

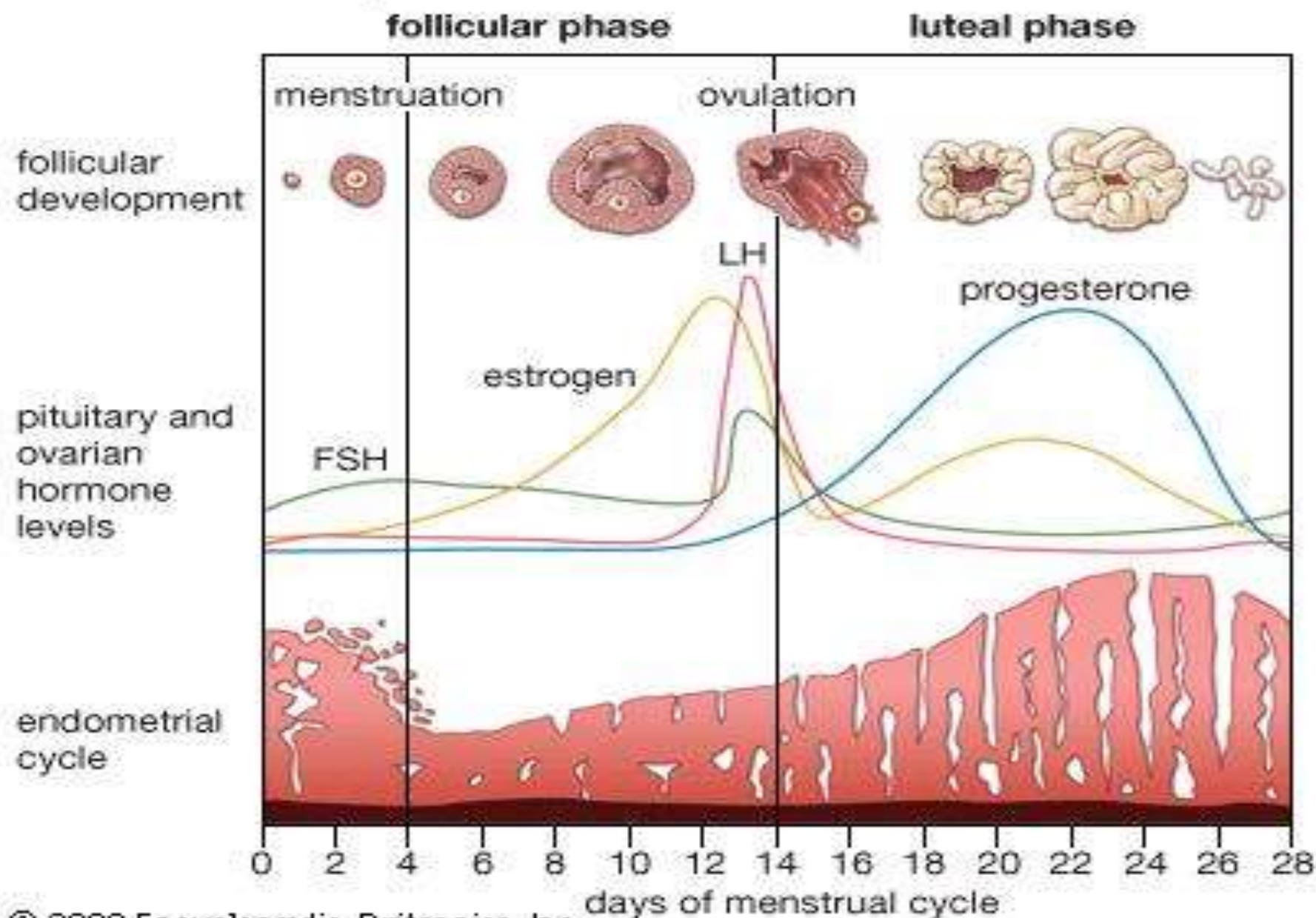
gametogenesis

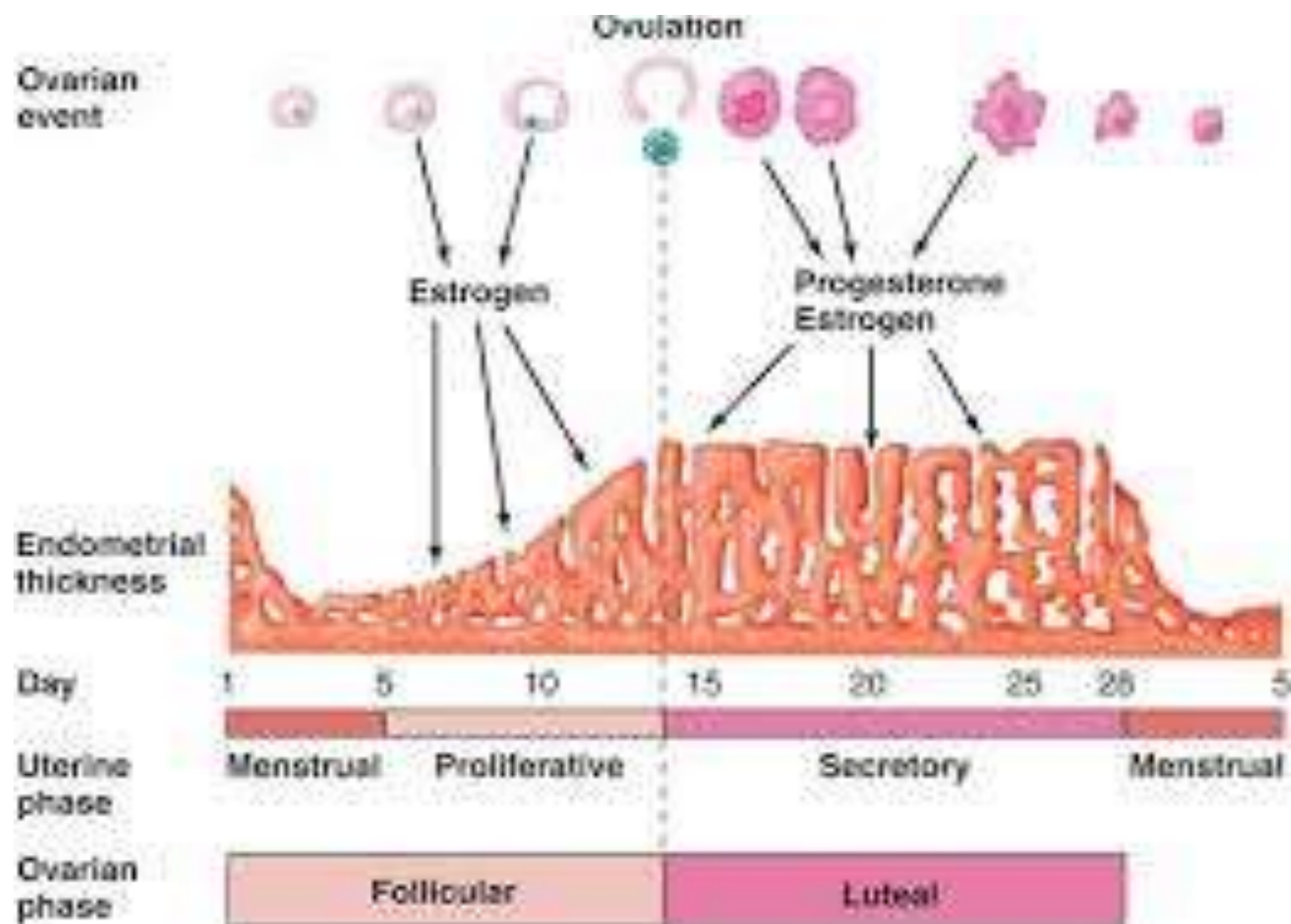
Oogenesis & menstrual cycle

Menstrual cycle

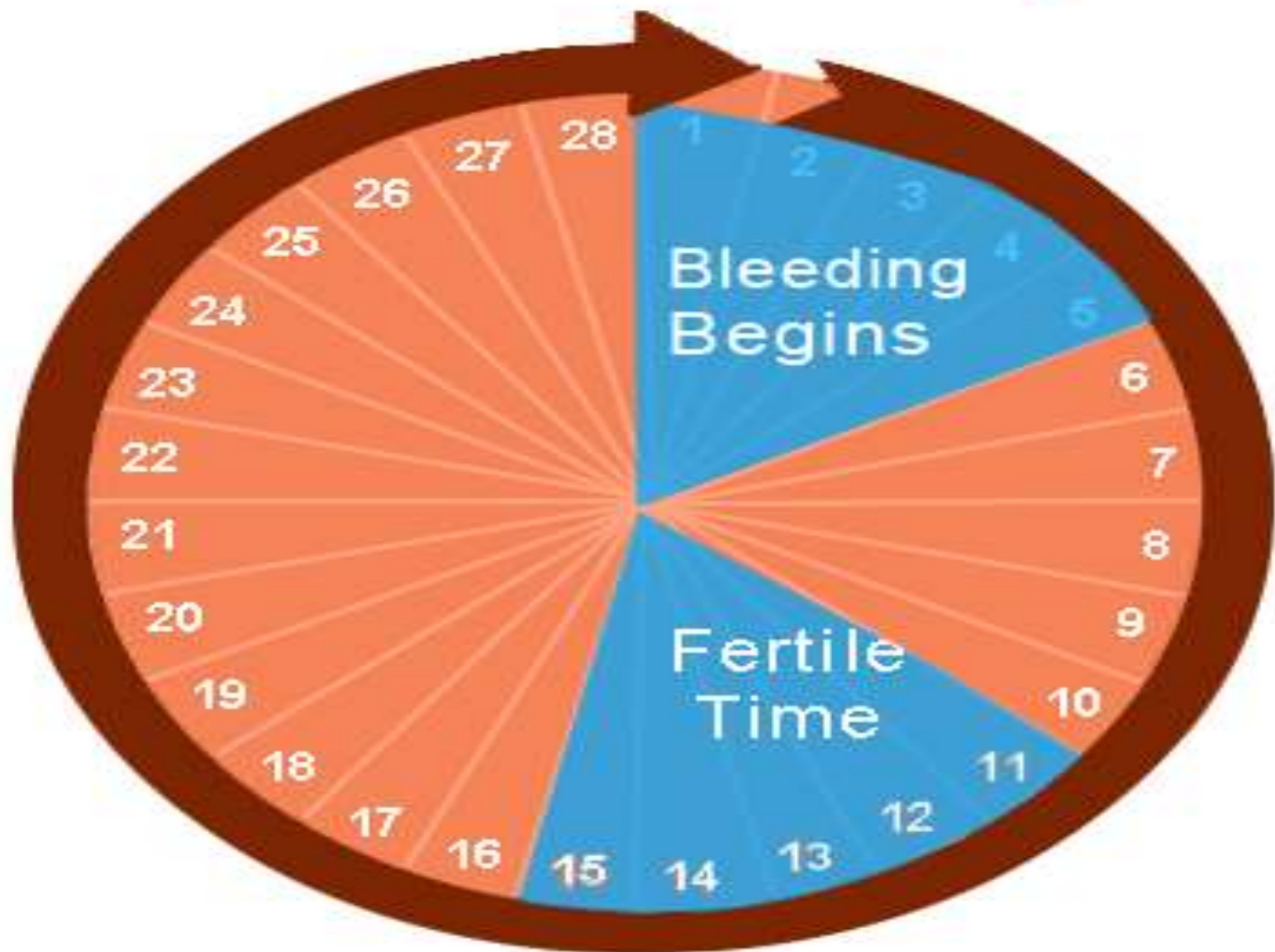
- applies to cyclical changes that occur in endometrium every month,
- Most obvious feature is monthly flow of blood (menstruation)
- menstrual cycle is divided into –postmenstrual, proliferative ,secretory& menstrual .
- menstrual cycle is also divided into **follicular** phase -- -changes are produced by oestrogens ,**luteal phase**---in which effect of progesterone predominate,
- both follicular & luteal phase are of roughly equal duration.

The menstrual cycle





The Menstrual Cycle

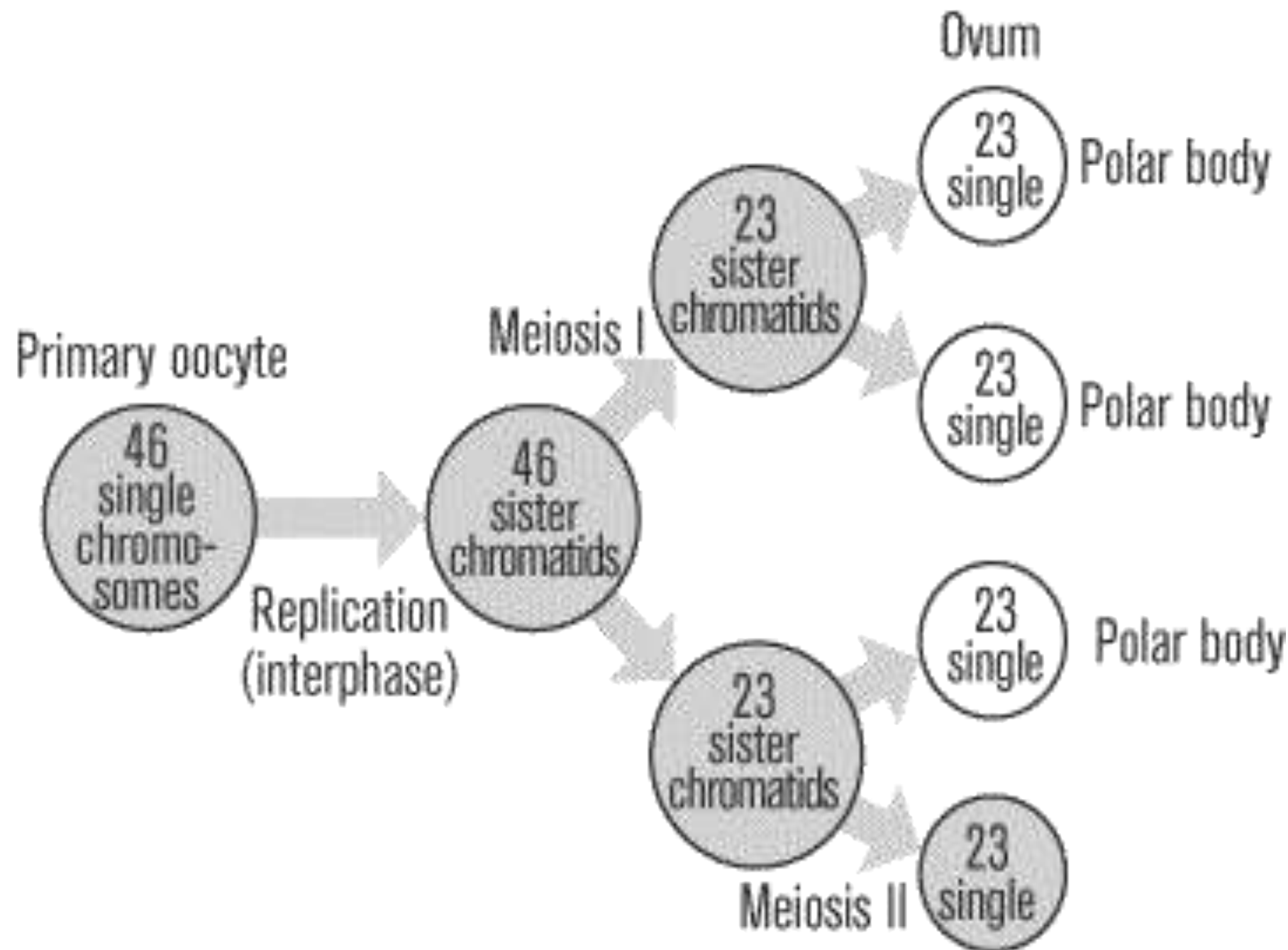


- **Main changes** in endometrium are --
- increase in thickness, growth of uterine glands,
- Changes in epithelial cells lining the glands,
- Increase in thickness & fluid content of endometrial stroma,
- Just before onset of menstruation, blood supply to superficial parts of endometrium is cut off, part is shed off & there is bleeding.
- menstrual cycle is influenced by oestrogen, by progesterone, by FSH & by LH.

- time of ovulation ---13 days prior to expected cycle of 28 days cycle.
- This time may vary for each month

oogenesis

- female gonad is ovary, & oogonia /germ cells that give rise to ova are contained in ovary.
- ovary has an outer part --cortex, & medulla (inner)
- cortex contain many large round cells called oogonia, all can be used throughout life of a woman are produced at a very early stage & donot multiply thereafter.
- ova are derived from oogonia .



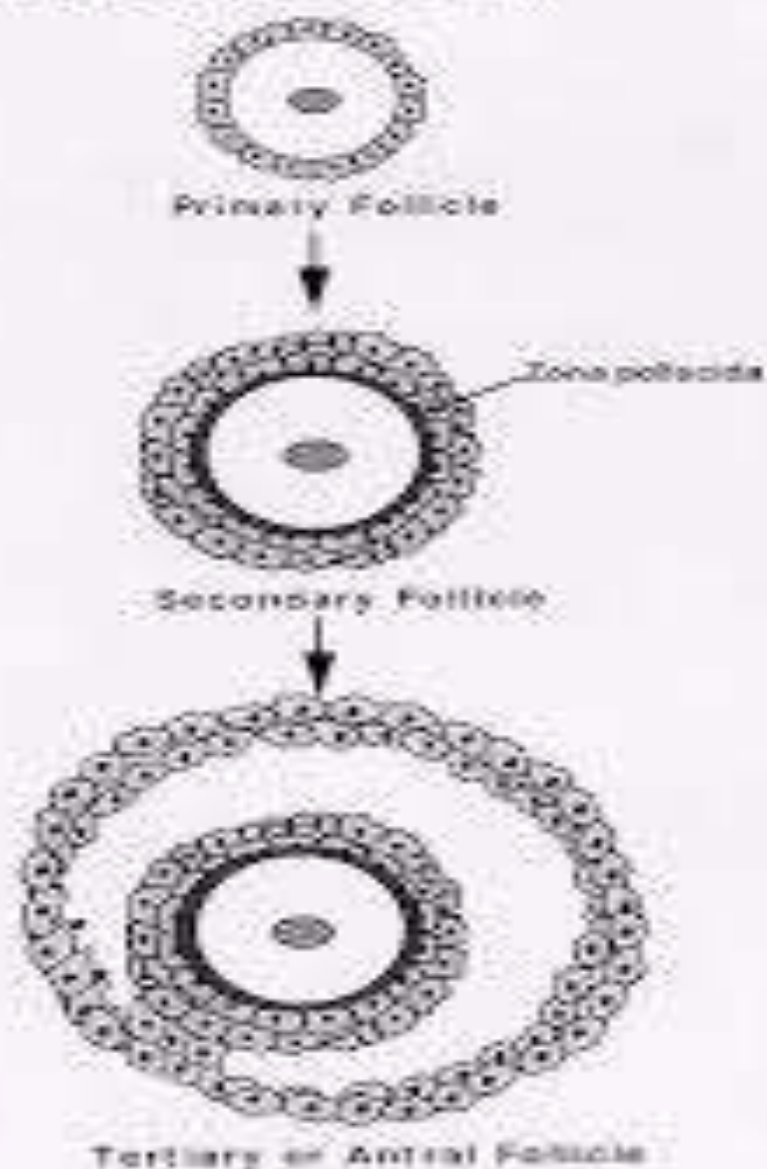
Differences b/w spermatogenesis & oogenesis

- one primary spermatocyte give rise to four spermatozoa, while one primary oocyte forms only one ovum.
- When primary spermatocyte divides its **cytoplasm is equally distributed** b/w two secondary spermatocytes formed. while when **primary oocyte** divides most of its cytoplasm goes to daughter cells, which forms **secondary oocyte**, other daughter cell (first polar body) receives half of chromosomes of primary oocyte but almost no cytoplasm. thus first **polar body** is merely getting rid of unwanted chromosomes.

Oogenesis before birth

- in female oogenesis (i.e **maturation of primitive germ cell to mature gamete**) begins before birth & primordial germ cells form oogonia (in males spermatogenesis begins at birth)
- after repeated mitotic division some of these arrest in **prophase of meiosis I** to form **primary oocytes**.

Figure 2 Oocyte Growth



During the process of oocyte growth, the somatic cells surrounding the oocyte proliferate and the oocyte increases in size and secretes the zona pellucida.

**PRIMORDIAL
FOLLICLE
40µm**

BASEMENT LAMINAE
DICTYATE OOCYTE
GRANULOSA CELLS

**PRIMARY
FOLLICLE
100µm**

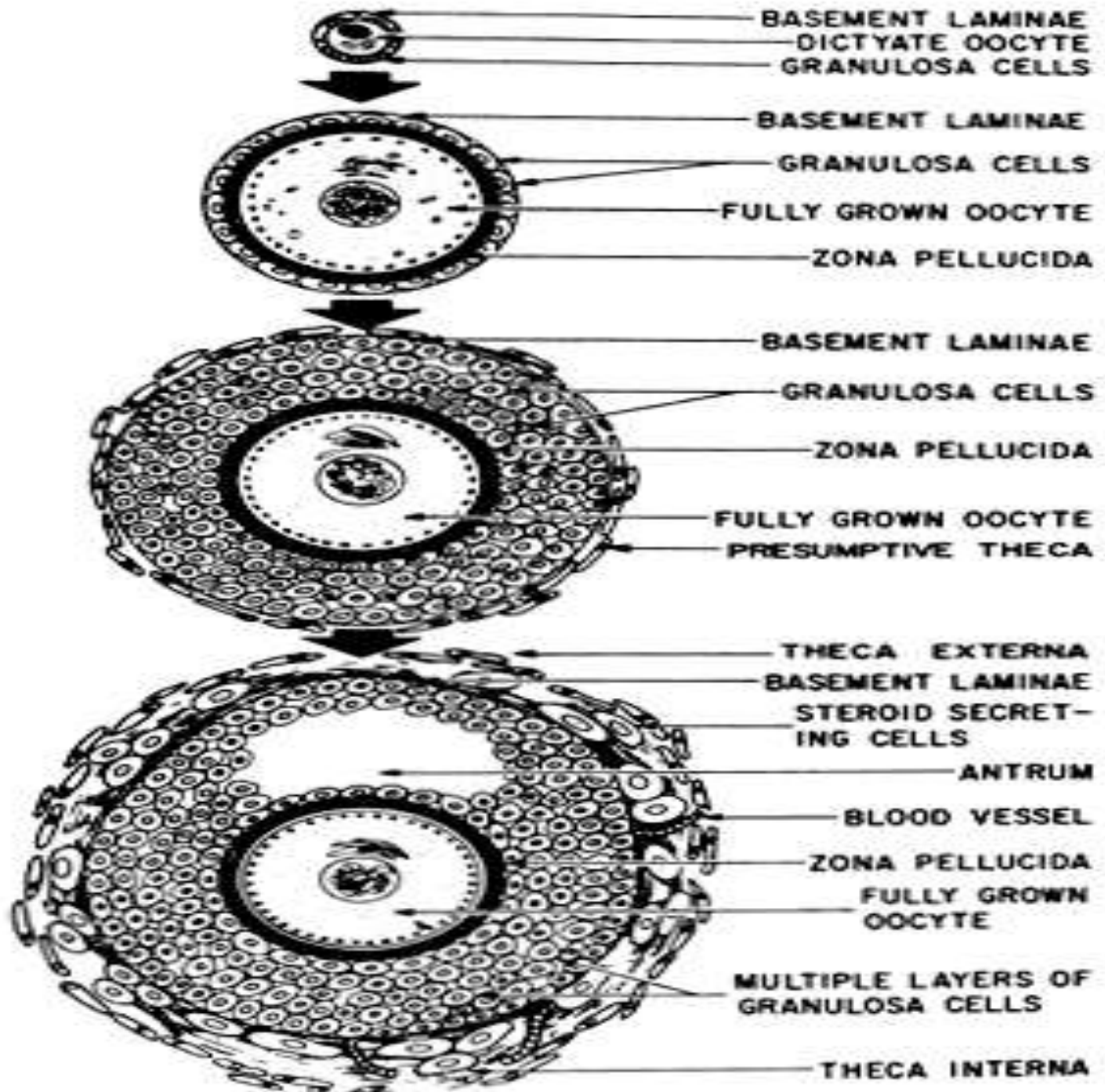
BASEMENT LAMINAE
GRANULOSA CELLS
FULLY GROWN OOCYTE
ZONA PELLUCIDA

**SECONDARY
FOLLICLE
200µm**

BASEMENT LAMINAE
GRANULOSA CELLS
ZONA PELLUCIDA
FULLY GROWN OOCYTE
PRESUMPTIVE THECA

**EARLY
TERTIARY
FOLLICLE
400µm**

THECA EXTERNA
BASEMENT LAMINAE
STEROID SECRETING
CELLS
ANTRUM
BLOOD VESSEL
ZONA PELLUCIDA
FULLY GROWN
OOCYTE
MULTIPLE LAYERS OF
GRANULOSA CELLS
THECA INTERNA



- during 5th month of I/U life the total number of germ cells reaches its maximum (approx.7 million)
- by 7th month of I/U life ,nearly all oogonia have become atretic & only primary oocytes remain surrounded by a layer of follicular cells derived from surface epithelium of ovary called **primordial follicle**.

- **near time of birth** all primary oocyte have started prophase of meiosis 1 but instead of proceeding into metaphase they enter **diplotene stage (resting stage),**
- they remain in this stage till puberty because of oocyte maturation inhibitor (OMI) secreted by follicular cells.

- **After birth**
- total no. of primary oocyte at birth is 7 lac to 2 million, during childhood most become atretic & only 4 lac approx. are present by beginning of puberty & only 500 will be ovulated.
- at puberty few primordial follicles start growing, each month 15-20 follicles from pool begin to mature & pass through **3 stages—**
 - a) primary /preantral,**
 - B) secondary/antral/vesicular/ graffian.**
 - C)preovulatory.**

- Secondary stage is longest
- preovulatory stage is around 37hrs before ovulation
- as primordial follicle begins to grow .
Surrounding follicular cells change from flat to cuboidal & proliferate to produce stratified epithelium of grannulose cells & this is called **primary /preantral follicle.**

- with further development theca folliculi organise into **theca externa & interna** (formed from surrounding stromal cells)
- granulosa cell & oocyte secrete a layer of glycoprotein on surface of oocyte from **zona pellucida**.
- fluid filled spaces appear b/w granulosa cell. Coalescence of these spaces form the antrum & follicle is termed **secondary /graafian follicle**.

- Granulosa cell surrounding the oocyte form cummulus oophorus.
- usually one follicle reaches full maturity & other degerate & become atretic.
- when secondary follicle is mature ,a surge in LH induces **preovulatory** growth phase.(occurs **36 hrs before ovulation**) resulting in completion of **meiosis 1**& formation of secondary oocyte & 1st polar body.

- the cell then enters meiotic 2 but arrest in metaphase approx 3hrs before ovulation.
- meiosis 2 is completed only if oocyte is fertilized otherwise cell degenerates in approx. 24 hrs after ovulation.

