



Introduction to Human Embryology

Terms & Concepts

- ✓ Terminology
- ✓ Gametogenesis
- ✓ Ovulation

Prof. Alp CAN

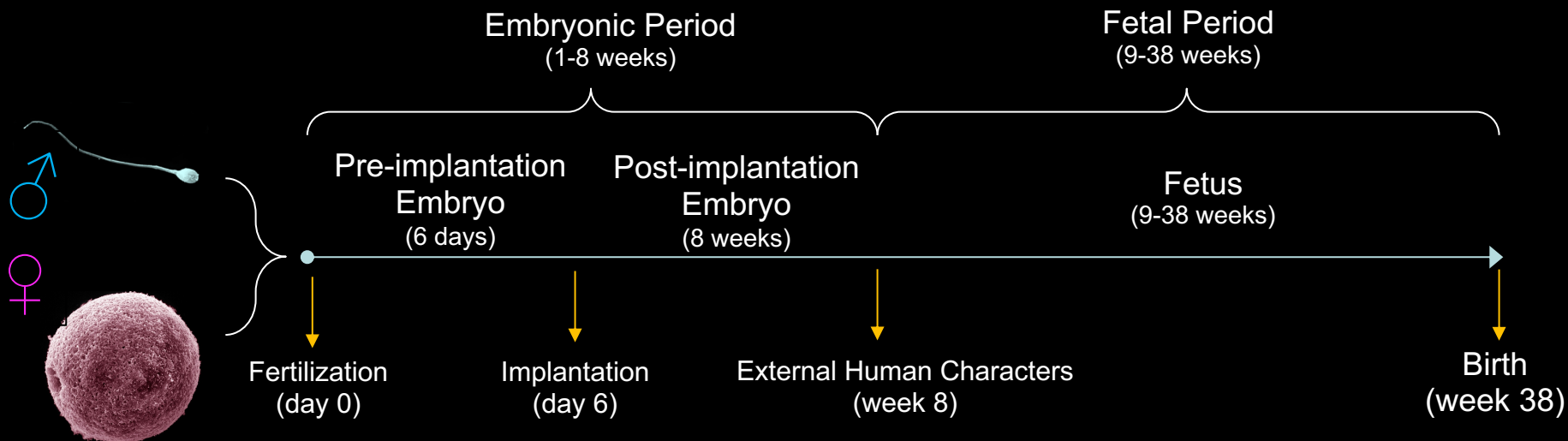
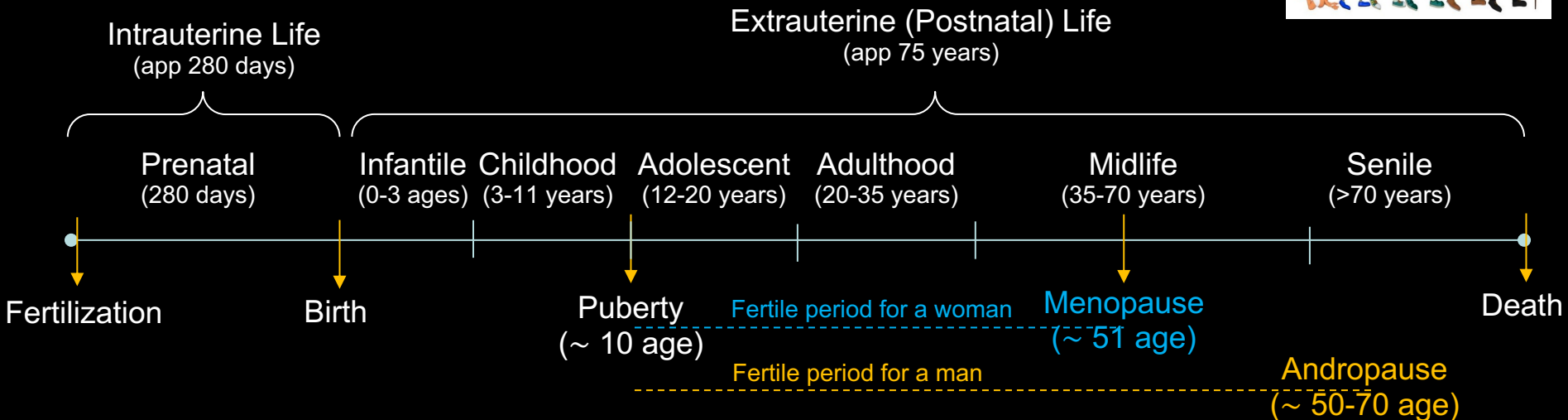
Department of Histology and Embryology

www.alpcan.com

What is Embryology related to?

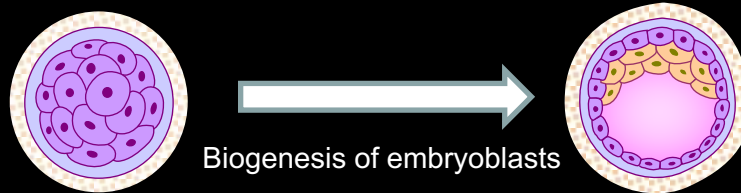
- Cellular and molecular description of human development in utero (=life before birth)
- Association of developing structures and functions
- Development of human gametes (spermatozoa and oocytes)
- Stem cells & progeny of cells and tissues
- Birth defects
- ART (Assisted Reproduction Technologies)

Stages of a Human Life

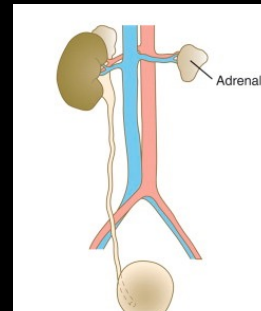


Common Terms

Biogenesis: The origin or formation of something.

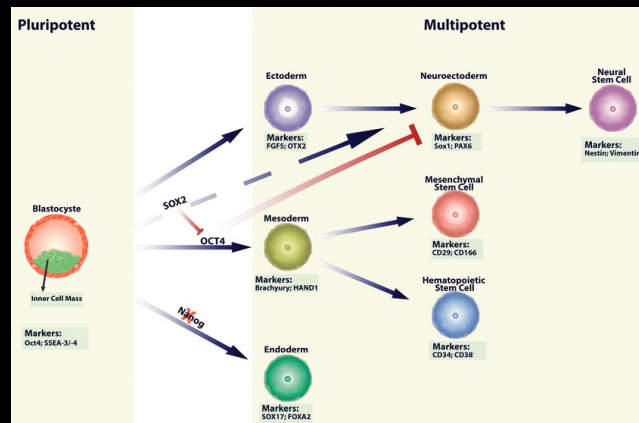


Agensis: Absence of an organ due to nonexistence of its primordium in the embryo.



Renal (kidney) agenesis

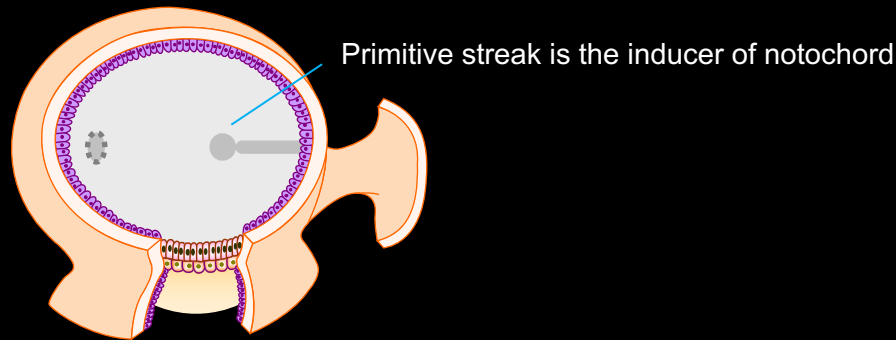
Progeny: A descendant or the descendants of a person, or a cell; offspring.



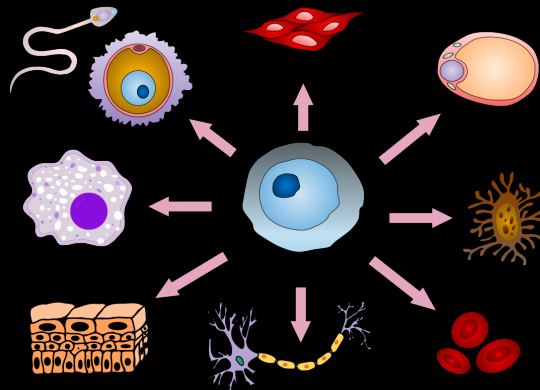
Common Terms

Induction: To start an embryonic phenomenon (formation of something).

Inducer: The molecular or cellular element that starts the induction.

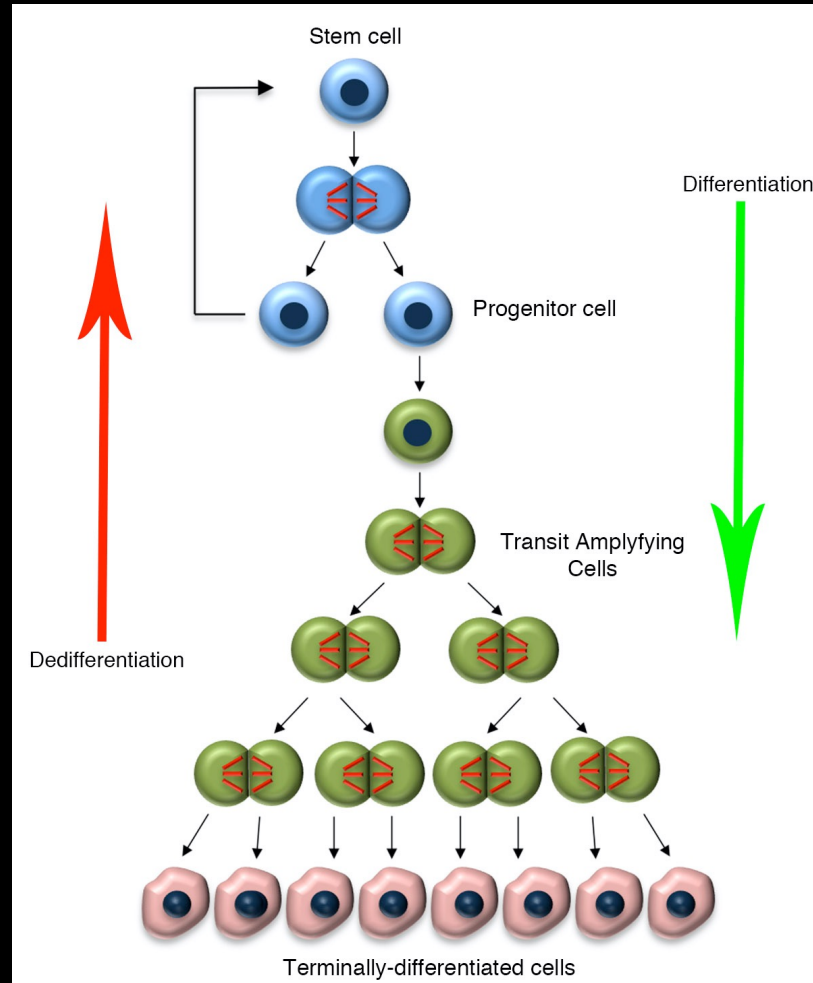


Differentiation: The process by which cells, tissues, and organs acquire specialized features during development.

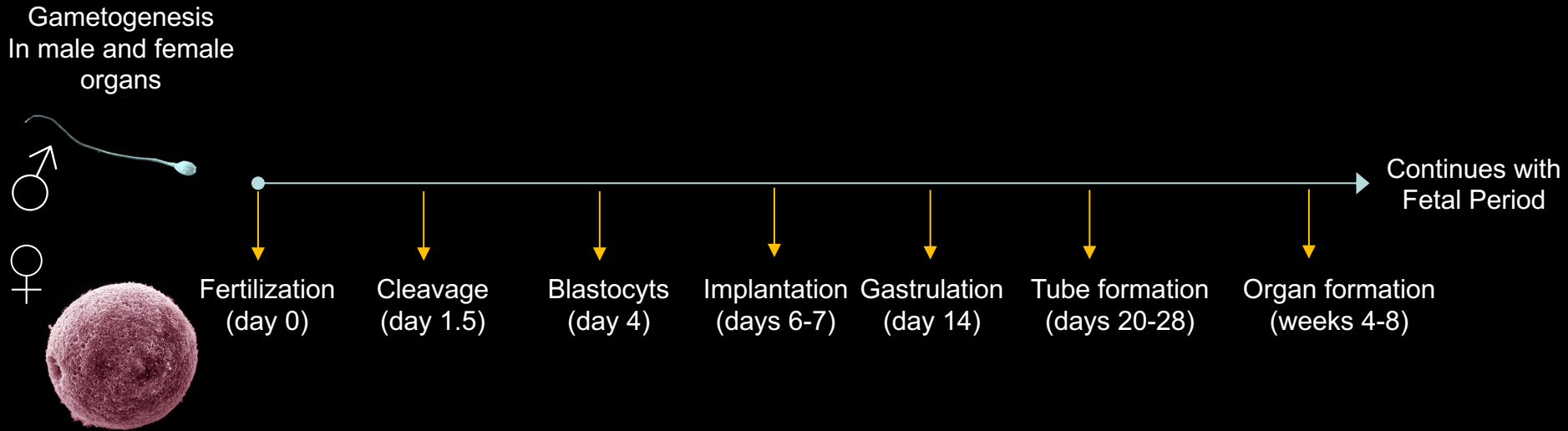


Common Terms

Dedifferentiation: Loss of differentiation of cells and their orientation to each other; anaplasia.



Stages of Embryonic Development (1-8 weeks)



- Fertilization = Fusion of male and female gametes to form a zygote
- Cleavage = Cell division of an embryo
- Blastocyst formation = Embryo becomes a cystic structure of having 2 cell types
- Implantation = Attachment of embryo to the wall of the uterus
- Gastrulation = The process by which an embryo forms three germ layers
- Tube formation = Elongation of embryo body
- Organogenesis = Development of specific tissues to form organ primordium

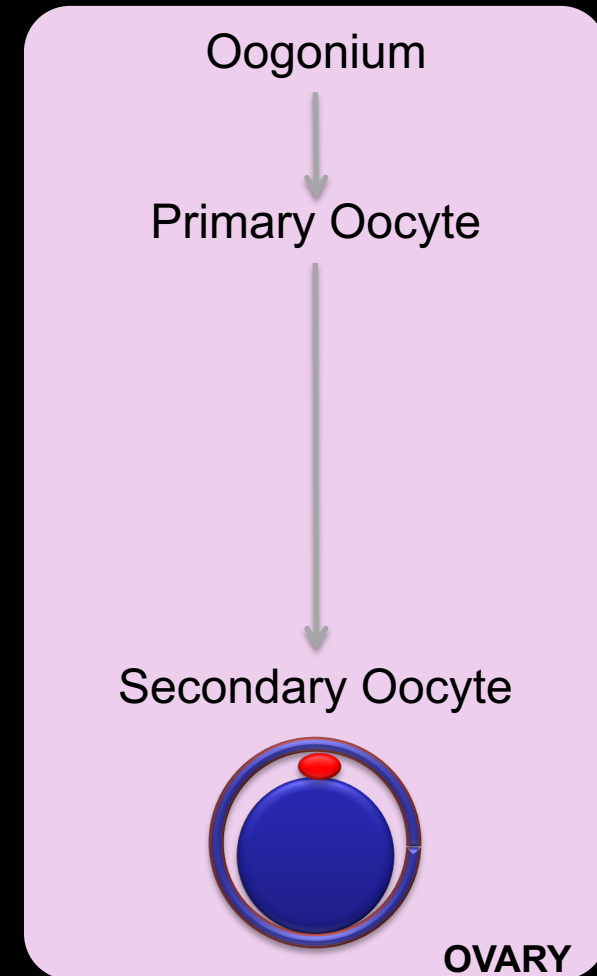
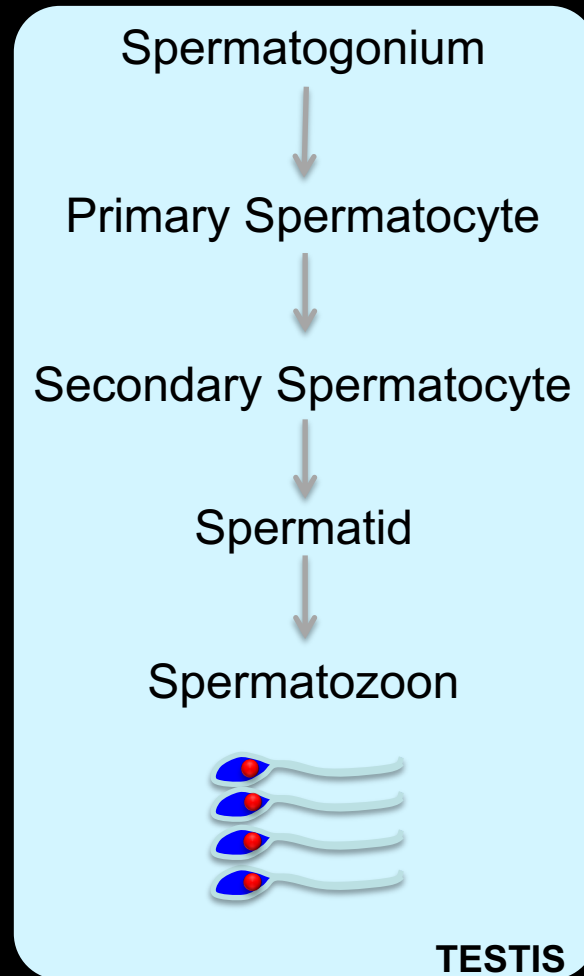
Primordial Germ Cells (PGCs)

- The earliest recognizable precursors of gametes, arise outside the gonads and migrate into the gonads during early embryonic development
- PGCs firstly appear as a group of cells besides epiblast in 2nd week
- They migrate to gonads till the end of 5th week
- PGCs proliferate by mitosis reaching to 2000-5000 cells, during and after their migration

Stages of Gametogenesis

Primordial Germ Cells

1. Proliferation (mitosis)
2. Maturation & Differentiation (meiosis)



Gametogenesis



Spermatogenesis

Formation & maturation of haploid (23n) spermatozoon (in testis and accessory glands)



Oogenesis

Formation & maturation of haploid (23n) oocyte (in ovary and uterine tubes)

Terminology



Mature Gametes As Freed Singular Cells

Spermatozoon (singular)

Spermatozoa (plural)

Oocyte (singular)

Oocytes (plural)

Ova (plural)

Stem (Progenitor) Cells of Gametes in Gonads

Spermatogonium (singular)

Spermatogonia (plural)

Oogonium (singular)

Oogonia (plural)

Gonads

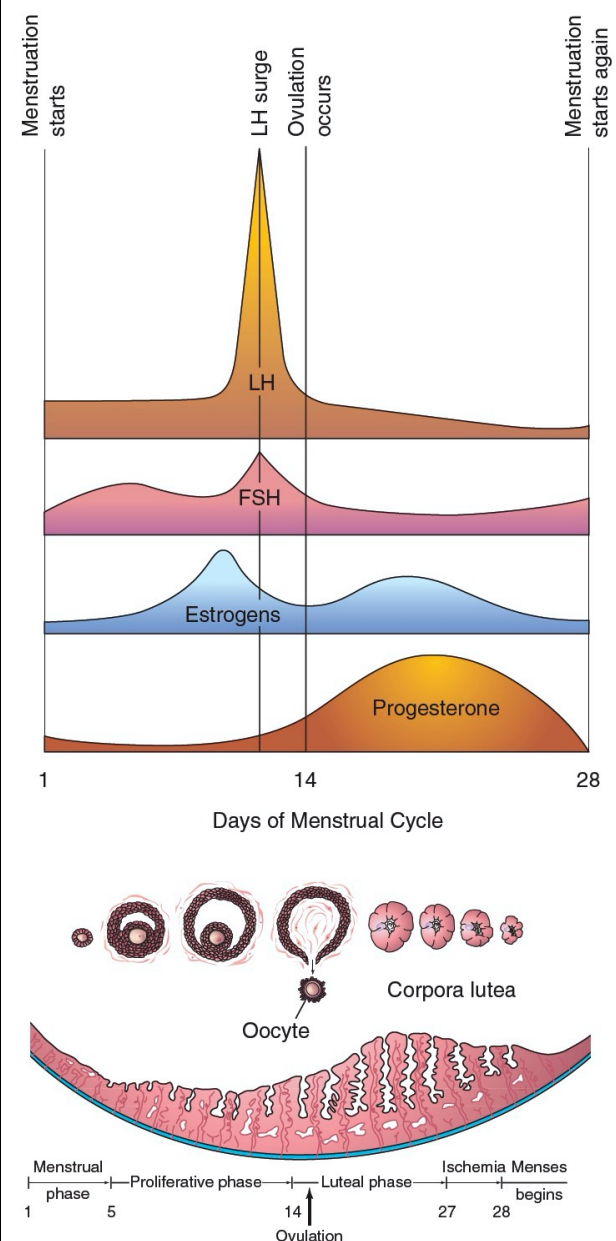
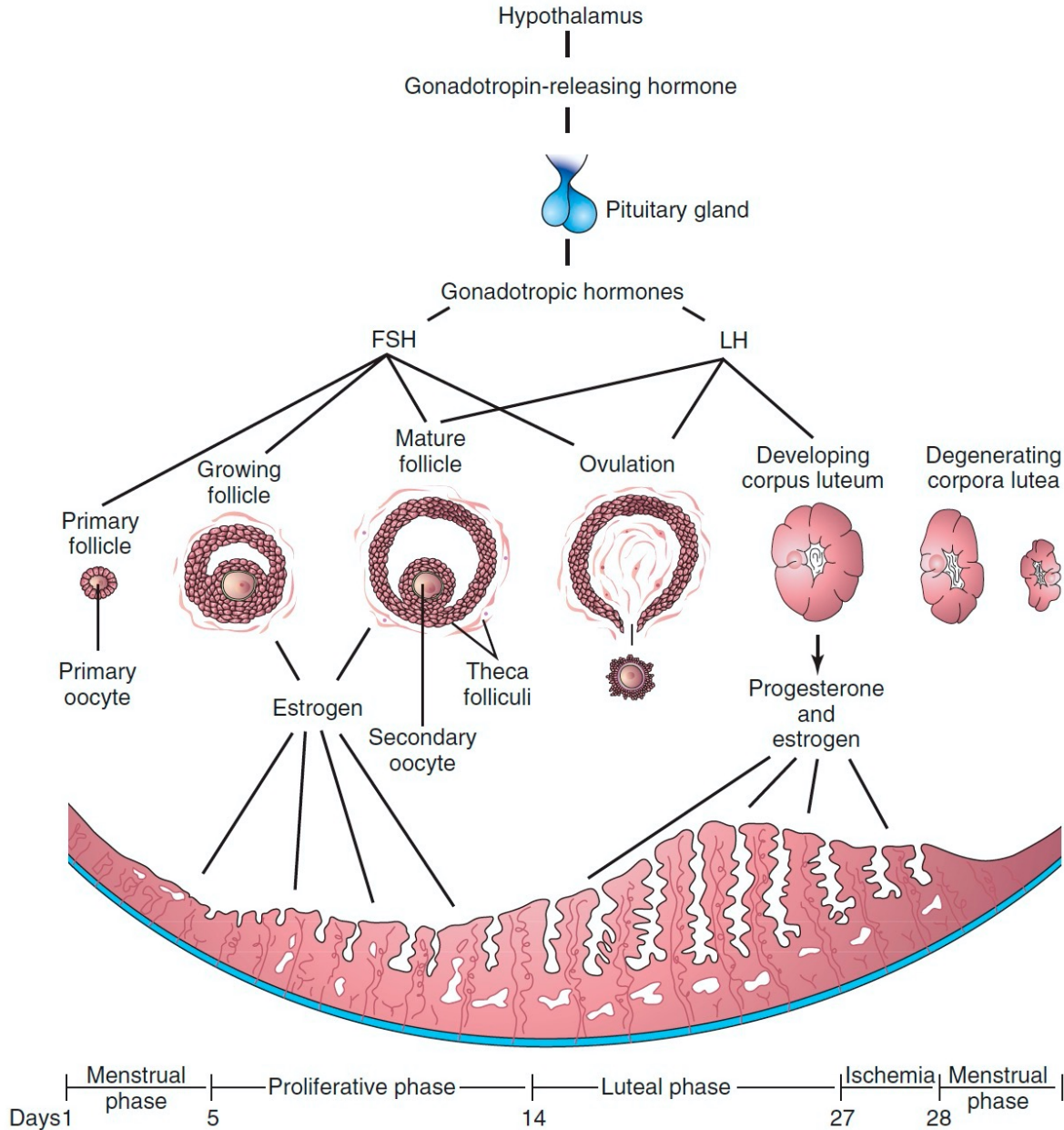
Testis (singular)

Testes (plural)

Ovarium; Ovary (singular)

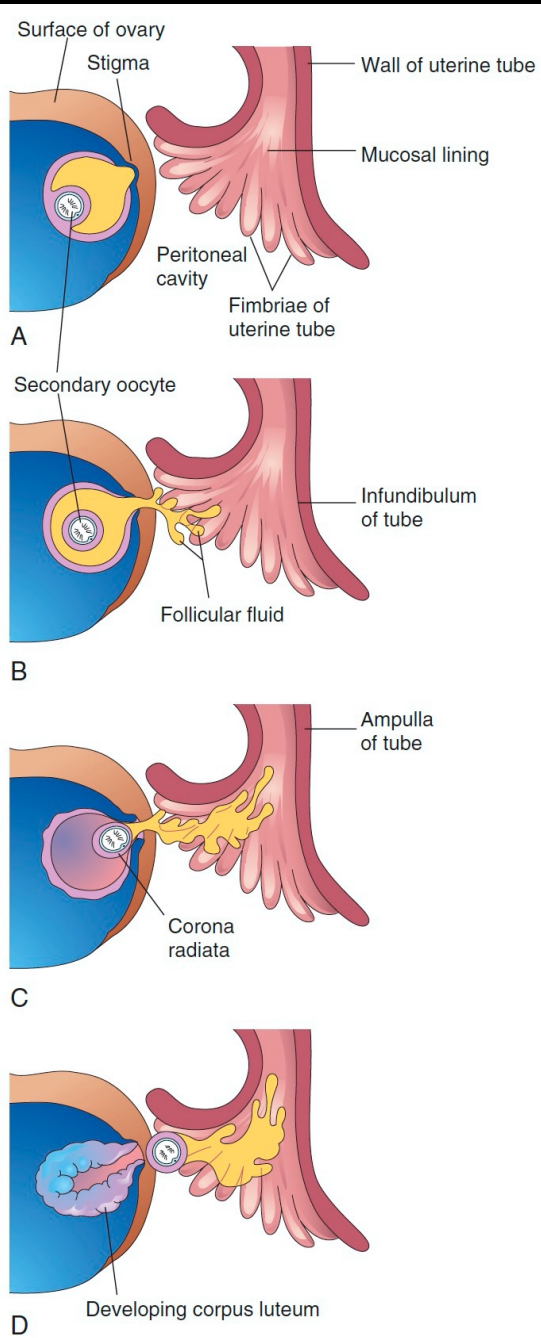
Ovaria, Ovaries (plural)

Menstrual Cycle



Ovulation

(discharge of oocyte from the ovary)



LH level rise in serum triggers;

- Inhibitory effect of MIS (meiosis inhibiting substance) stops, and
 - Granulosa cells retract their transzonal processes
 - Zona pellucida expands
- Meiosis resumes; First polar body (PB) expels, and first meiotic division completes
- Oocyte reaches second meiosis (metaphase II) (secondary oocyte=ovum) (3 hours before ovulation)
- LH activates collagenases which degrade the ovary wall
- LH activates prostaglandins to contract the ovarium surface and ovulation occurs

Meeting of Sperms with an Cumulus-Oocyte Complex (COC)

- 1% of spermatozoa deposited in the vagina enter the cervix and reach ampulla region of the uterine tubes in 2-7 hours
- Fertilization usually takes place in ampulla.
- Secondary oocyte can get fertilized during its voyage within the uterine tube that lasts 48-72 hours

