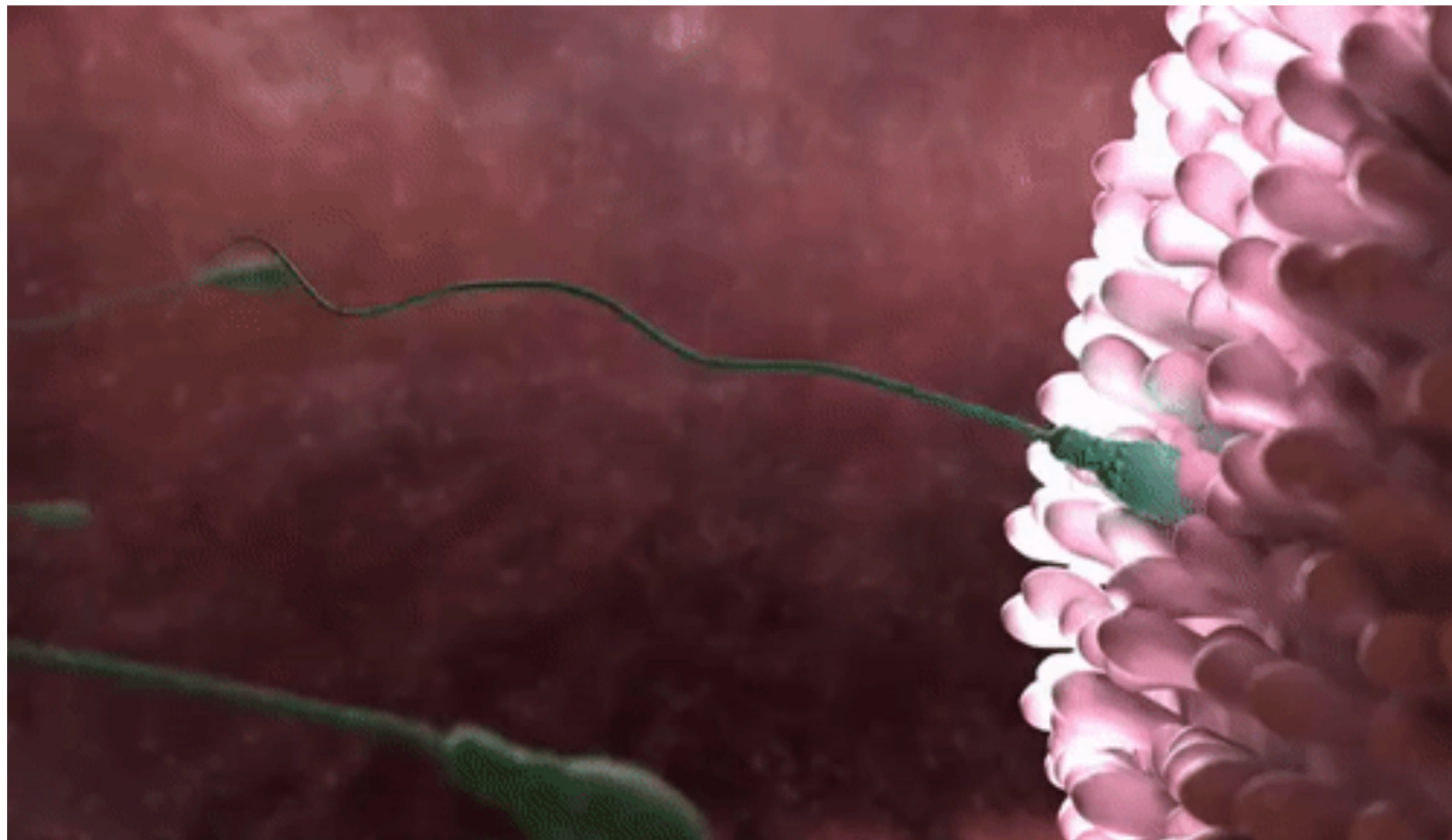


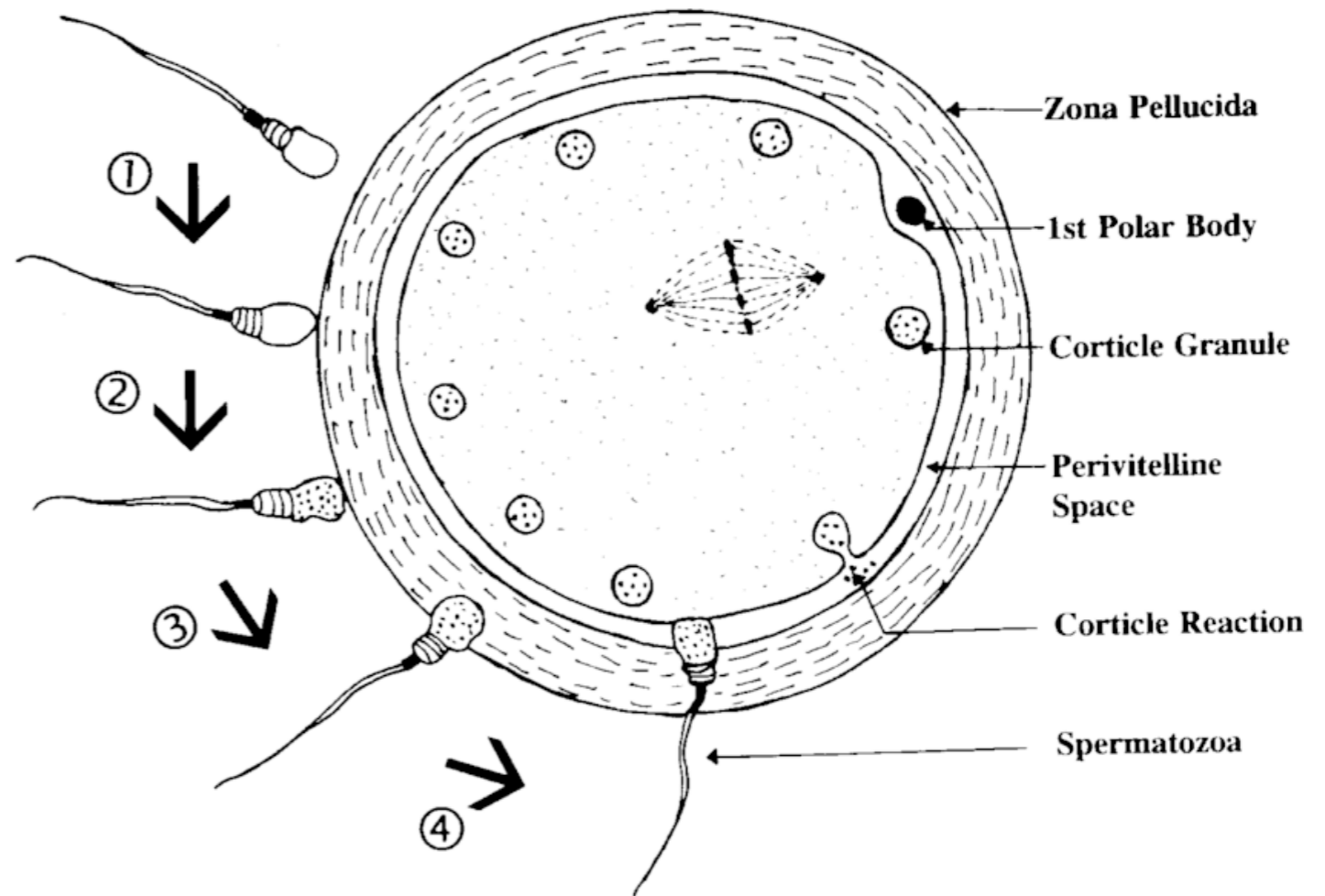
Reproduction

11.4 Part II



Fertilization

- The union of gametes —> the nucleus of a spermatozoa penetrate the ovum through the **Zona Pellucida**
- Only a single sperm can enter to prevent **polyspermy**
- A series of steps occurs to ensure one sperm only



Fertilization

1. Acrosome reaction

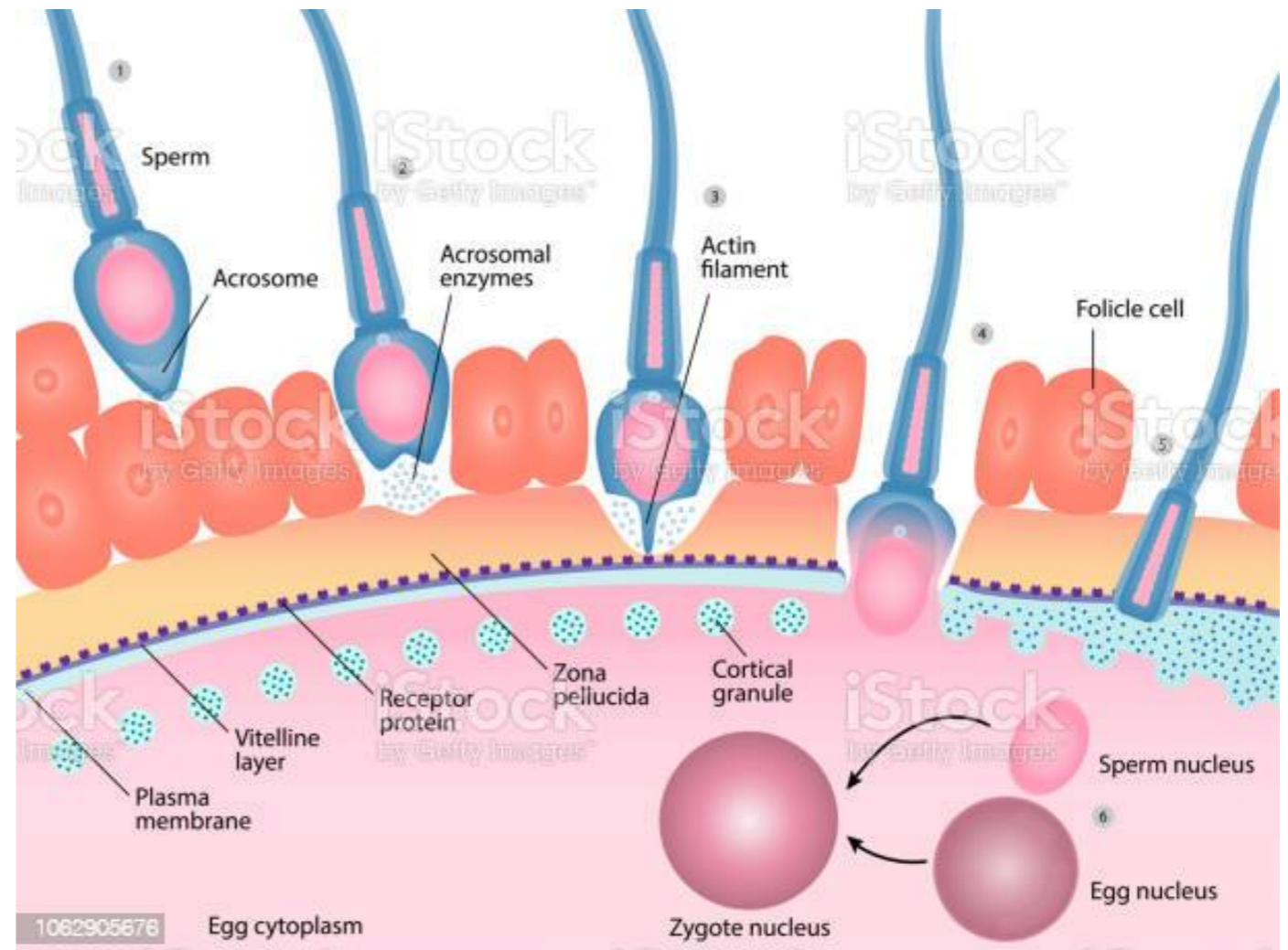
- the head of sperm contains enzymes that dissolve the glycoprotein gel coat (Zona Pellucida)

2. Penetration of egg

- the sperm head membrane has proteins that bind to egg membrane proteins and they fuse

3. Cortical Reaction

- sperm fusion causes activation of cortical release by the egg (exocytosis)
- cortical digests membrane binding protein (no more binding)
- hardens the Zona Pellucida (no more penetration)



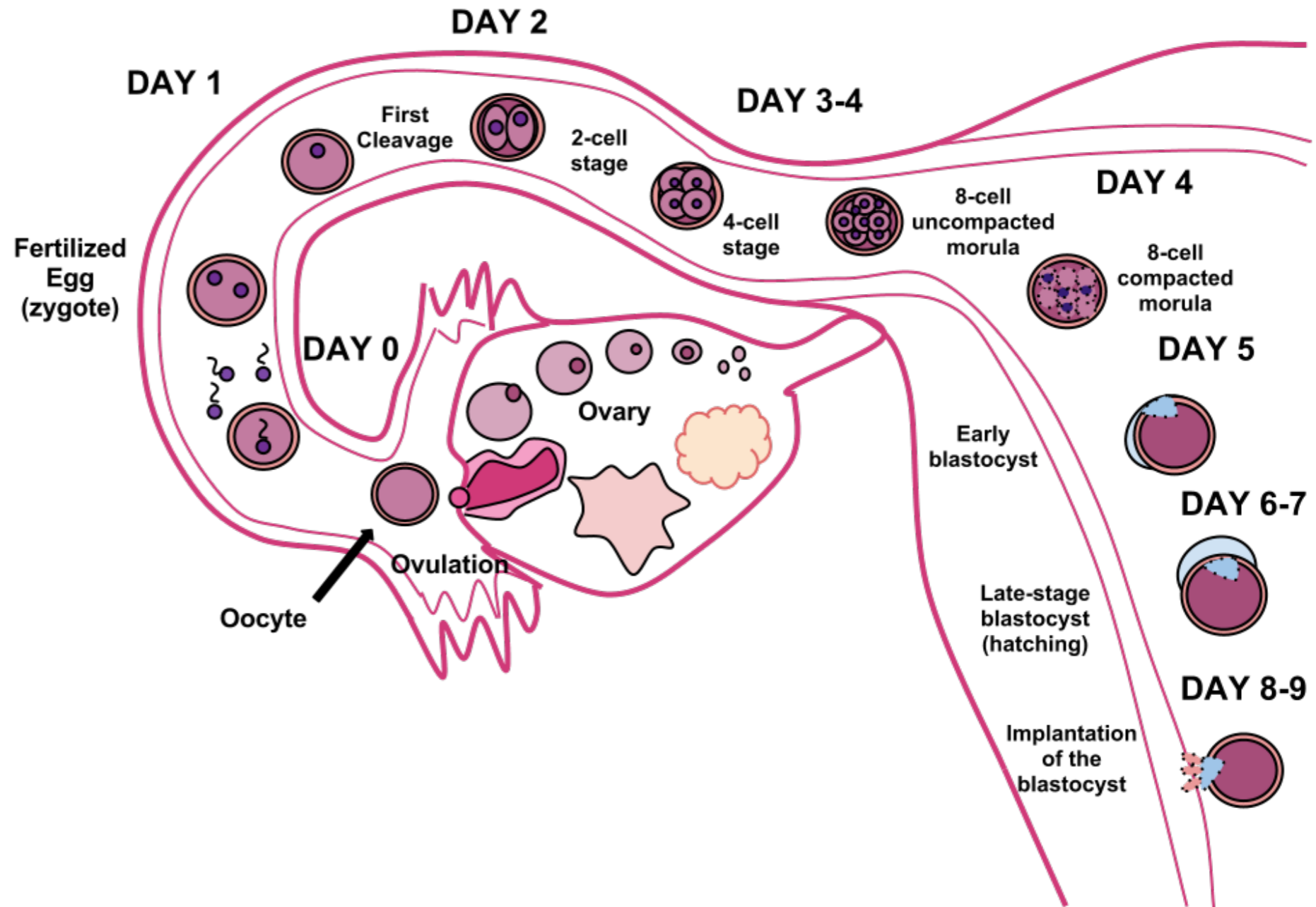
Internal vs External Fertilization

1. Internal fertilization mostly in terrestrial organisms
 - prevents drying of the gametes
 - internal fertilization protects developing embryos
 - environmental conditions are stable (pH, temperature)
 - reduced pollutant exposure
2. External fertilization in aquatic habitats is most common
 - predation exposure
 - variable environmental condition
 - lower offspring success
 - gametes released in close proximity



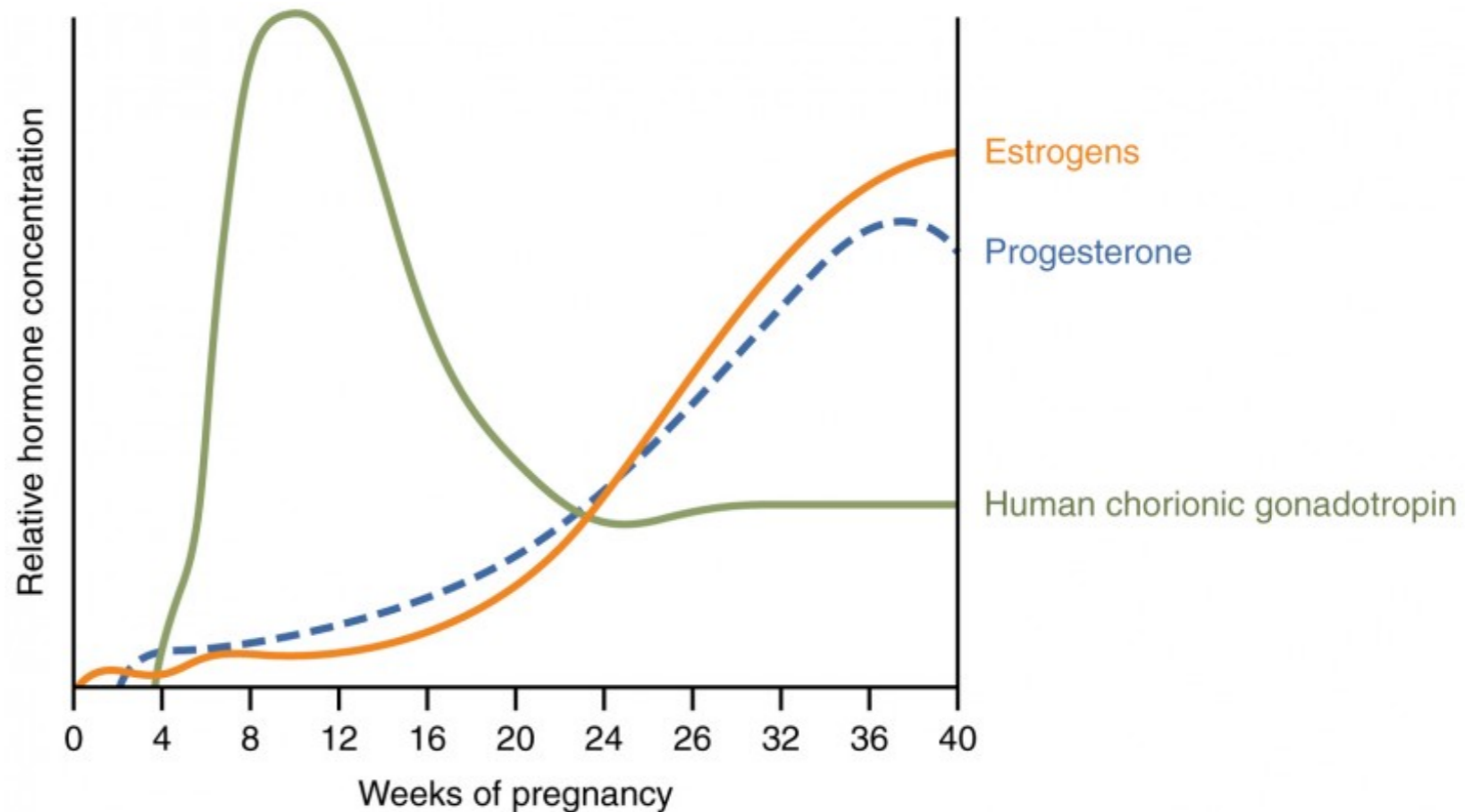
Implantation

1. In humans, fertilization of the egg occurs in the fallopian tubes, upon exiting the ovary
 - multiple cell division occurs over a week (1->2->....≈125) until it reaches the uterus
 - called **Blastocyst**
2. Blastocyst used up egg cell stores (≈day 7)
 - embeds in the endometrium of the uterus wall to receive nutrients
 - called **implantation**



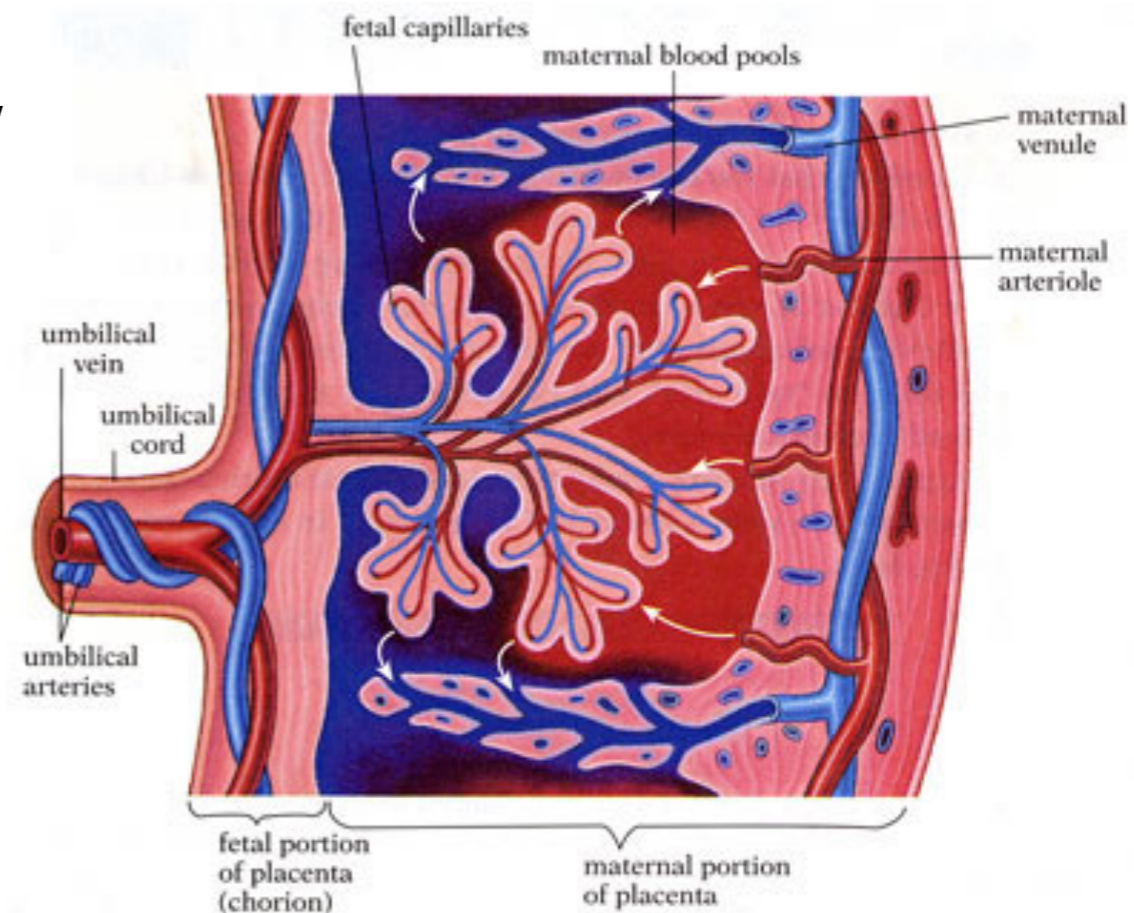
Implantation

3. Blastocyst develops fingerlike projections to penetrate endometrial lining
4. Mothers blood to provide nutrient and oxygen and remove waste
5. Once implanted, rapid growth of over eight weeks (starting to form a spine)
6. The developing embryo secretes human chorionic hormone (hCG hormone)
7. Stimulates the corpus luteum in ovary to secrete the hormones (progesterone and estrogen)
8. The endometrium is maintained and menstruation is skips



Placental wall

- The placental tissue is produced by the embryo, is layered adjacent to maternal tissues
- Consists of fingerlike villi that contain blood vessels to exchange nutrients
- mothers blood pools (out from arterioles and returning through venules) into inter-villous space to provide nutrients around villi.
- nutrients travel 5 μ m of through villi tissue into fetal blood (O₂, glucose, vital mineral, antibodies, etc)
- the hormones progesterone and estrogen are now produce by placenta to maintain pregnancy



Try these

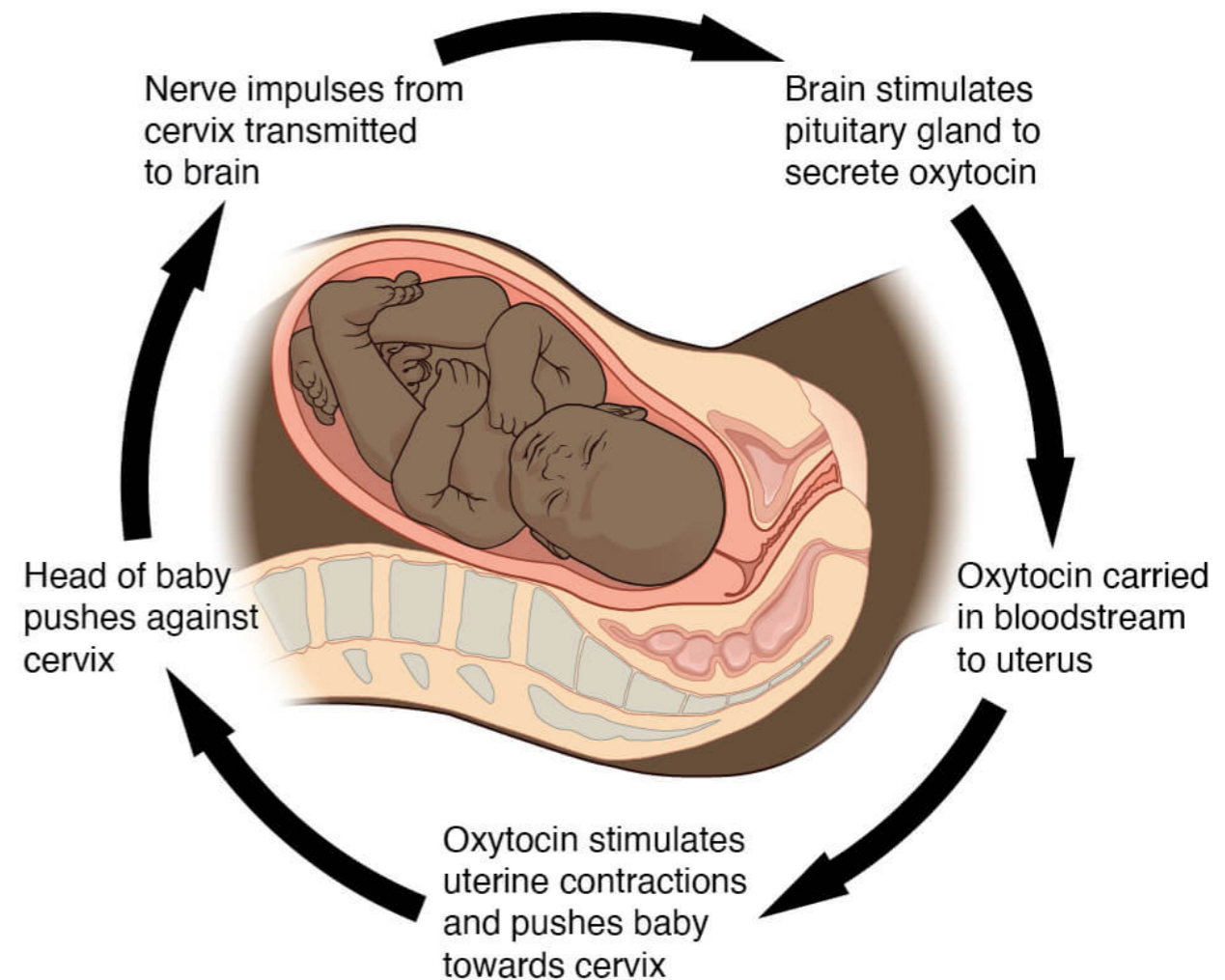
- Try data based question on page 507
- Read about estrogen pollution on 508 and complete the data based question that follows.

Birth



Birth

- Progesterone produced by the placenta inhibits Oxytocin (the hormone that starts contraction)
- When progesterone ceases release, oxytocin is released by the pituitary gland.
- Contractions begin. This stimulates a positive feedback to pituitary to produce more oxytocin
- Contractions progress
- Oxytocin also stimulates the beginning of milk production



Try these also

- Read about gestation period and try data based question on page 510

| Gestation Periods | |
|--------------------------|-------------|
| Species | Days |
| Asian Elephant | 645 |
| Cow | 284 |
| Human | 266 |
| Chimpanzee | 227 |
| Black Bear | 210 |
| Lion | 108 |
| Dog | 63 |
| Rabbit | 33 |