



# EMBRYOLOGIE BIOLOGIE DU DEVELOPPEMENT

## APPAREIL URINAIRE

L2 UE7

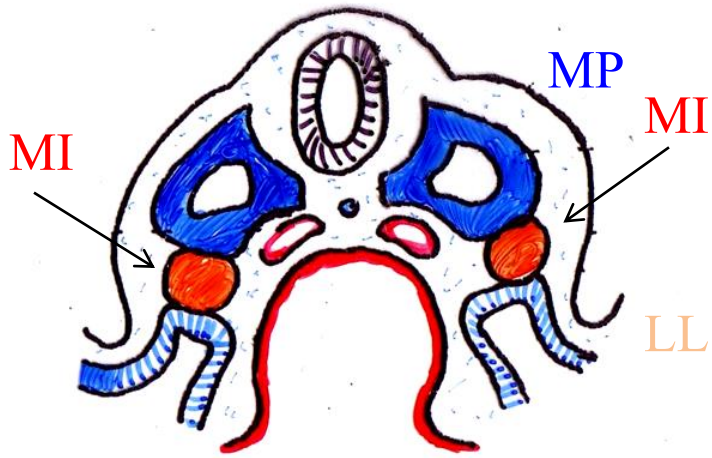
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Université Paris Diderot  
Faculté de Médecine

# Plan du cours

- ✓ Origine des reins
- ✓ Structures rénales primitives
  - Le Pronéphros
  - Le mésonéphros
- ✓ Le métanéphros (rein définitif)
  - Architecture
  - Divisions du système excréteur
  - Pyélon (bassinnet)
  - Calices
  - Aspects moléculaires de la croissance du bourgeon urétéral
  - Développement des néphrons
  - Développement des glomérules
  - Répartition des tubes rénaux
  - Structure anatomique d'un néphron
- ✓ Datation de l'âge gestationnel (compte des glomérules)
- ✓ Migration rénale
- ✓ Cloisonnement des voies urogénitales

# Origine des reins

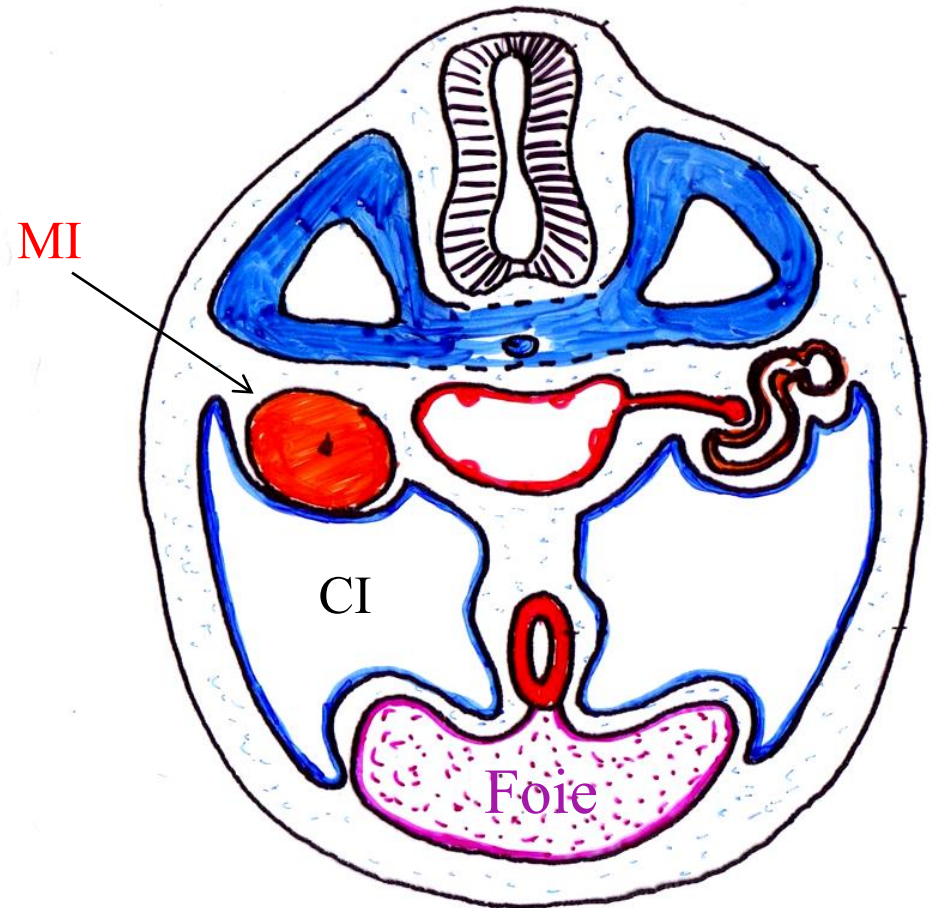


Le mésoblaste intra-embryonnaire intermédiaire

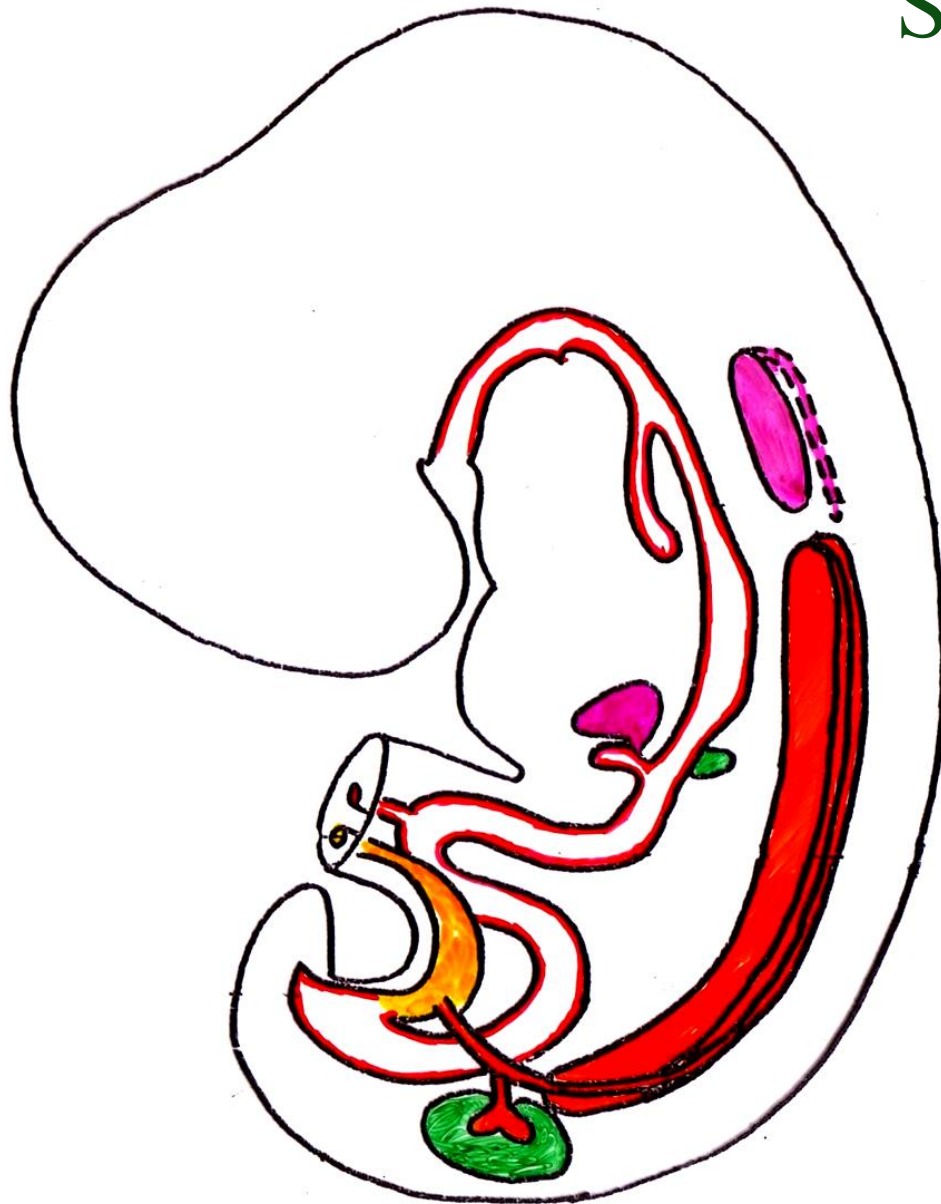
MI : Mésoblaste Intermédiaire

MP: Mésoblaste Para-axial

LL : Lames latérales



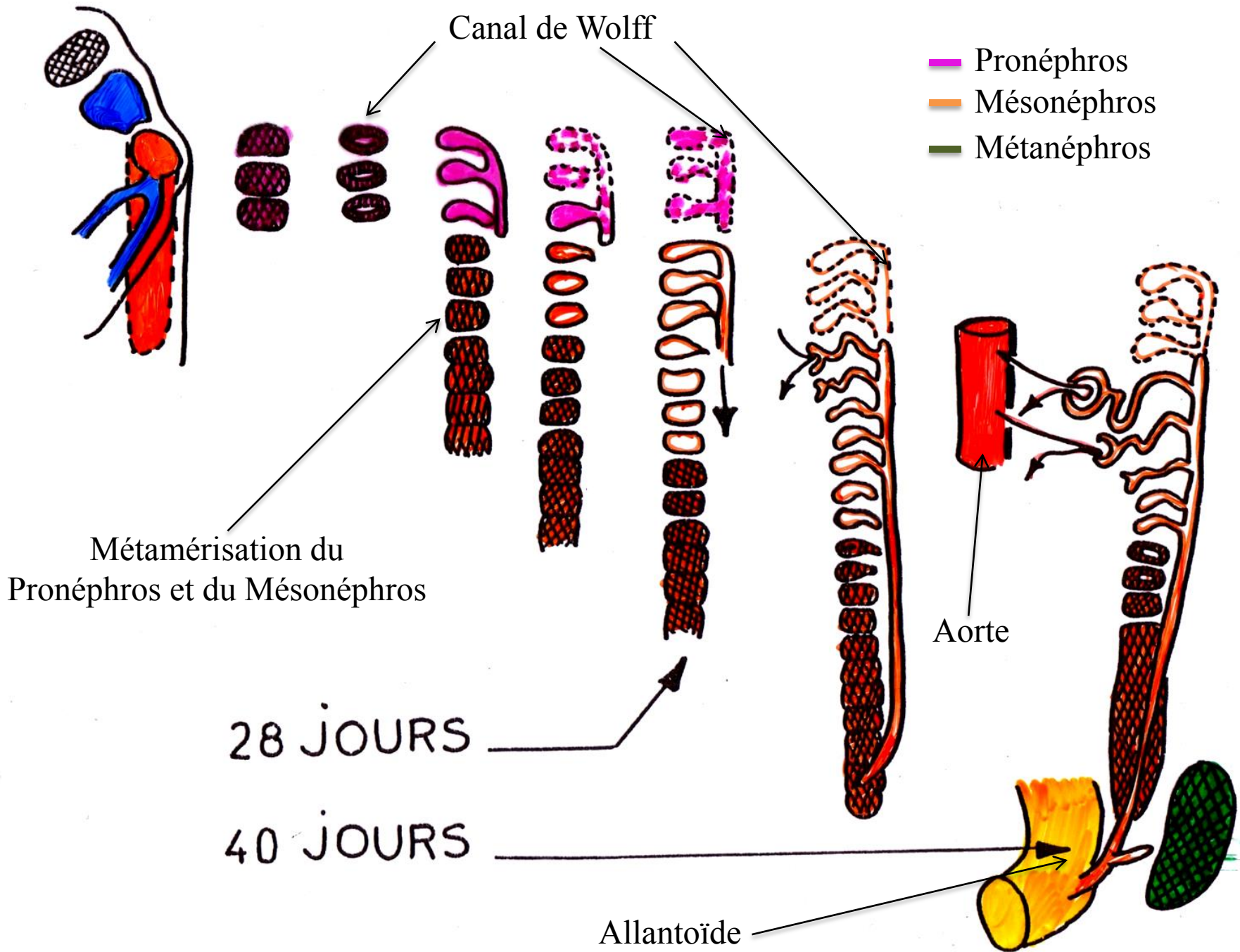
# Structures rénales primitives



3<sup>e</sup> – 4<sup>e</sup> semaines

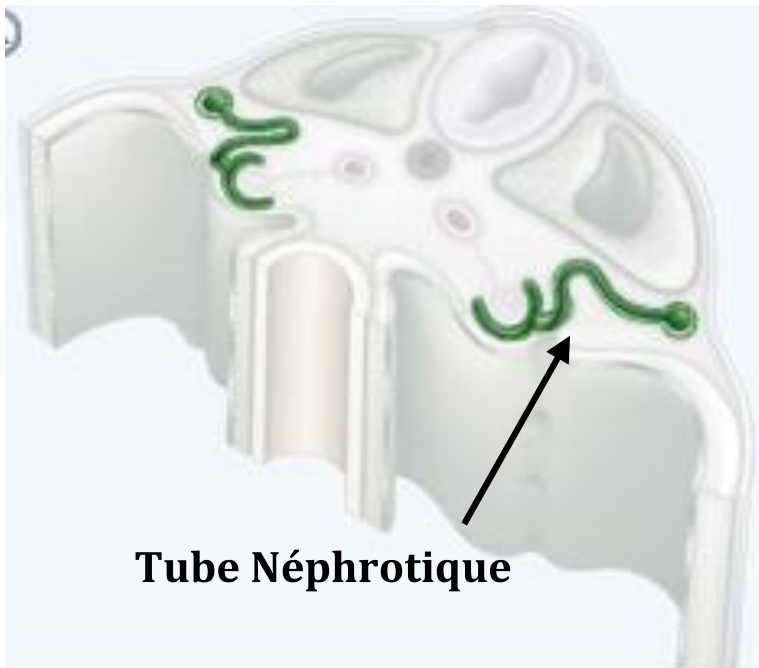
4<sup>e</sup> – 8<sup>e</sup> semaines

5<sup>e</sup> semaine

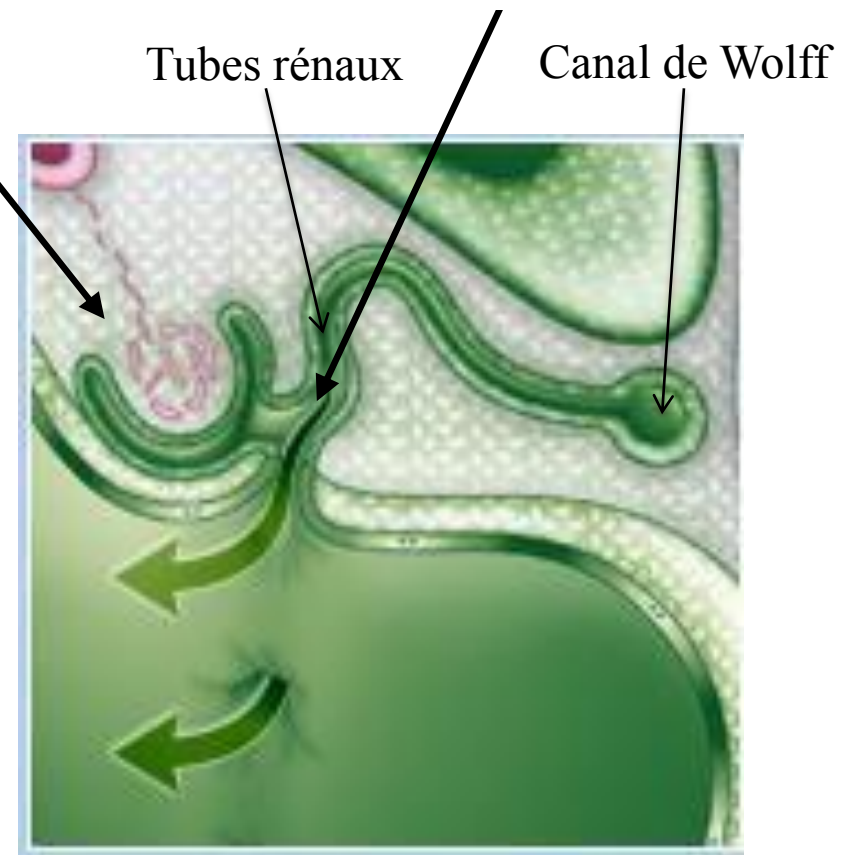


# Le Pronéphros

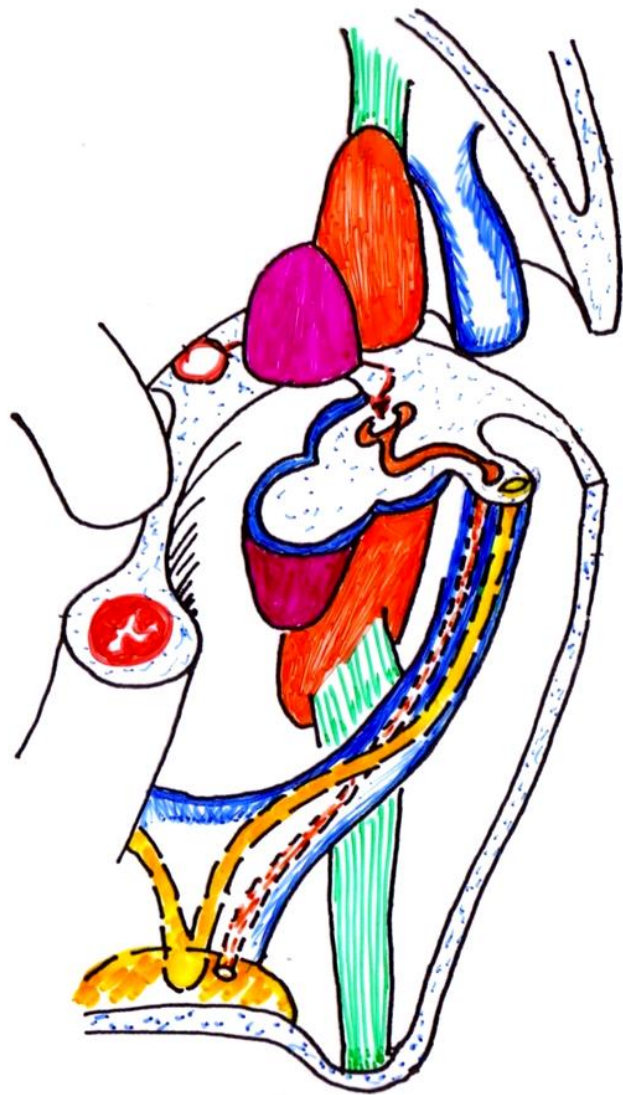
**Invagination de la paroi interne = médiale,  
suite à l'arrivée du peloton vasculaire**



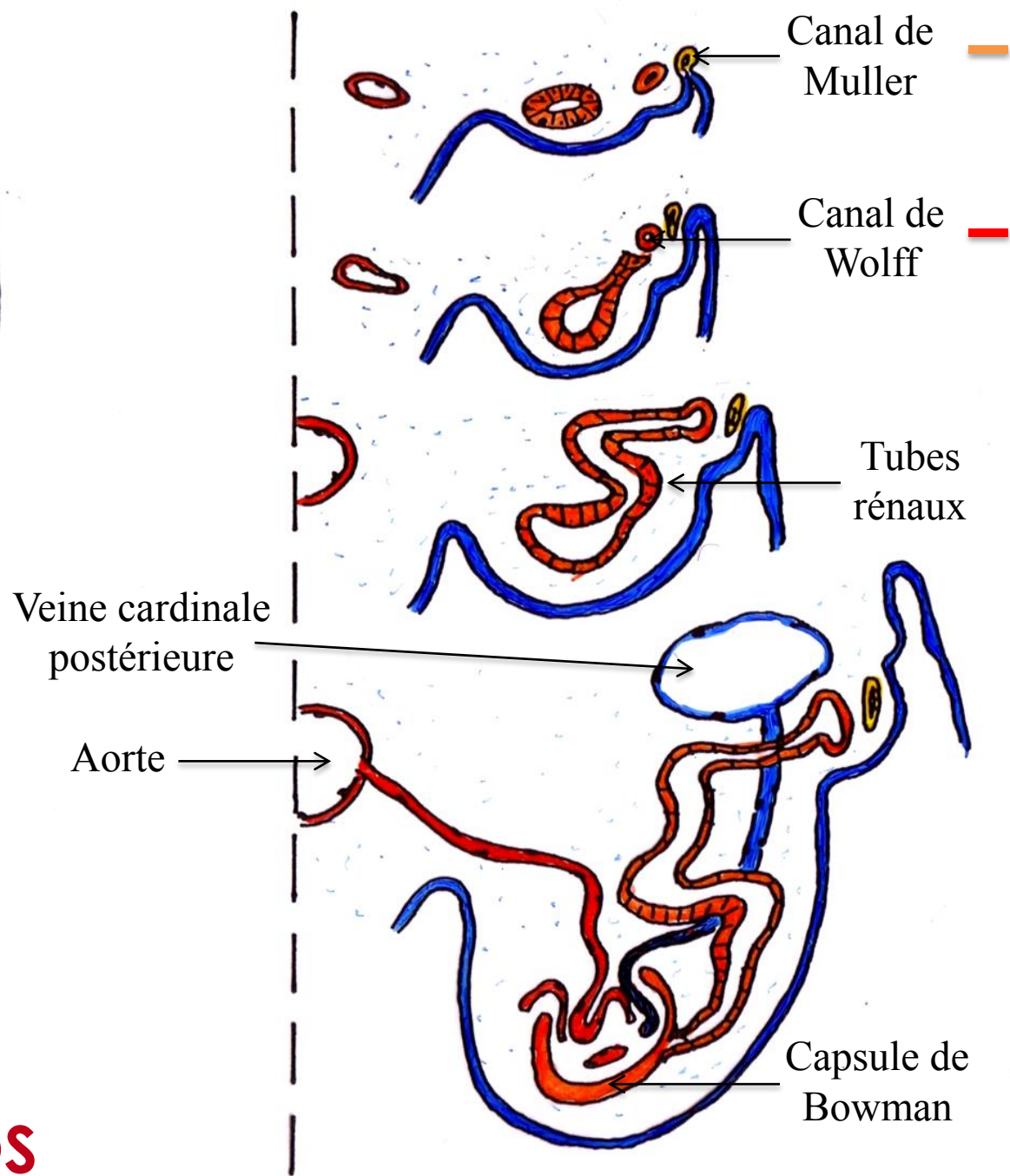
**Ouverture dans le coelome**



**Structure transitoire : persiste pendant 24h - 48h**



# MESONEPHROS



Canal de Muller

Canal de Wolff

Tubes rénaux

Veine cardinale postérieure

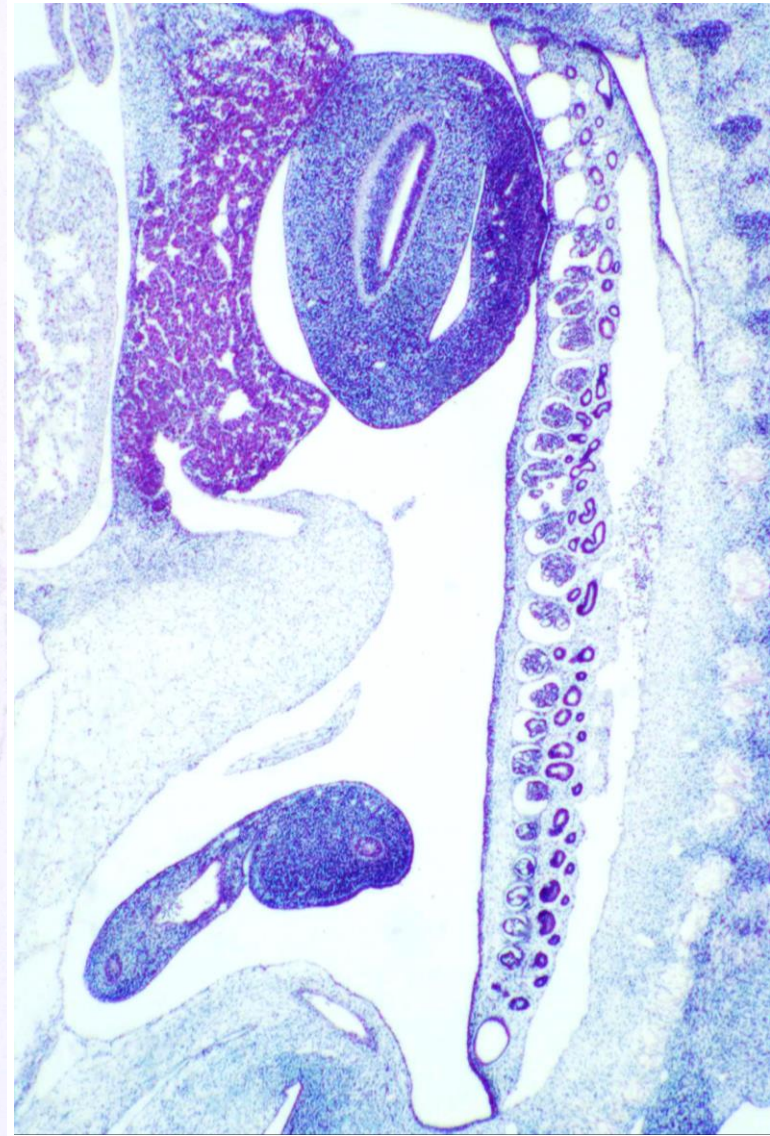
Aorte

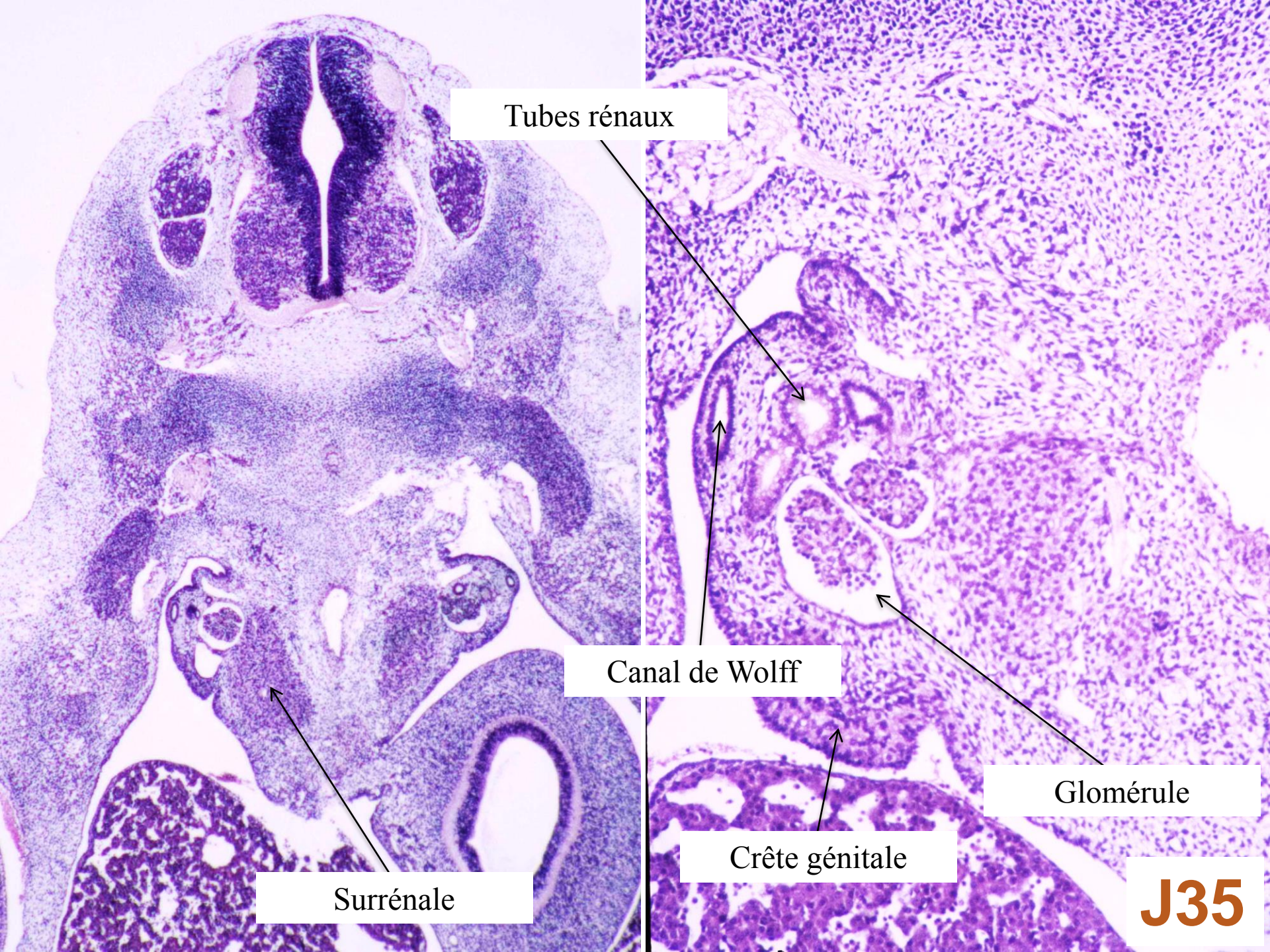
Capsule de Bowman



**J30**







Tubes rénaux

Canal de Wolff

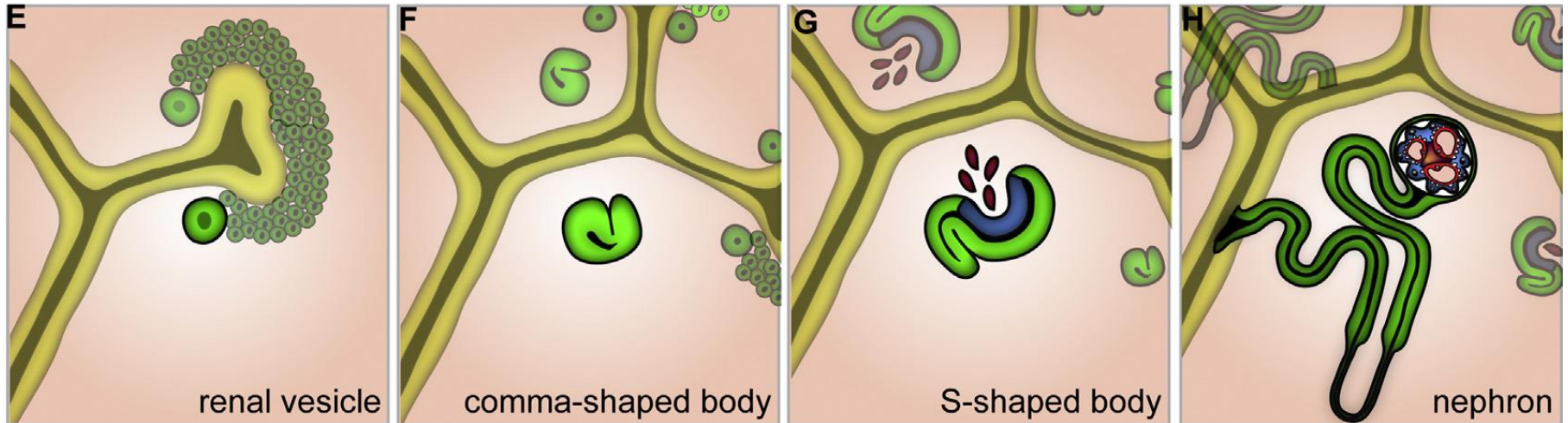
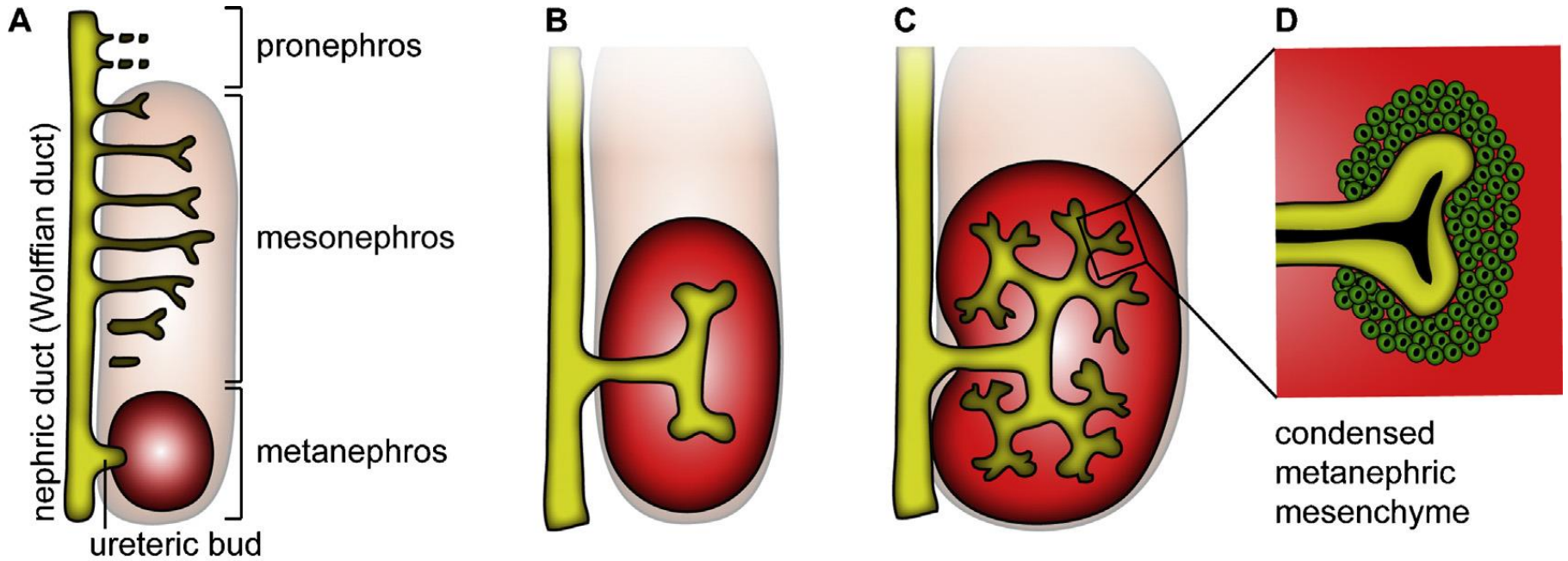
Surrénale

Crête génitale

Glomérule

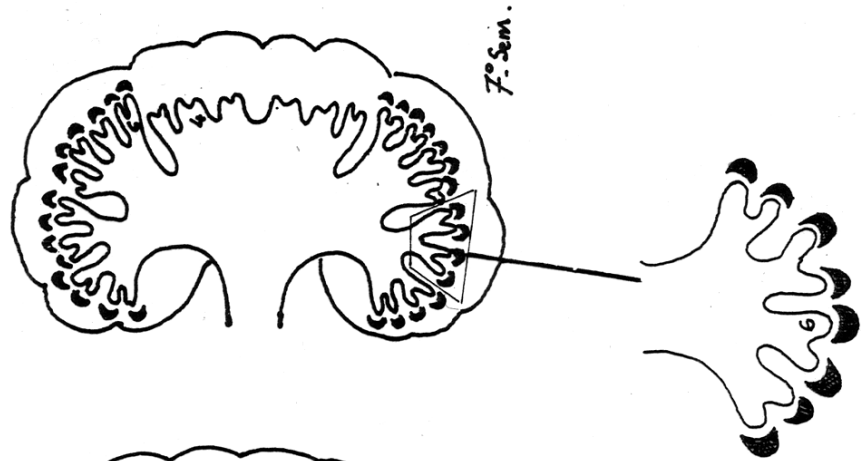
**J35**

# Architecture du métanéphros



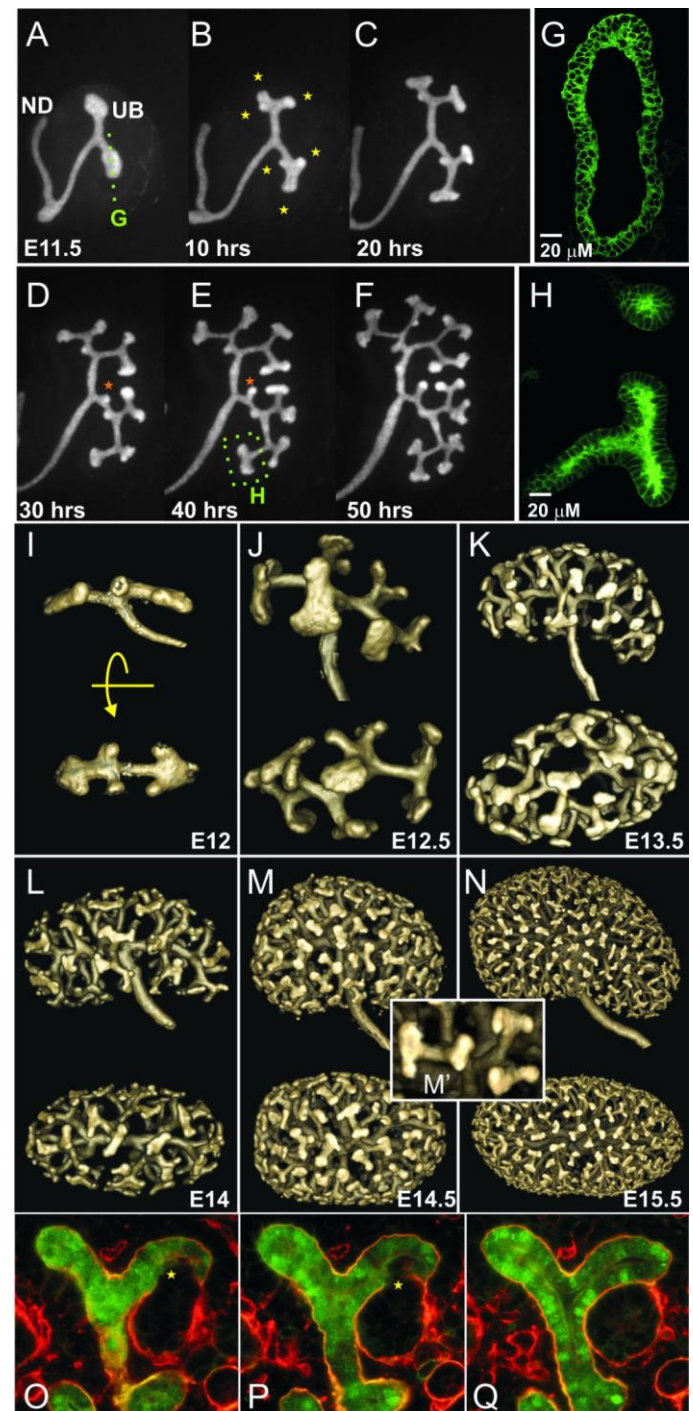
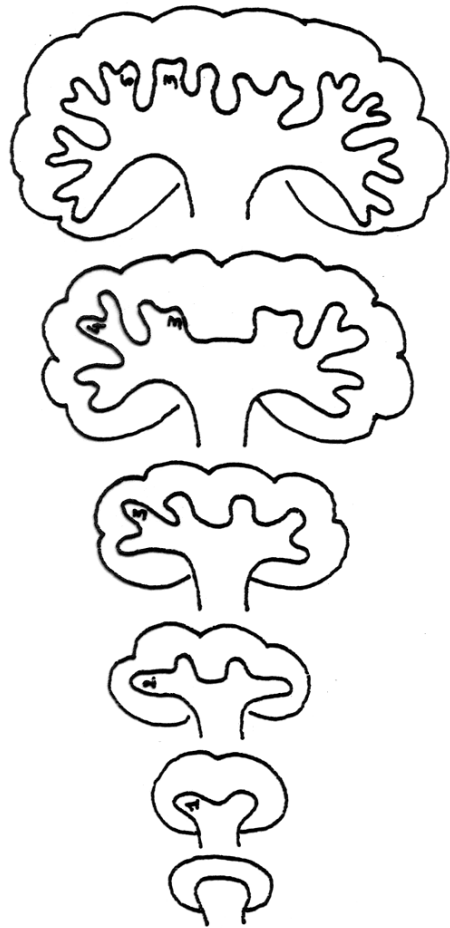
Corps en virgule

Corps en S



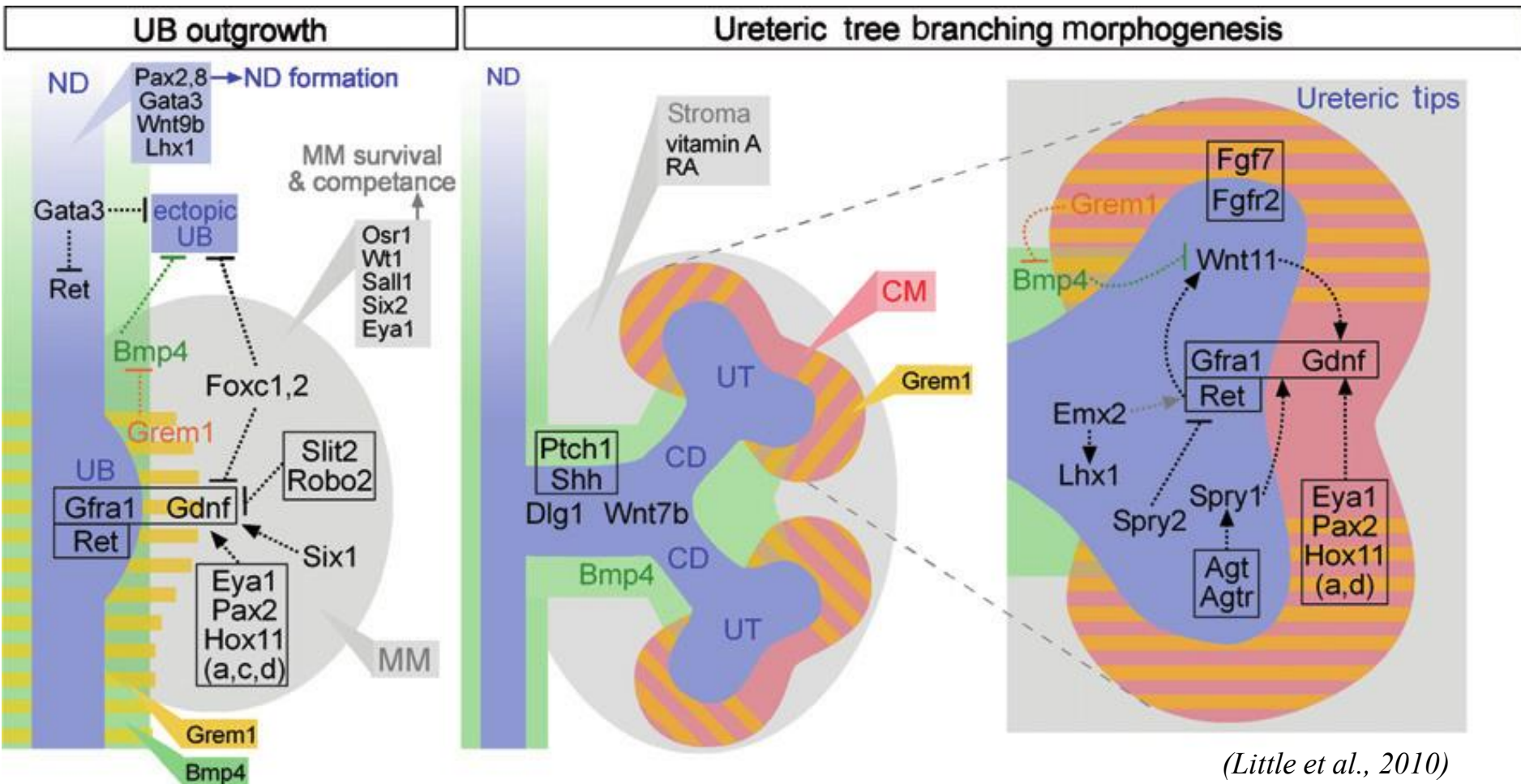
# Systeme excréteur

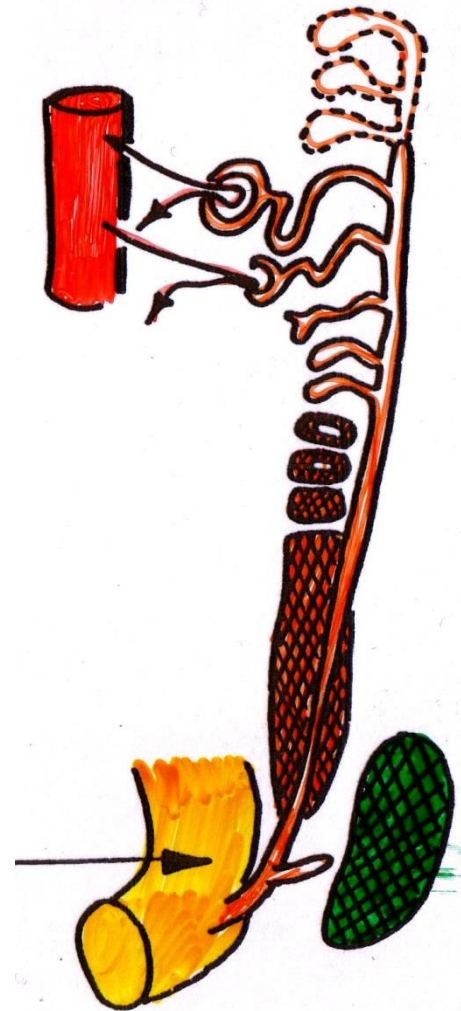
15 générations de  
divisions  
dichotomiques



(Costantini 2012)

# Aspects moléculaires de la croissance du bourgeon urétéral





**METANEPHROS**

**J40**

# Développement des néphrons

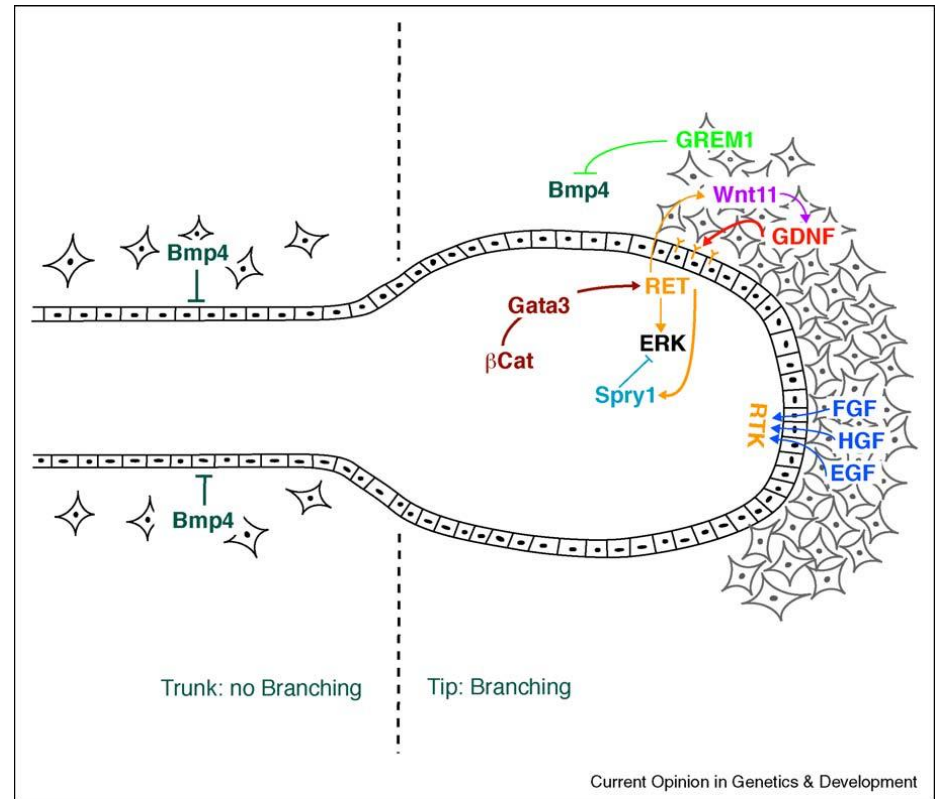


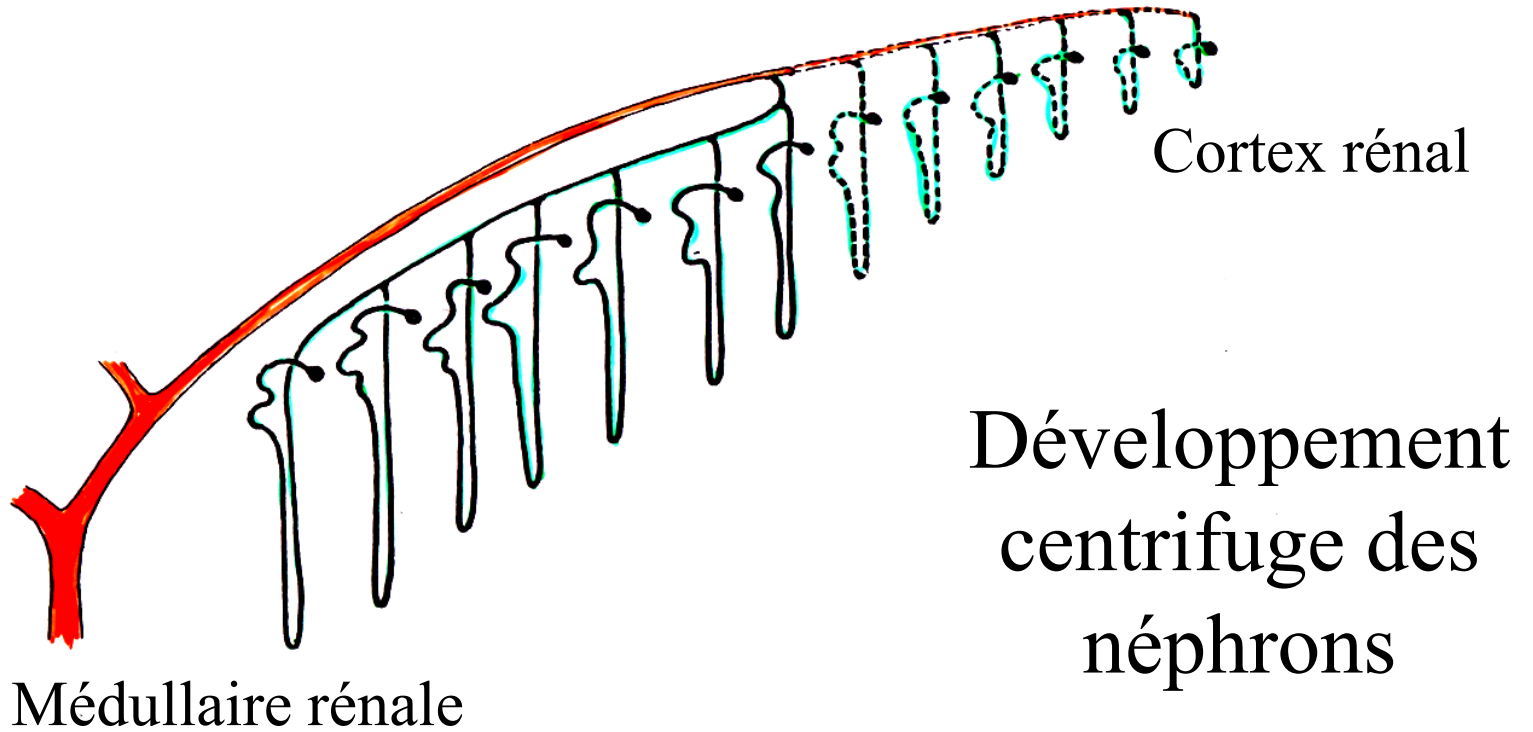
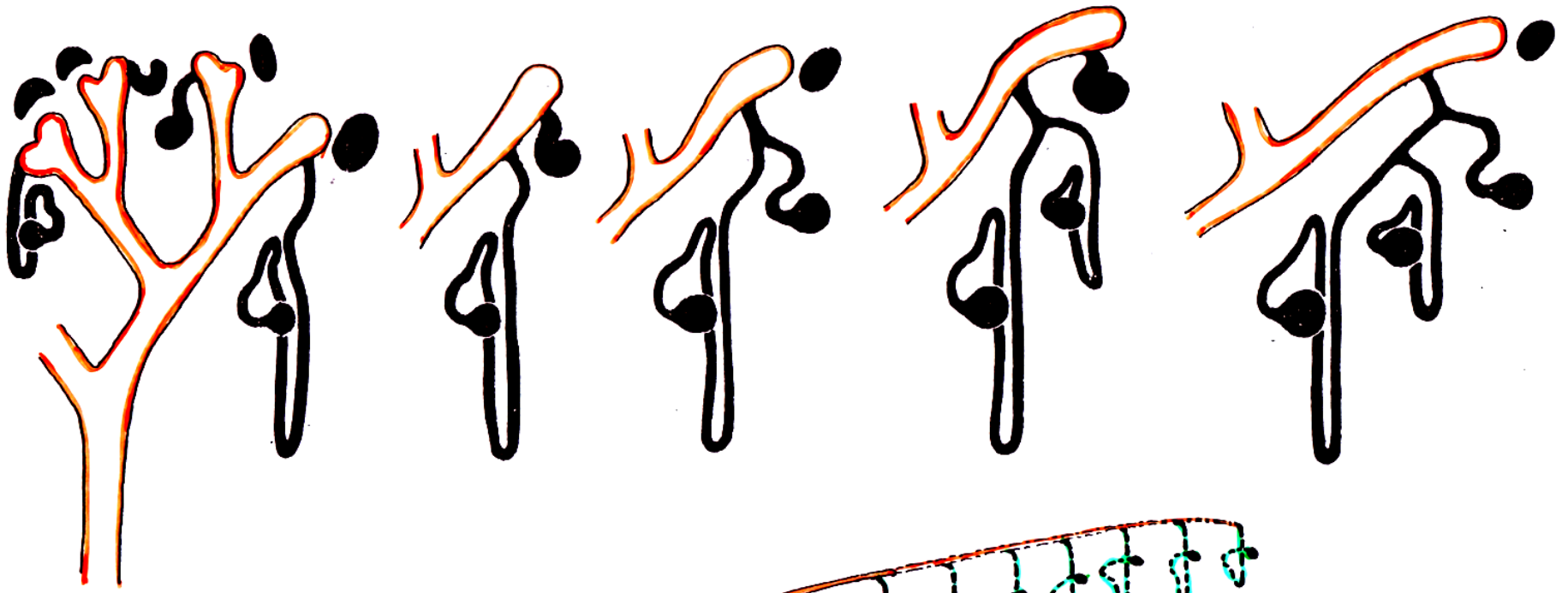
Coiffe : blastème métanéphrogène

Vésicule rénale



Capsule de Bowman





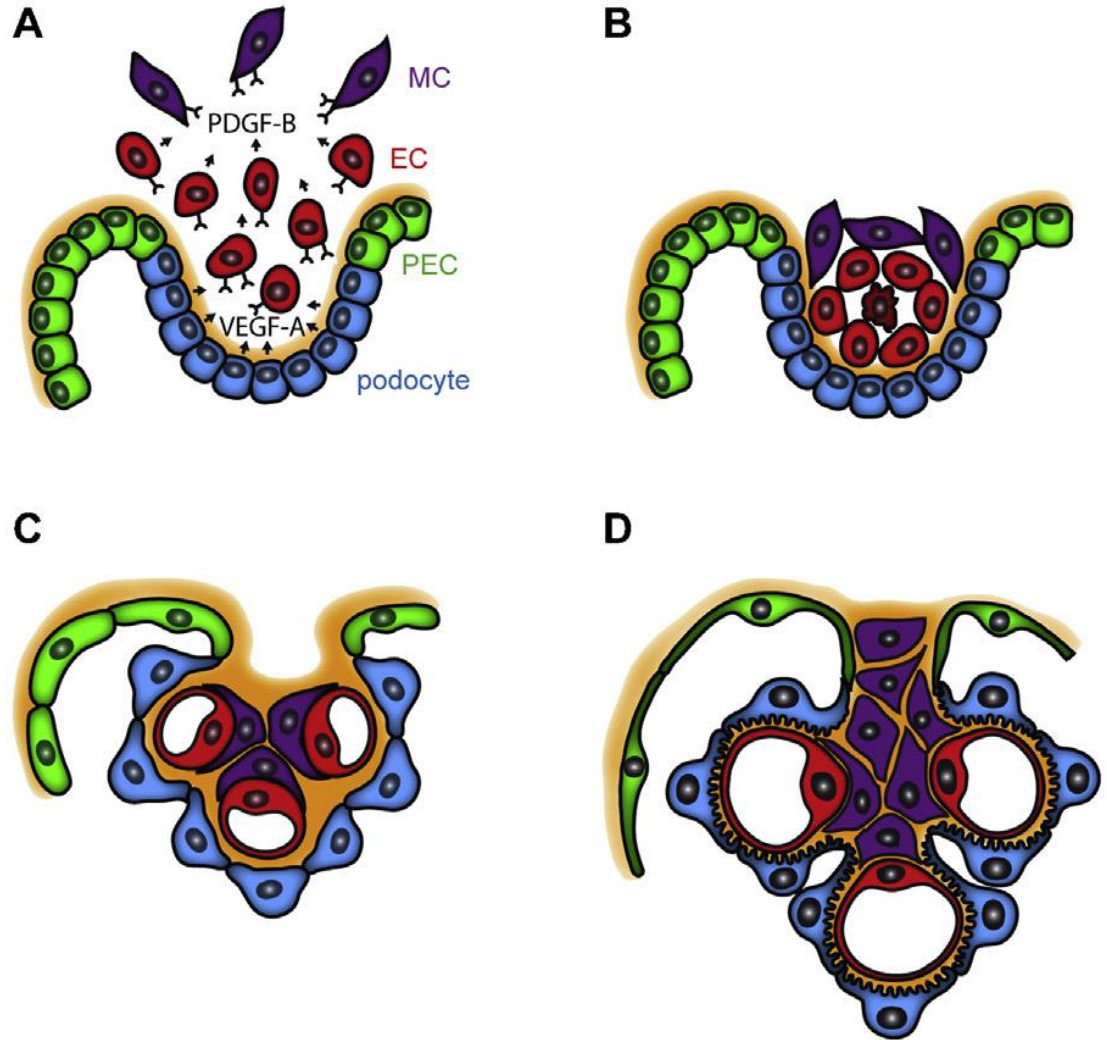
Développement  
centrifuge des  
néphrons



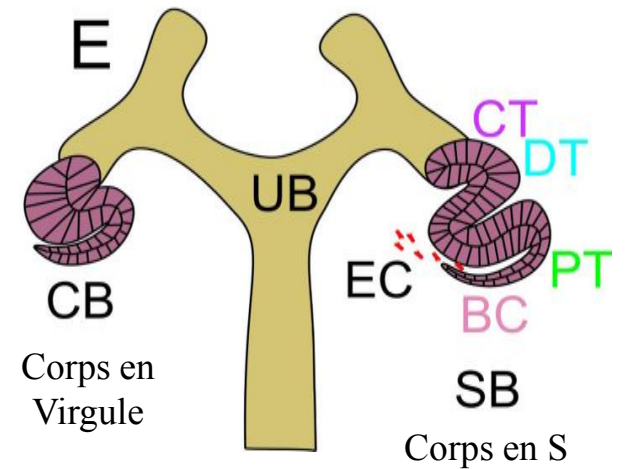
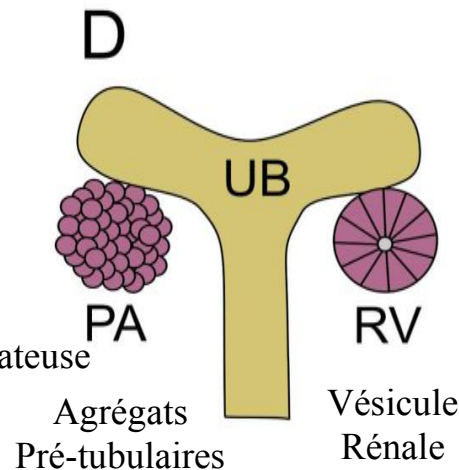
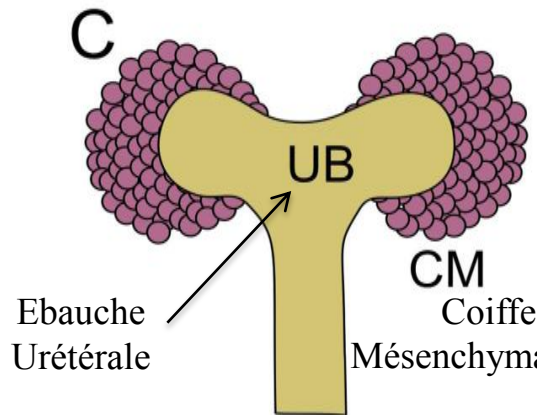
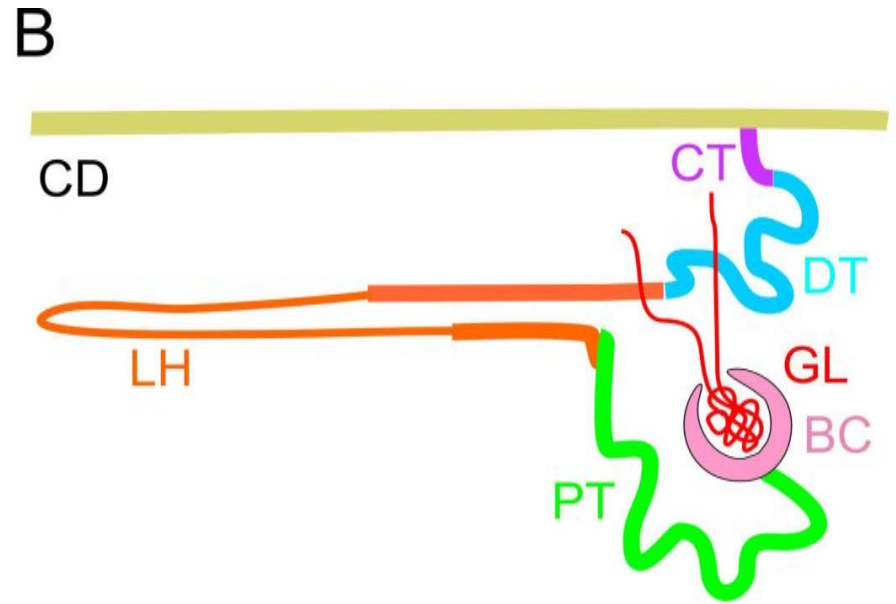
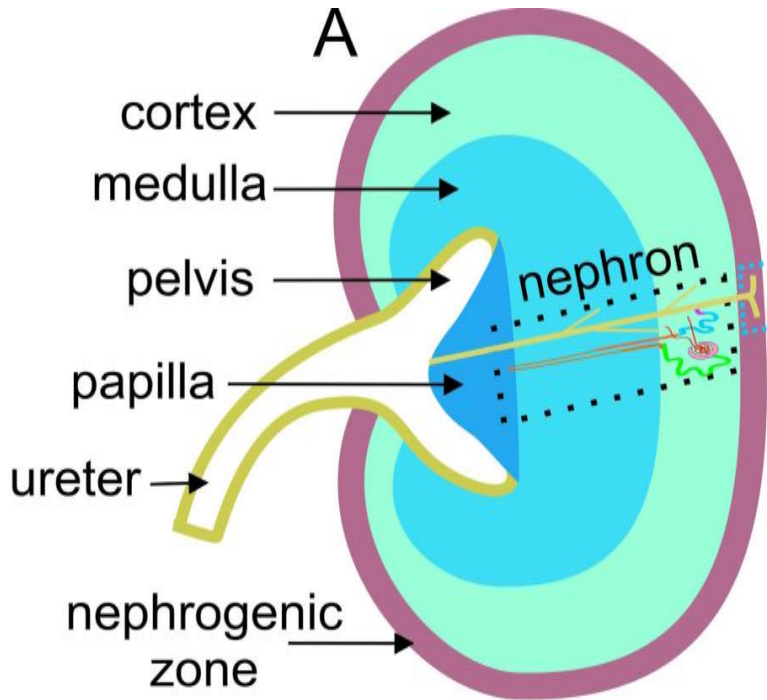
# Développement des glomérules

## Stade corps en S :

1. Sécrétion de VEGF-A par les progéniteurs des podocytes
2. Attraction des cellules endothéliales
3. Expression de PDGF-B par les cellules endothéliales
4. Attraction des progéniteurs des cellules mésangiales
5. Accolement des cellules mésangiales aux cellules endothéliales induisant la formation de boucles des capillaires

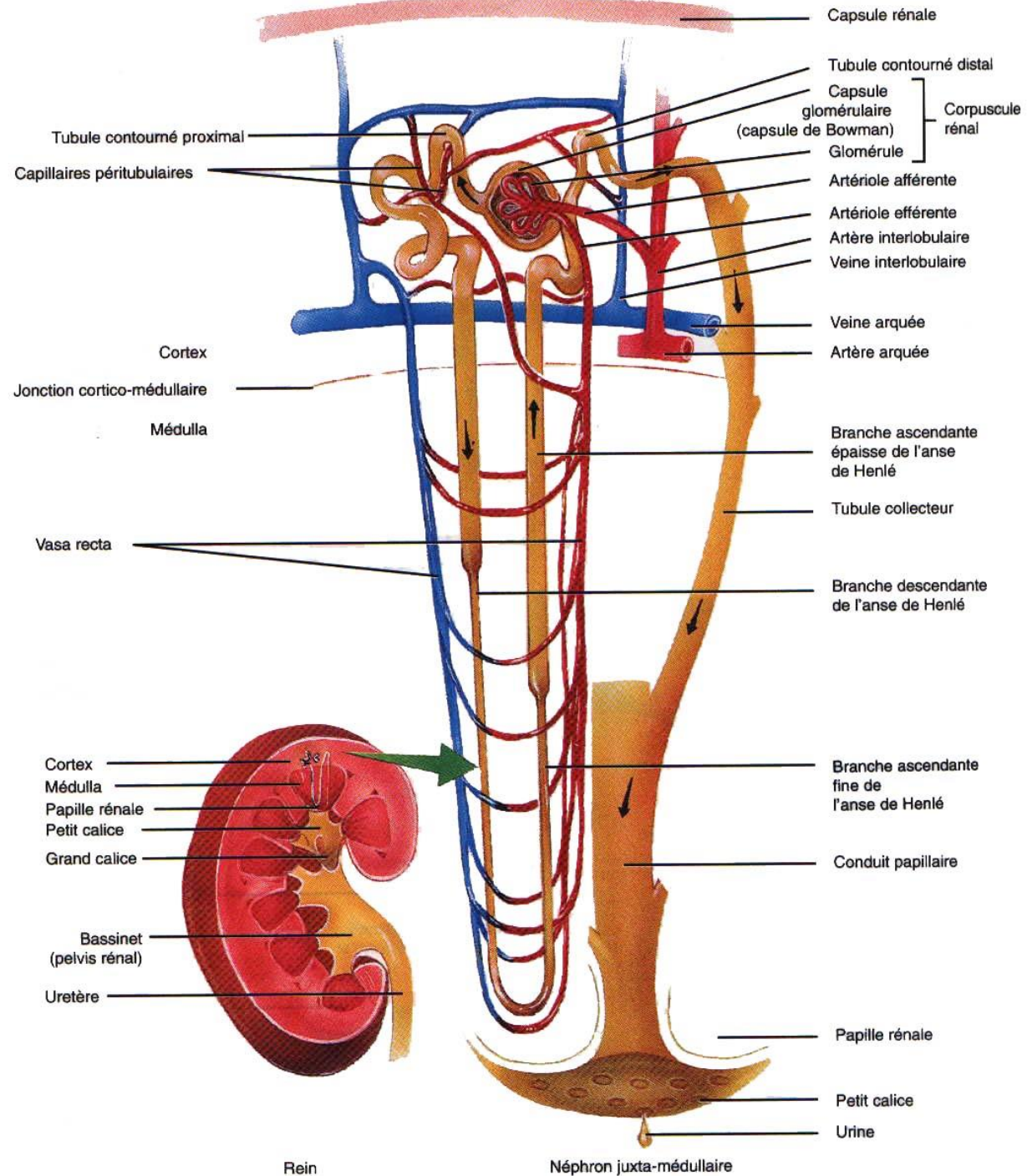


# Répartition des tubes rénaux

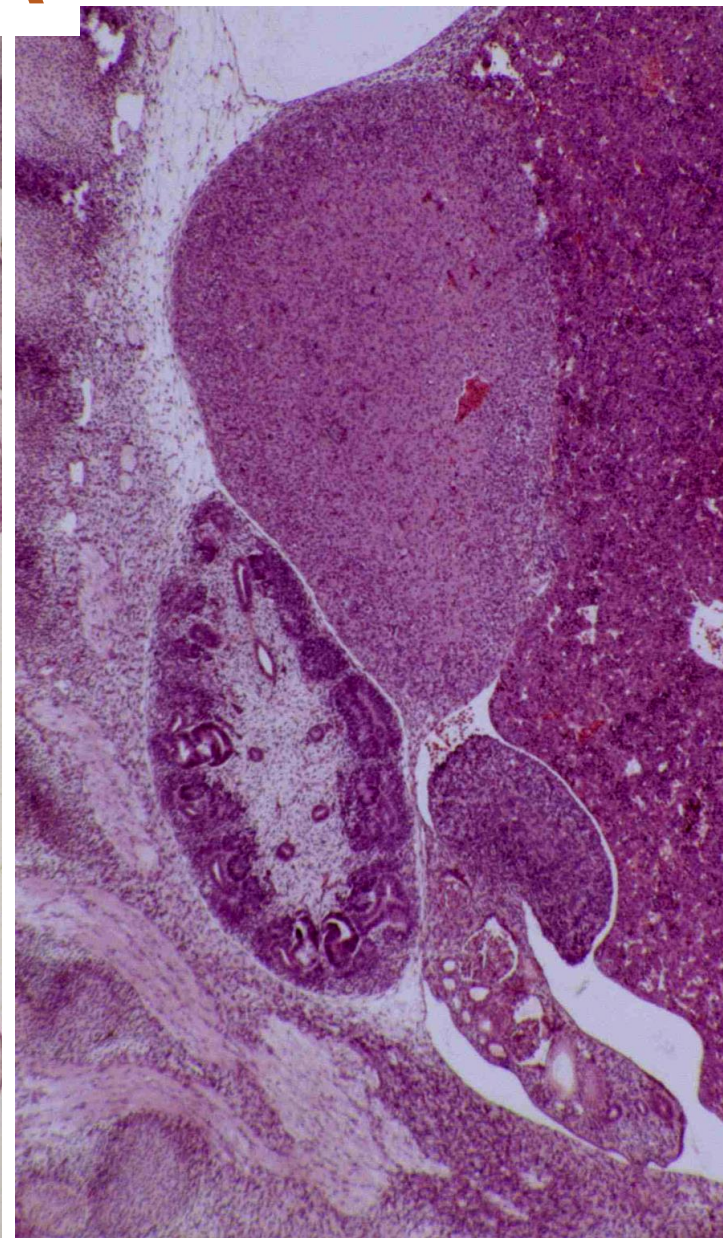


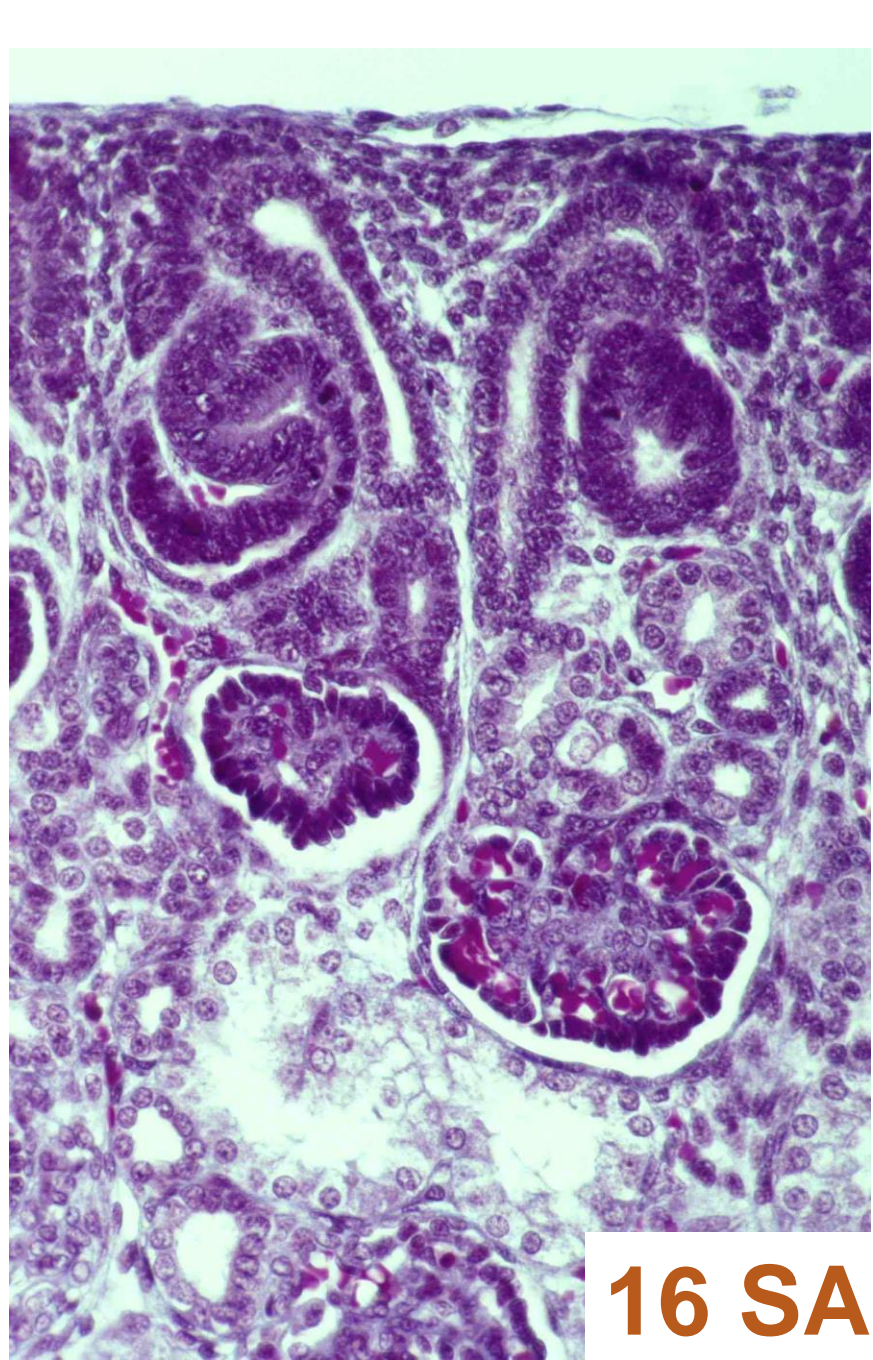
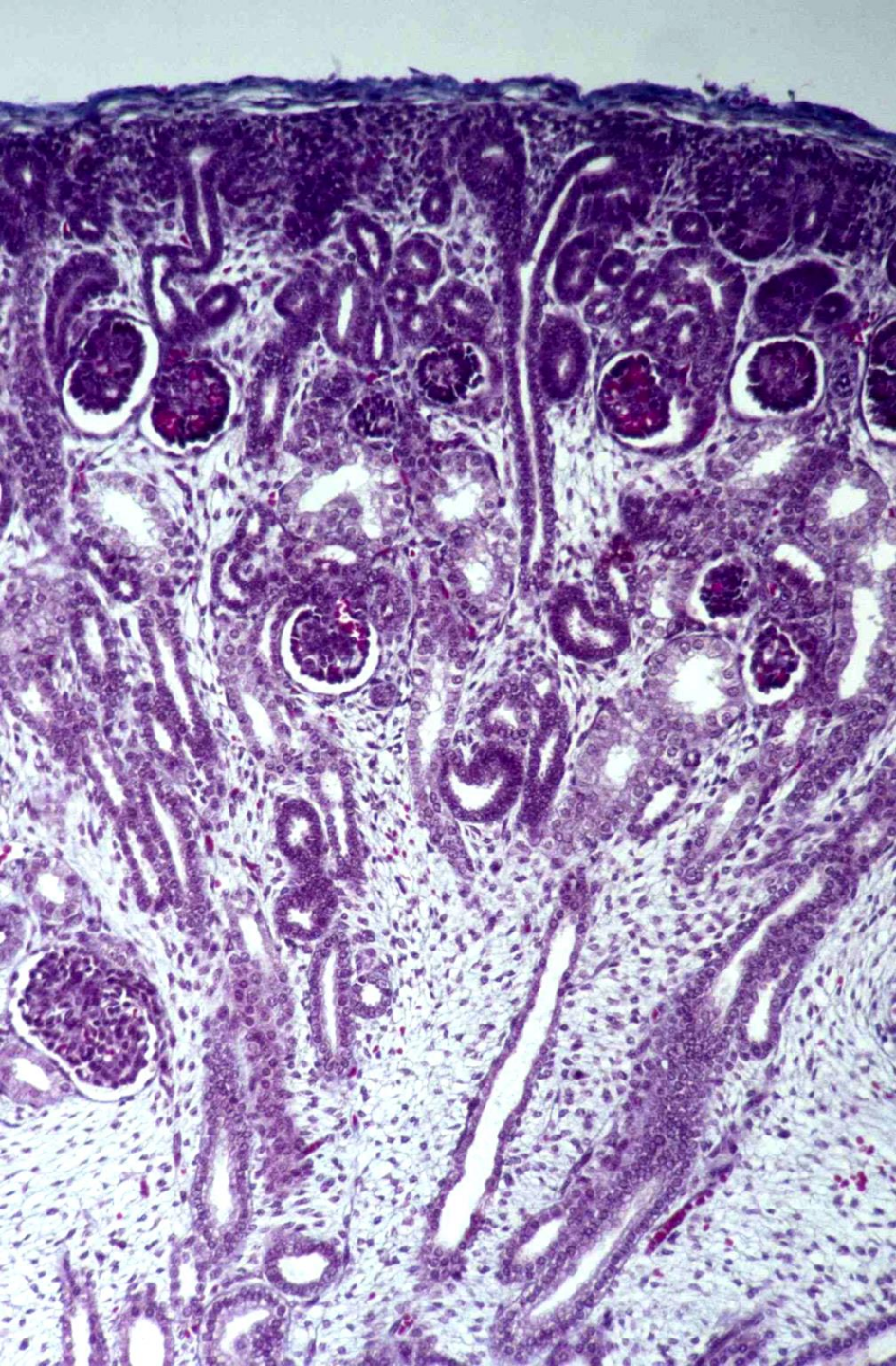
(Costantini 2012)

# Structure anatomique d'un néphron



10 SA





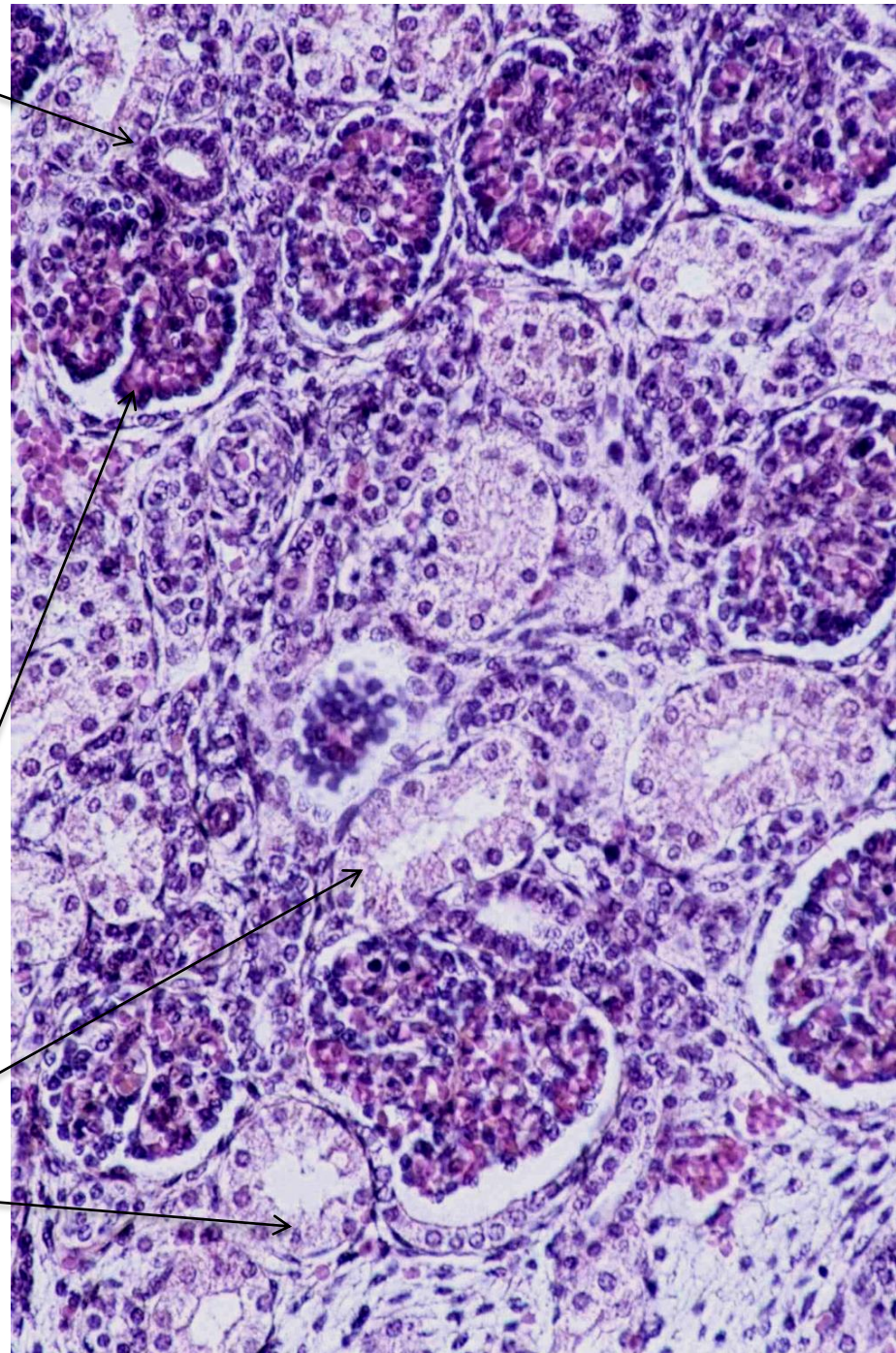
**16 SA**



Tubes contournés  
distaux

Glomérule

Tubes contournés  
proximaux

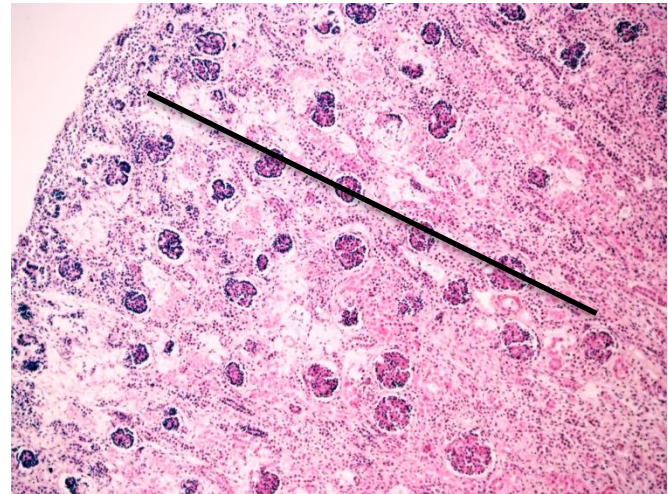


**24 SA**

# Datation de l'âge gestationnel fœtal

## Compte des glomérules matures par rangée :

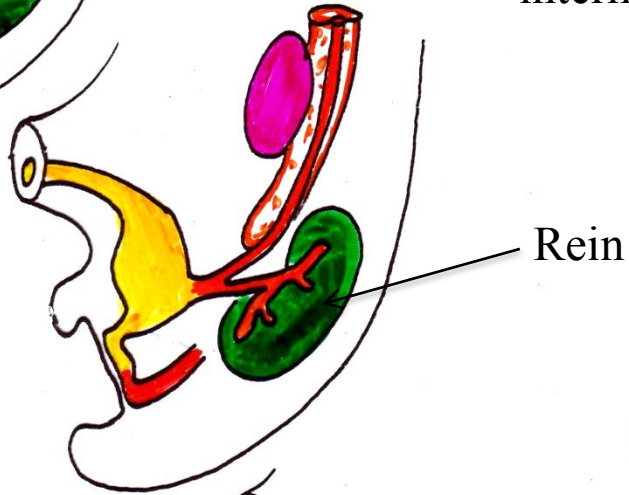
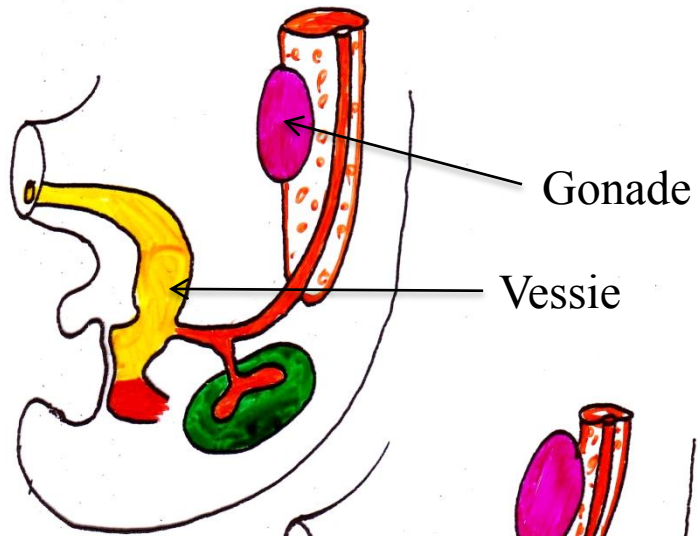
- 1 à 2 glomérules : 17-18 SA
- 2 à 3 glomérules : 20-21 SA
- 3 à 4 glomérules : 24-25 SA
- 4 à 5 glomérules : 28-29 SA
- 6 à 7 glomérules : 32-33 SA
- 7 à 8 glomérules : 36-37 SA



A terme entre 9 et 10 glomérules matures

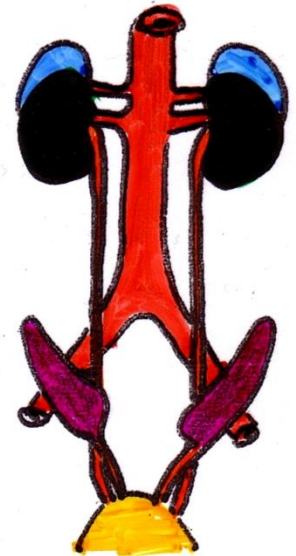
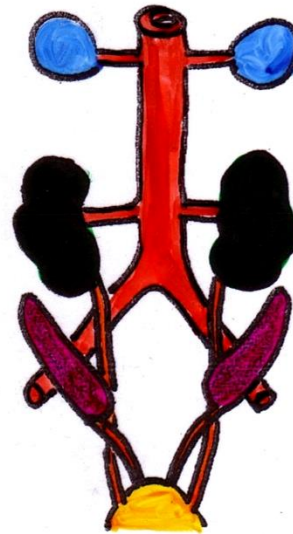
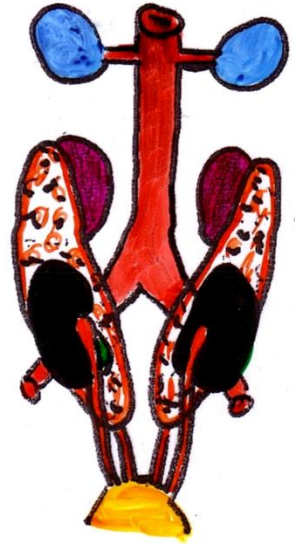
Au total, entre 900000 et 1,6 million de glomérules  
dans un rein de nouveau-né = rein adulte

# Migration



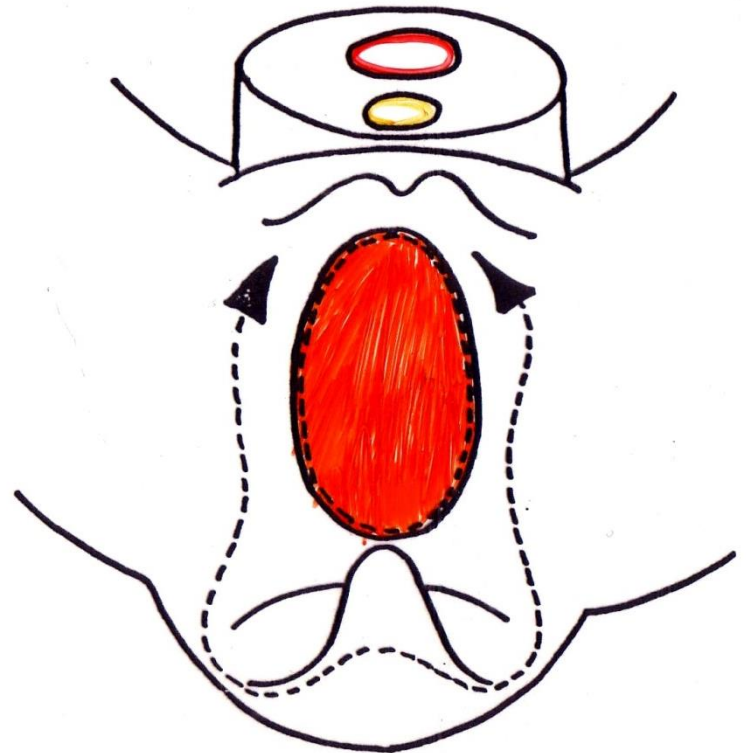
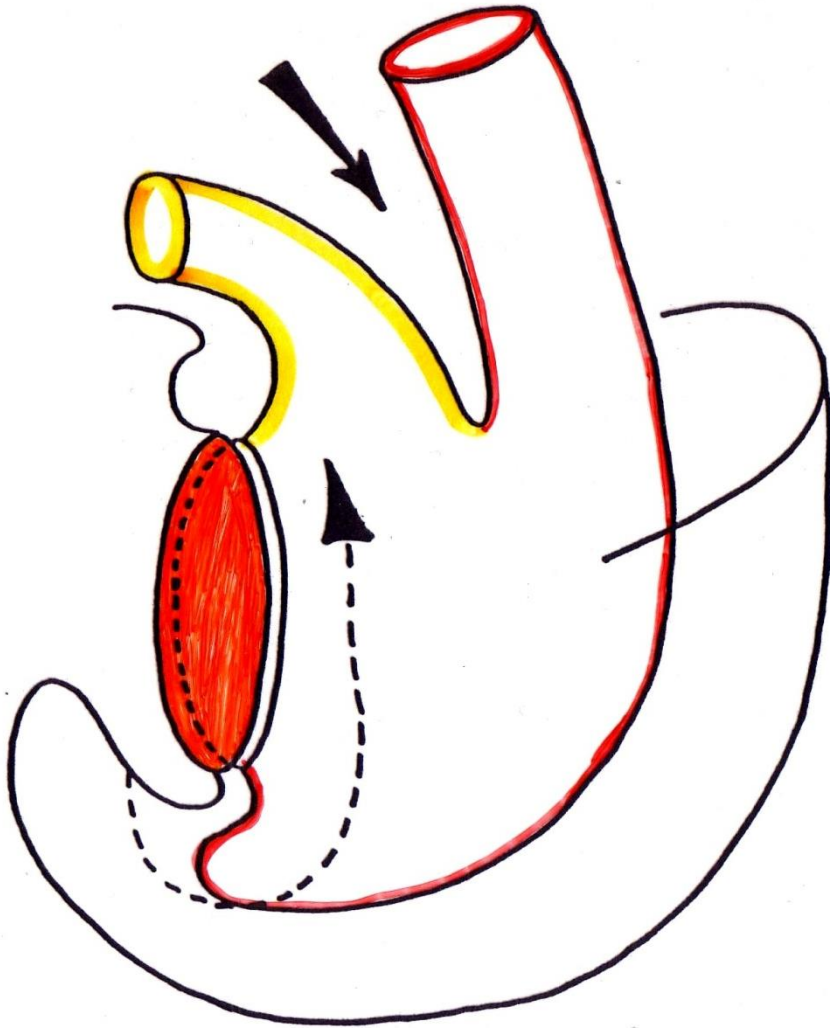
Surrénales

Mésoblaste  
intermédiaire



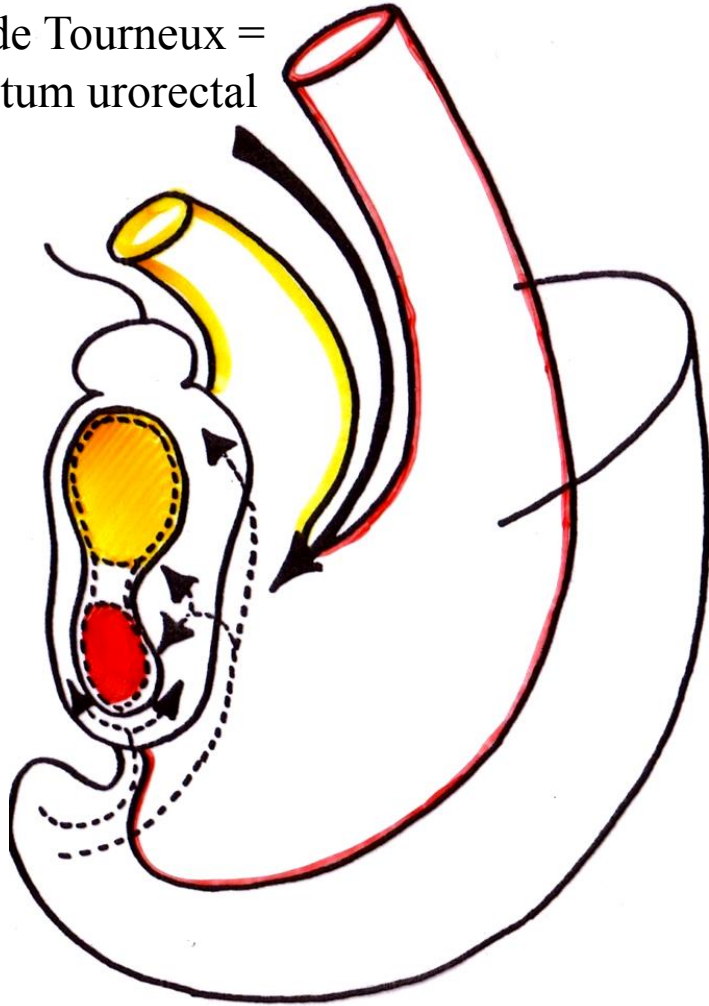


# CLOISONNEMENT DU CLOAQUE

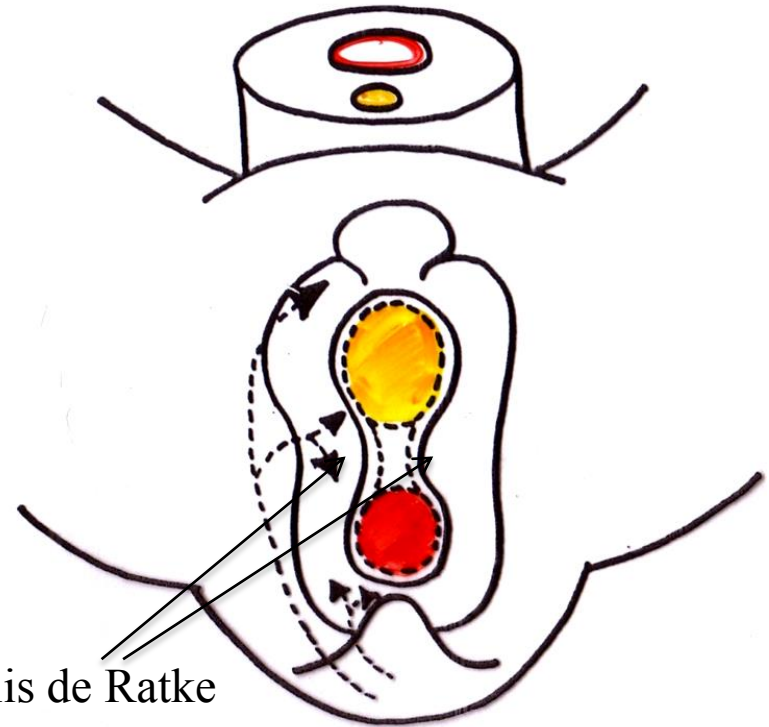


5<sup>ème</sup> semaine

Pli de Tourneux =  
Septum urorectal



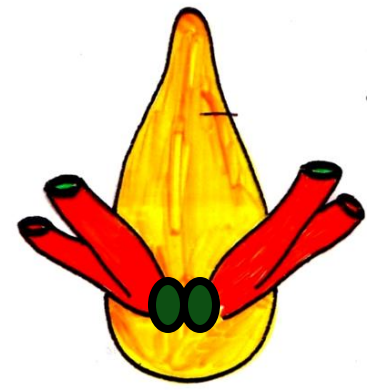
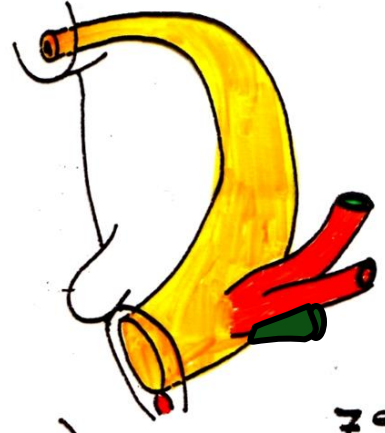
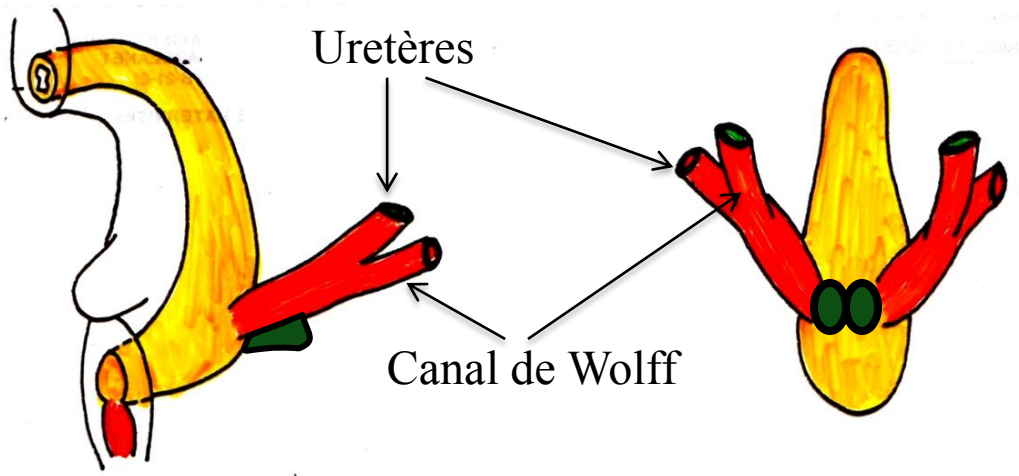
# SINUS URO-GENITAL



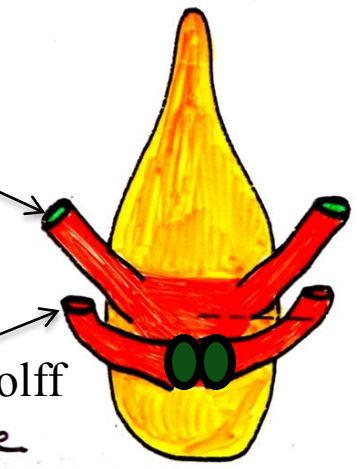
Plis de Ratke

7<sup>ème</sup> semaine

# URETERES VESSIE



7<sup>e</sup> semaine



8<sup>e</sup> semaine

# URETRE

