早期胚胎发育

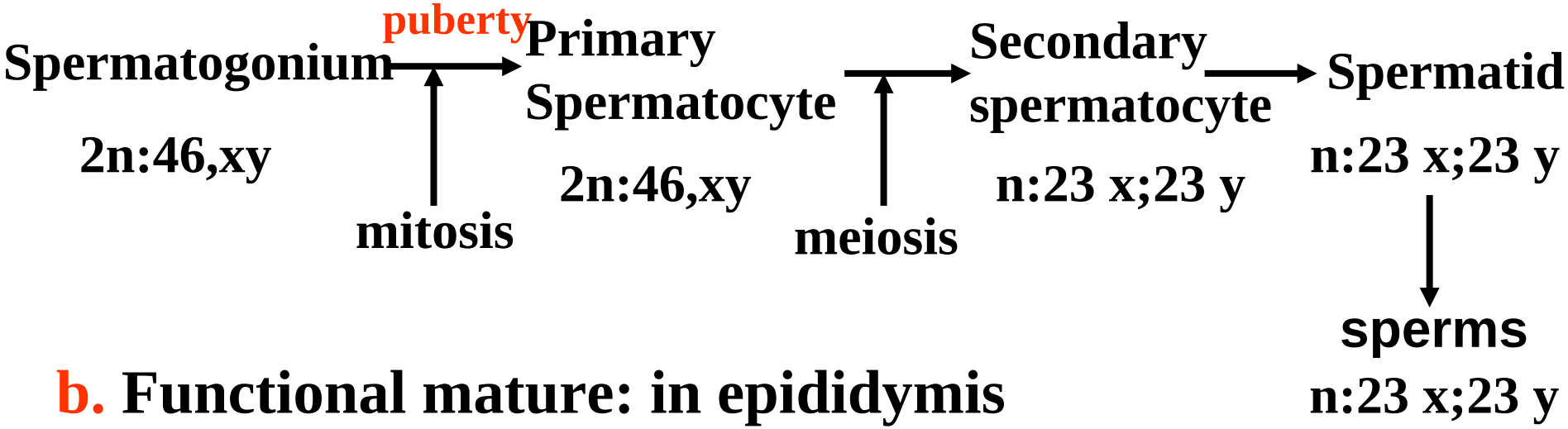
郝利铭

Gametogenesis

(配子的发生）

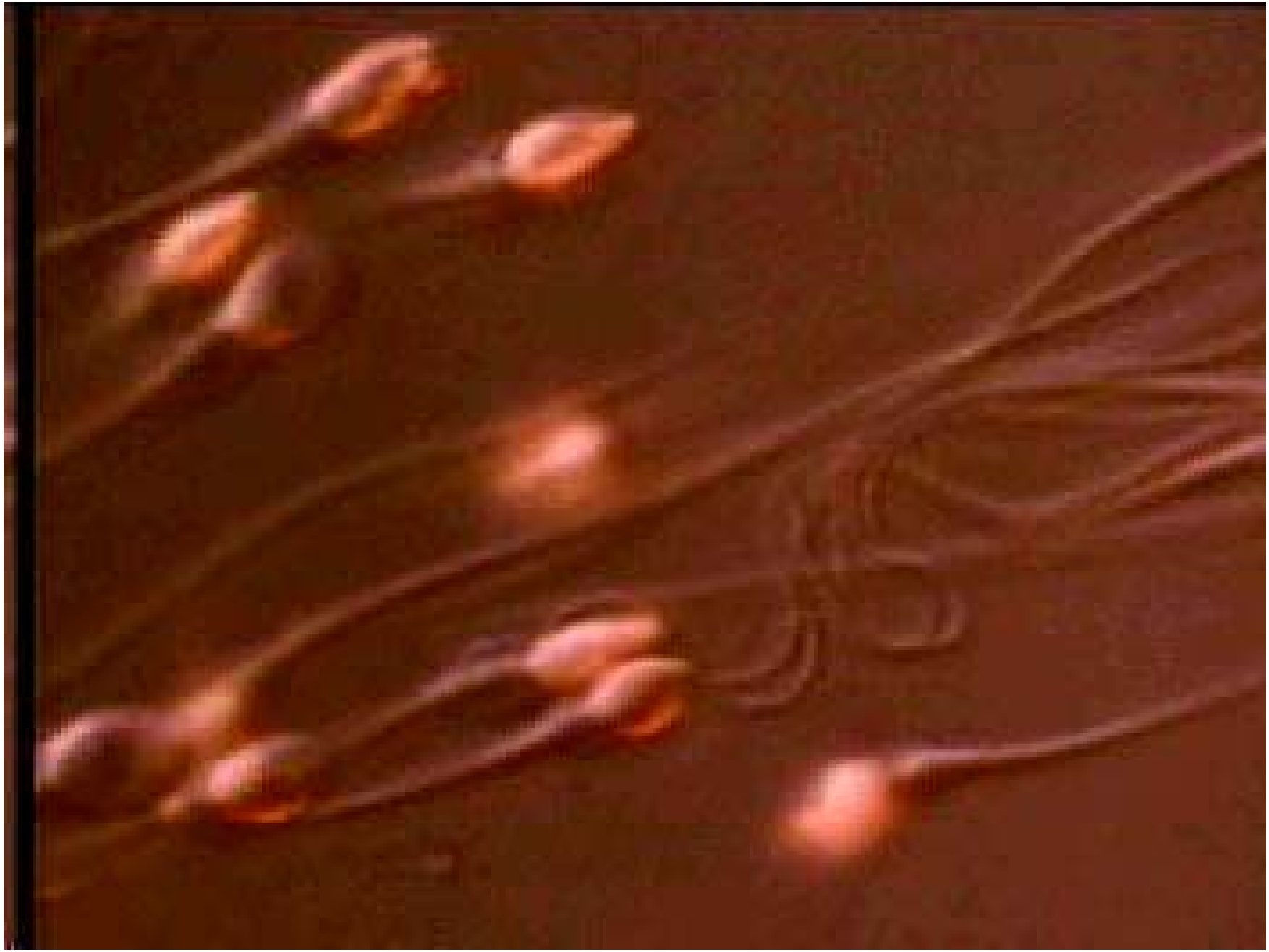
1. Spermatogenesis（精子的发生）

a. Process

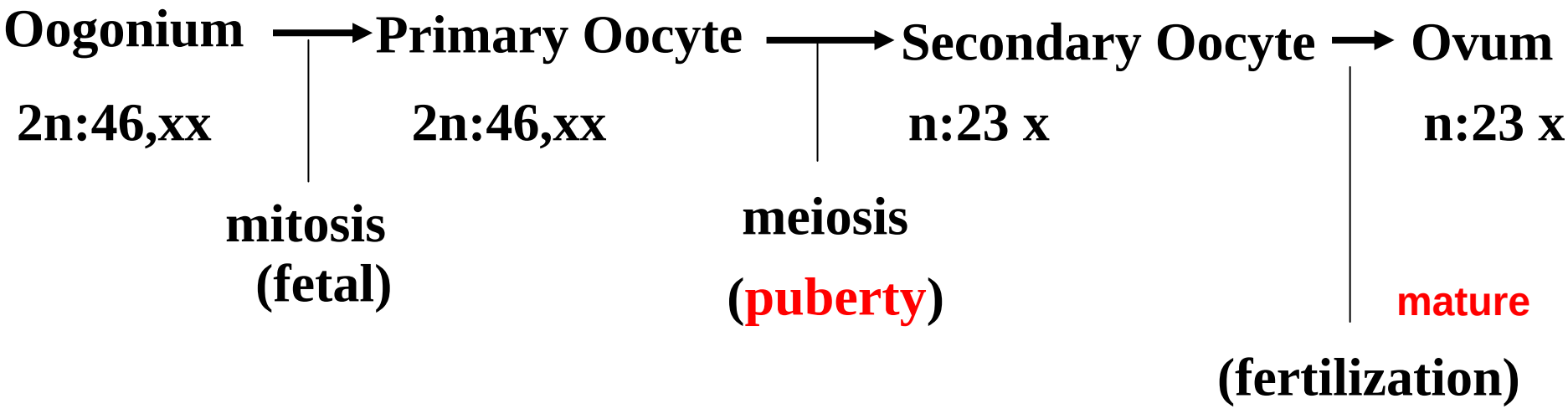


b. Functional mature: in epididymis

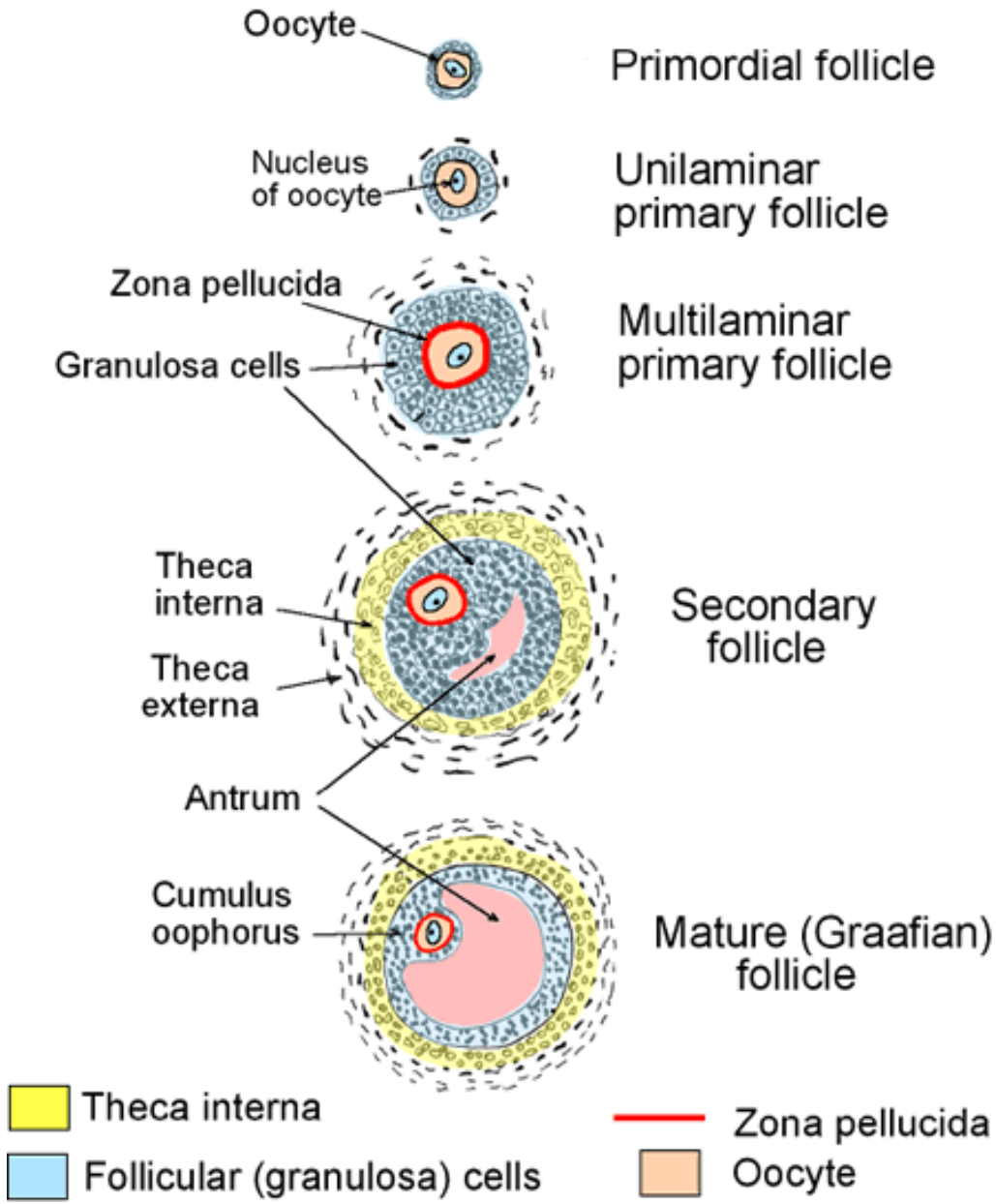
c. Capacitation: process of obtaining capacity of the fertilization

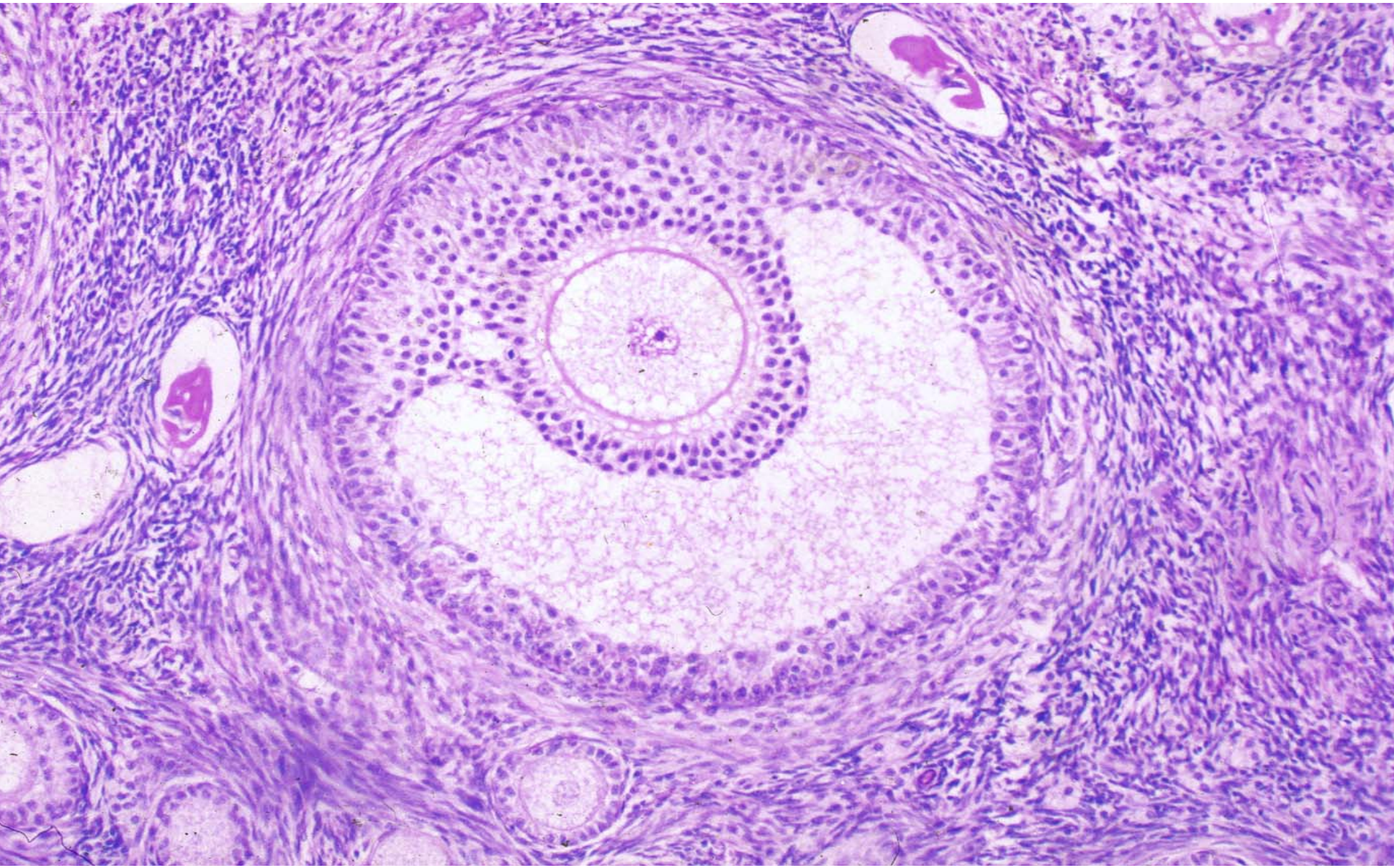


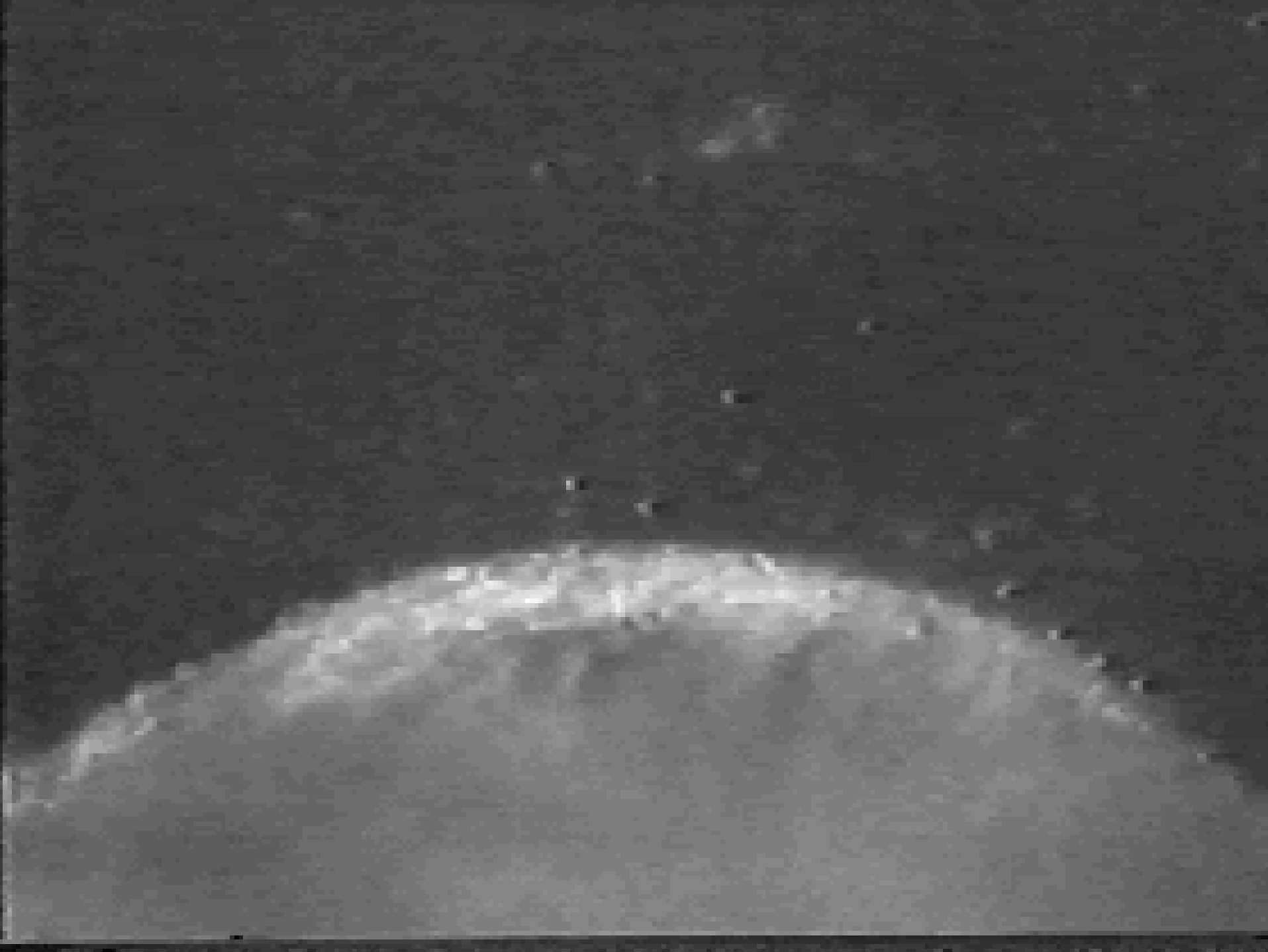
Oogenesis

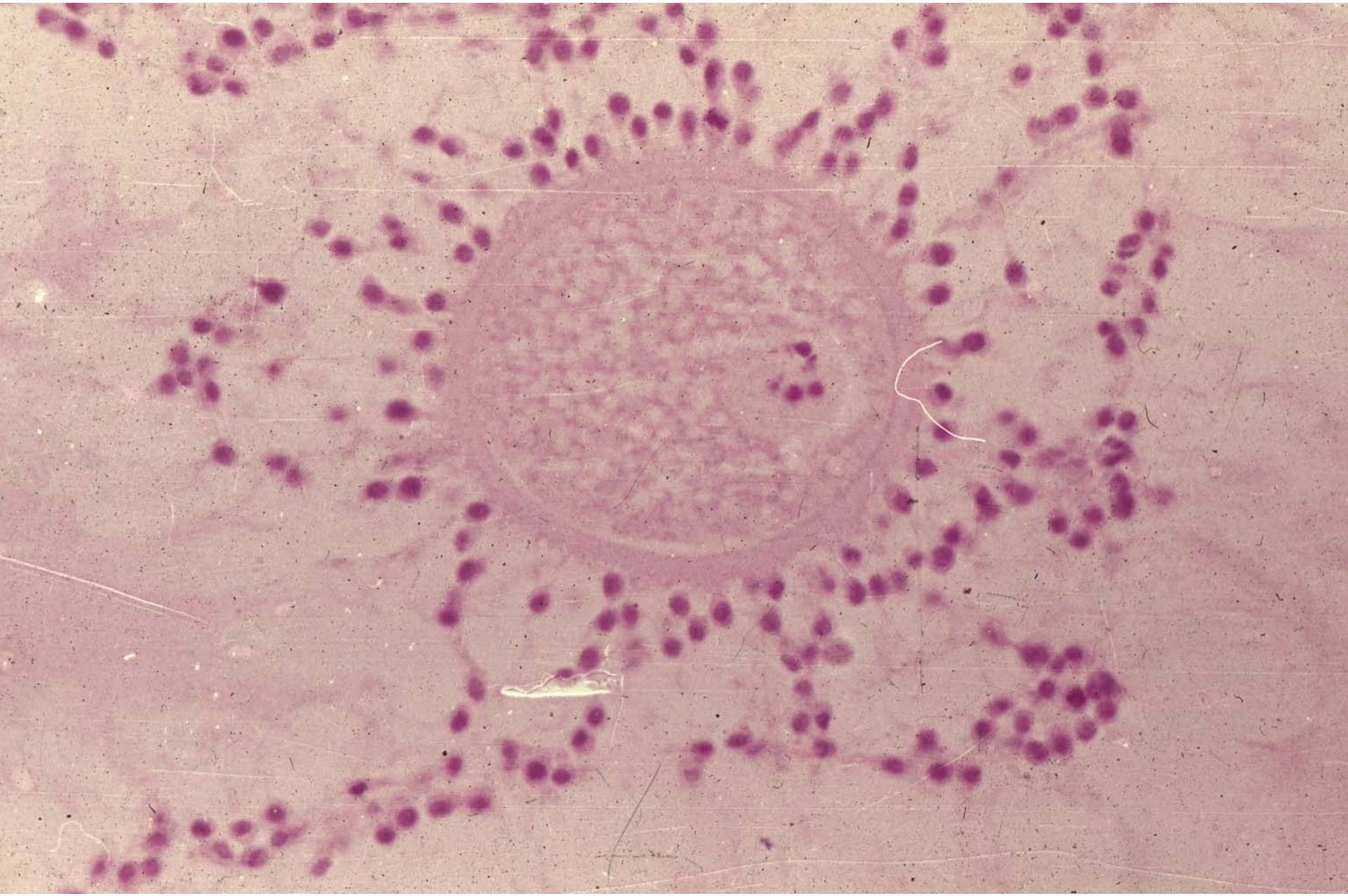

Oogonium
2n:46,xx
mitosis
(fetal)
Primary Oocyte
2n:46,xx
meiosis
(puberty)
Secondary Oocyte
n:23 x
Ovum
n:23 x
mature
(fertilization)

Development of follicles



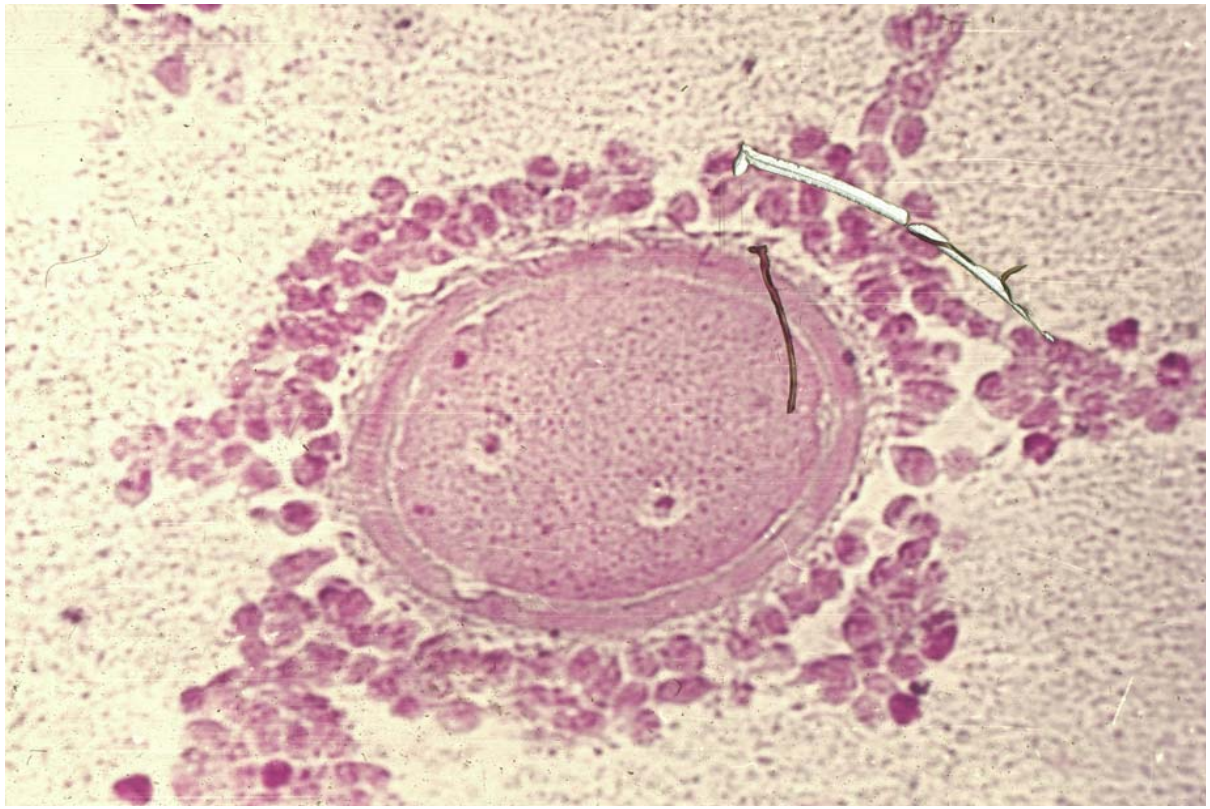


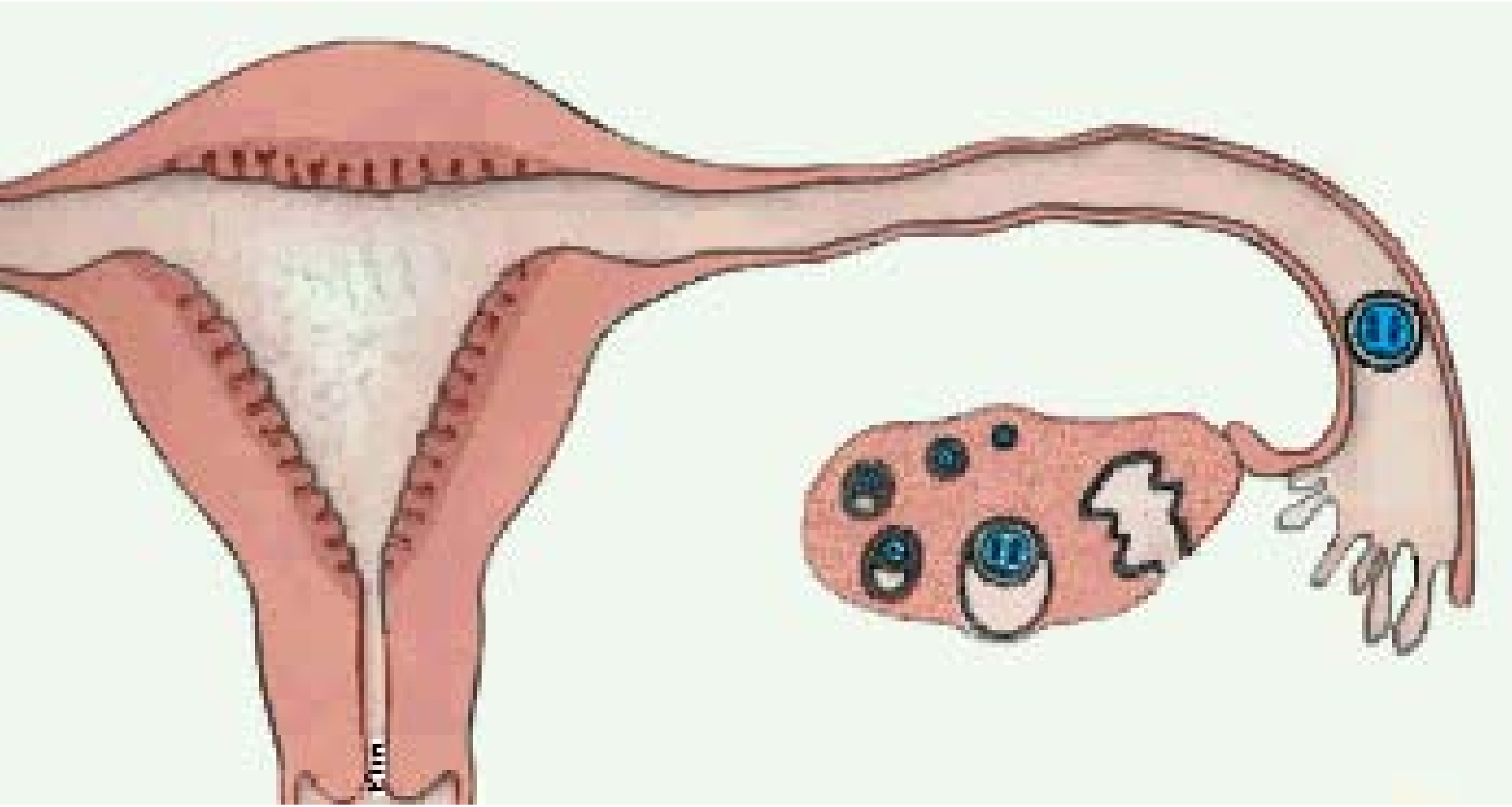




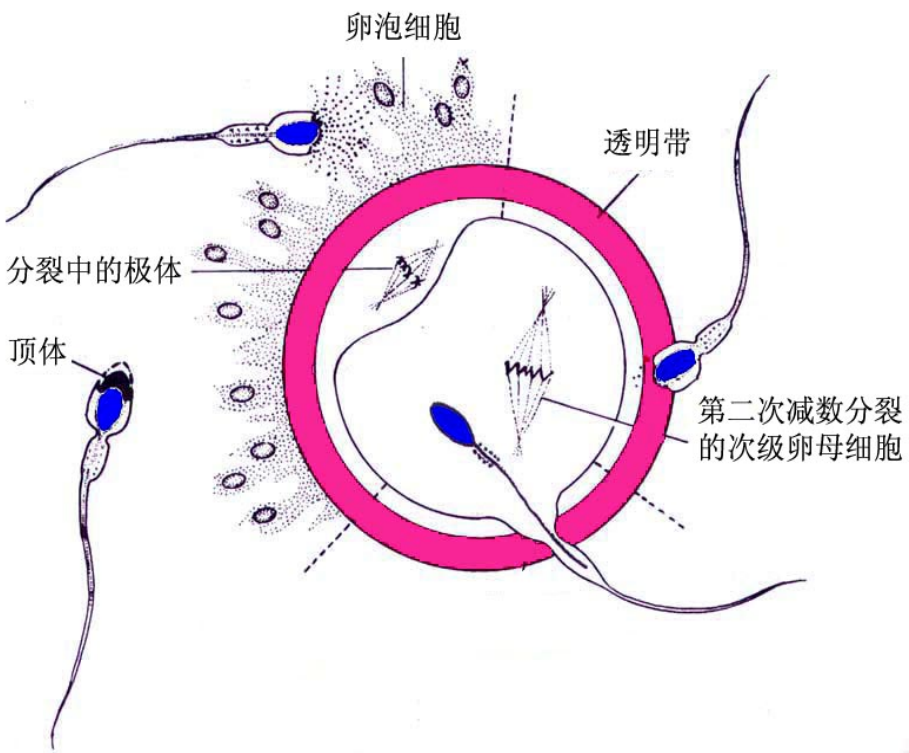
fertilization

- 受精(Fertilization):成熟并获能后的精子与卵子结合形成受精卵的过程。





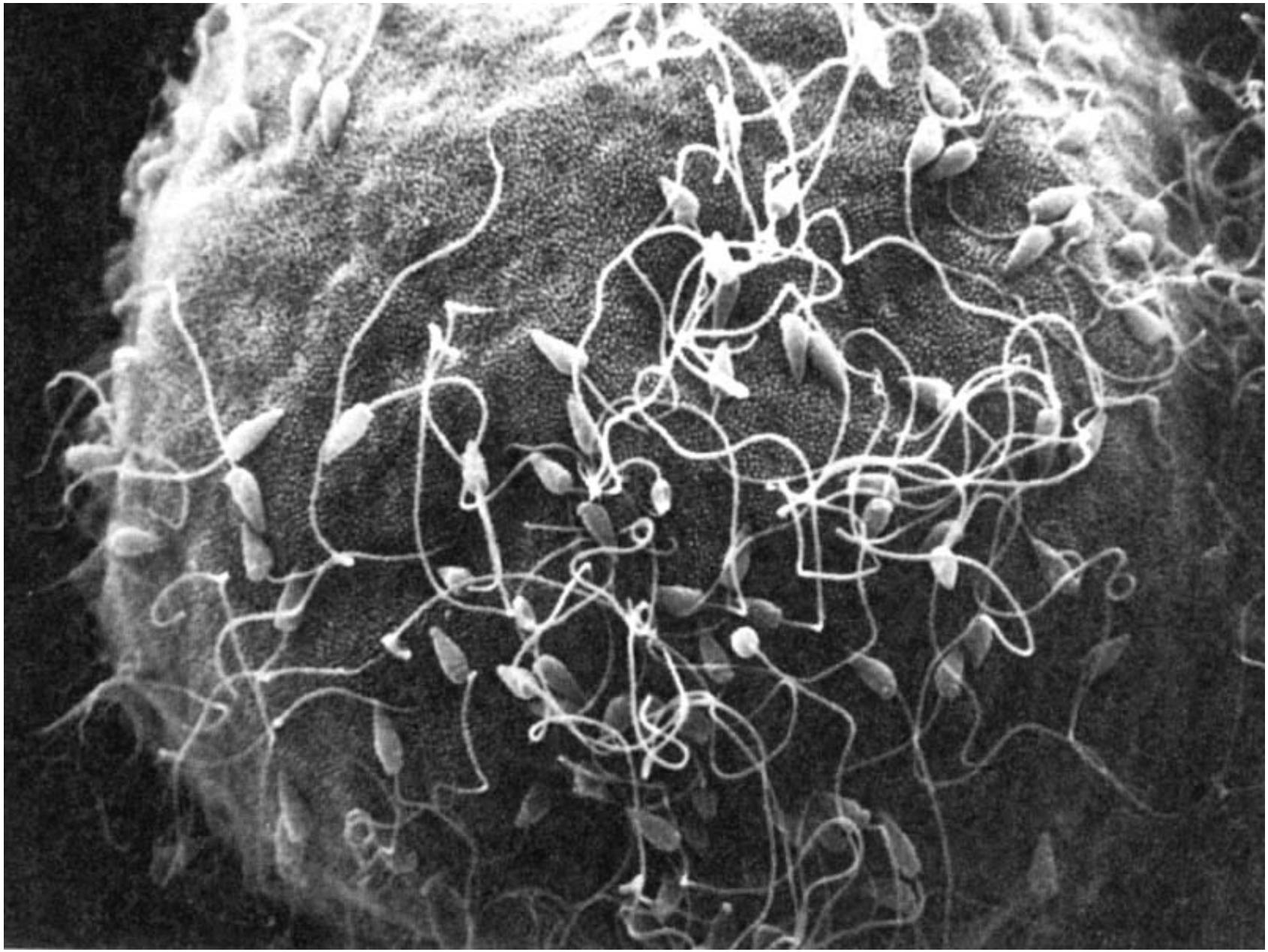
Process of fertilization

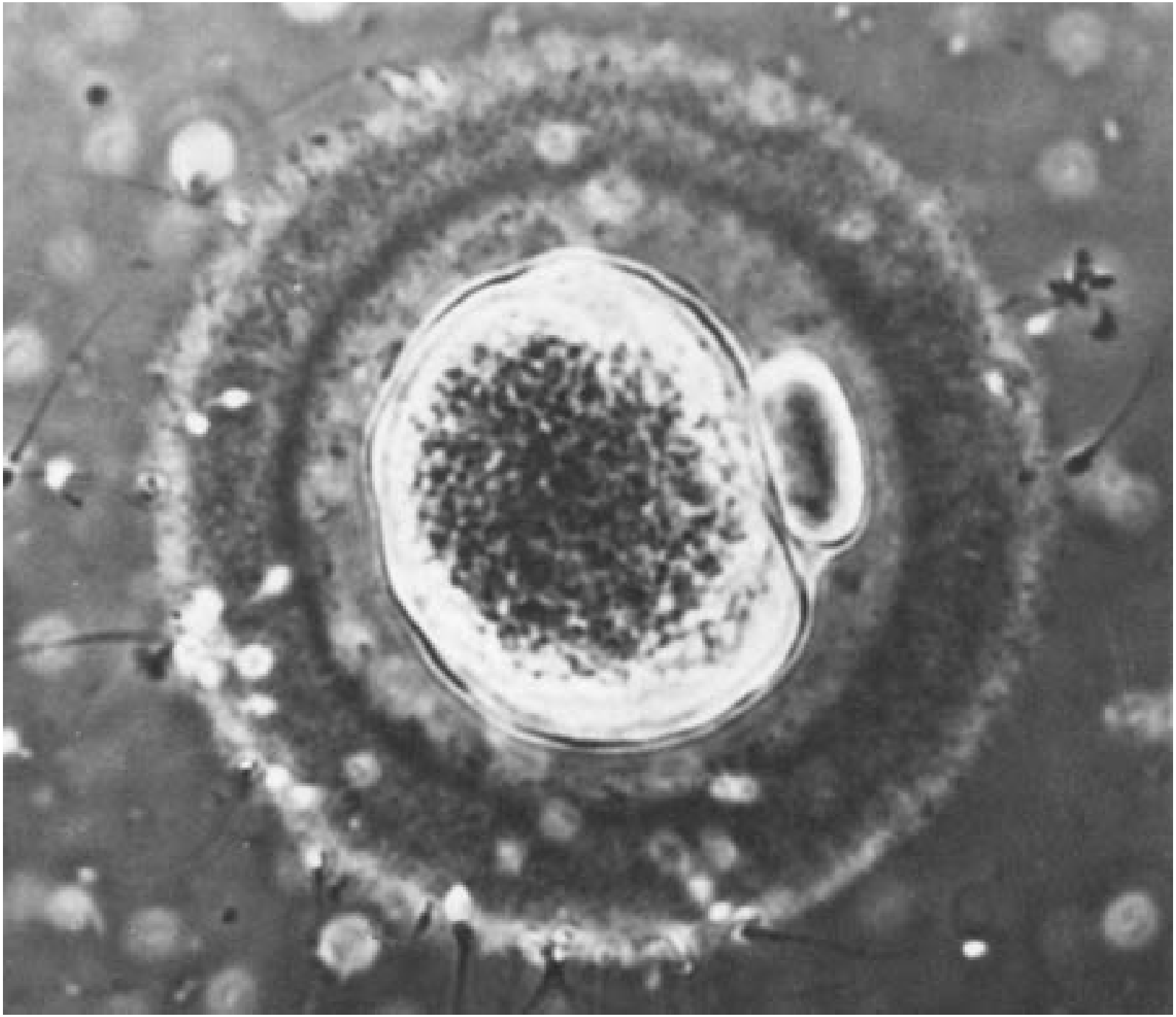


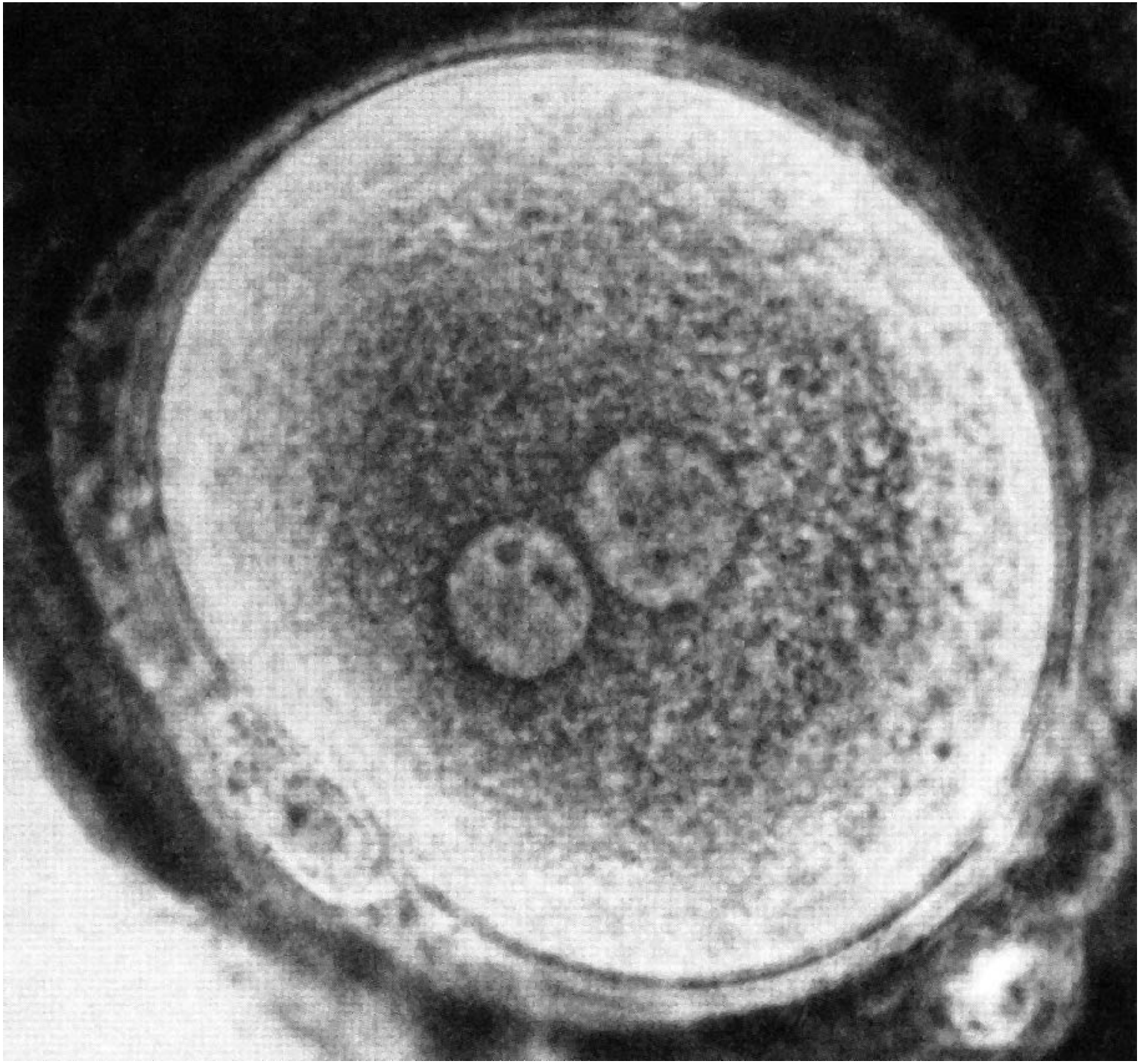
1. 穿过放射冠

2. 穿过透明带

3.精卵质膜融合





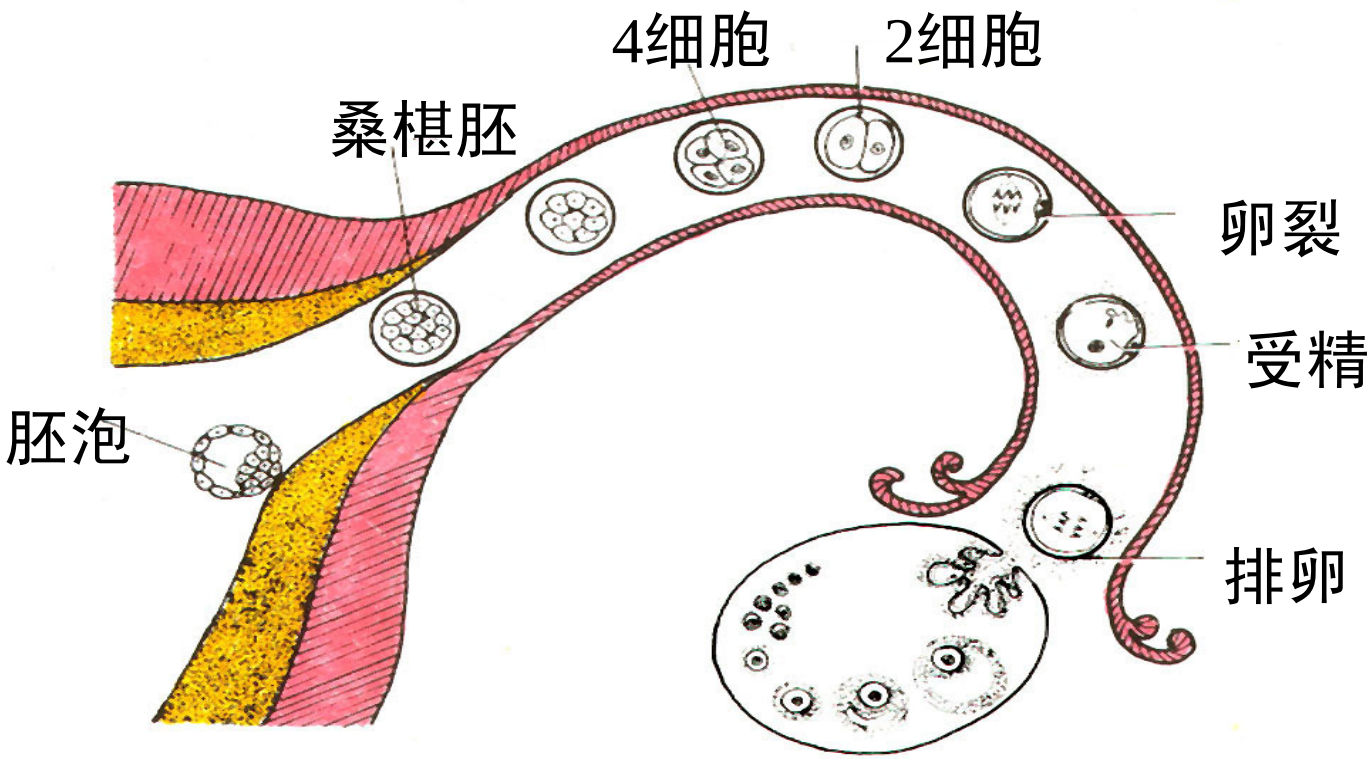


受精的结果

- 形成新的生命，启动新个体的发育过程。
- 使新个体既遗传又变异。
- 决定新生命的性别。

受精的地点

输卵管壶腹部



受精的条件

1.精子和卵子相遇
- 生殖管道通畅
- 精子运动速度
- 精子的数目

2.精子和卵子必须在规定的时间内相遇
- 精子：**20**小时内
- 卵子：**12**小时内

3.精子必须获能。获能方式
- 体内
- 体外

试管婴儿

1978年诞生了世界上第一例试管婴儿

1988年**3**月**10**日在北京医科大学第三附属医院诞生了中国第一例试管婴儿。研究者是北京医科大学附属三院妇产科教授张丽珠和北京医科大学基础医学部副教授刘斌


南方都市報
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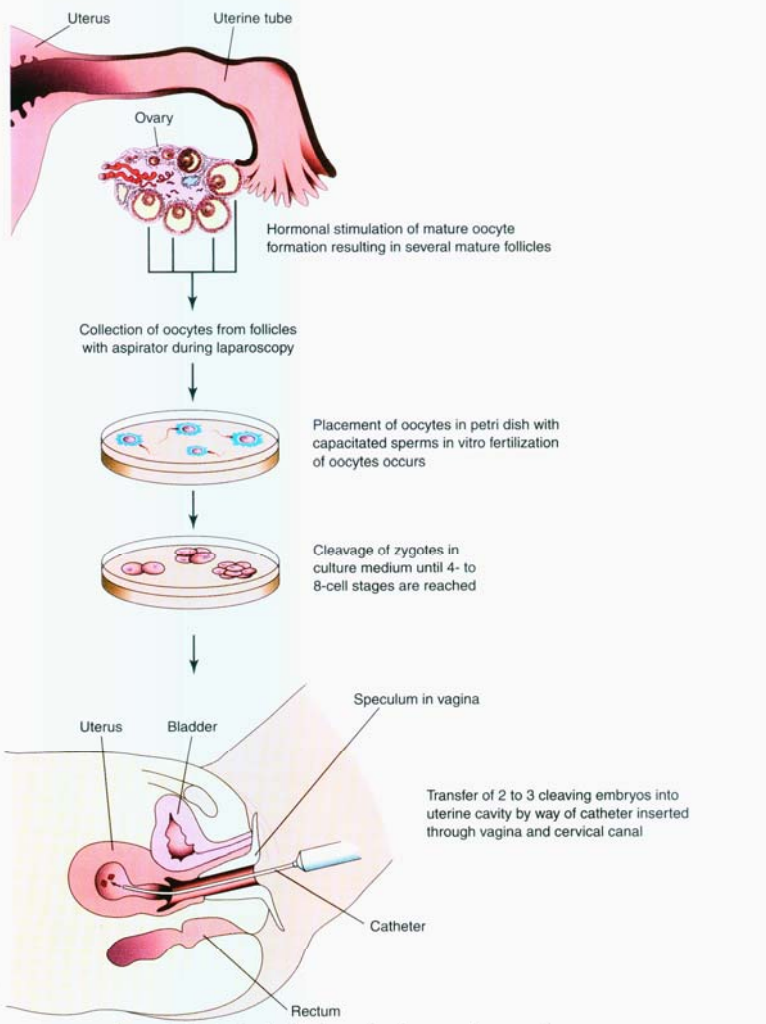
试管婴儿诞生的基本原理



■ Figure 2–18. In vitro fertilization and embryo transfer procedures.

Parthenogenesis

ized but develop parthenogenetically. In a few other species (e.g., rabbits), an unfertilized ovum can be induced experimentally to undergo parthenogenetic

体外受精

（fertilization in vitro, IVF）

+

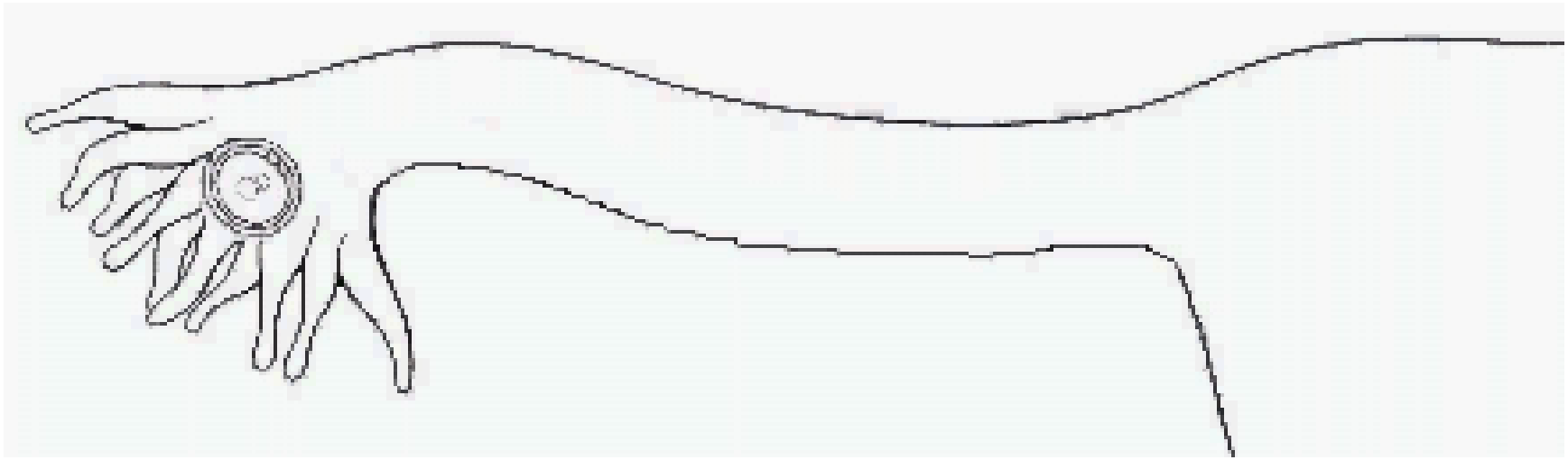
胚胎移植

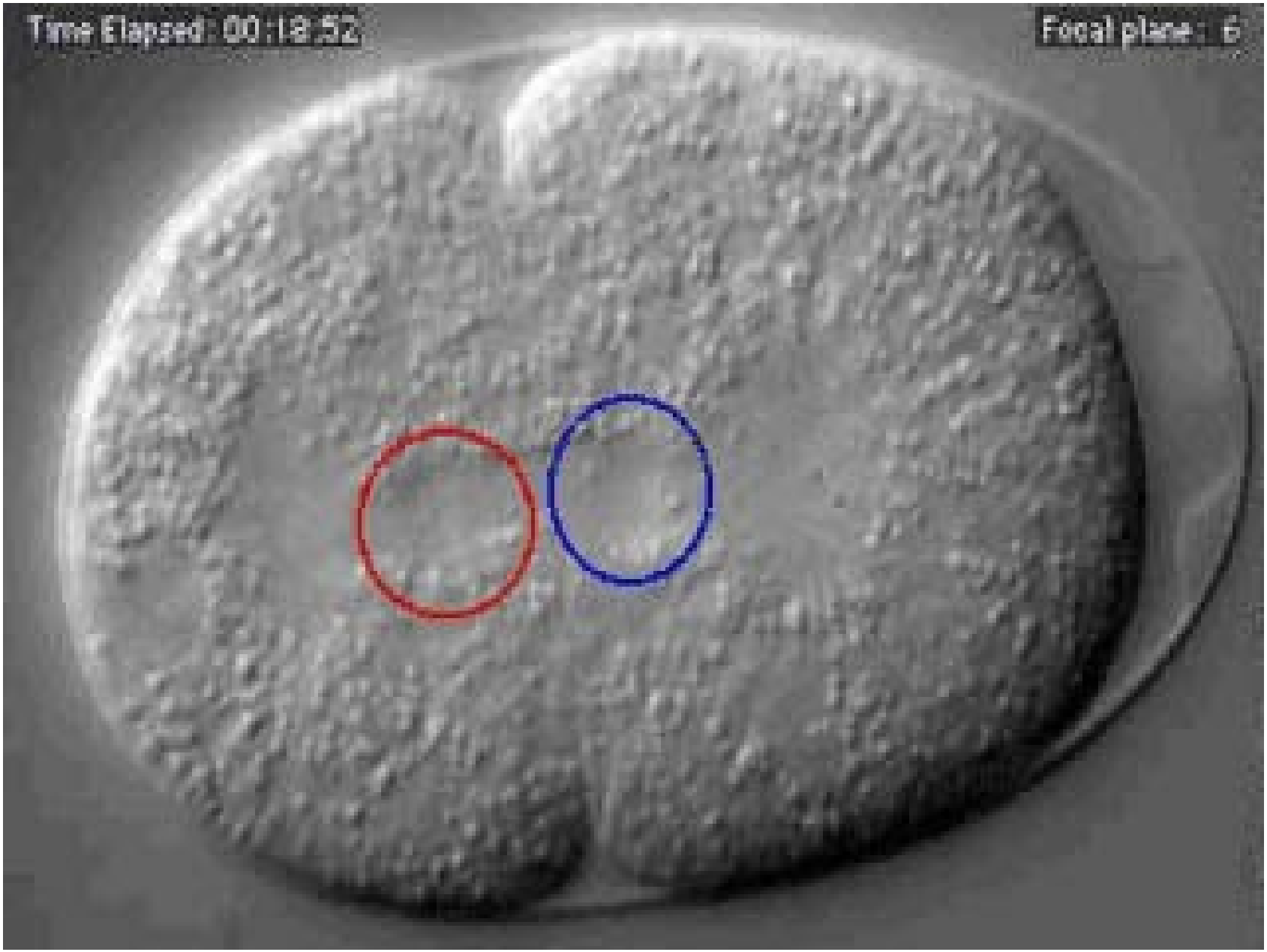
（embryo transfer ET)

“试管婴儿”（test tube baby）

- 第一代：**IVF+ET**
- 第二代：卵母细胞单精子显微注射（**intracytoplasmic sperm injection ICSI**）**+ ET**
- 第三代：体外受精获得的早期人胚进行遗传学检测获得优质早胚，进而实施胚胎移植而诞生的婴儿称第三代试管婴儿。早胚优选 **+ ET**
- 第四代：卵浆置换技术（通过显微操作将活力差的卵浆与健康女性卵浆置换）提高卵子的质量、增强卵子的活力，再行体外受精及胚胎移植所获得的婴儿称第四代试管婴儿。卵浆置换技术**+ IVF + ET**

早期胚胎发生



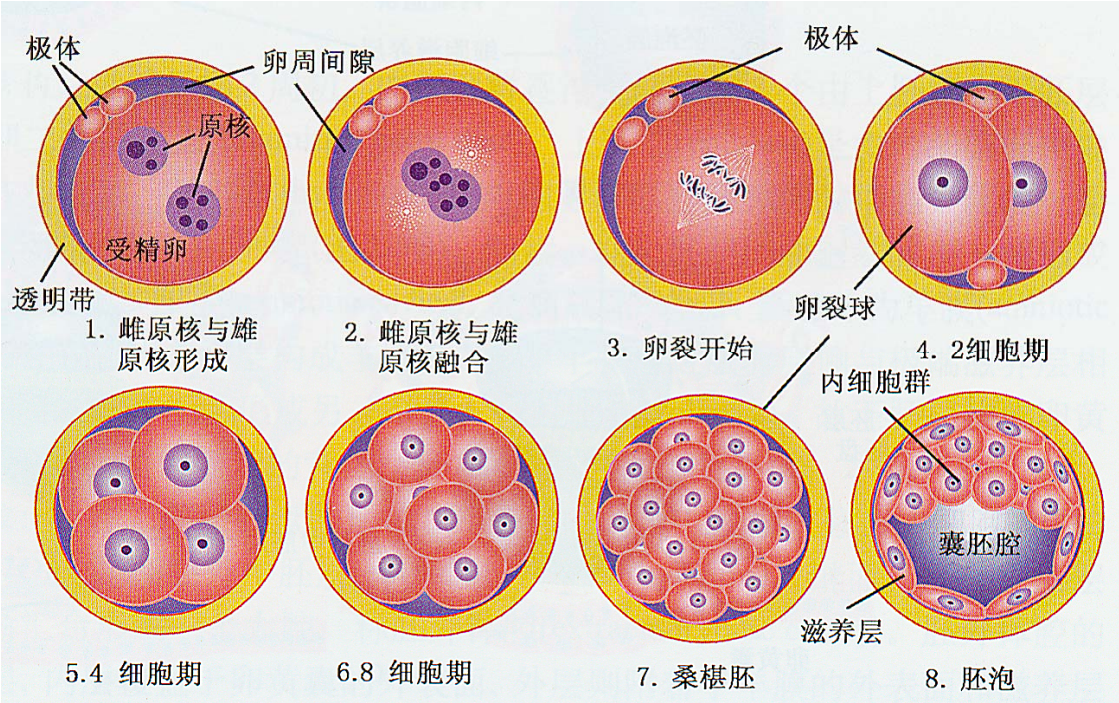

Time Elapsed: 00:18:52
Focal plane: 6

胚泡形成

卵裂（cleavage）：是受精卵进行的有丝分裂

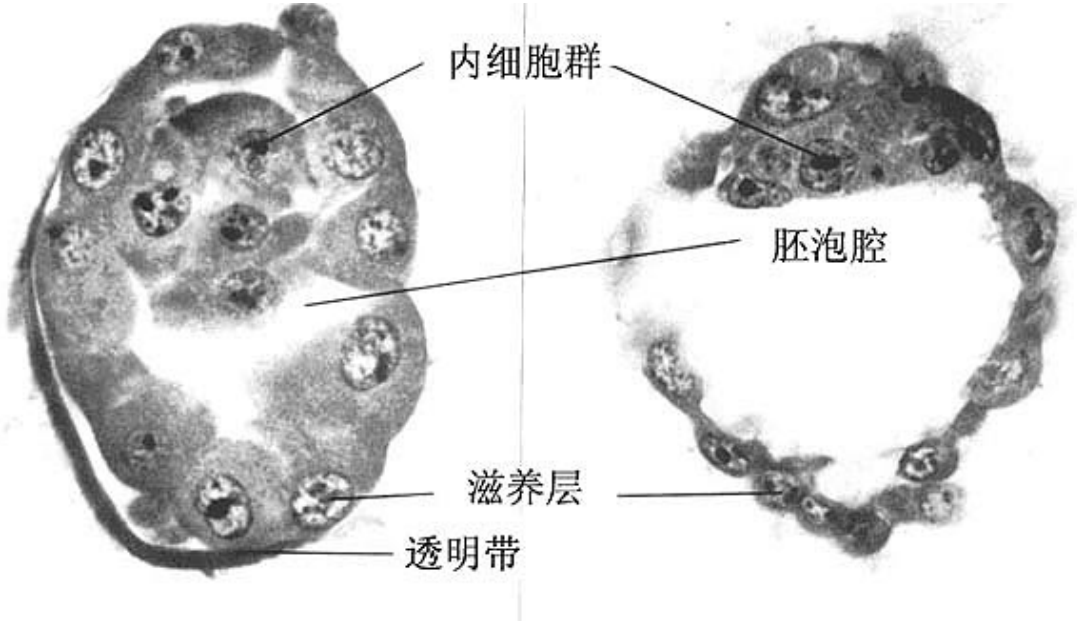
卵裂球（blastomere）：卵裂形成的子细胞

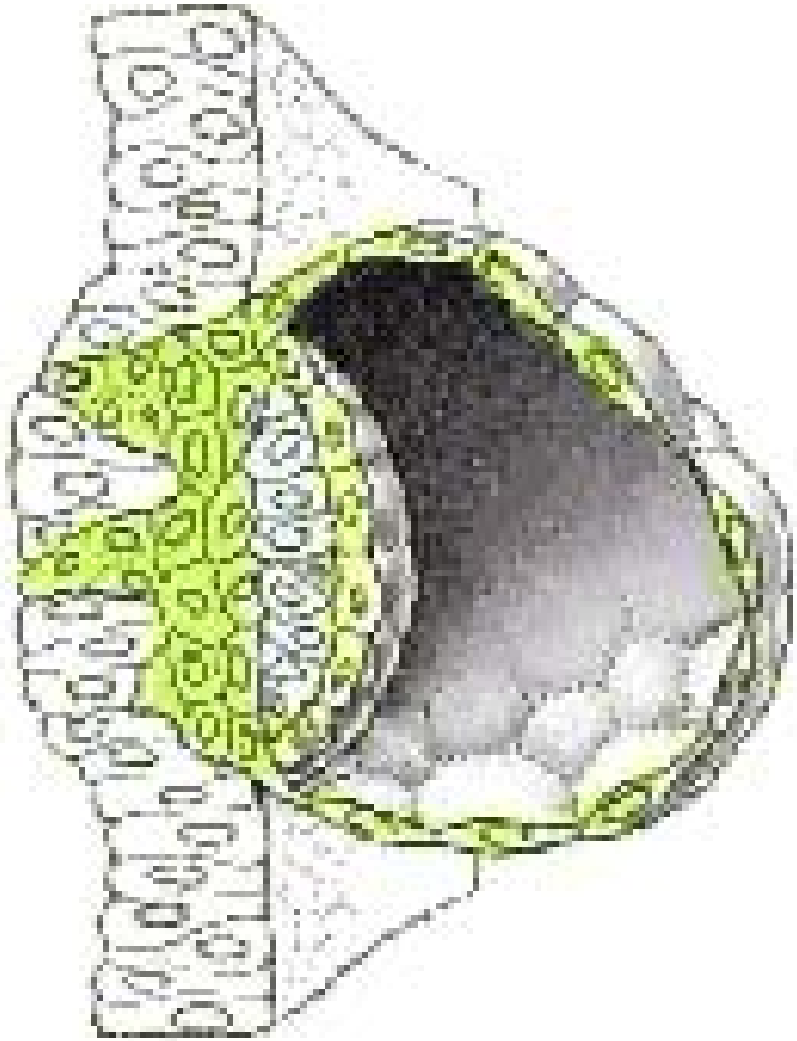
桑椹胚（morula）：卵裂球为12-16个时，细胞紧密相贴，外形似桑椹



胚泡结构

- 受精后第**4-5**天，形成胚泡
- 胚泡结构：滋养层**(trophoblast)**
  胚泡腔**(blastocyst cavity)**
  内细胞群**(inner cell mass)**
  极端滋养层**(polar trophoblast)**

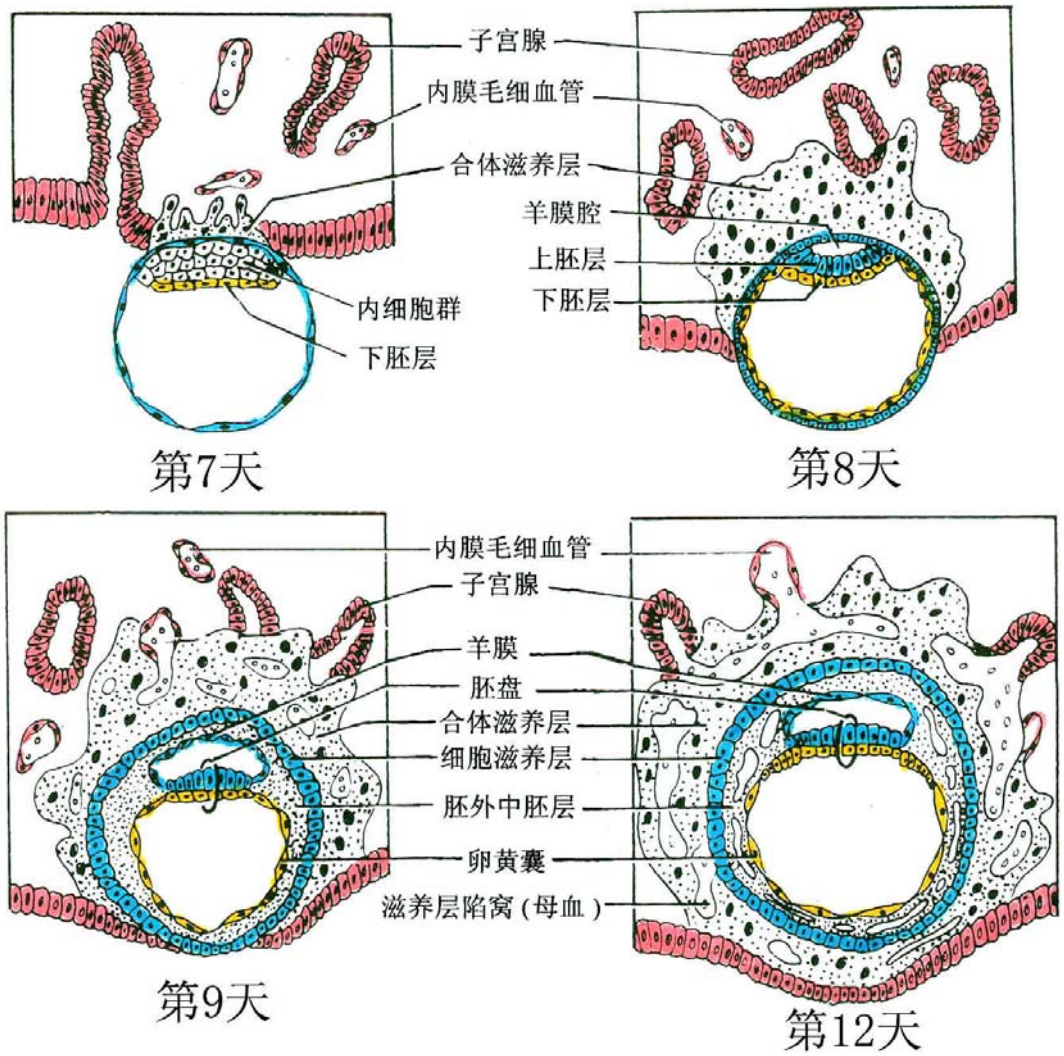




植入(implantation)

- 植入：胚泡逐渐埋入子宫内膜的过程
- 时间：受精后第5-6天开始，受精后第11-12天结束

植入的过程


子宫腺
内膜毛细血管
合体滋养层
羊膜腔
上胚层
下胚层
内细胞群
下胚层
第7天
第8天
内膜毛细血管
子宫腺
羊膜
胚盘
合体滋养层
细胞滋养层
胚外中胚层
卵黄囊
滋养层陷窝(母血)
第9天
第12天

植入的部位

- 植入的正常部位：子宫底或子宫体
- 异常部位：

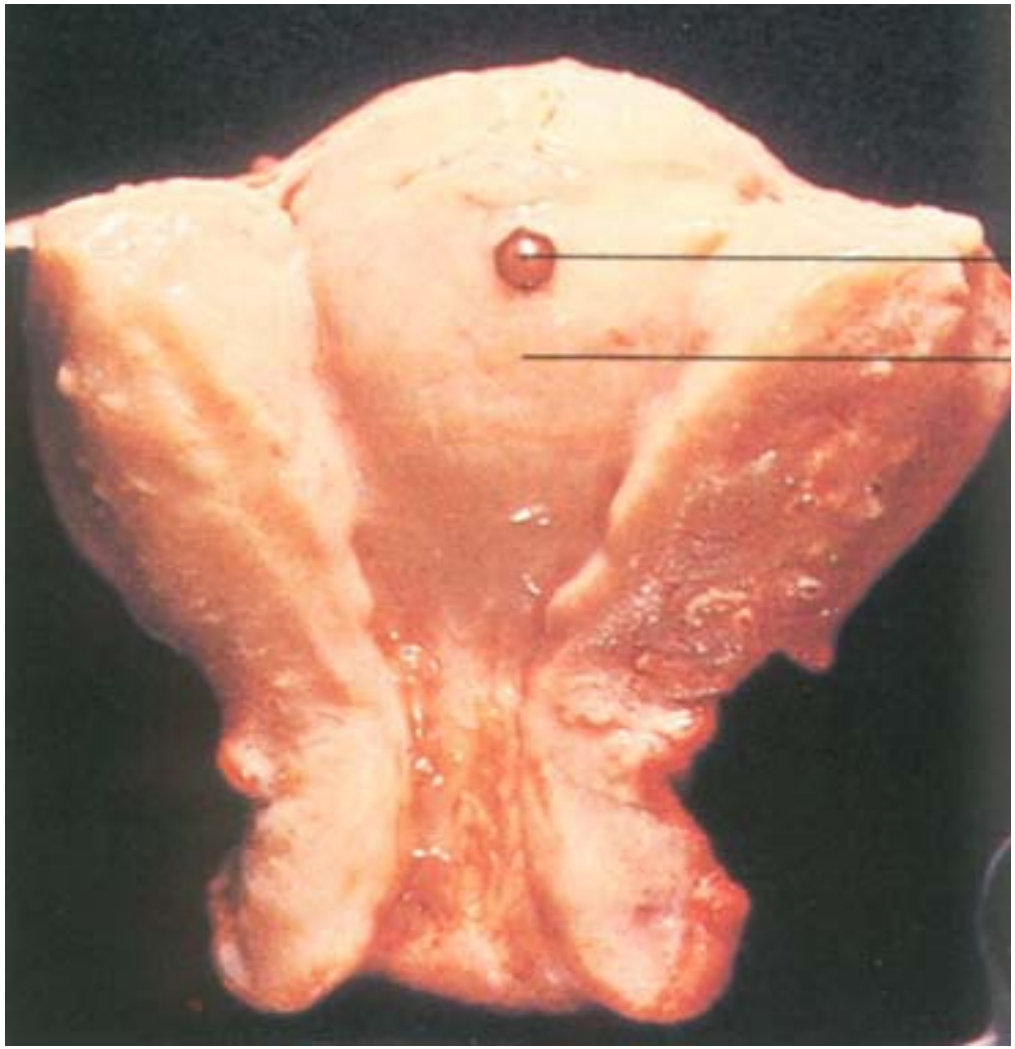
（1）宫外孕**(ectopic pregnancy)**

子宫以外植入的部位为宫外孕

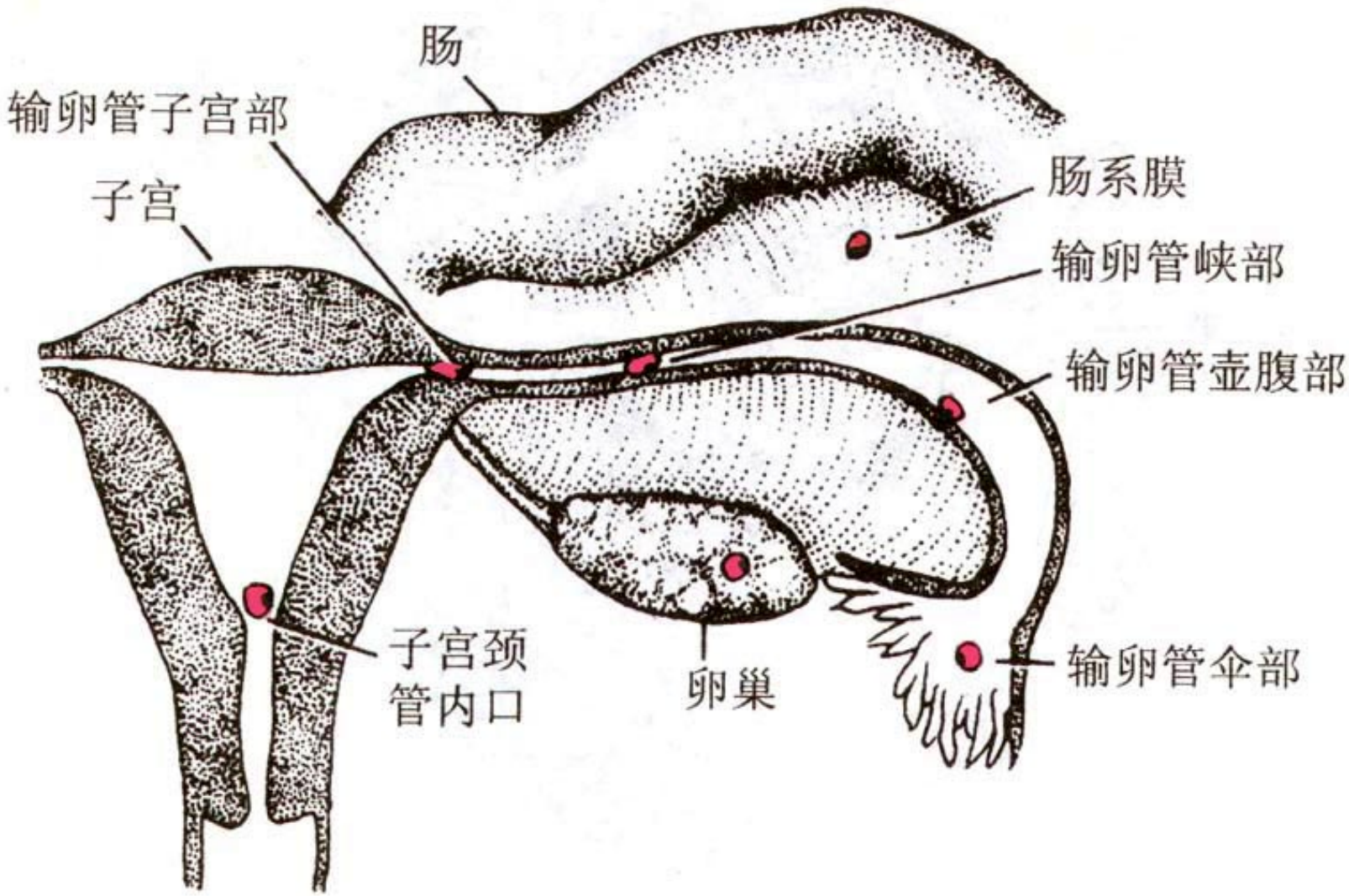
（2）前置胎盘**(placenta previa)**

胚泡植入到子宫颈处形成的胎盘

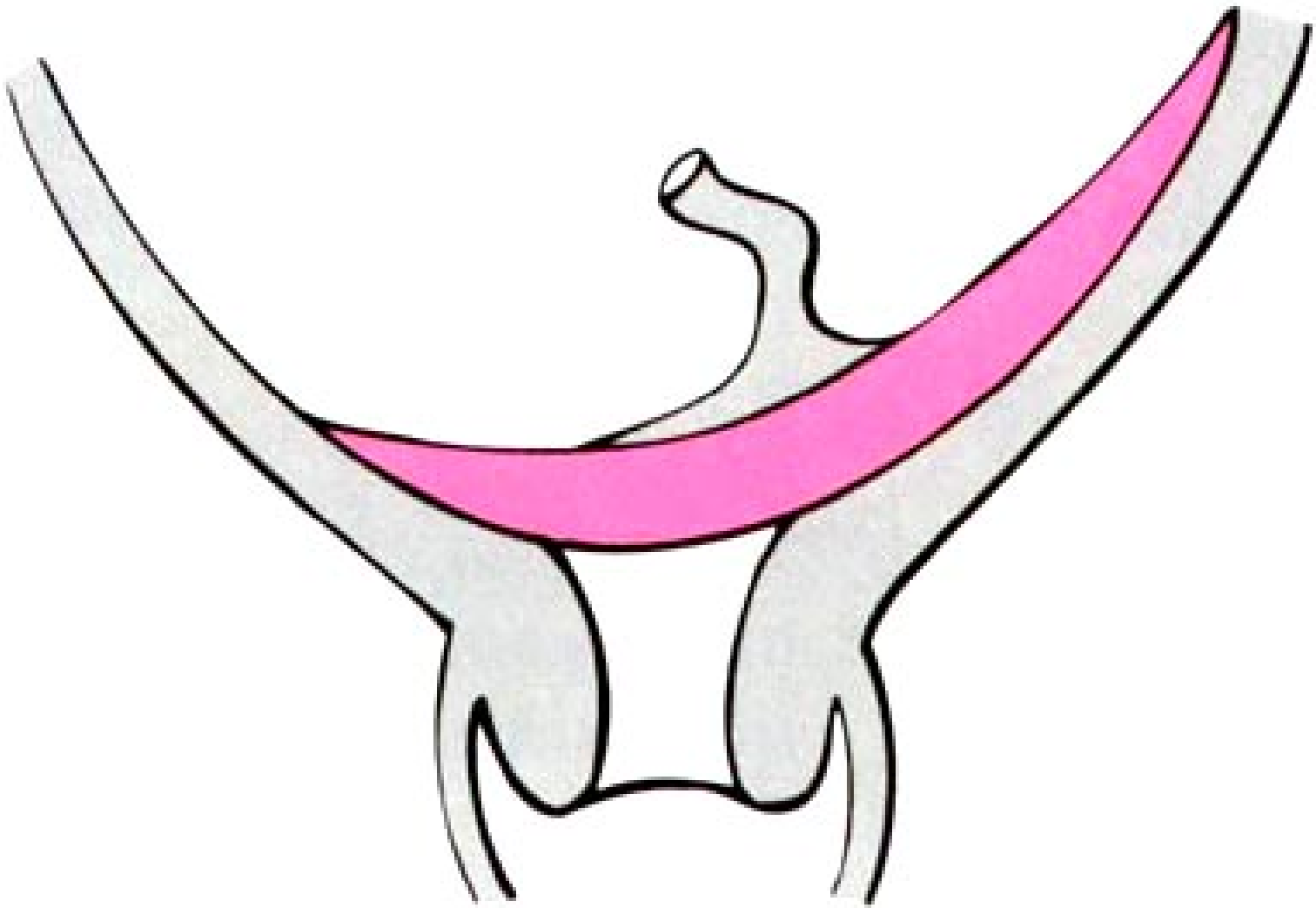
正常植入的部位



宫外孕

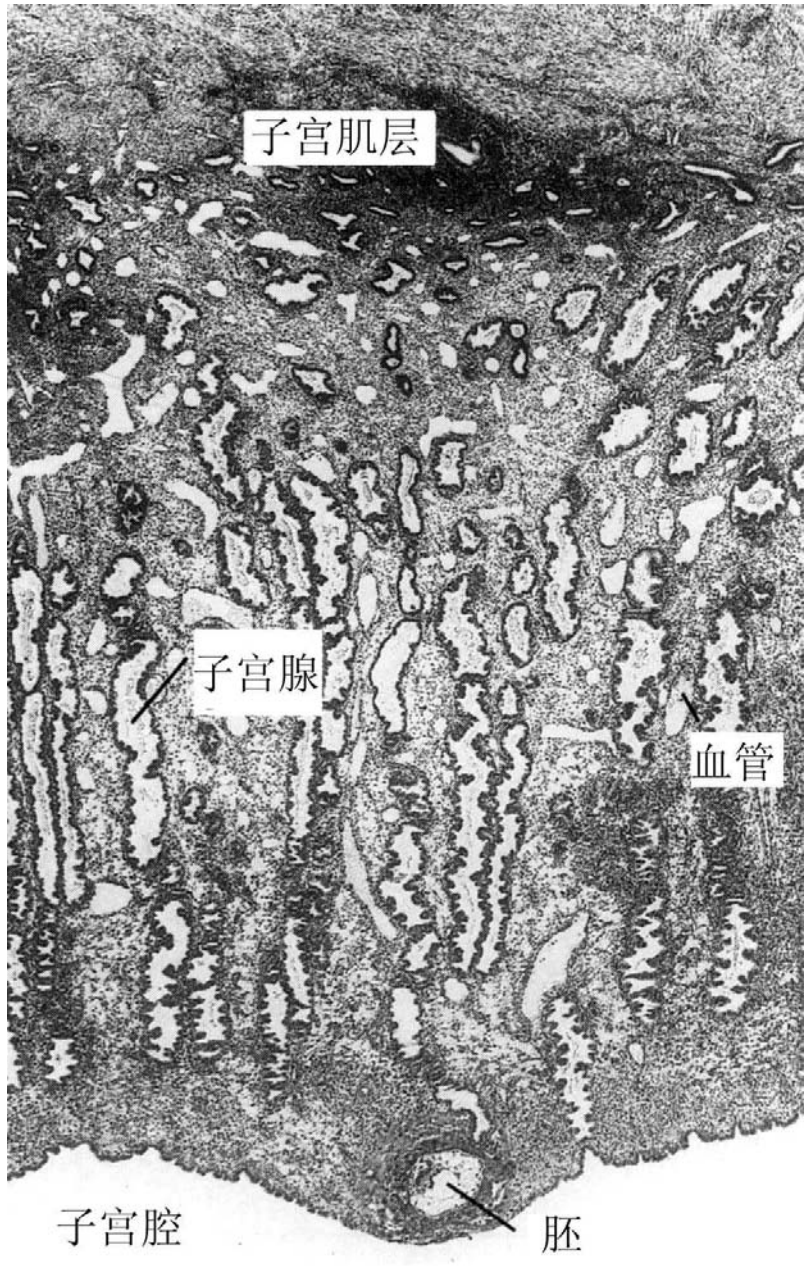


前置胎盘



植入的条件

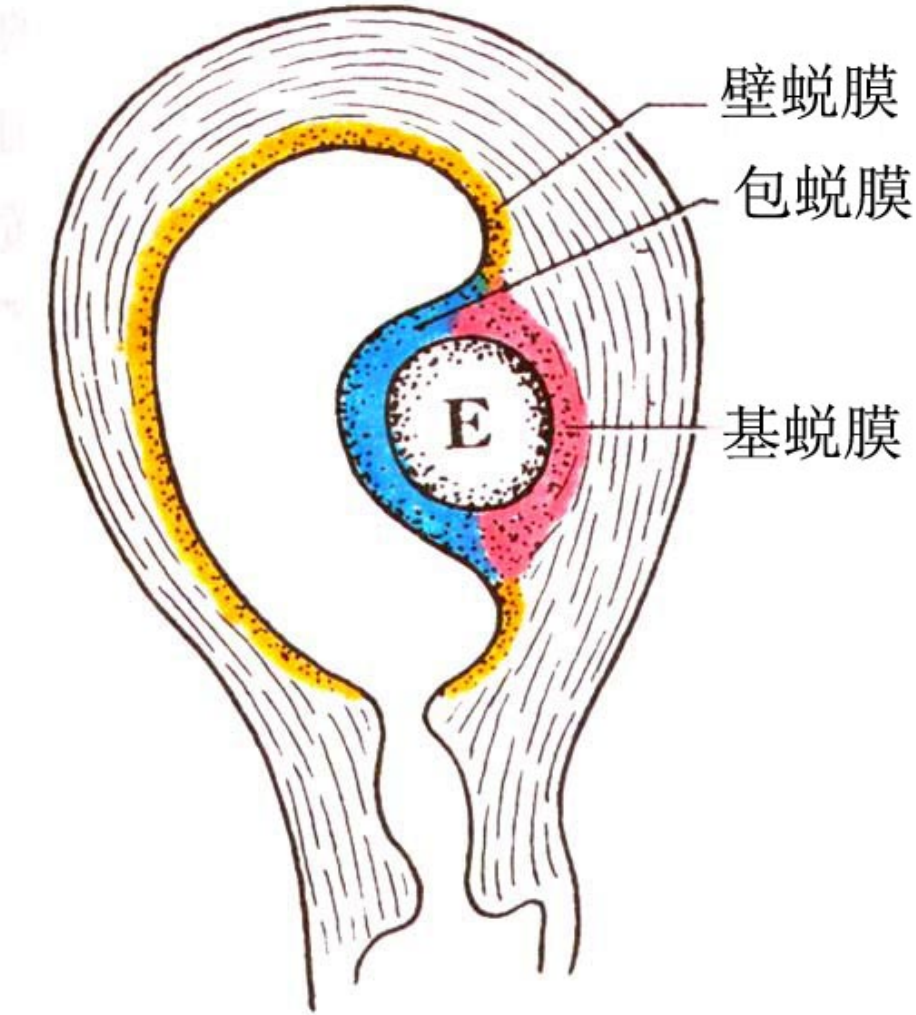
- 生殖管道必须畅通
- 子宫内膜处于分泌期
- 内分泌水平必须处于正常水平



蜕膜(decidua)

- 胚泡植入后，子宫内膜的功能层为蜕膜
- 分类：底蜕膜**(dicidua basalis)**
  包蜕膜**(decidua capsularis)**
  壁蜕膜**(decidua parietalis)**

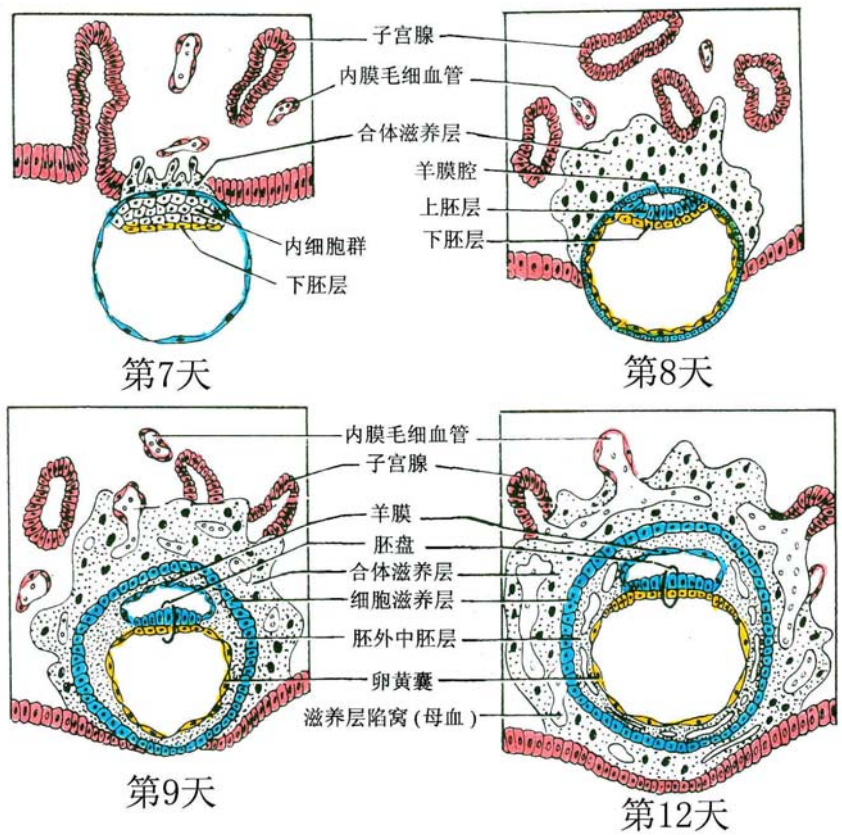
蜕　膜



二胚层形成

时间：第2周

内细胞群 → 上胚层
内细胞群 → 下胚层

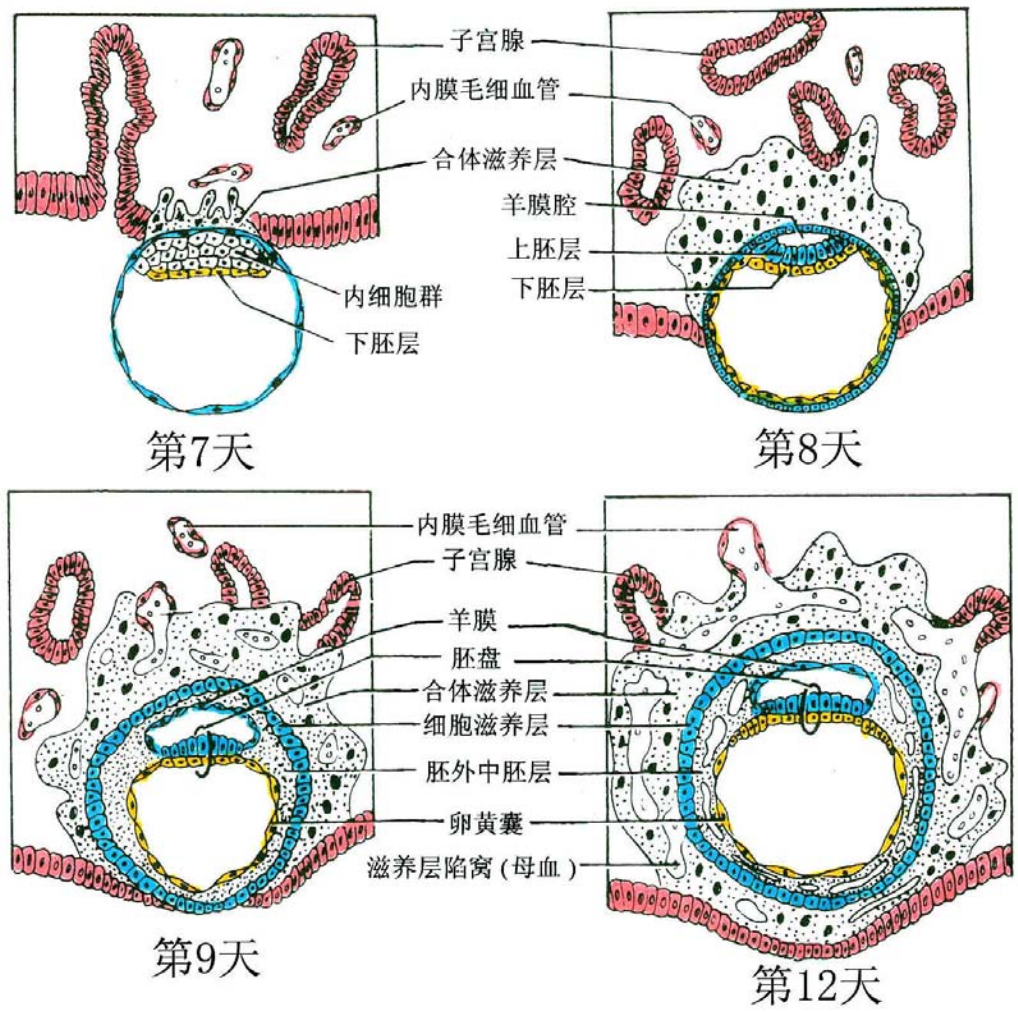


胚盘：圆形，由上、下胚盘组成

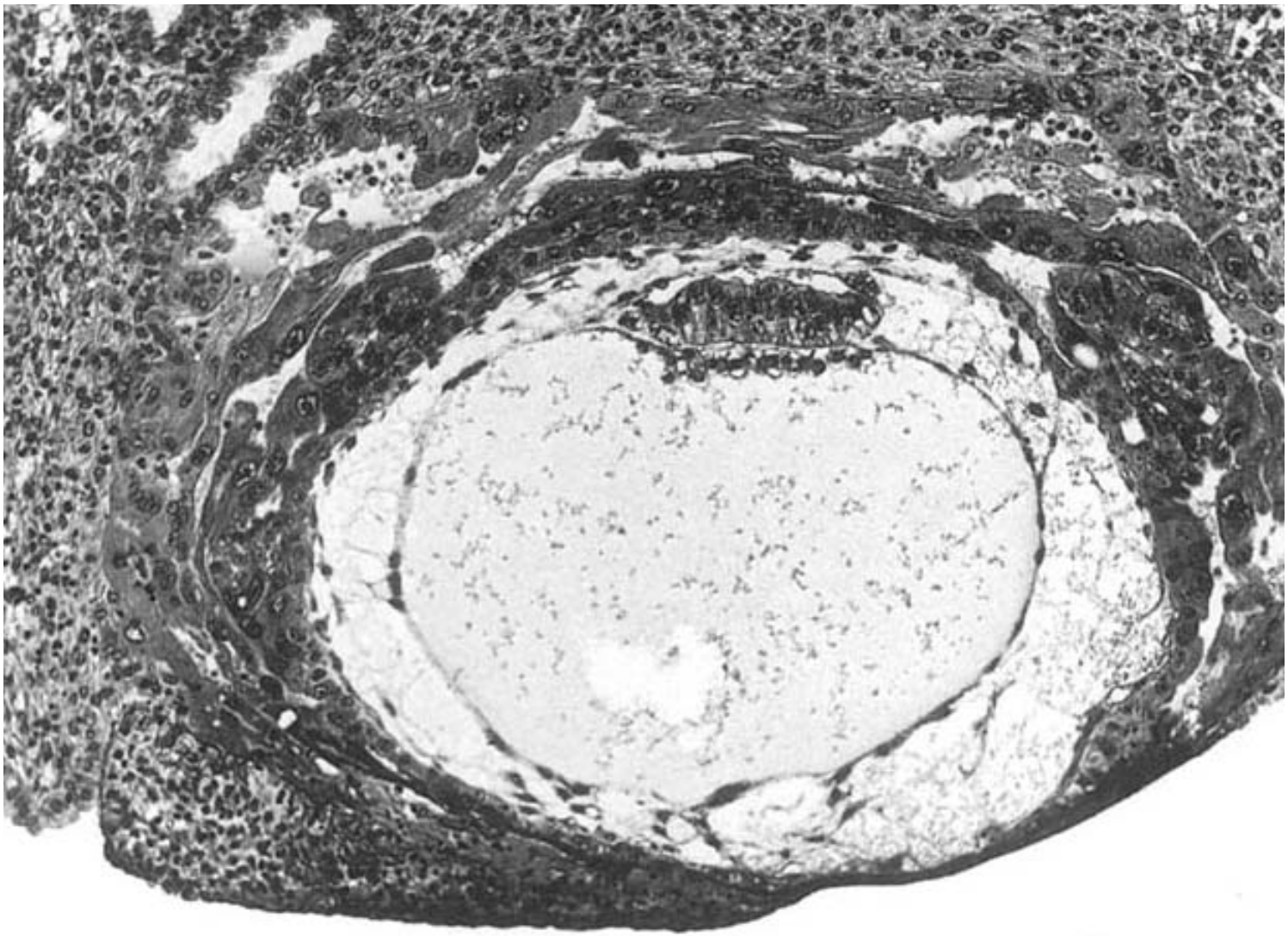
滋养层的早期分化

细胞滋养层

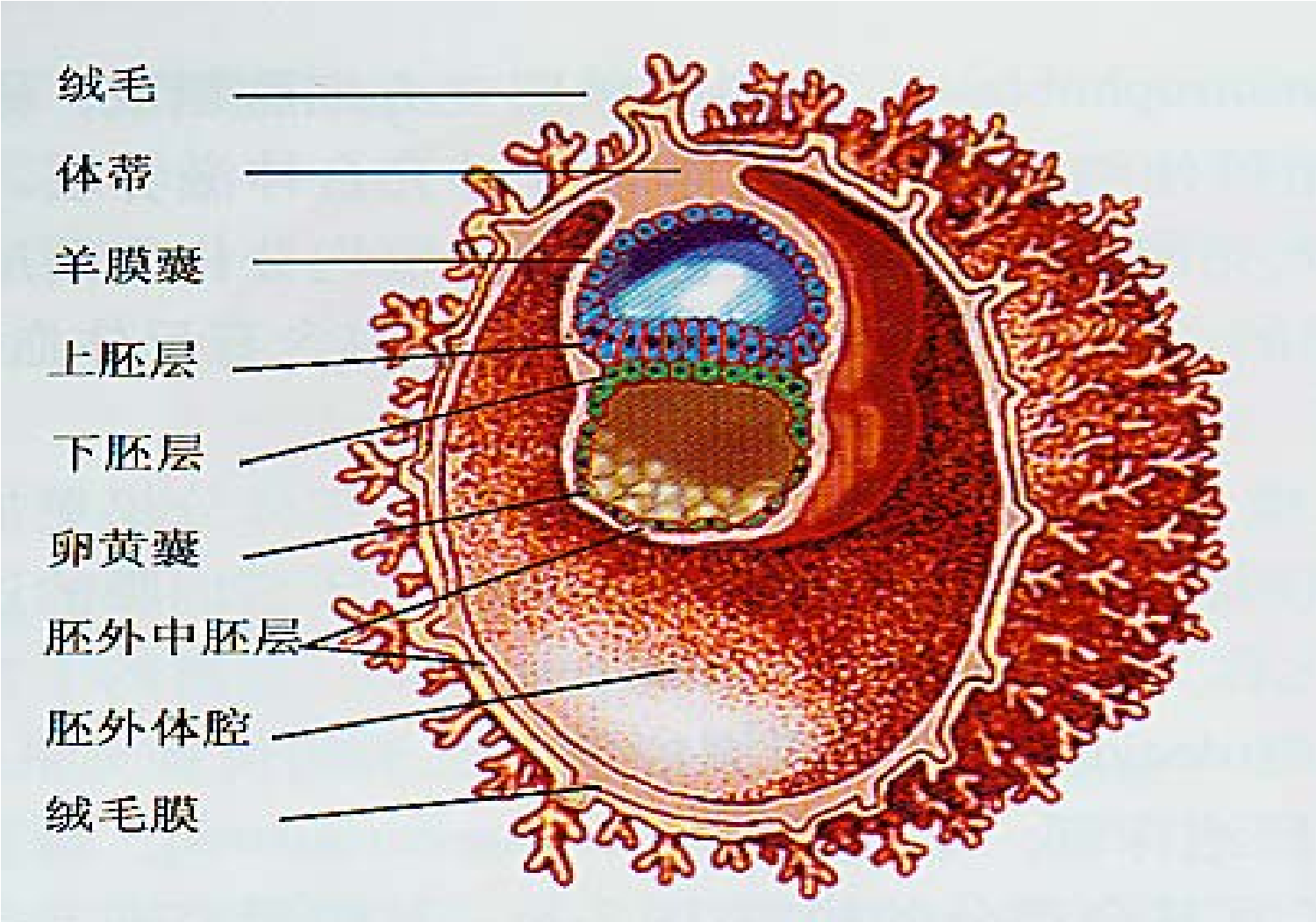
合体滋养层



羊膜腔和卵黄囊的形成

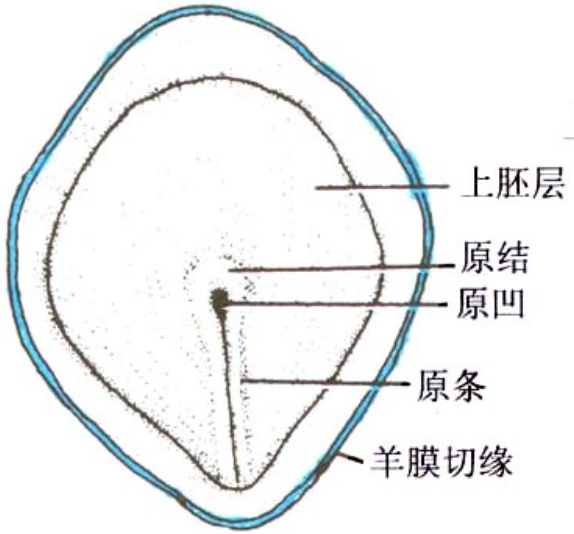


胚外中胚层的形成和分化

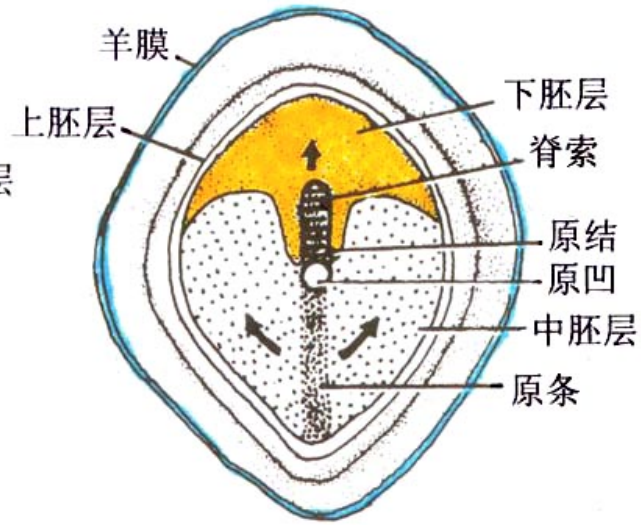


三胚层(trilaminar germ disc)的形成

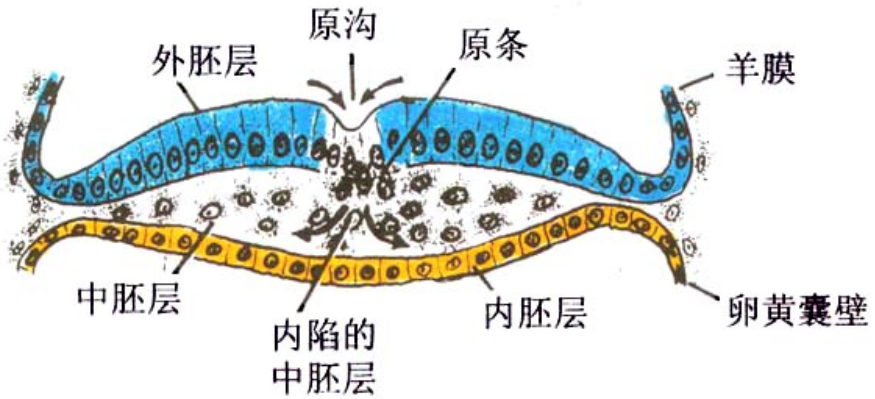
- 形成原条和原结
- 上胚层迁移形成中胚层**(mesoderm)**
- 上胚层迁移形成内胚层**(endoderm)**
- 上胚层形成外胚层**(ectoderm)**
- 上胚层形成脊索**(notochord)**



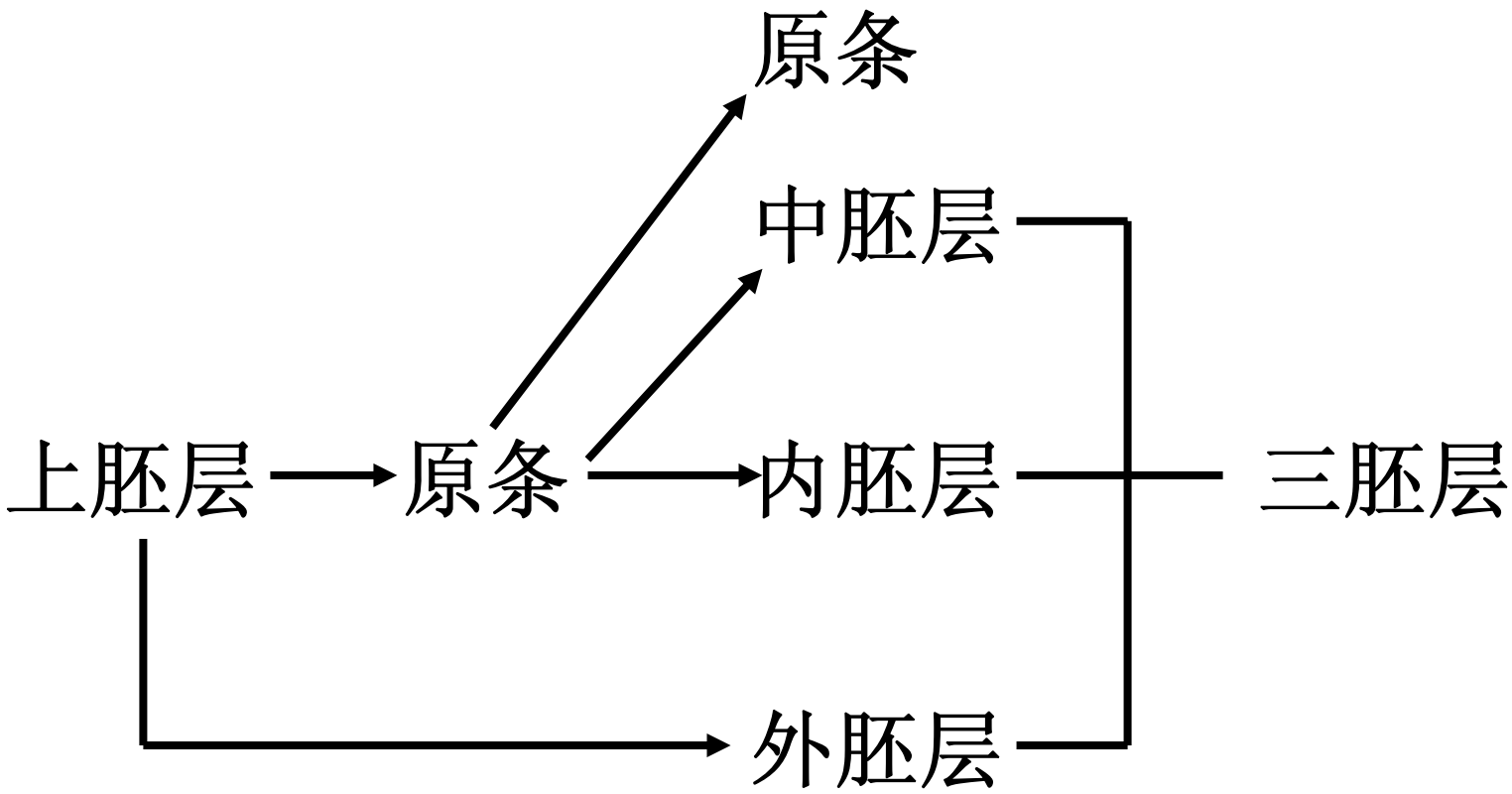
胚盘背面观

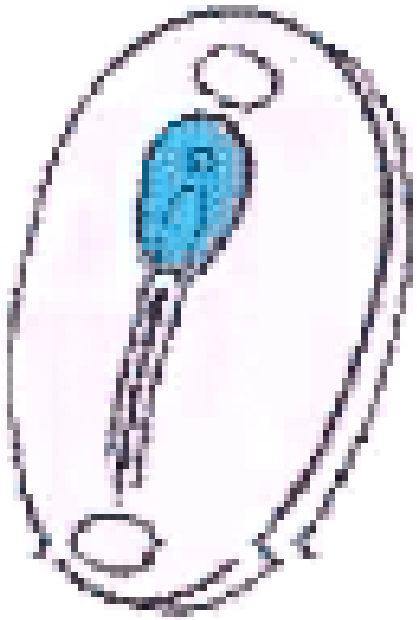


示中胚层和脊索

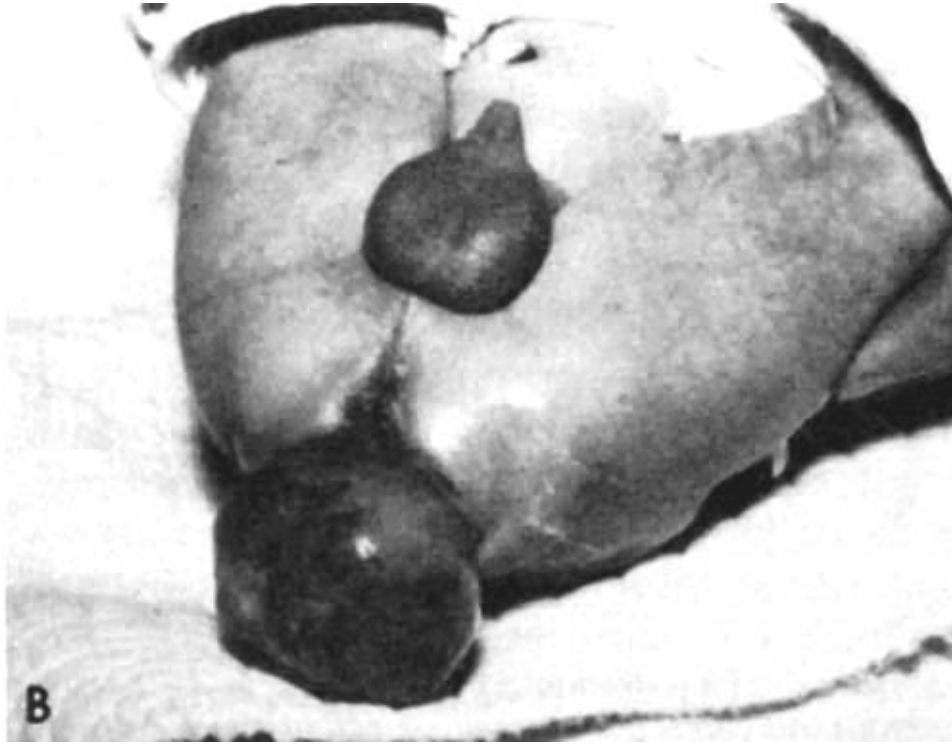


横切面，示中胚层形成

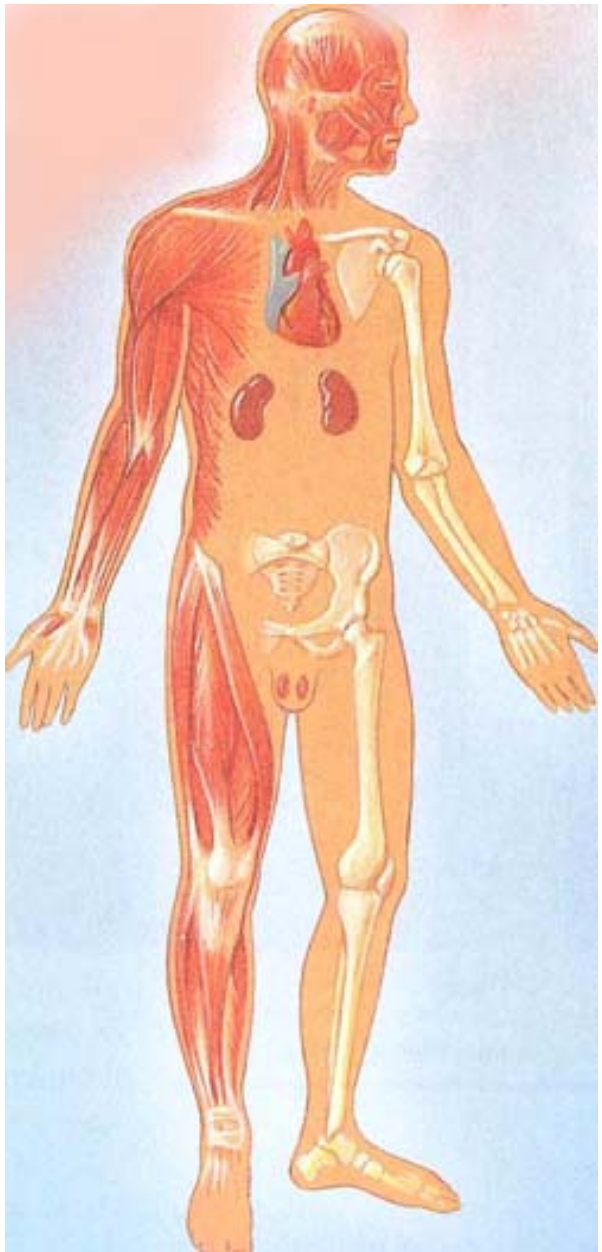

原条
中胚层
上胚层
原条
内胚层
三胚层
外胚层

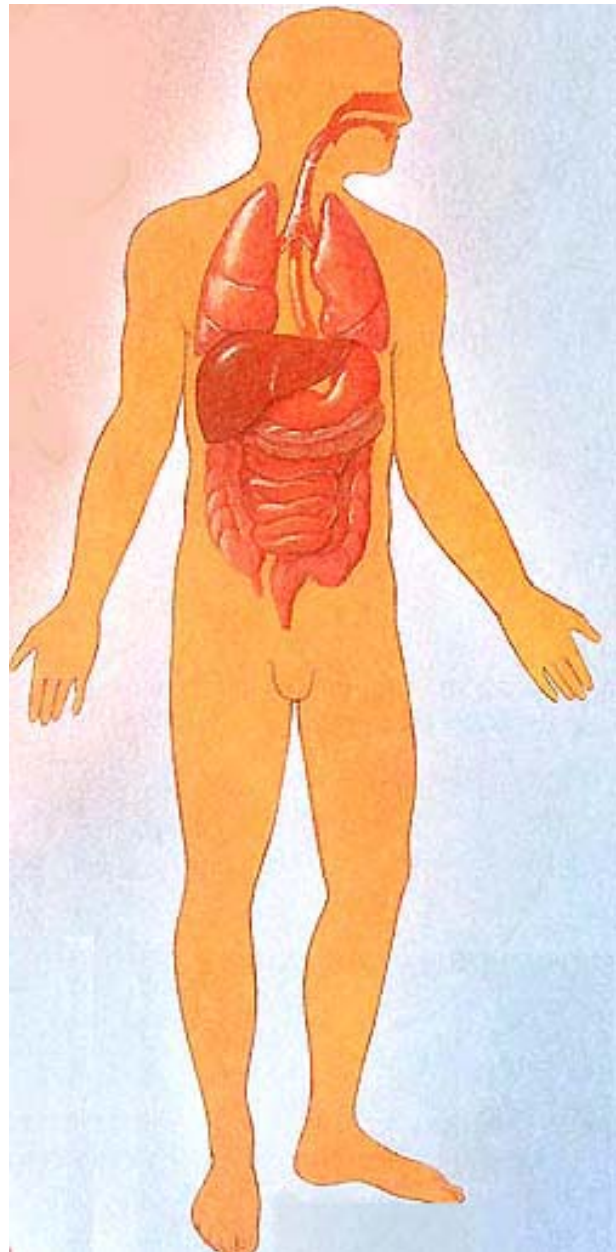



A


B

三胚层的分化





神经管形成和分化

外胚层

↓ 诱导 ← 脊索

神经板

↓ ↘

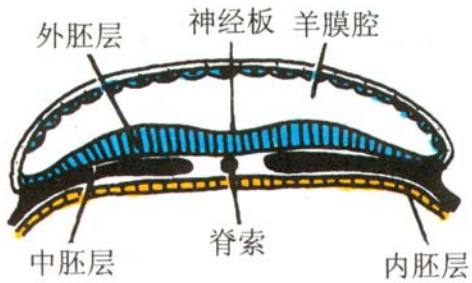
神经沟　　神经褶

↓　　↓

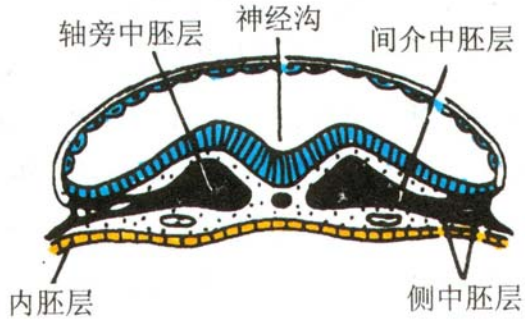
神经管　　周围神经系统 → 神经节、神经

↓

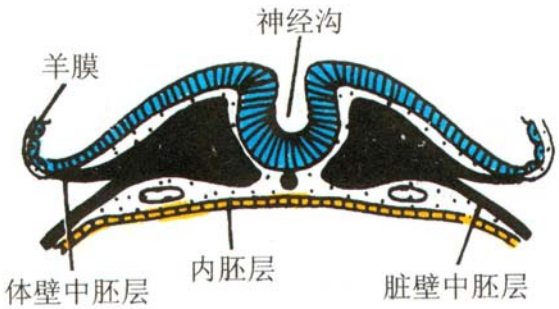
中枢神经系统 → 脑、脊髓



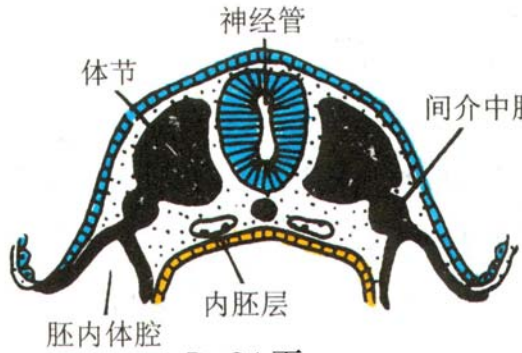
A 17天



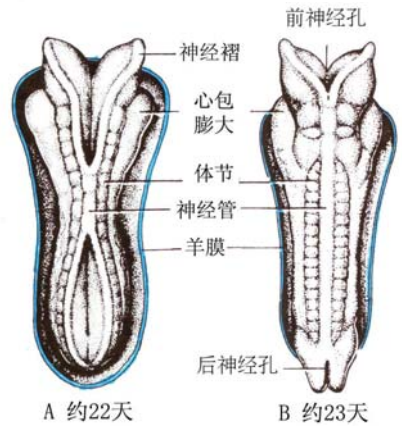
B 19天



C 20天



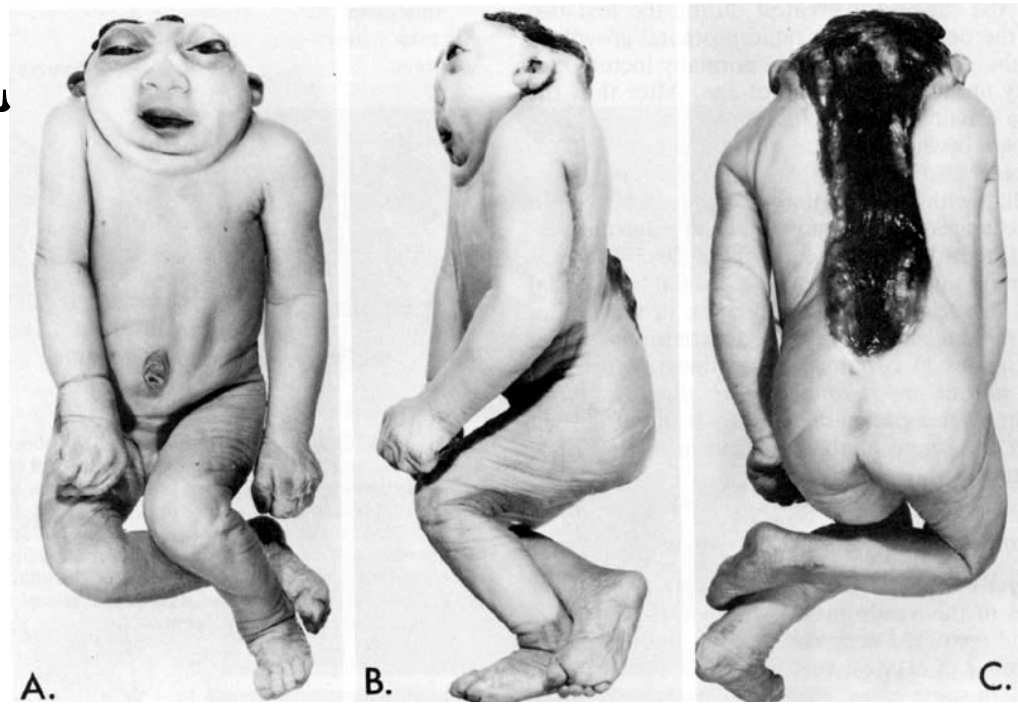
D 21天



神经管发育畸形

前神经孔 —未闭→ 无脑儿

后神经孔 —未闭→ 脊髓脊柱裂



外胚层分化的结构

1.中枢神经系统

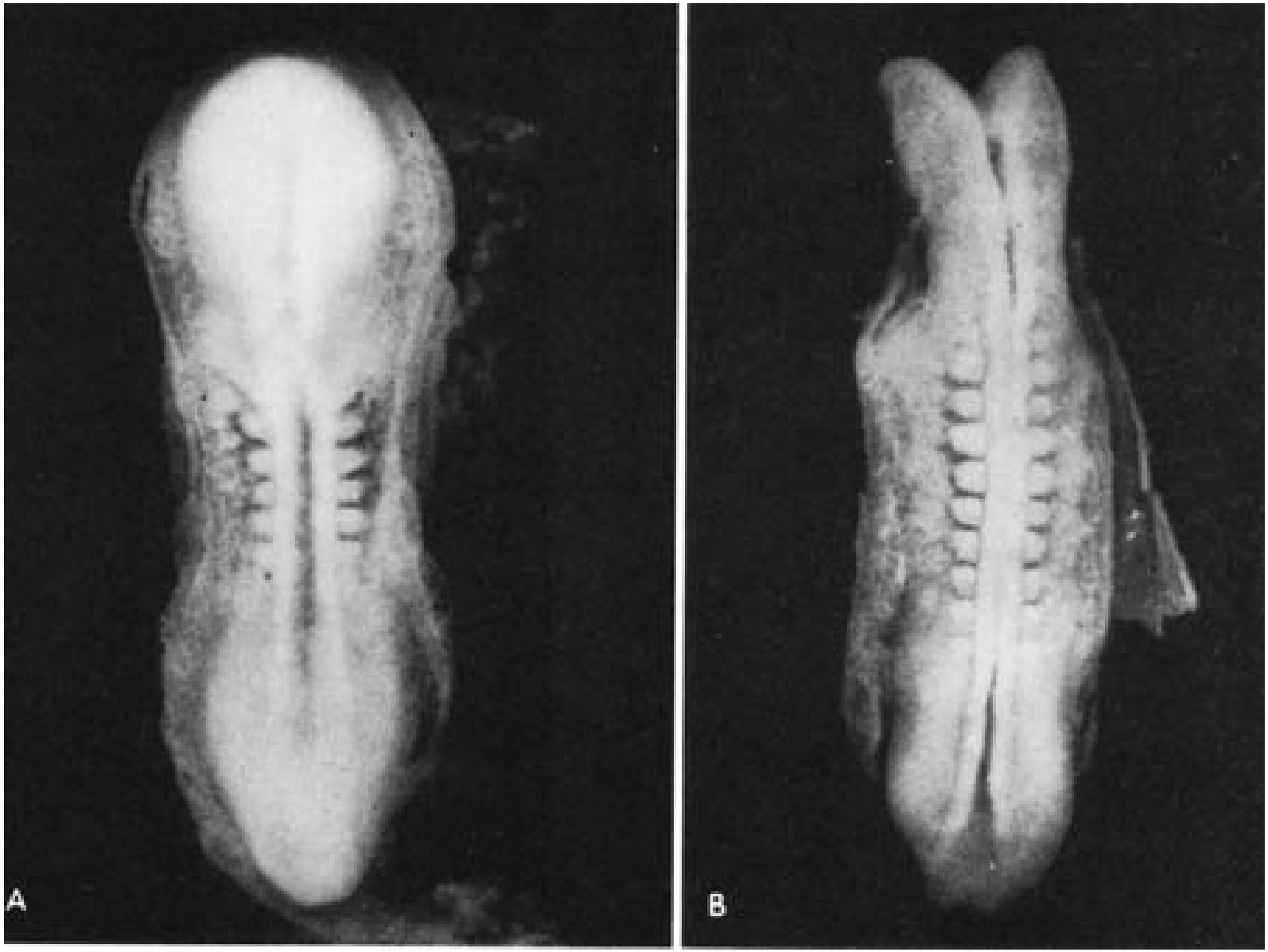
2.周围神经系统

3.皮肤表皮

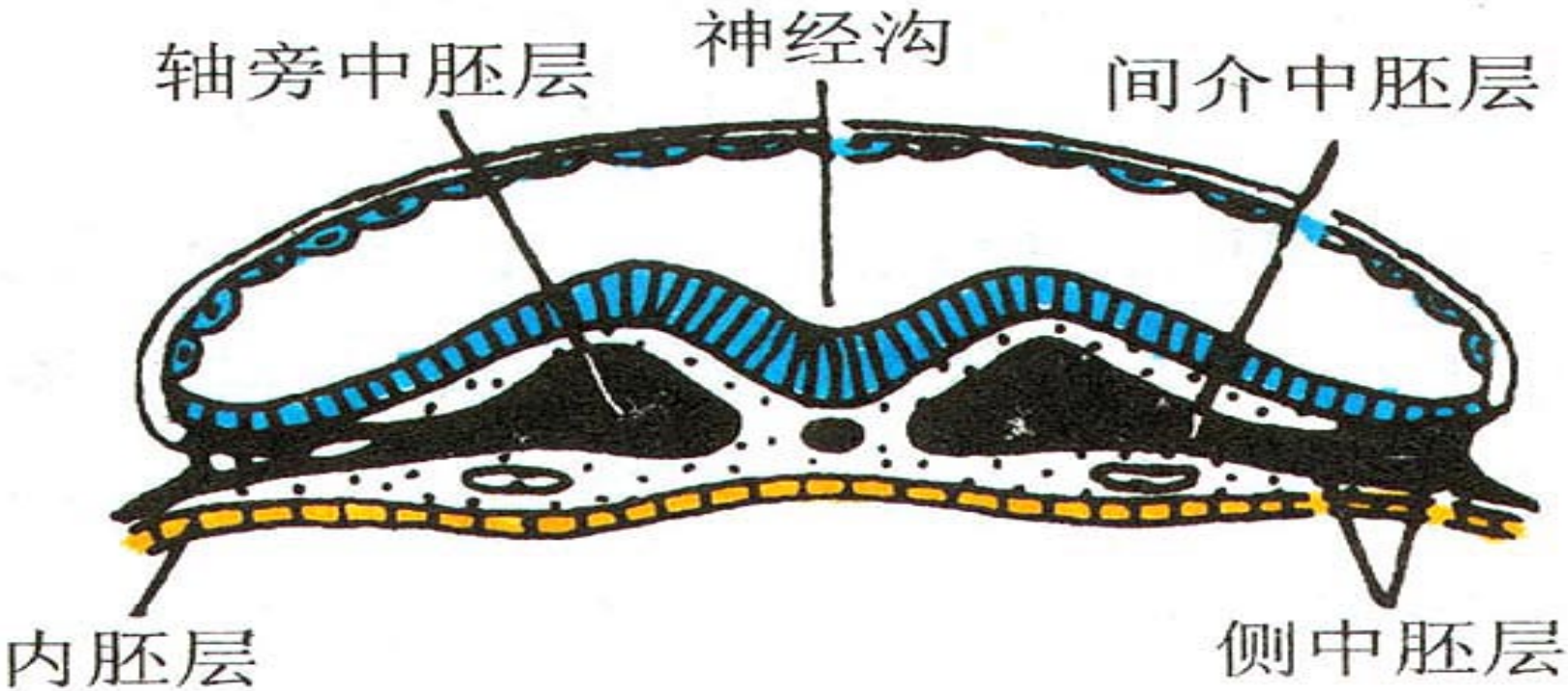
4. 肾上腺髓质

5.某些APUD系细胞

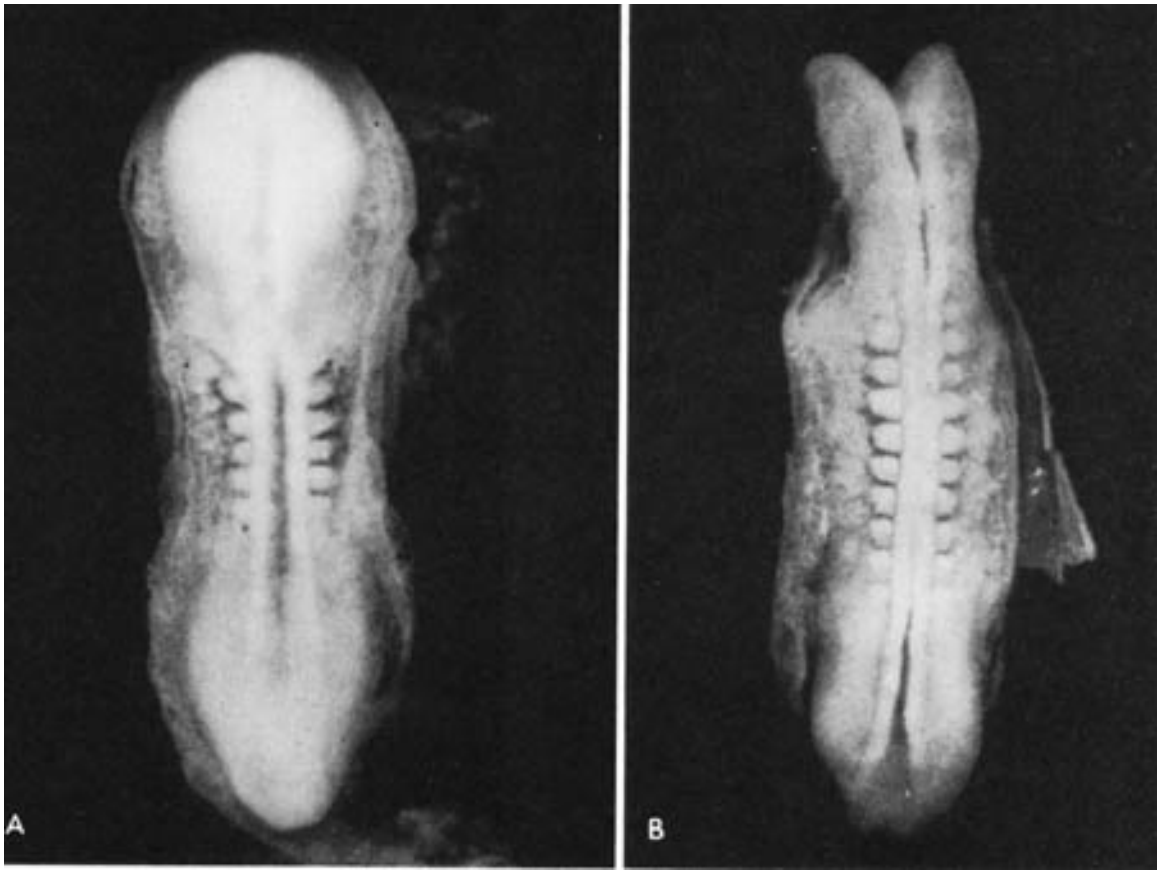
6.耳原基和晶状体原基


A
B

中胚层分化



轴旁中胚层的分化



体节分化

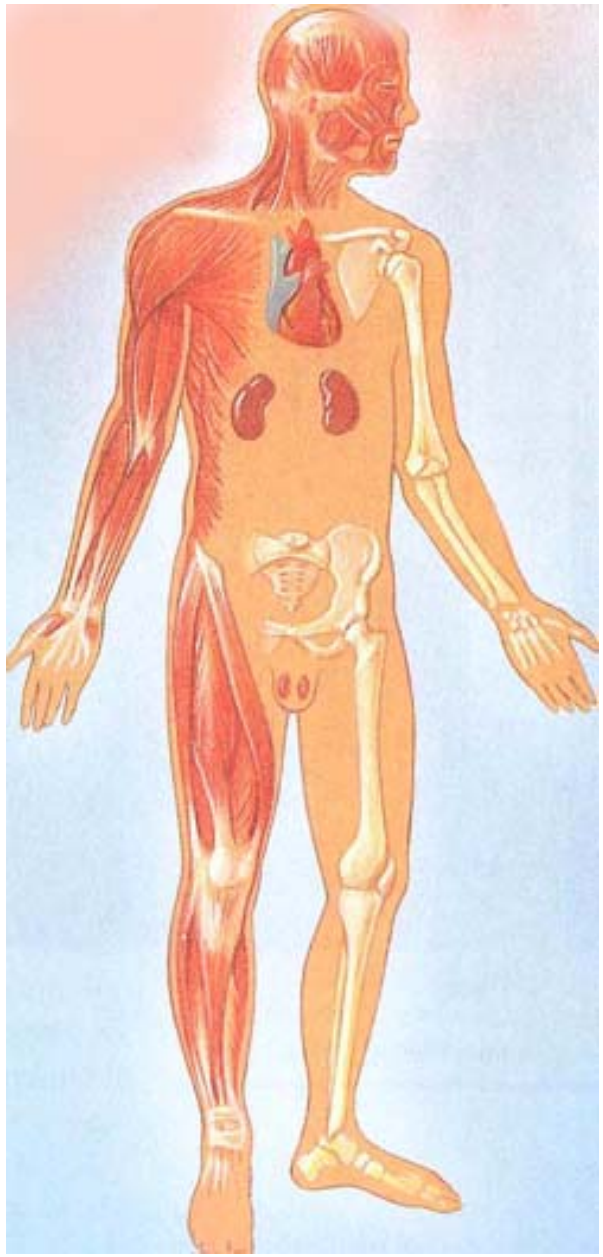
脊柱

中轴骨骼肌

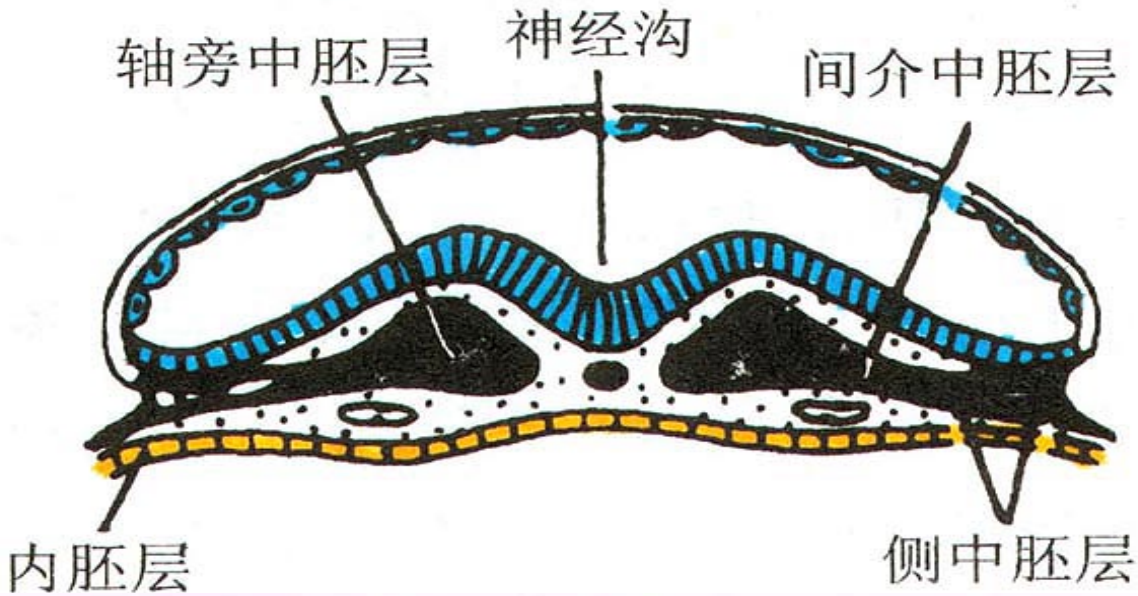
皮肤真皮

间介中胚层分化

泌尿、生殖系统原基



侧中胚层分化



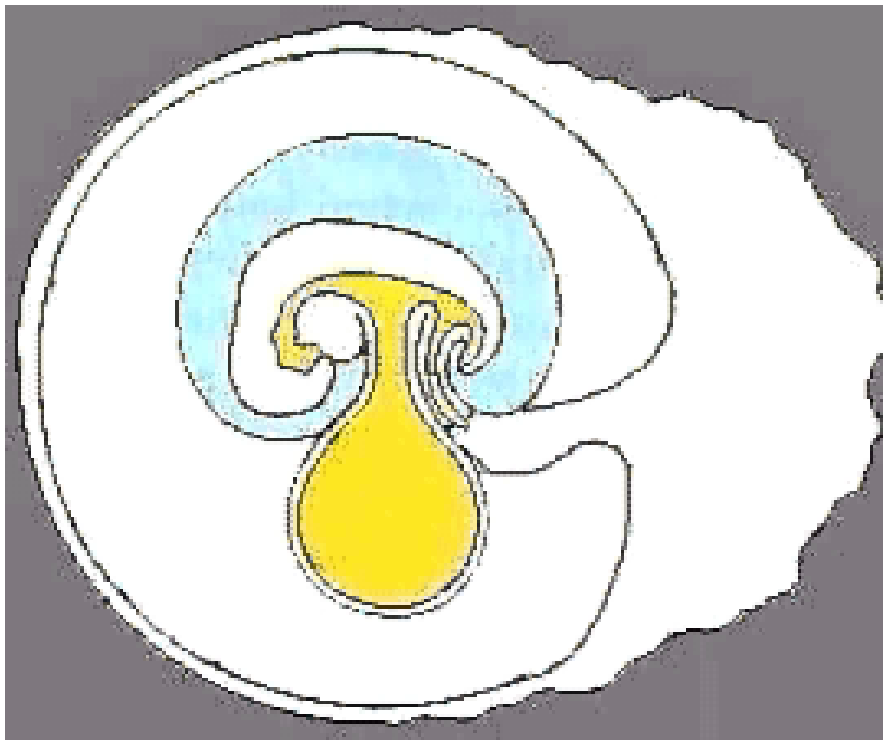
1.体壁中胚层

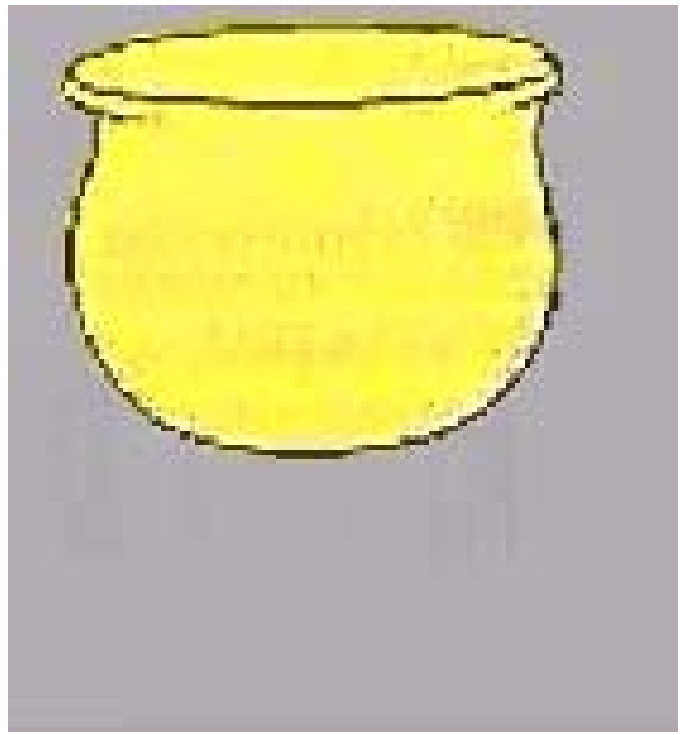
体壁骨骼、体壁肌肉、浆膜壁层

2.脏壁中胚层

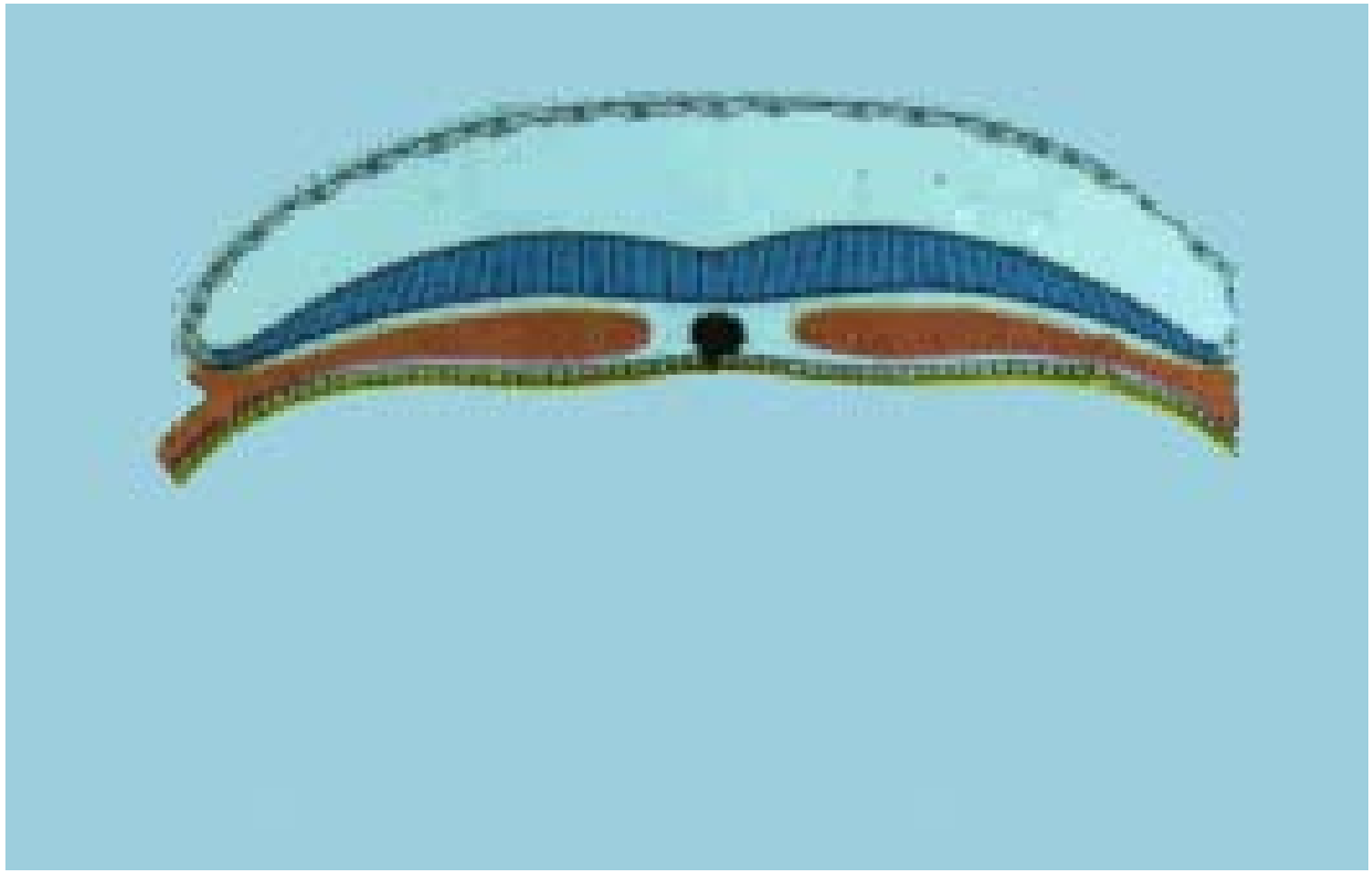
浆膜脏层、内脏平滑肌、结缔组织

内胚层的分化

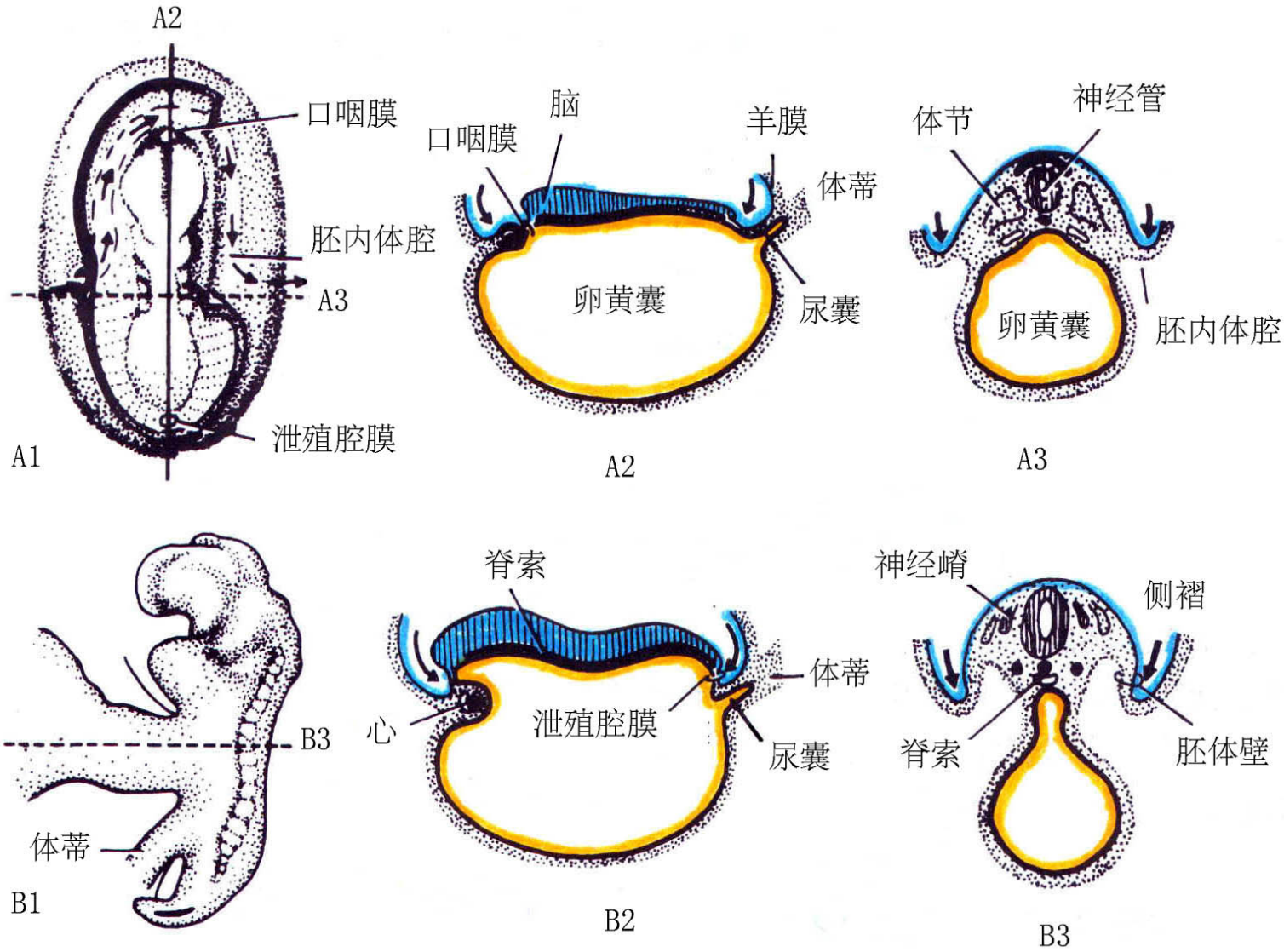




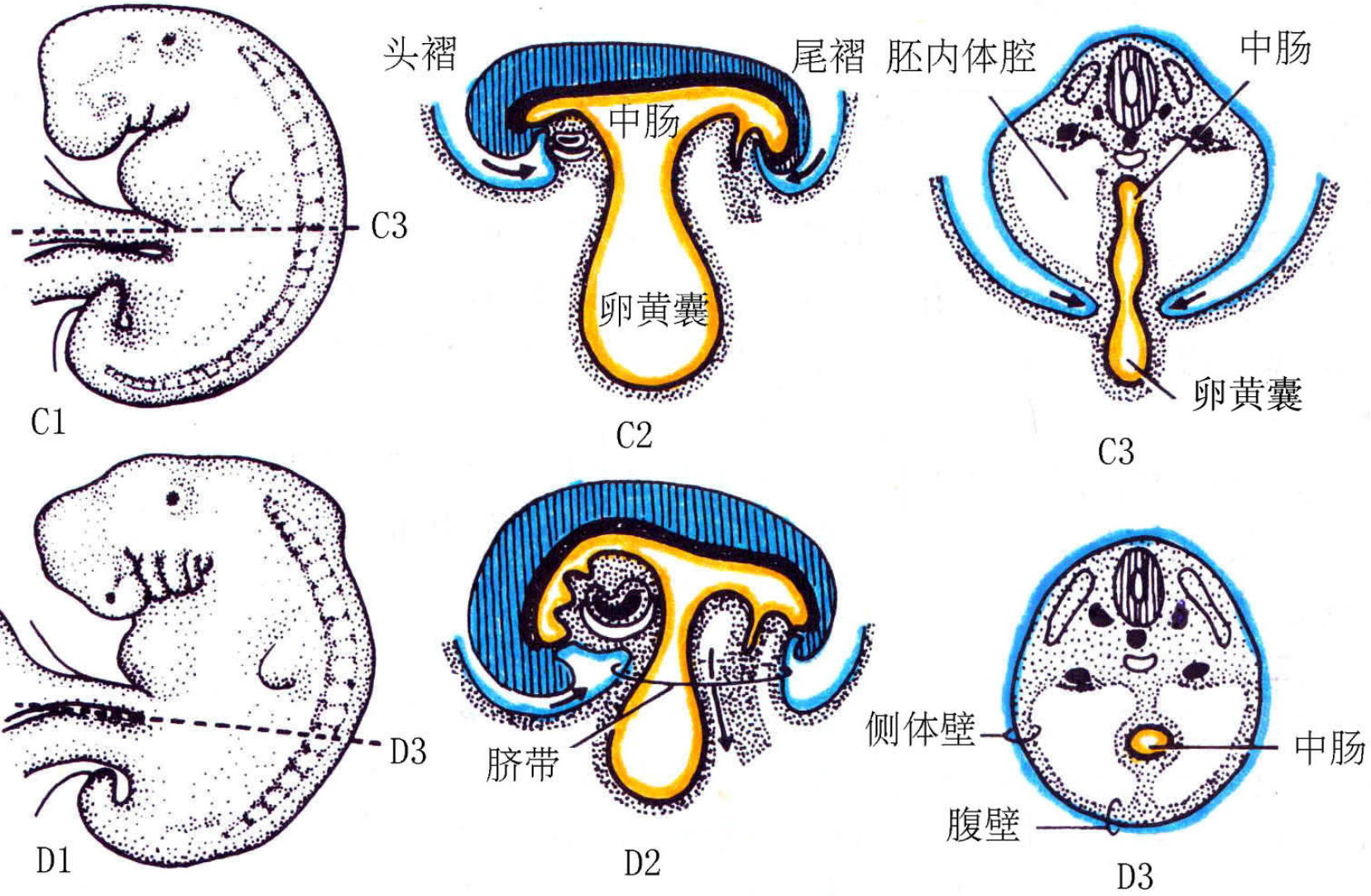
中胚层的分化



内胚层分化（一）

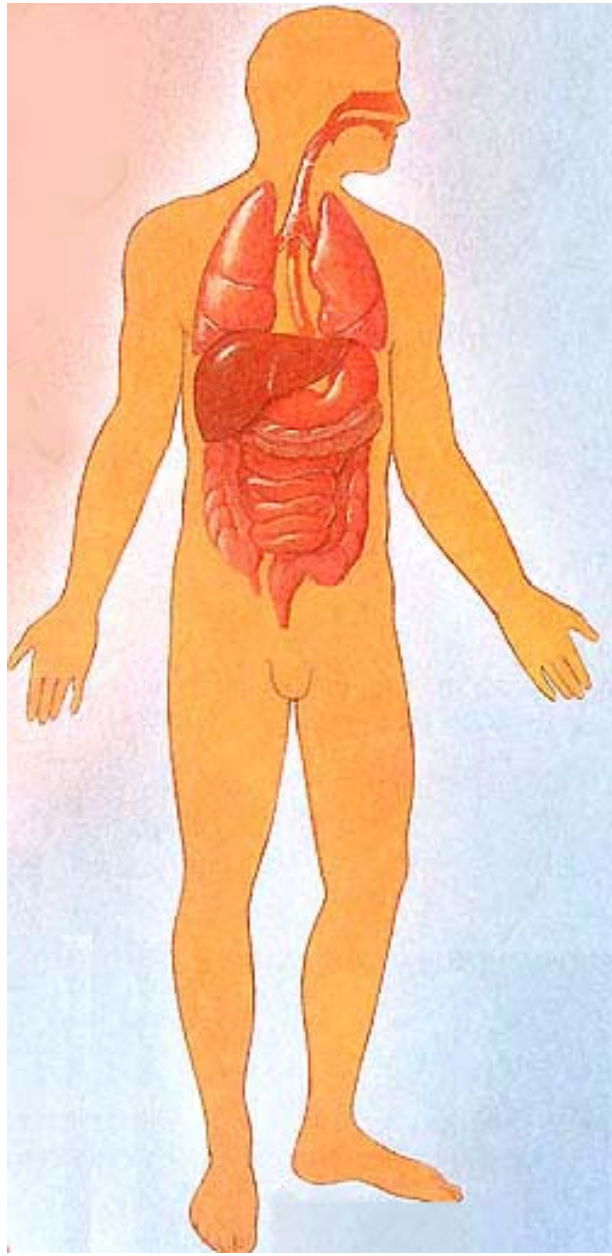

A2
口咽膜
胚内体腔
A3
泄殖腔膜
A1
脑
口咽膜
羊膜
体蒂
卵黄囊
尿囊
A2
体节
神经管
卵黄囊
胚内体腔
A3
B3
体蒂
B1
脊索
心
泄殖腔膜
体蒂
尿囊
B2
神经嵴
侧褶
脊索
胚体壁
B3

内胚层分化（二）

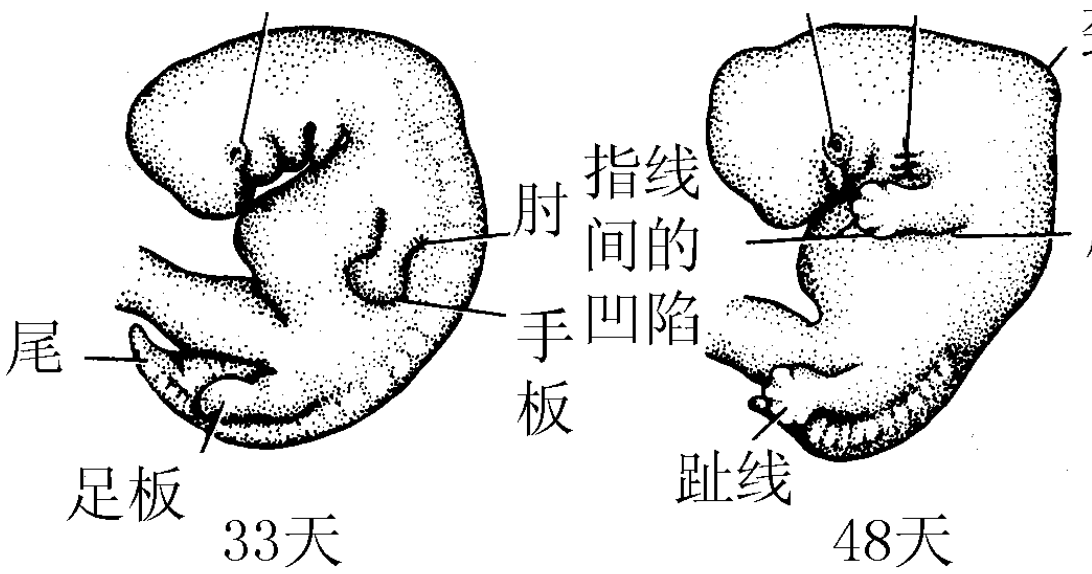


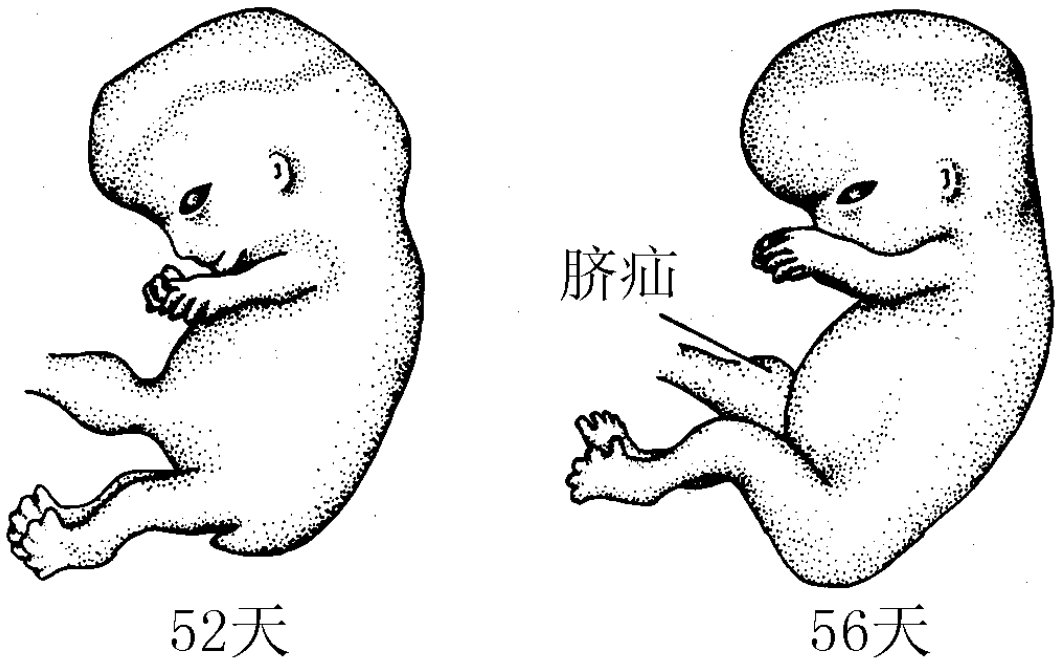
内胚层的分化（三）

消化系统原基
呼吸系统原基
—— 上皮



胚期5~8周的发育





胚期5~8周实物标本

第5周

第6周

第8周

小　结

- 受精的定义及正常部位
- 植入的定义及正常部位
- 二胚层及三胚层的定义
- 三胚层的分化方向
- 神经管的形成过程