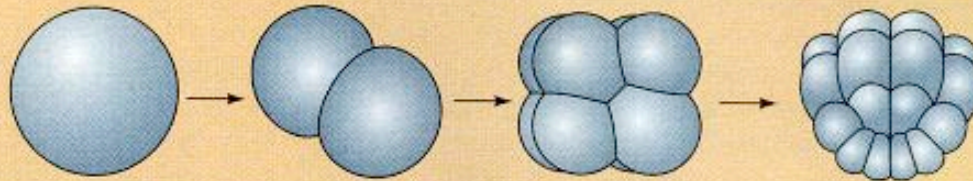
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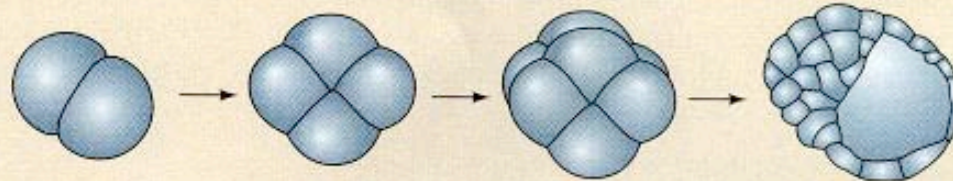
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Tunicates



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Mammals, nematodes

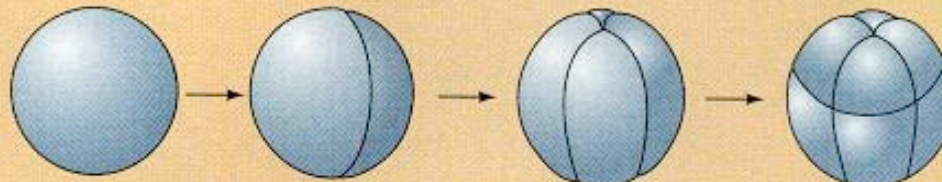


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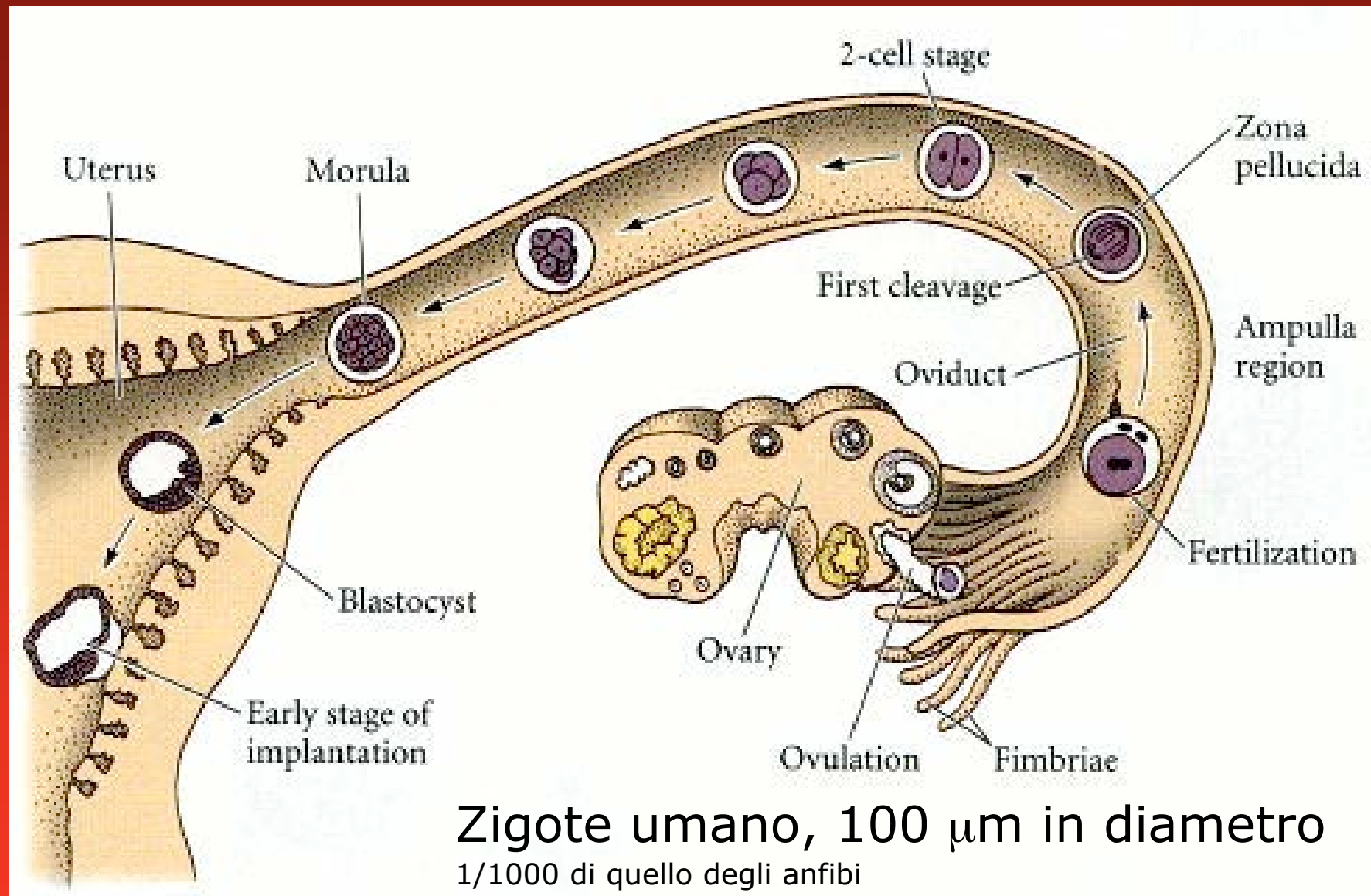
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Radial

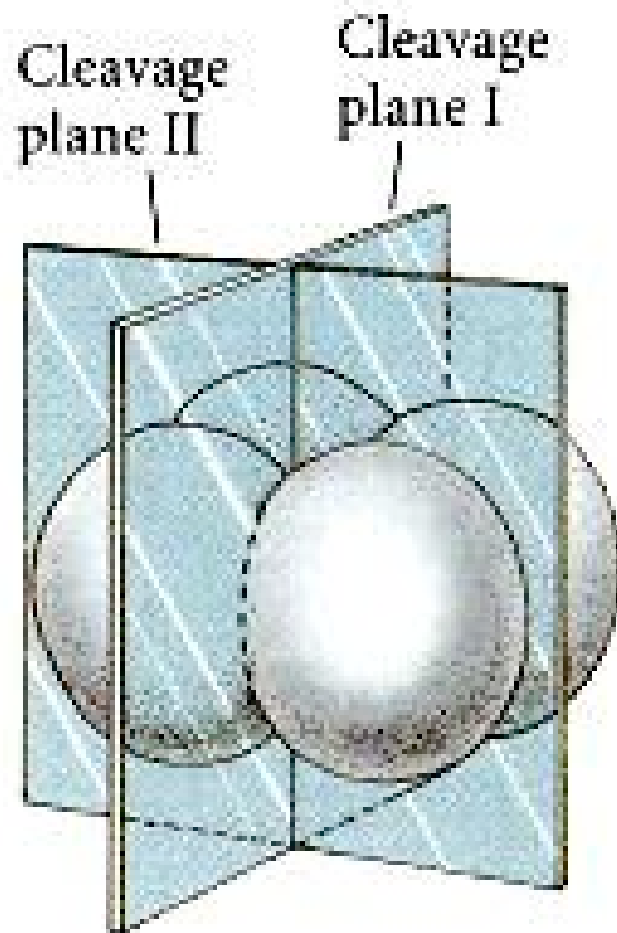
Amphibians



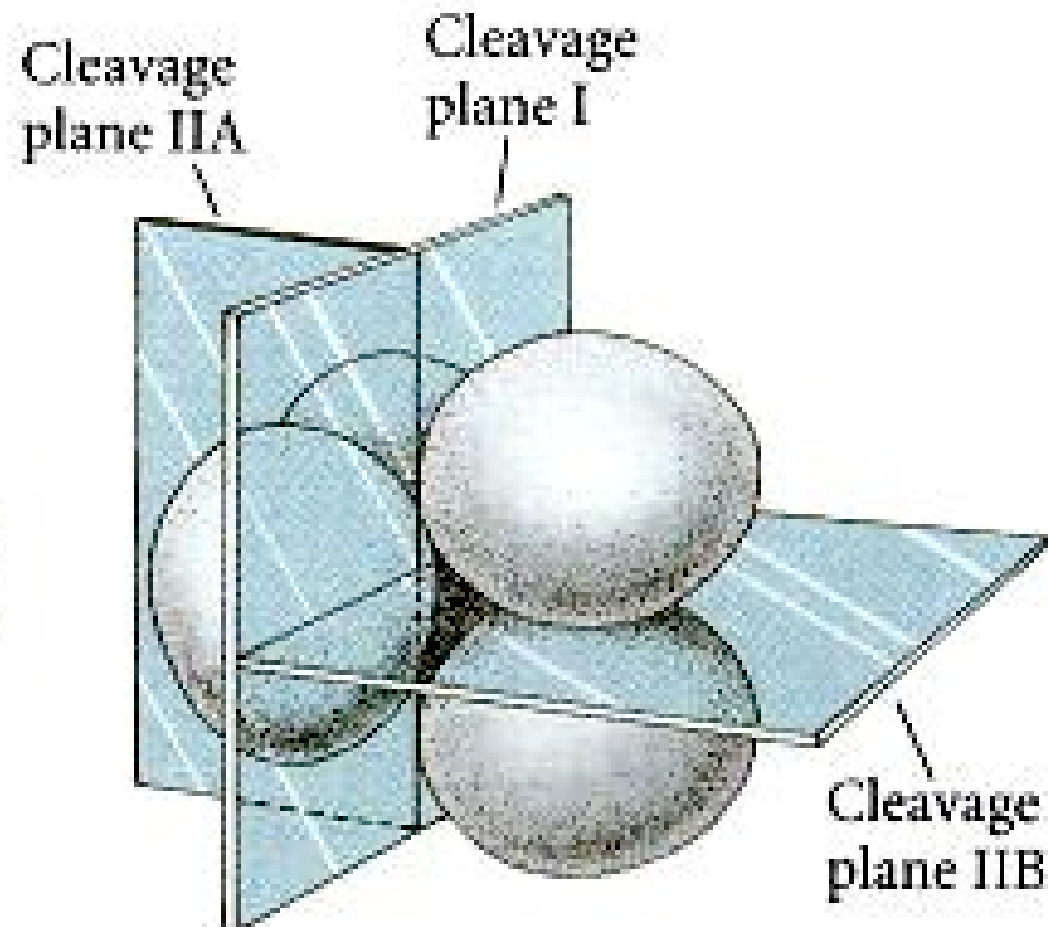
Lo sviluppo di un embrione umano dalla fecondazione all'impianto



Le prime segmentazioni a confronto: radiale e rotazionale



(A) ECHINODERM
AND AMPHIBIAN

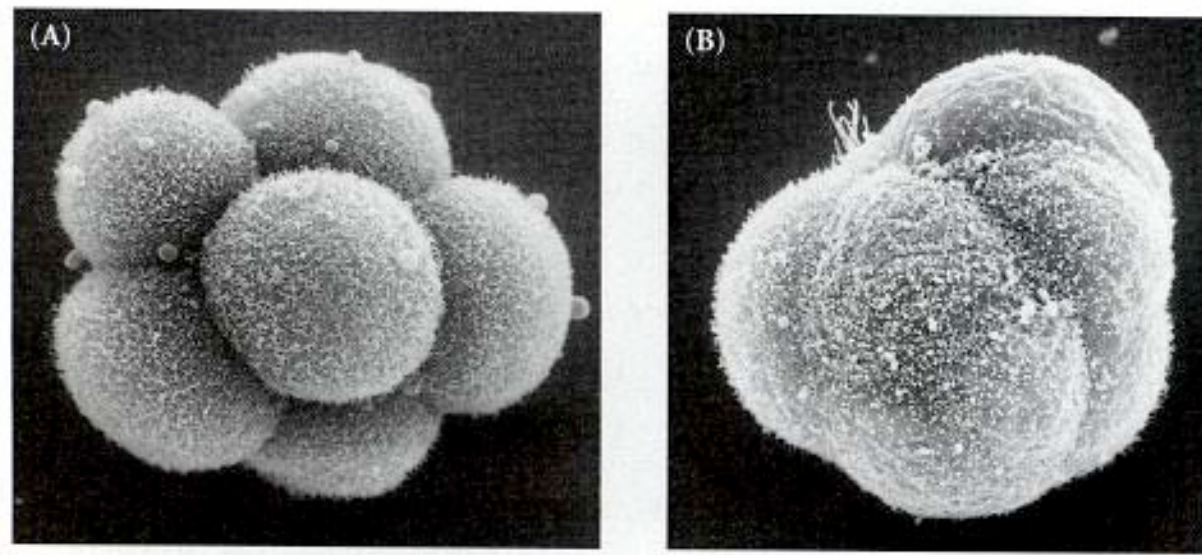
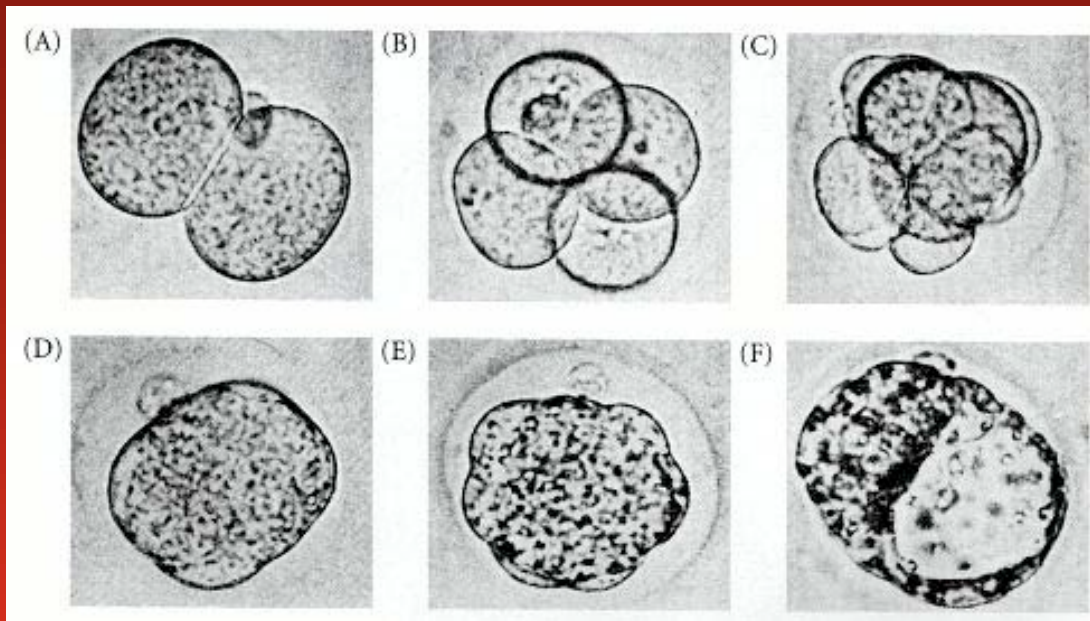


(B) MAMMAL

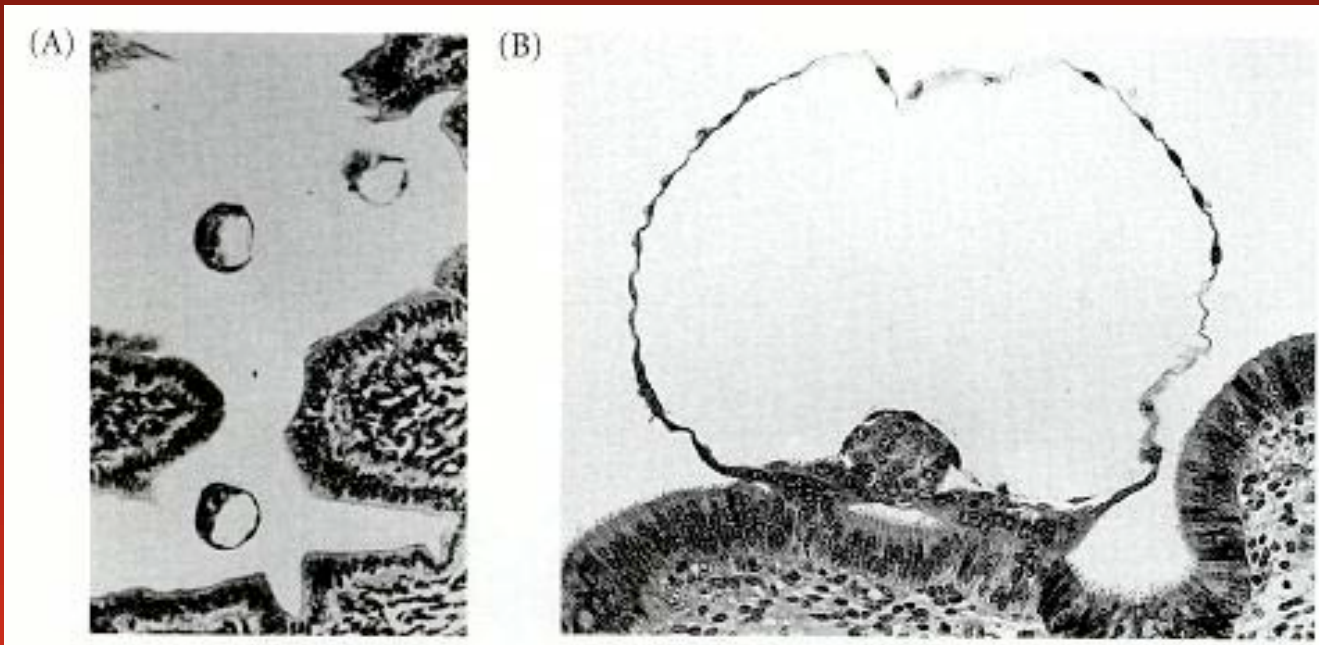
Particolarita' della segmentazione dei mammiferi

- 1) **Lentezza** delle divisioni cellulari: una ogni 12-24 ore
- 2) Orientamento **rotazionale**
- 3) **Asincronia** delle divisioni, spesso l'embrione contiene un numero dispari di cellule
- 4) Il genoma si attiva prestissimo (da due cellule in poi) e **non** ha stadio di **transizione di midblastula**
- 5) L'embrione va incontro al fenomeno della **compattazione**

La compattazione dell'embrione



L'impianto della blastocisti nell'utero



La fuga dalla zona pellucida e'
mediata dall'attivit  della
stripsina



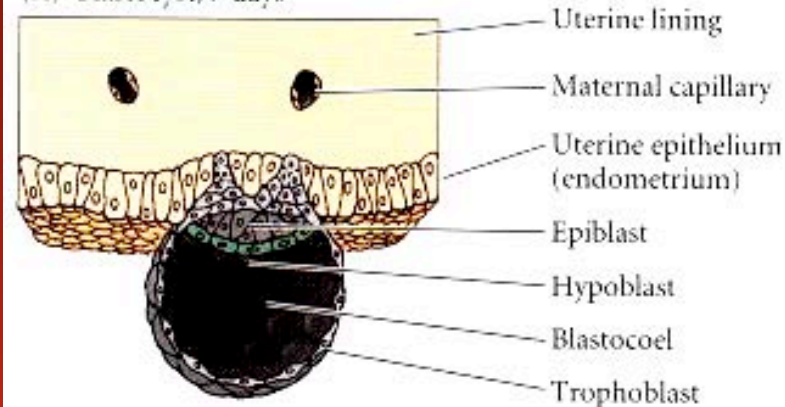
L'endometrio *uterino* "cattura" la blastocisti

Matrice extracellulare costituita da collagene, laminina, fibronectina, acido ialuronico e recettori dell'eparansolfato

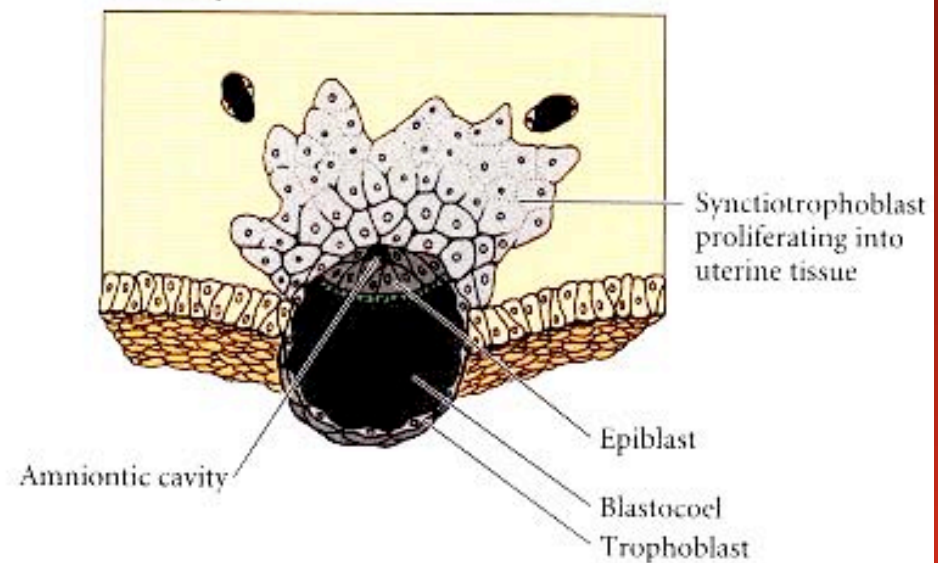
Trofoblasto contiene integrine che legano collagene, fibronectina e laminina e sintetizza proteoglicano-eparansolfato, quindi produce proteasi che lidono la matrice consentendo la sua "sepoltura" nell'endometrio

Formazione dei tessuti nell'embrione umano a e7-e11

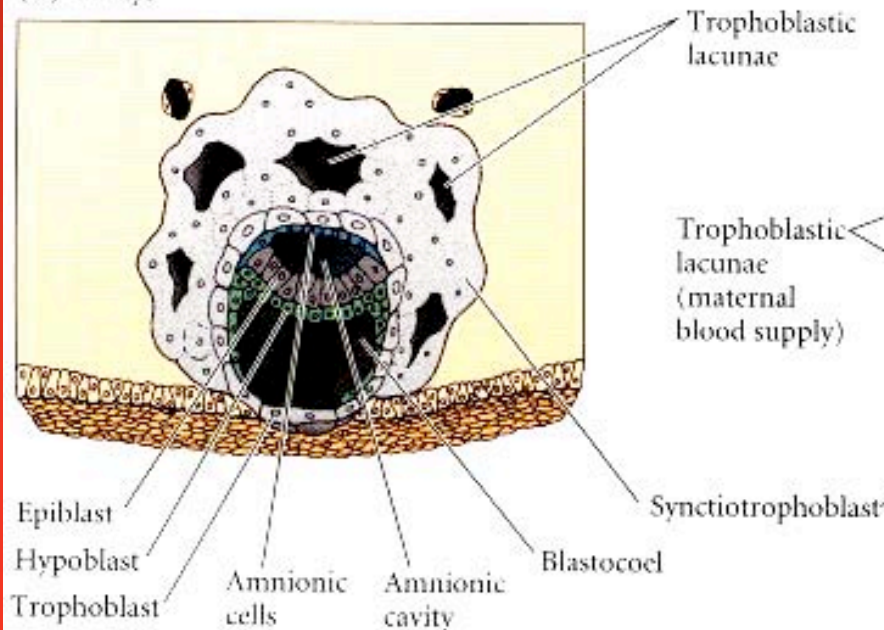
(A) Blastocyst, 7 days



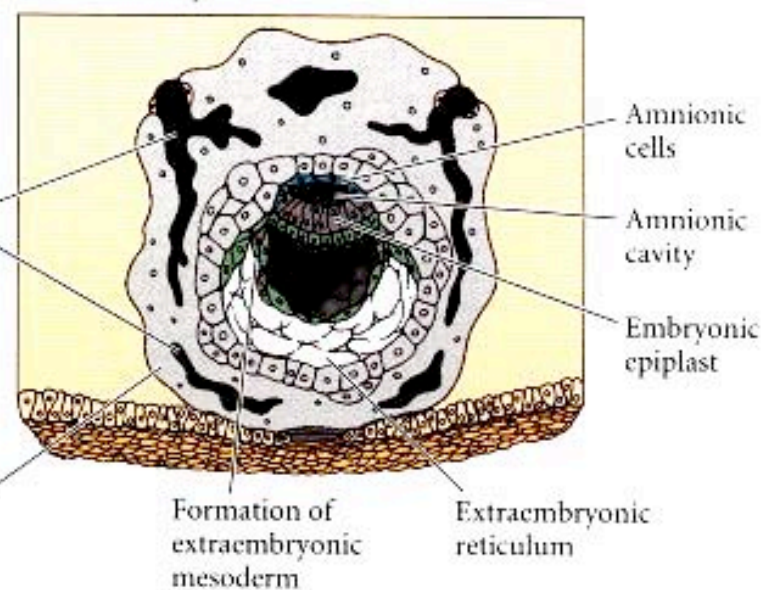
(B) 8 Days



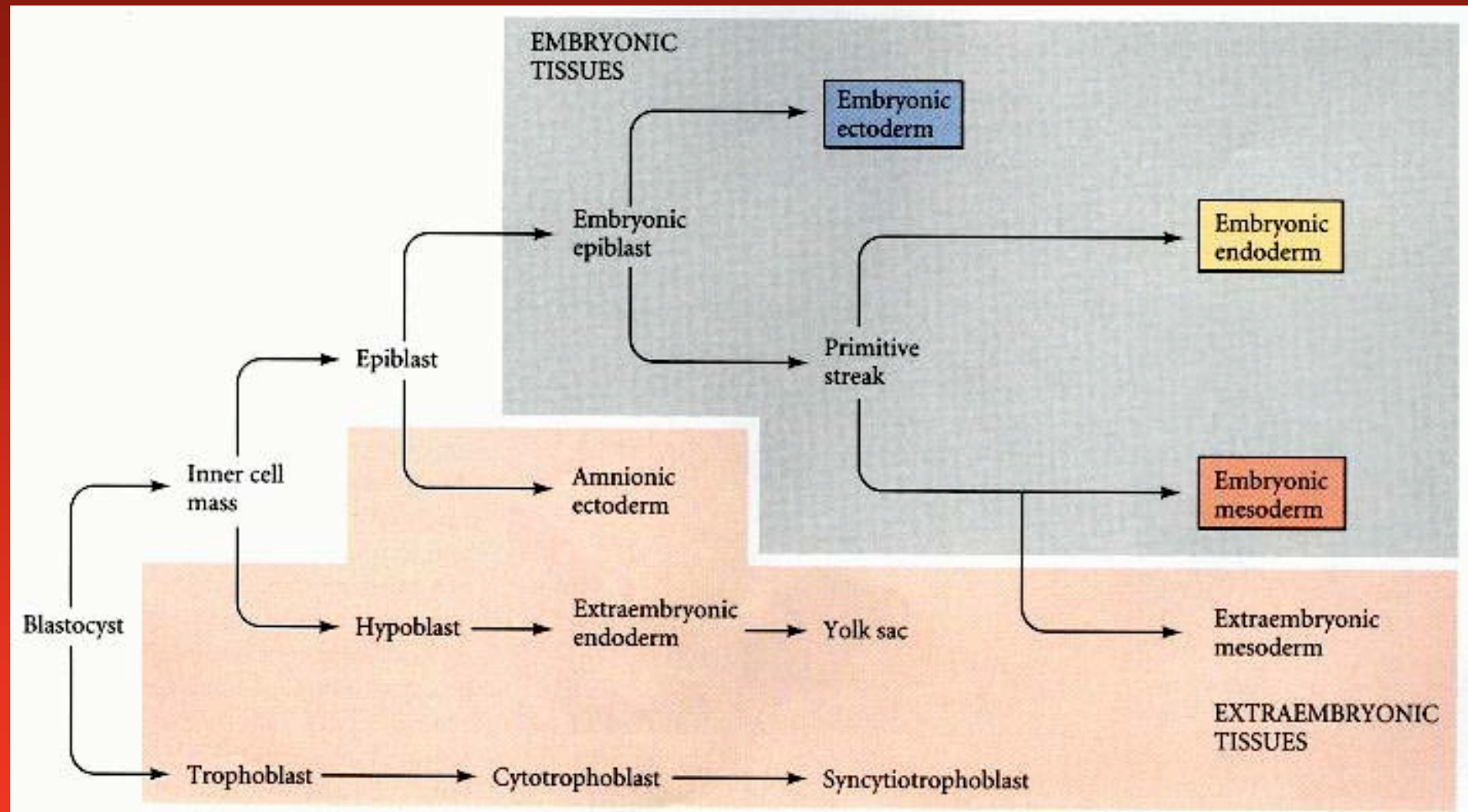
(C) 9 Days



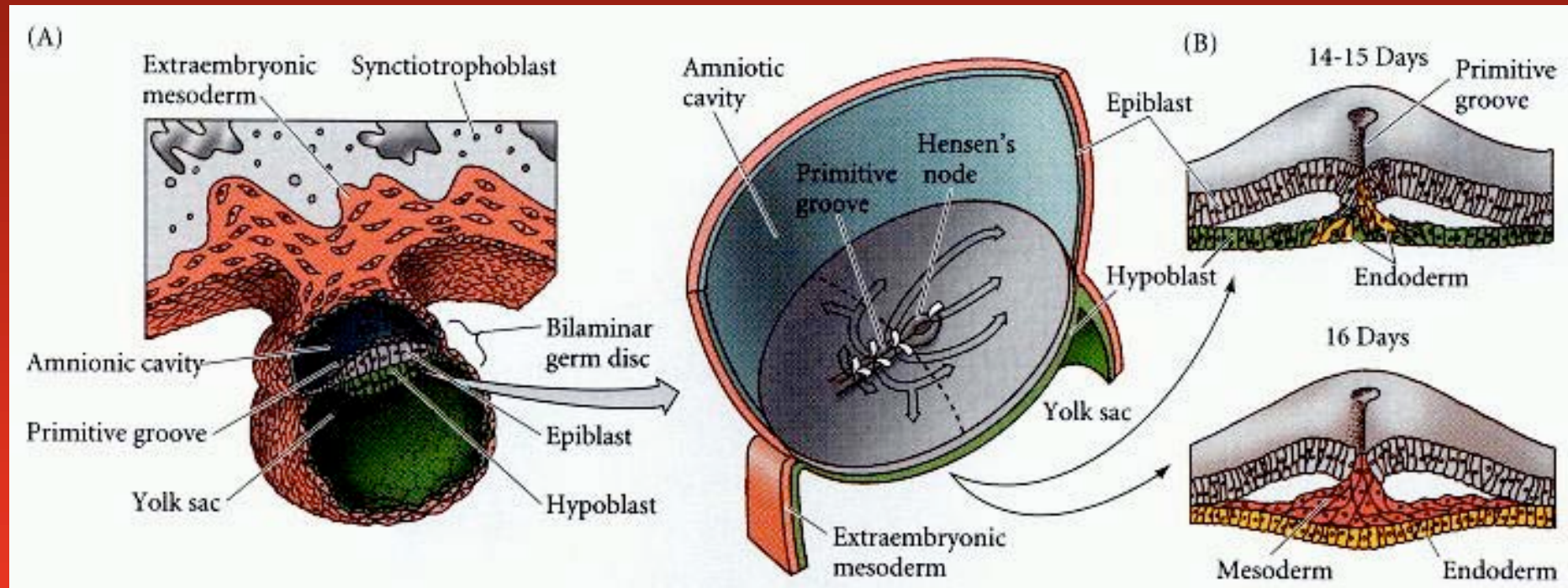
(D) 10-11 Days



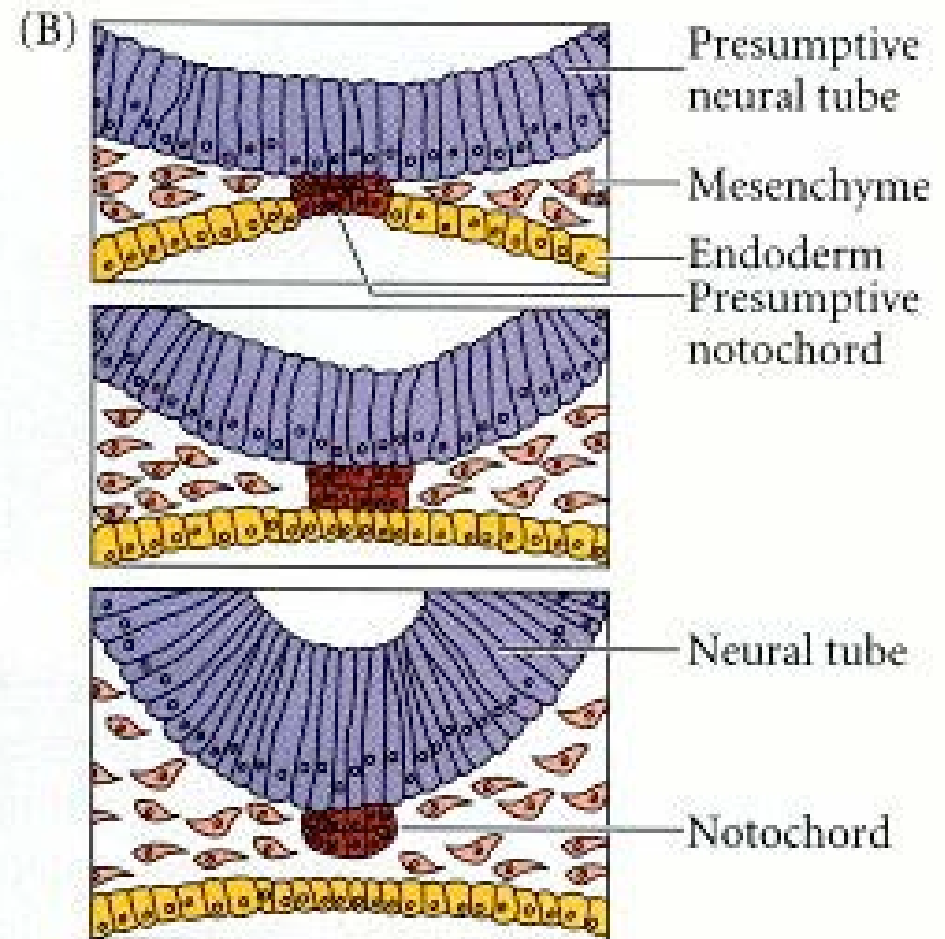
Origine dei tessuti umani



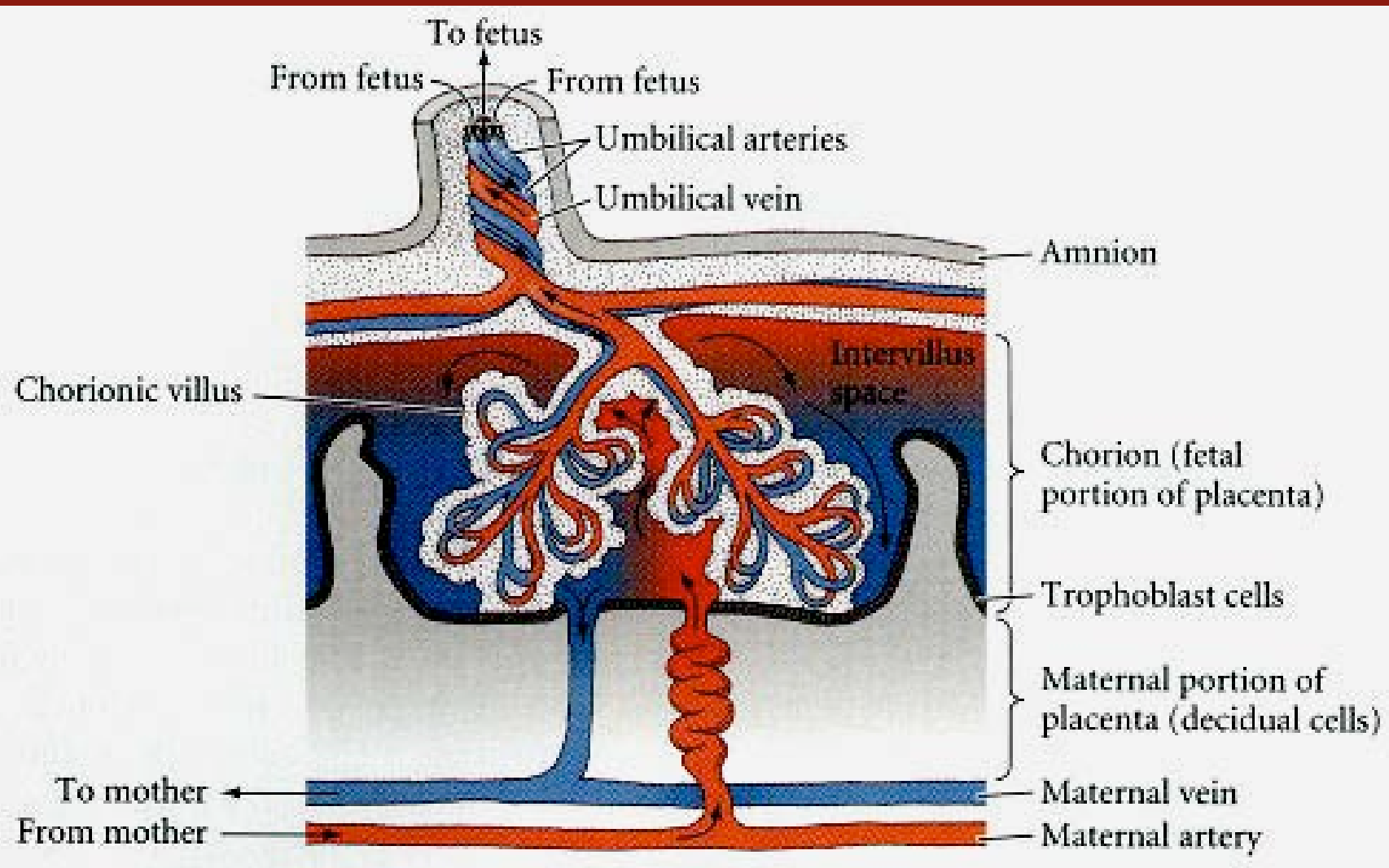
La struttura dell'amnios e la gastrulazione umana



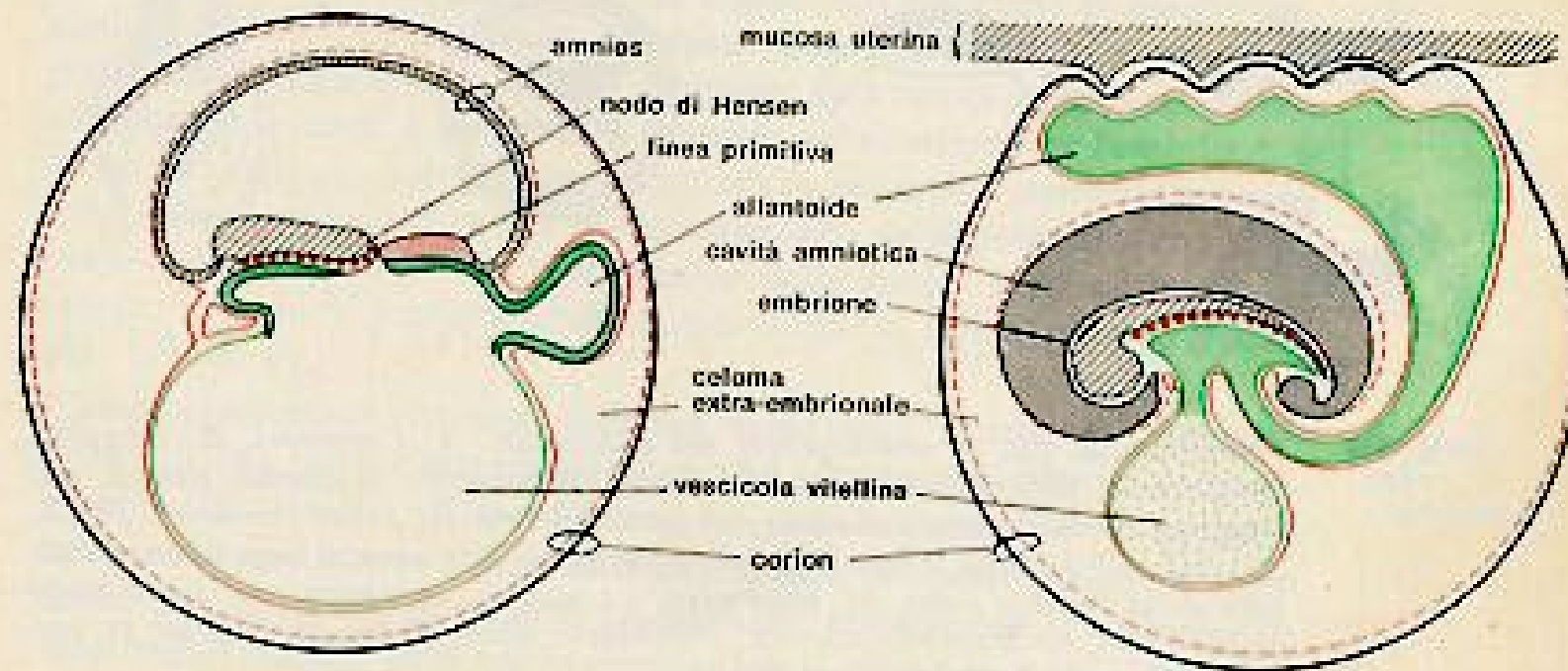
Formazione della notocorda nel topo



Relazione tra villi coriali e sangue materno nell'utero



Aspetto generale degli annessi embrionali nei mammiferi

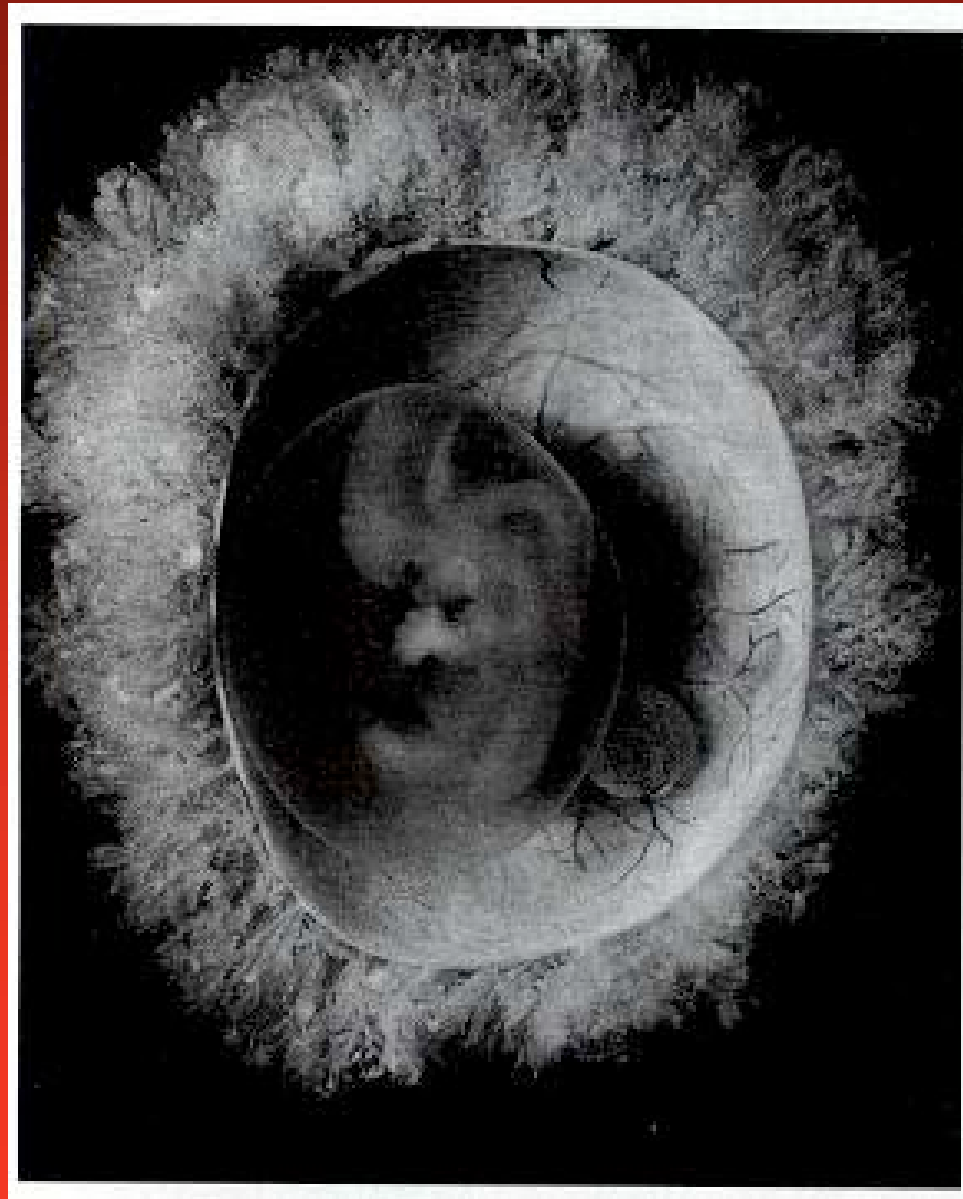


E. Stadio della linea primitiva

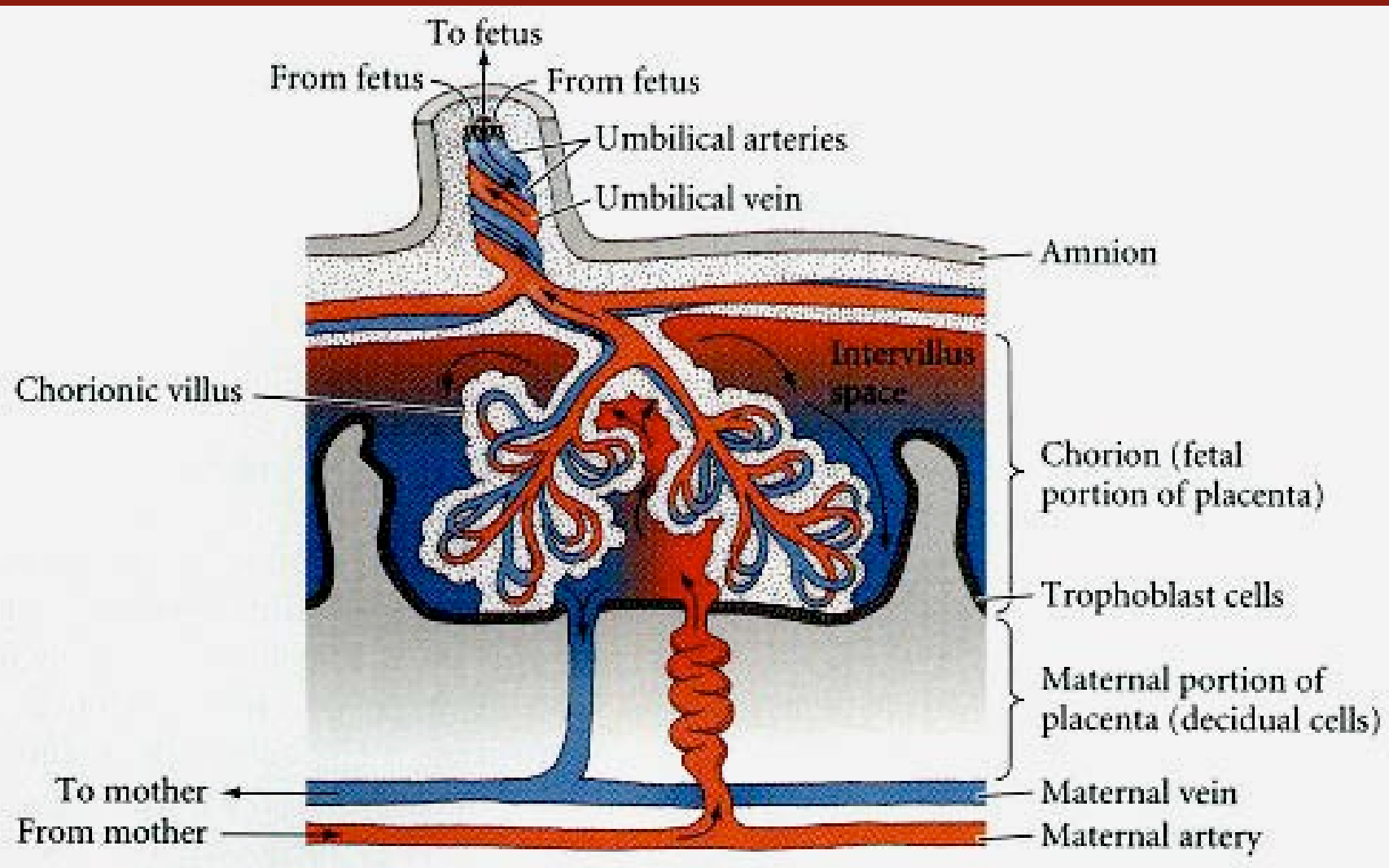
F. Sviluppo dell'allantoide

III. ASPETTO GENERALE DEGLI ANNESSI EMBRIONALI

L'embrione umano a e40 e la placenta



Relazione tra villi coriali e sangue materno nell'utero



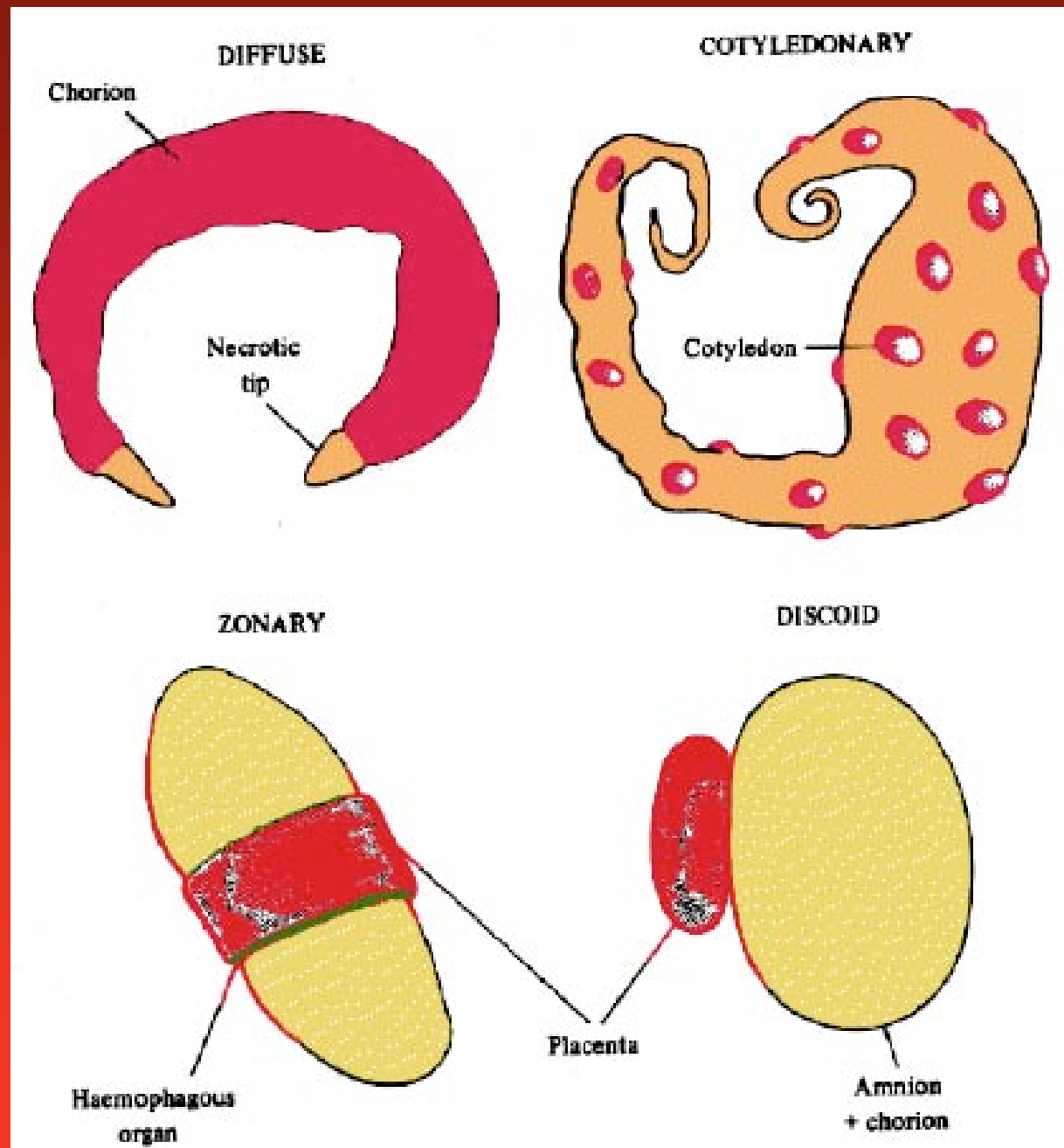
LA PLACENTA

Organo di fusione del **corion** (embrionale) costituito da trofoblasto e mesoderma vascolarizzato con la **parete uterina** (materna), costituita da endometrio e decidua

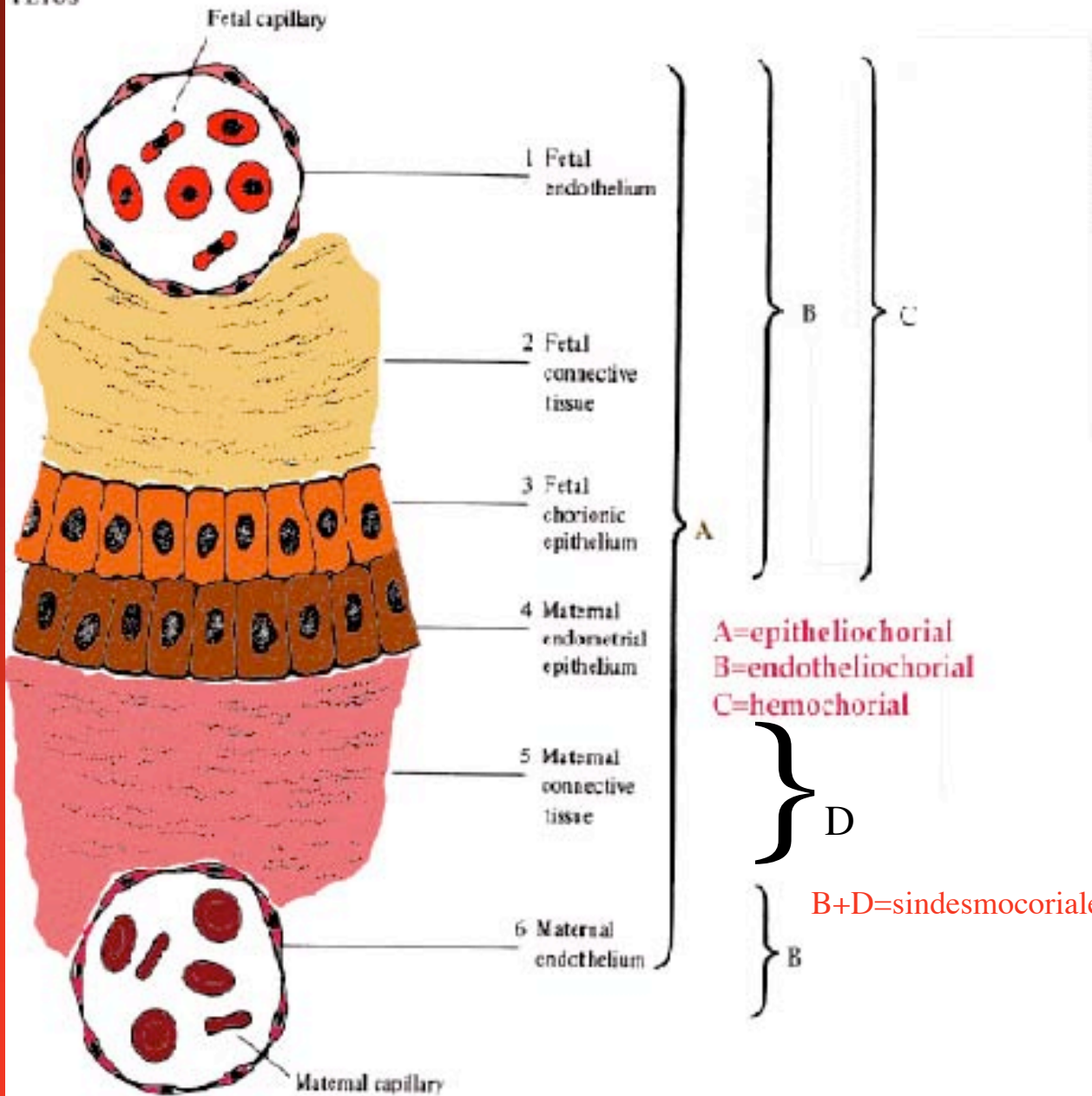
E' un organo nutrizionale endocrino e immunologico

A seconda della distribuzione dei villi sulla superficie del corion, si distinguono placente 1) **diffuse** (Cetacei, Lemuroidei); 2) **cotiledonari** (Ruminanti); 3) **zonali** (carnivori); 4) **discoidali** (uomo, roditori)

Tipi di placenta nei mammiferi



FETUS



MOTHER

Le placenti nei mammiferi

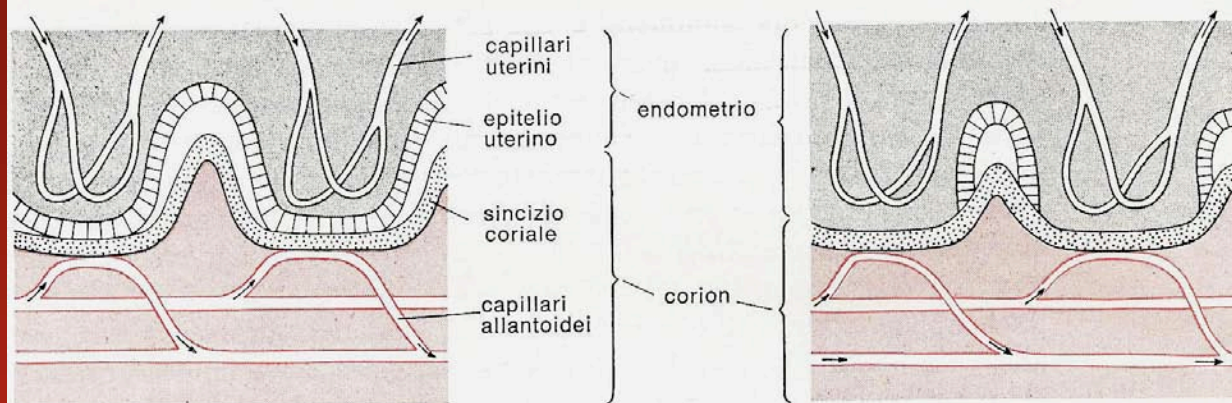
A: marsupiali
Pachidermi
Cetacei
Equini
suini

B: carnivori

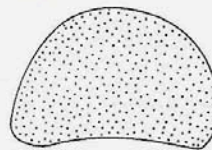
B+D: ruminanti

C: uomo
roditori

Le placente nei mammiferi



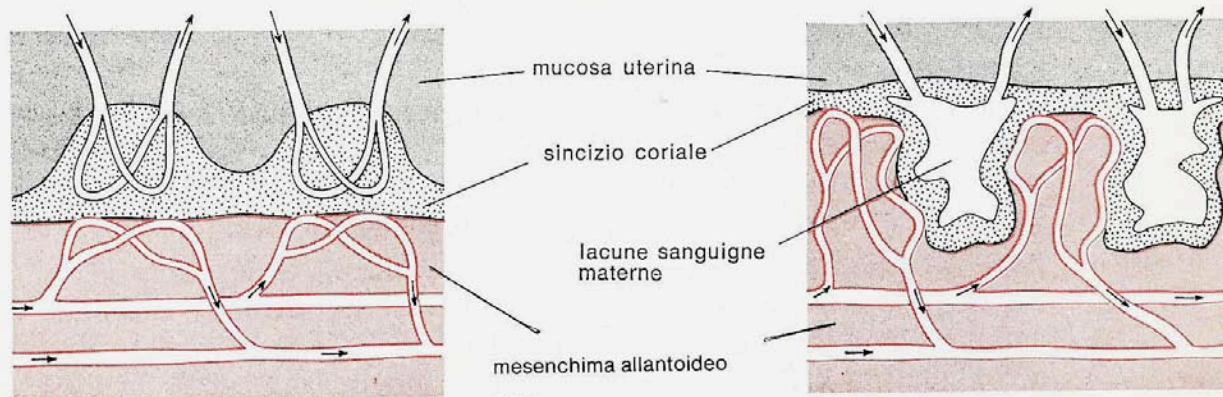
A. Epitelio-coriale e diffusa



B. Sindesmo-coriale e multipla



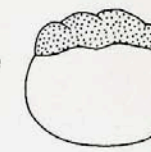
I. PLACENTE ADECIDUATE



C. Endotelio-coriale e zonale

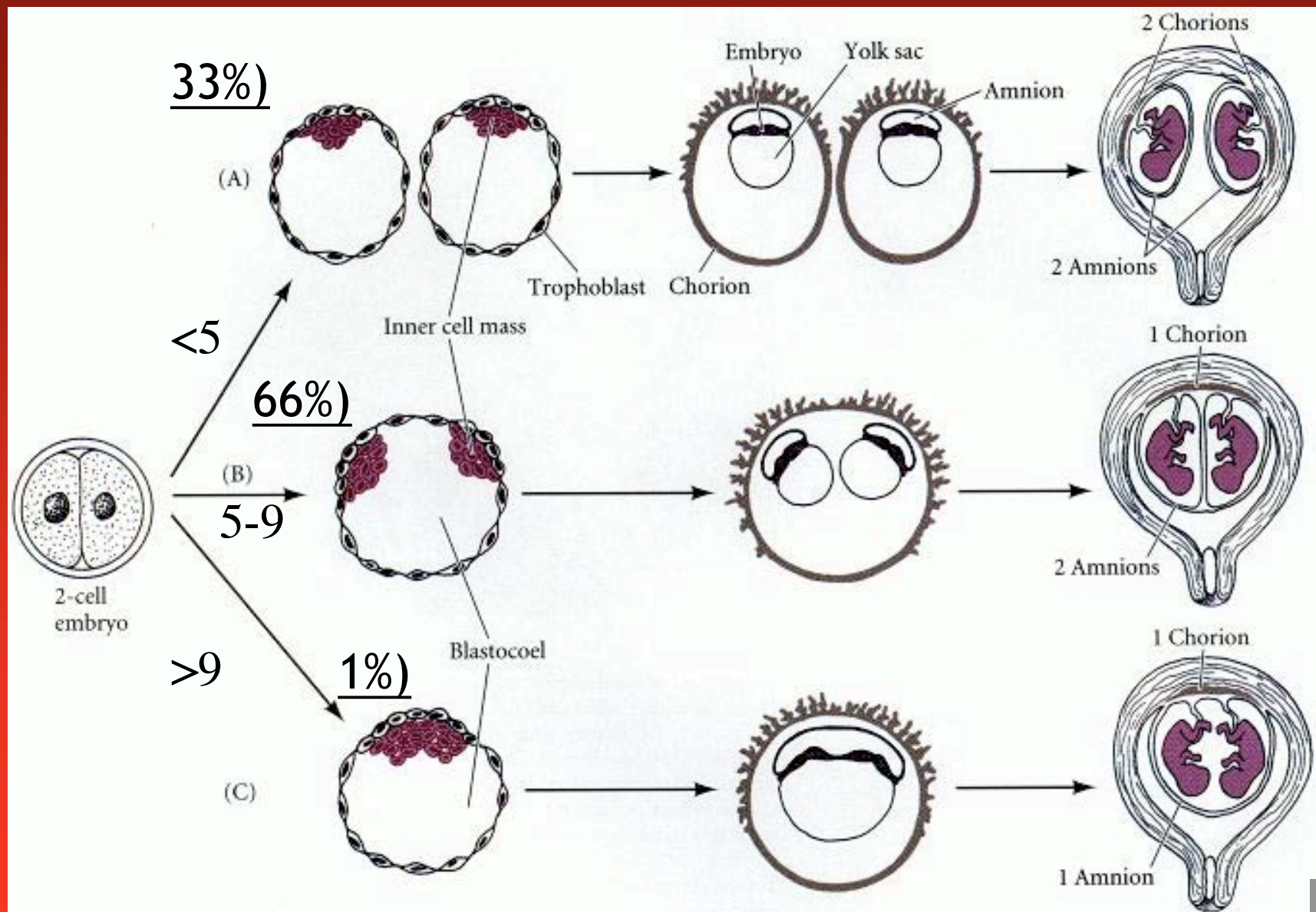


D. Emo-coriale e discoidale

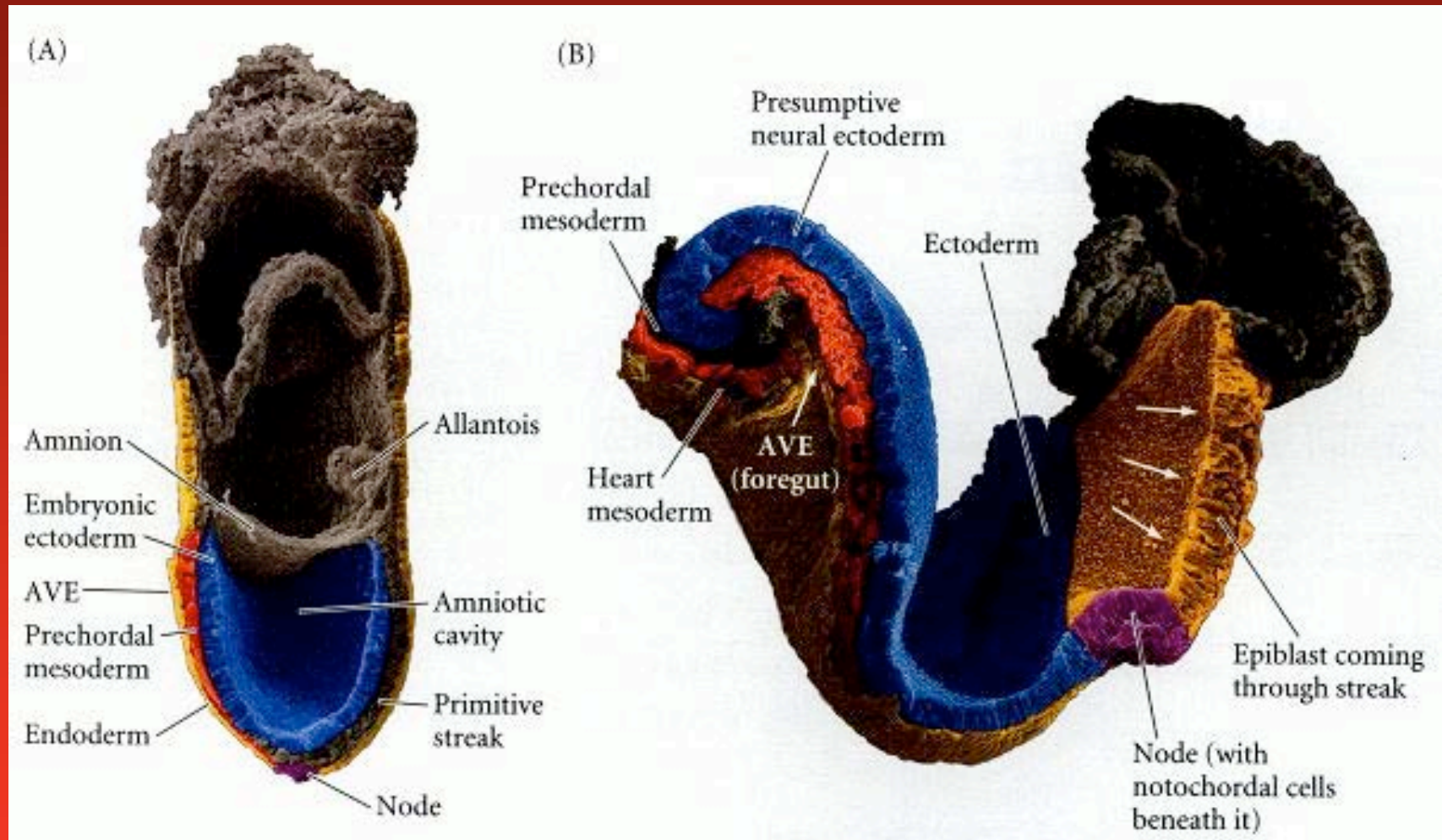


II. PLACENTE DECIDUATE

I gemelli monozigoti (0,25%)



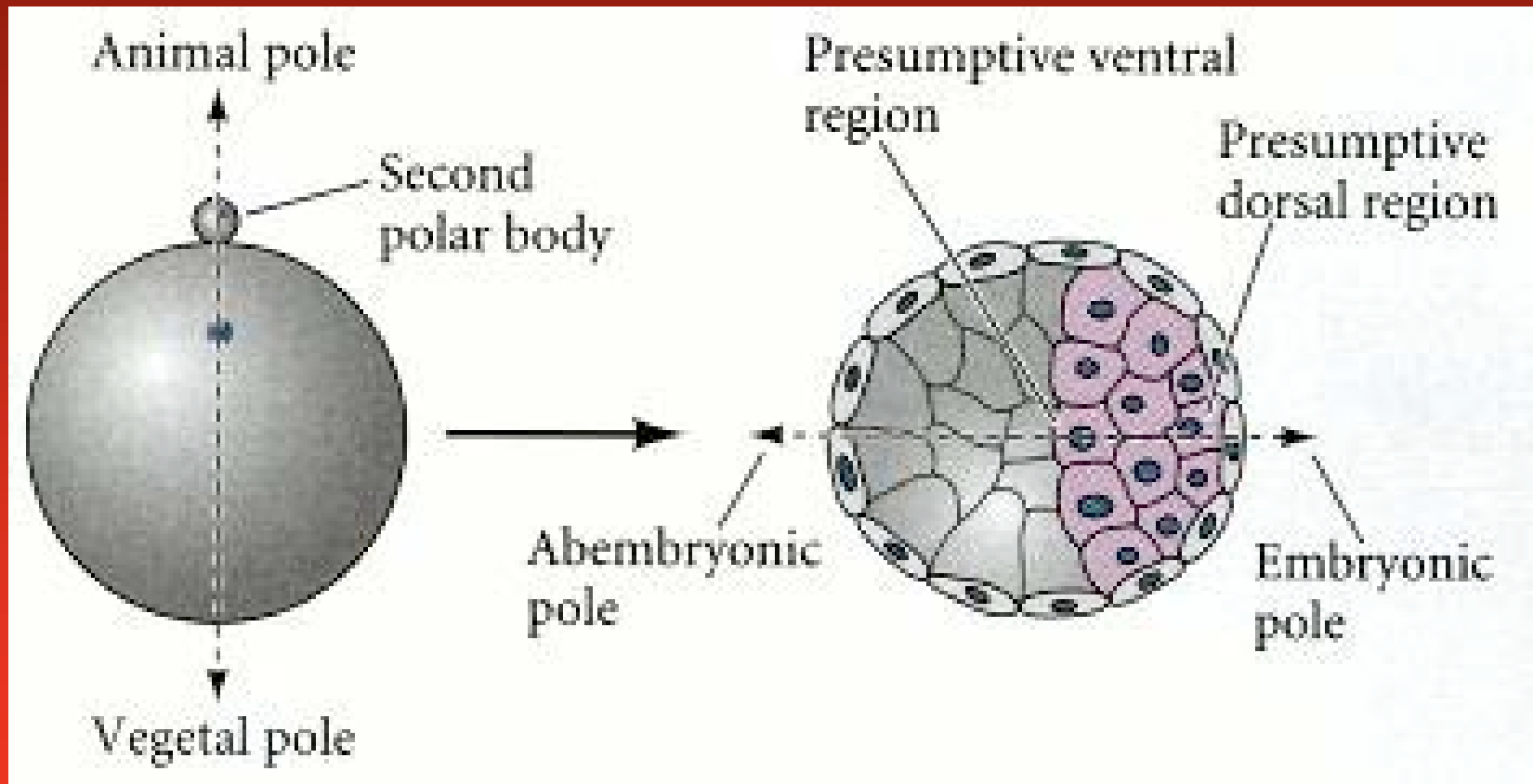
I due centri di segnalazione dell'embrione di topo



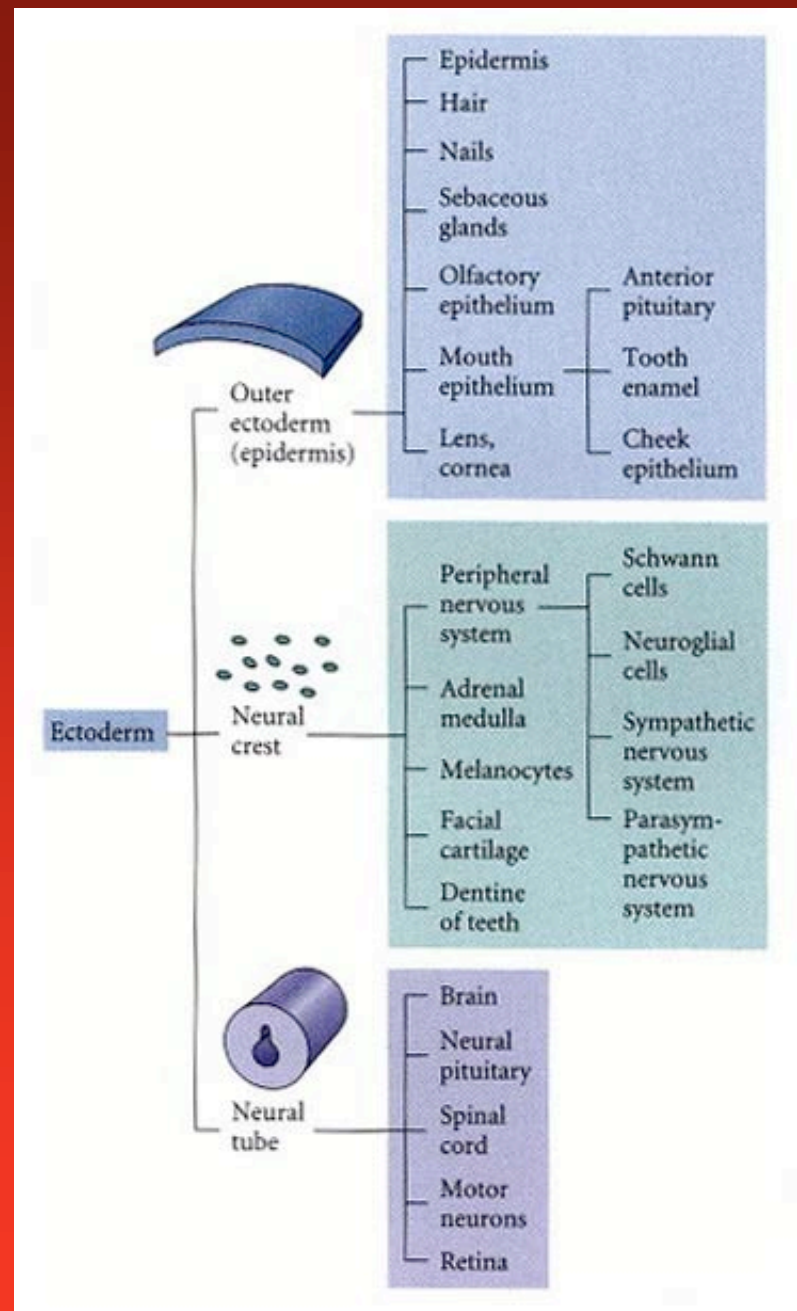
La mutazione di uno dei geni organizzatori della testa: *Lim-1*



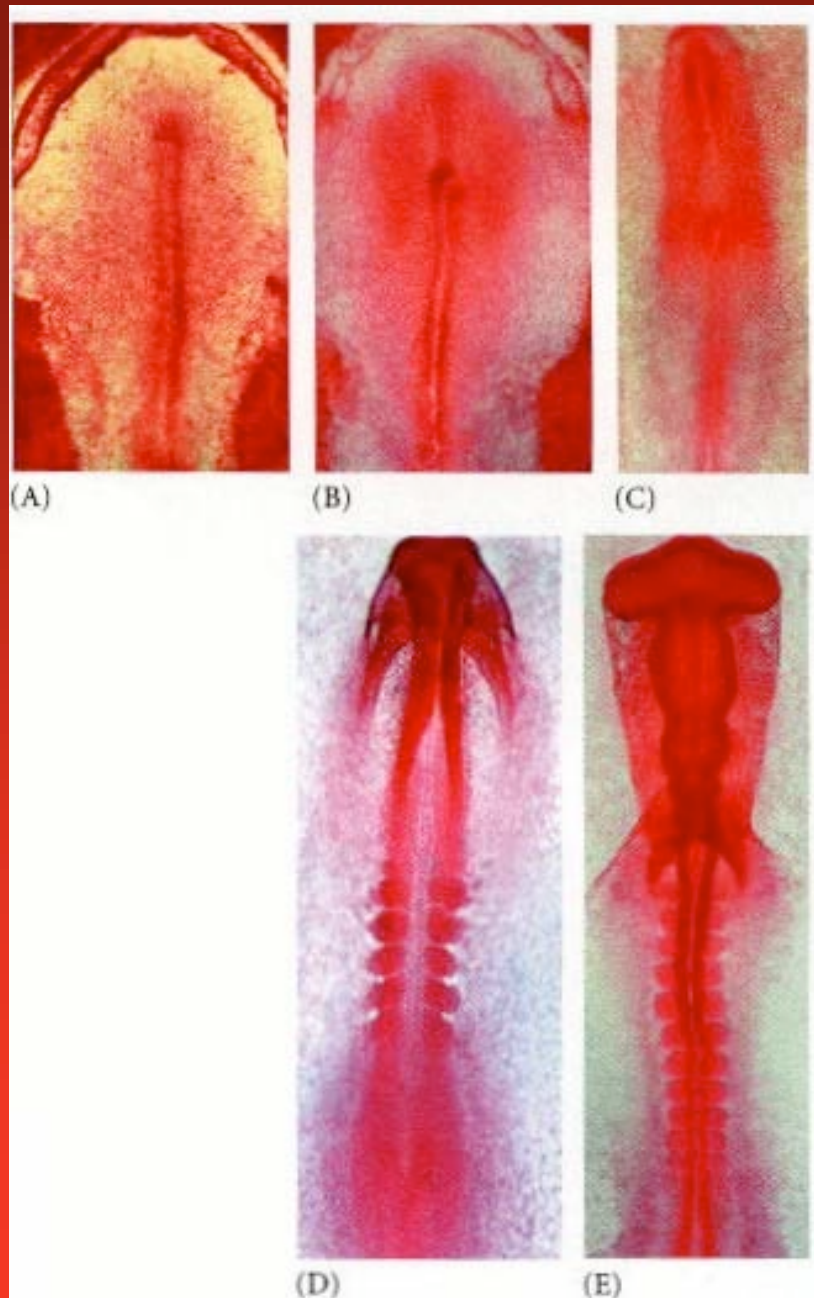
Formazione dell'asse dorso-ventrale



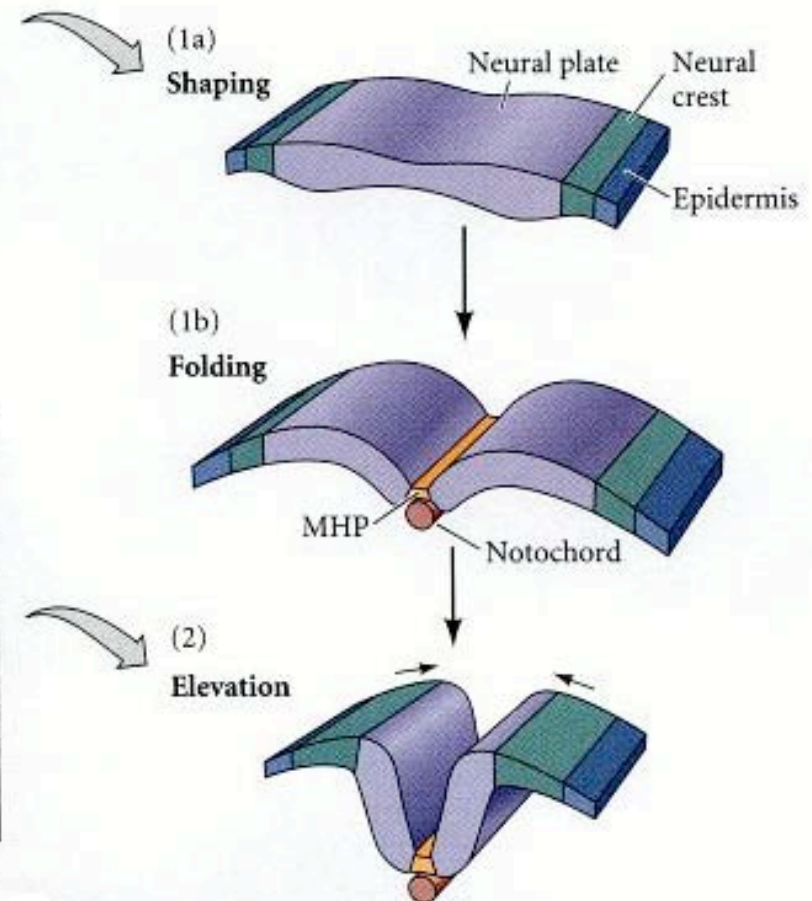
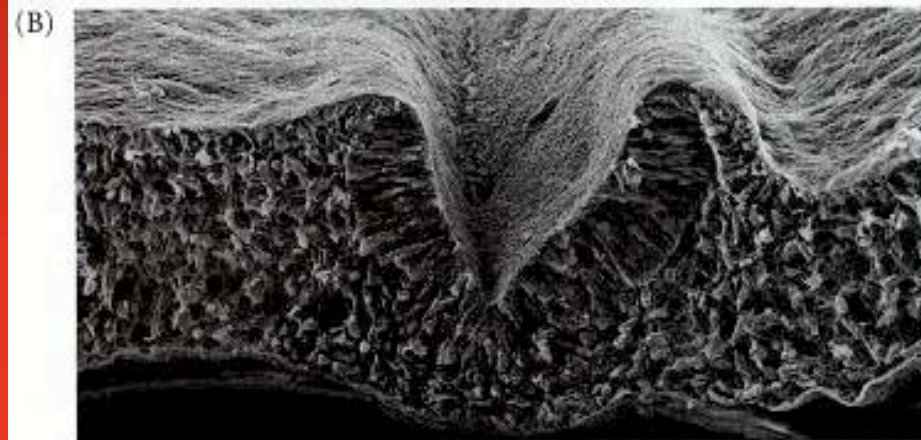
Il destino dell'ectoderma dei vertebrati



Neurulazione negli uccelli

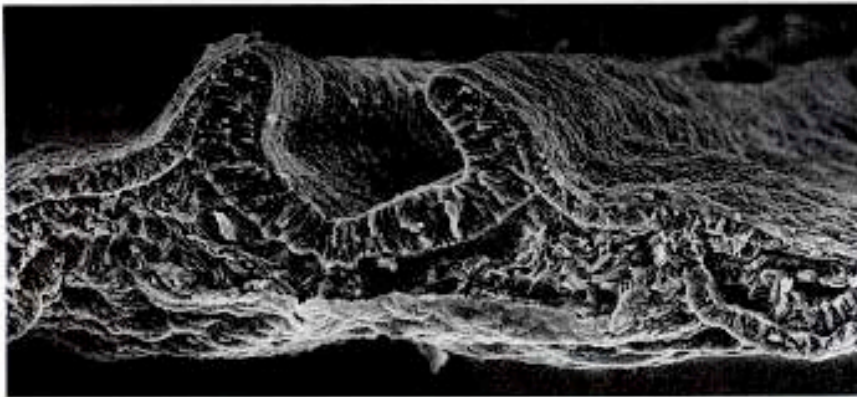


La neurulazione primaria nel pollo.I

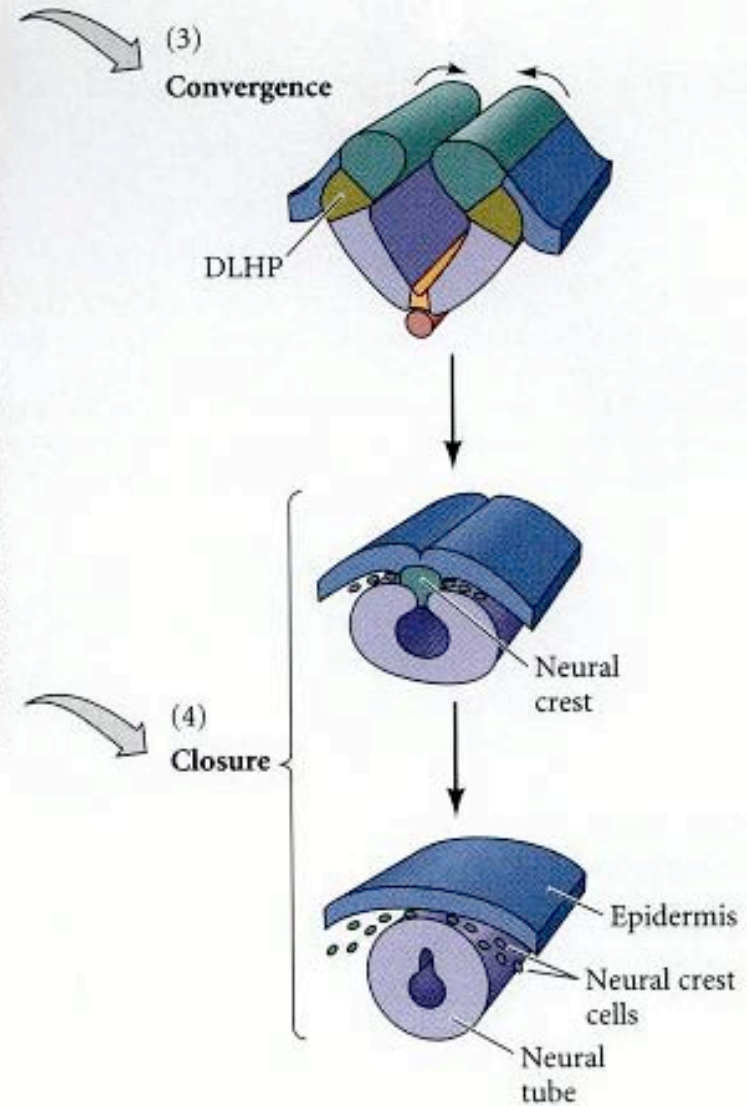
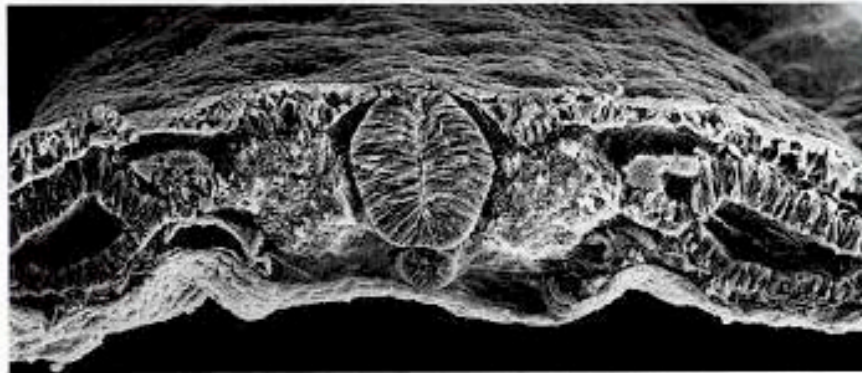


La neurulazione primaria nel pollo.II

(C)

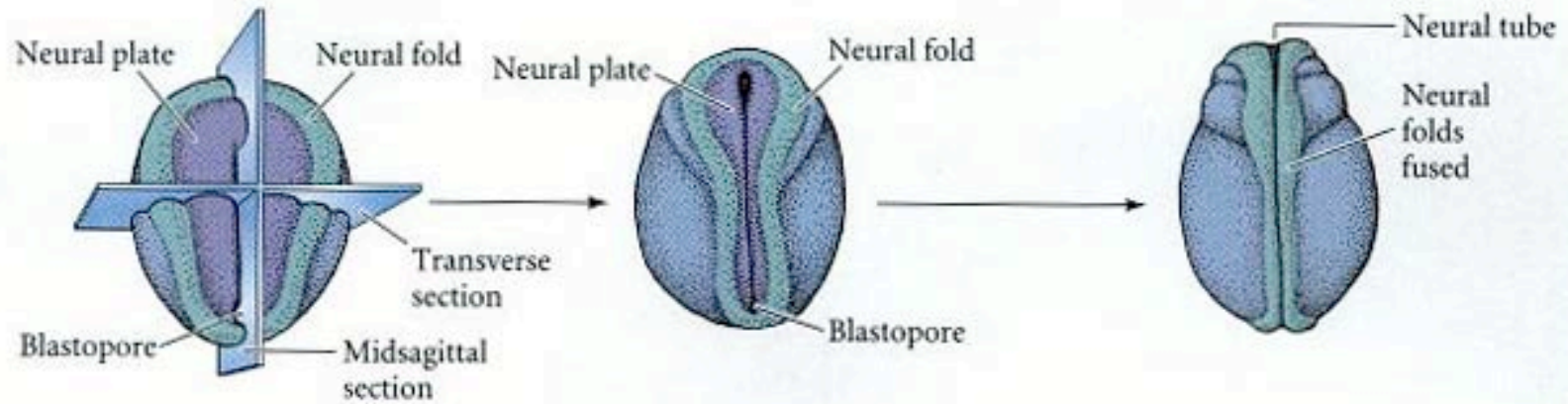


(D)

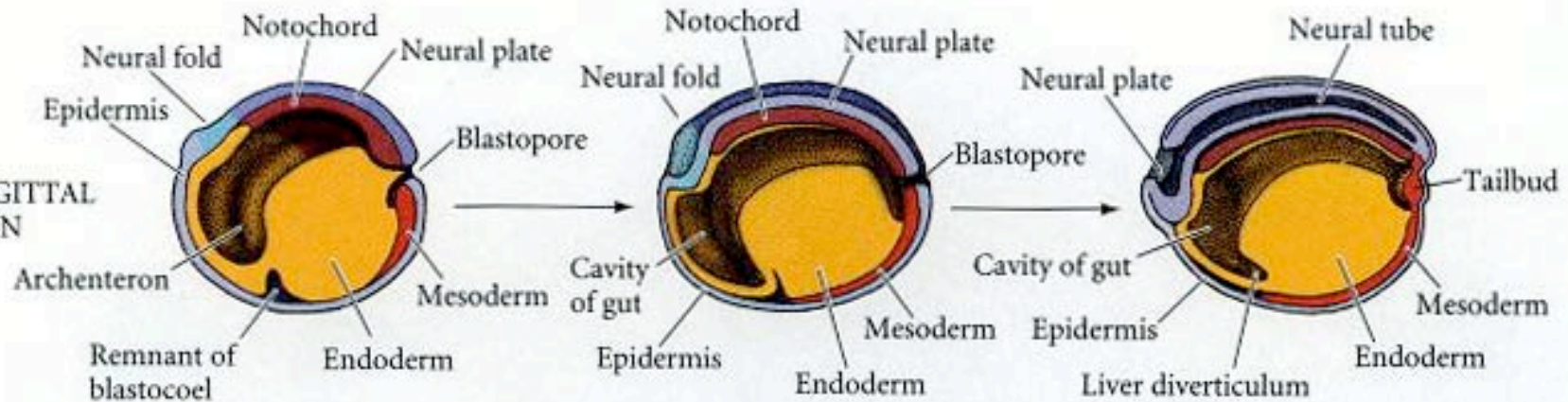


La neurulazione primaria negli anfi

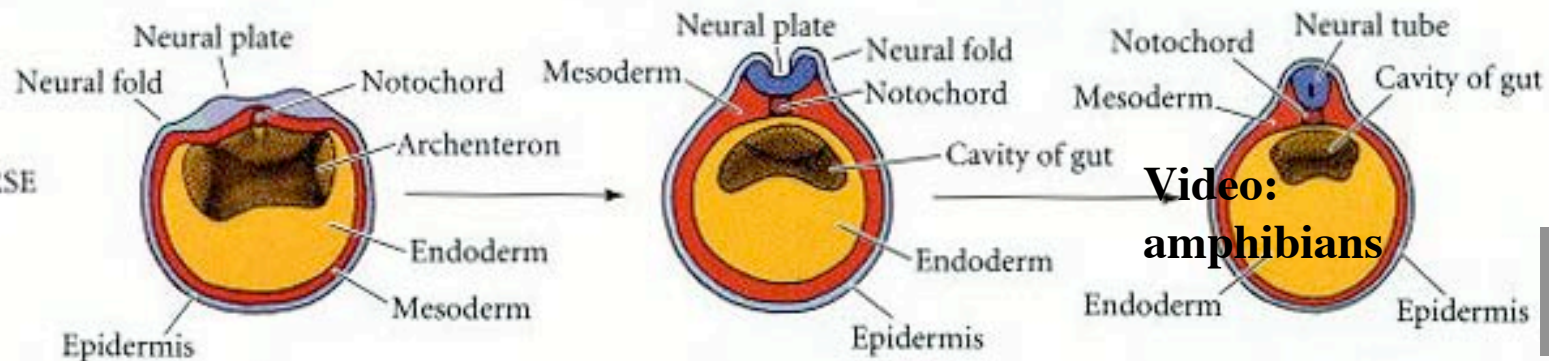
(A)
DORSAL
SURFACE
VIEW



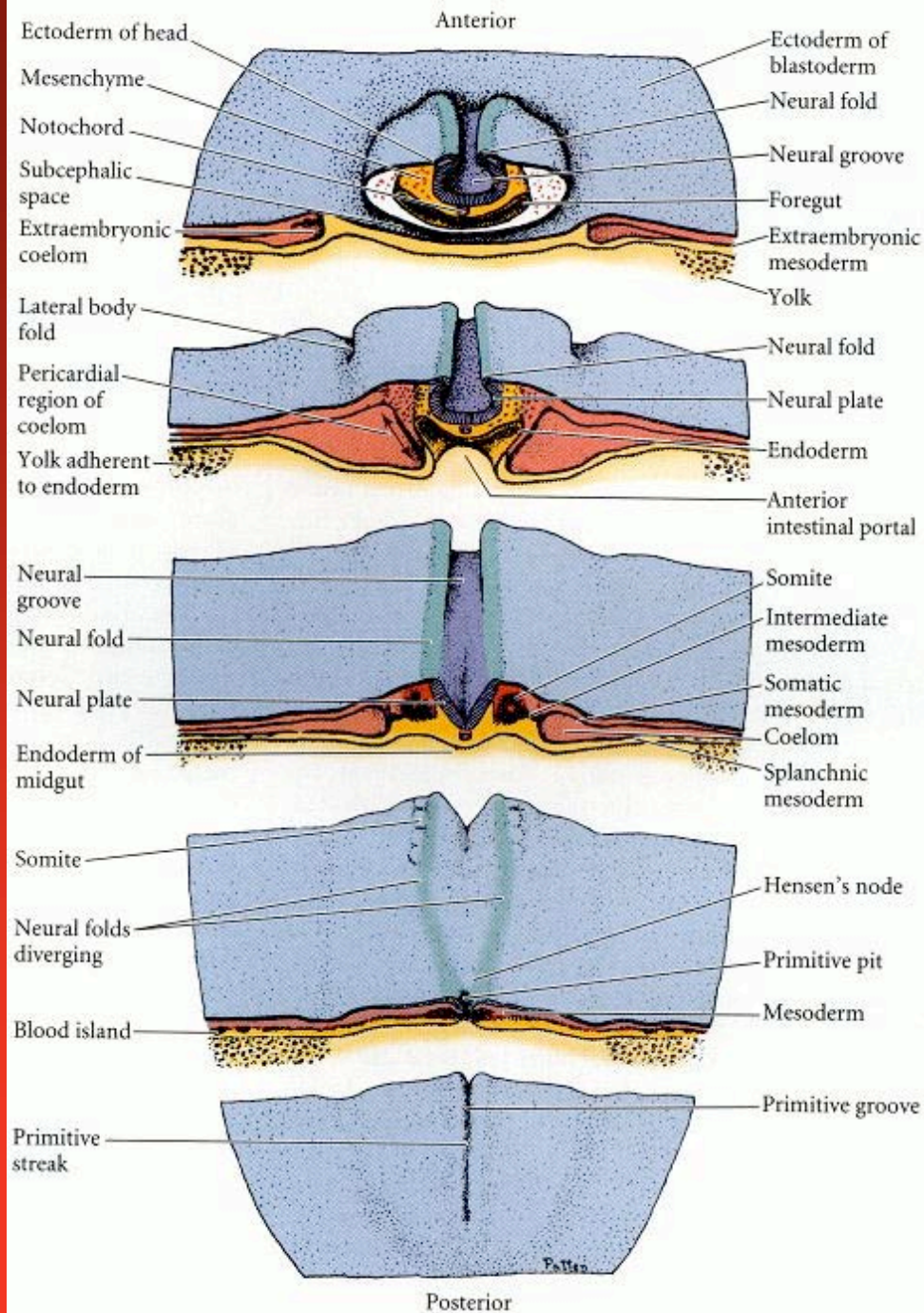
(B)
MIDSAGITTAL
SECTION



(C)
TRANSVERSE
SECTION



Video:
amphibians

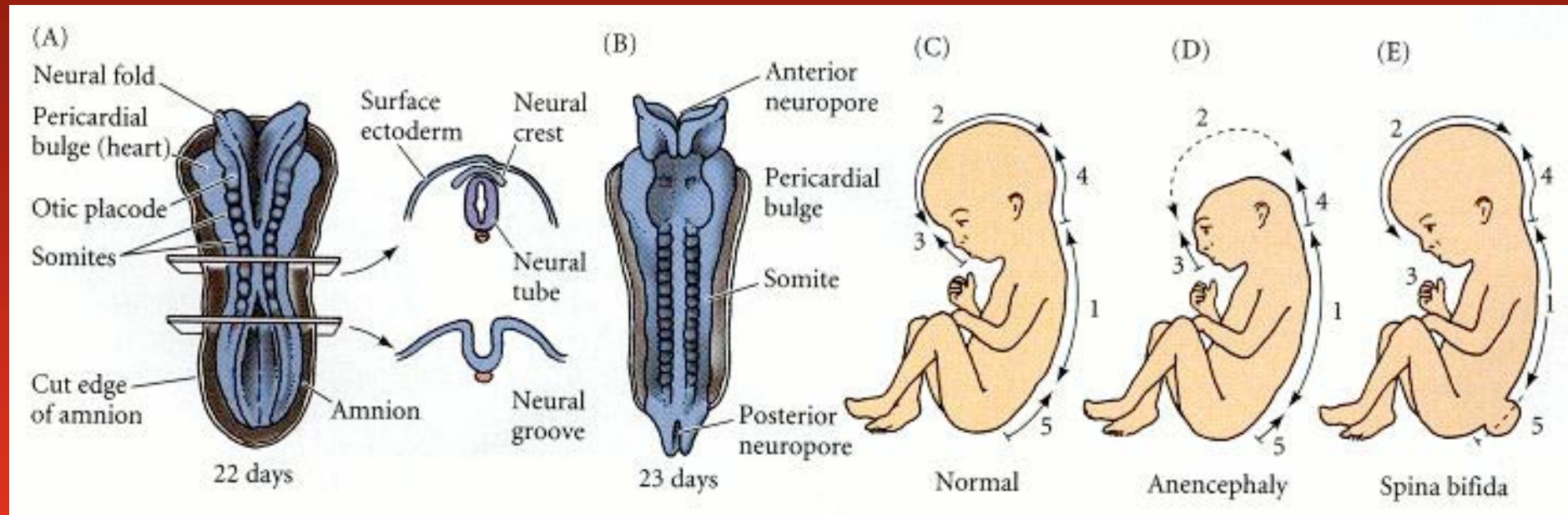


Asse antero-posteriore della neurulazione negli uccelli

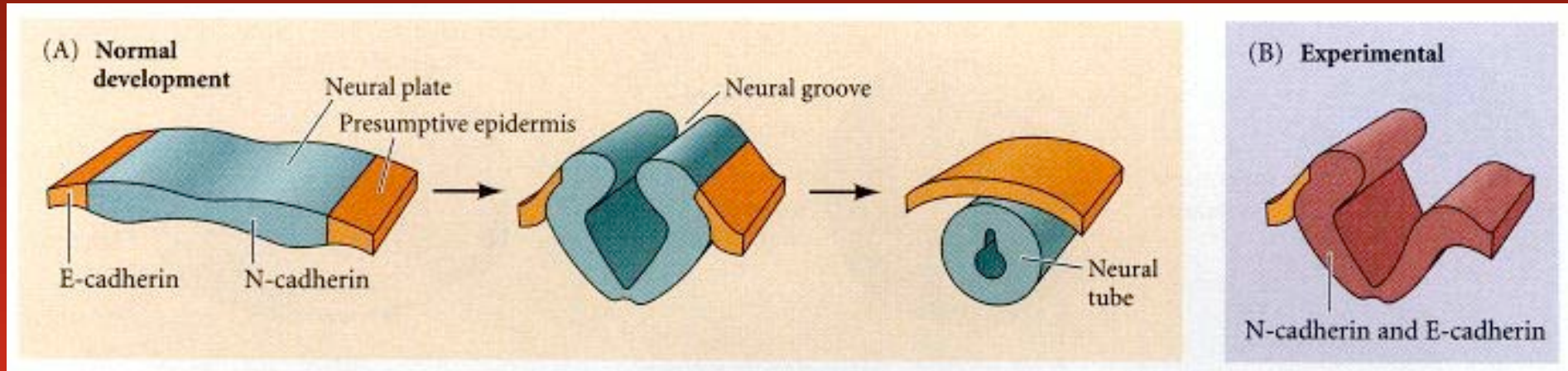
Video: chick mid

BioSvi
FC22.6
02

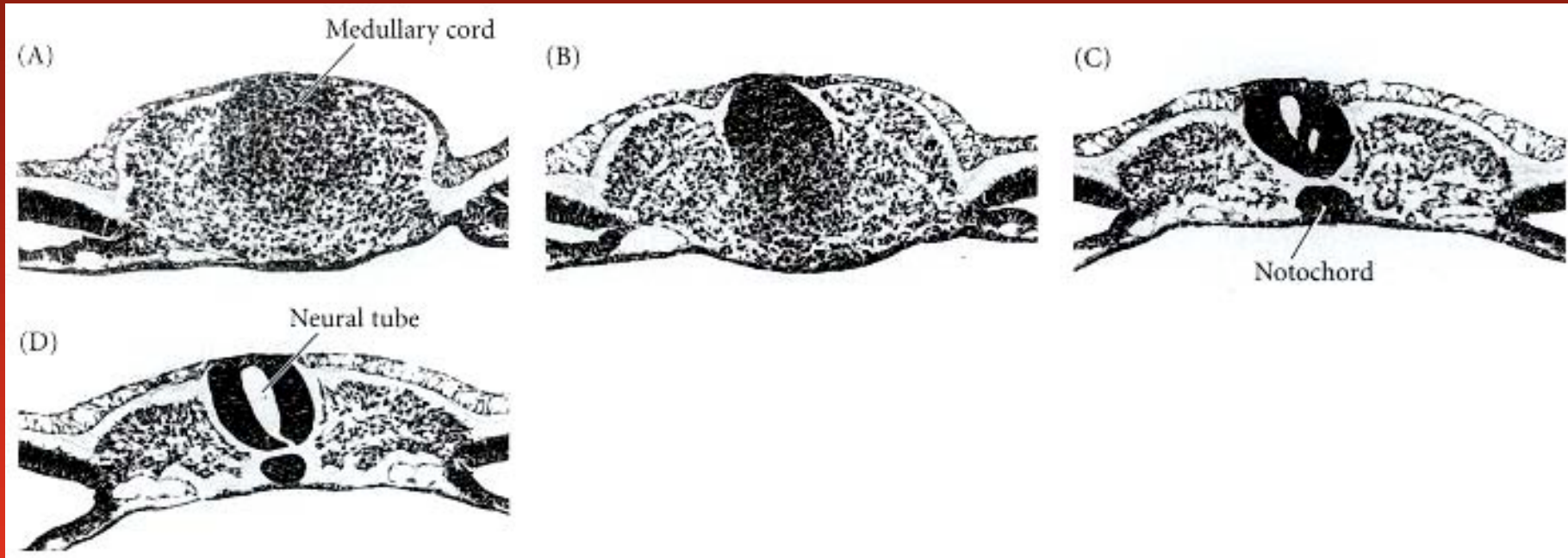
La neurulazione nell'uomo



L'importanza delle caderine nella chiusura del tubo neurale



La neurulazione secondaria



Formazione dell'asse latero-laterale

