OBG LECTURE

2.1: Menstrual cycle

2.2: Conception & Fetal development

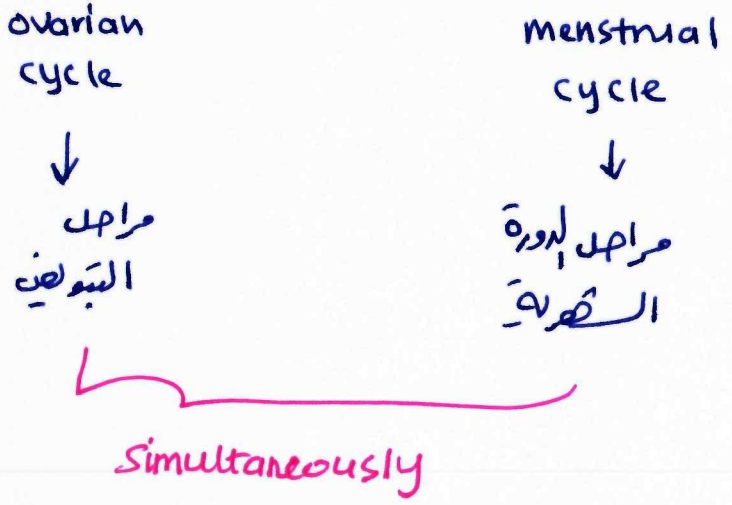
المحاضرة الثانية

الجزء الأول

2.1: FEMALE REPRODUCTIVE CYCLE

دورة الجهاز التناسلي الأنثوي

- The female reproductive cycle (FRC) is composed of the **ovarian cycle, during which ovulation occurs, and the menstrual cycle, during which menstruation occurs**. These two cycles take place simultaneously.



Effects of female hormones

- After menarche, a woman undergoes a cyclic pattern of ovulation and menstruation for a period of 30 to 40 years. This cyclic pattern is disrupted only by **pregnancy.**
- The ovary, vagina, uterus, and fallopian tubes are major target organs for female hormones.
- The ovaries produce **mature gametes and secrete hormones**. Ovarian hormones include the **estrogens, progesterone, and testosterone**.
- The ovary is sensitive to follicle-stimulating hormone (FSH) and luteinizing hormone (LH). The uterus is sensitive to estrogen and progesterone.

دورة التبويض الدورة الشهرية تتغير في حال الحمل فقط

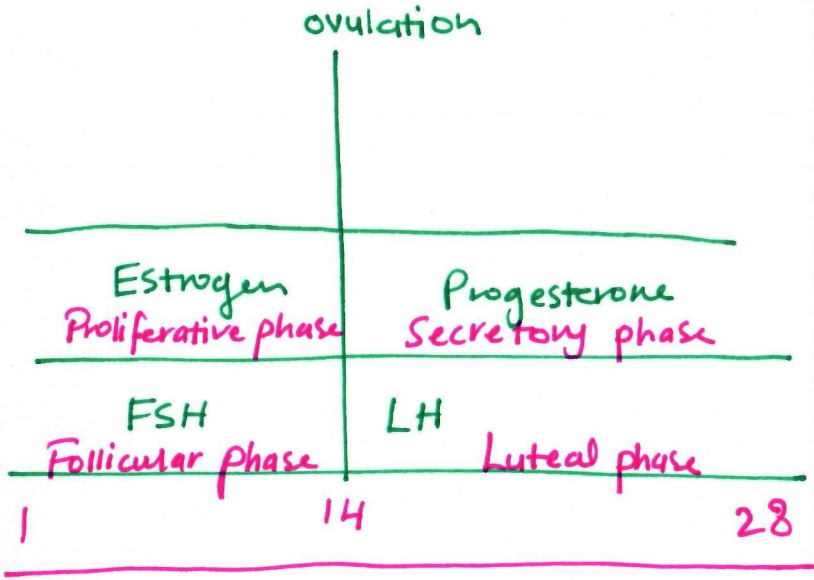
كلام عام للقراءة

estrogen
progesterone
Testosterone.

Ovarian Cycle :— FSH LH
Menstrual = :— estrogen / progesterone

Estrogen

- Estrogens control the development of the female secondary sex characteristics
- Estrogens assist in the maturation of the ovarian follicles and cause the endometrial mucosa to proliferate following menstruation. The amount of estrogens is greatest during the **proliferative (follicular or estrogenic) phase** of the menstrual cycle.
- Estrogens cause the uterus to increase in size and weight because of increased glycogen, amino acids, electrolytes, and water. Blood supply is expanded as well. The endometrial mucosa is in a ready state as a result of estrogenic influence.
- Estrogens inhibit FSH production and stimulate LH production.



الاستروجين 1. يساعد في بلوغ جوانب البويضة
2. يساعد تضاعف لبطانة الرحم
3. يزيد من حجم وزن الرحم بسبب زيادة المواد البنائية فيه

Progesterone

- Progesterone is secreted by the **corpus luteum** and is found in greatest amounts during the **secretory (luteal or progestational) phase** of the menstrual cycle.
- It decreases uterine motility and contractility caused by estrogens, thereby preparing the uterus for implantation after the ovum is fertilized. This hormone is often called the **hormone of pregnancy** because its effects on the uterus allow pregnancy to be maintained.
- Under the influence of progesterone, the vaginal epithelium proliferates, and the cervix secretes thick, viscous mucus.
- In the breast, progesterone stimulates development of lobules and alveoli and supports secretory function of the breast during lactation.
- The temperature rise of about 0.3°C to 0.6°C (0.5°F to 1°F) that accompanies ovulation and persists throughout the secretory phase of the menstrual cycle.

تذكر

duct system depeloped by estrogen.

lobular - alveolar system developed by progesterone

5

Prostaglandins

- Prostaglandins (PGs) are oxygenated fatty acids that are produced by the cells of the endometrium and are also classified as hormones. Prostaglandins have varied actions in the body.
- The two primary types of prostaglandins are groups E and F.
- Generally, **PGE relaxes smooth muscles and is a potent vasodilator**; **PGF is a potent vasoconstrictor** and increases the contractility of muscles and arteries.
- Prostaglandin production increases during follicular maturation, is dependent on gonadotropins, and seems to be critical to follicular rupture.

PG E	relaxes smooth muscles vasodilator
PG F	vasoconstrictor ↑ contractility of muscles = = arteries

Gonadotropins (FSH, LH) → ↑PG production → Follicular maturation → Follicular Rupture.

6

Neuro - hormonal Basis of the Female Reproductive Cycle

Hypothalamus - GnRH

Anterior pituitary – FSH/LH

Ovary – FSH – Follicles – Estrogen - Ovulation (due to LH surge)

Follicular phase

Ovary – LH – Corpus luteum – Progesterone

Luteal phase.

السبب الرئيسي

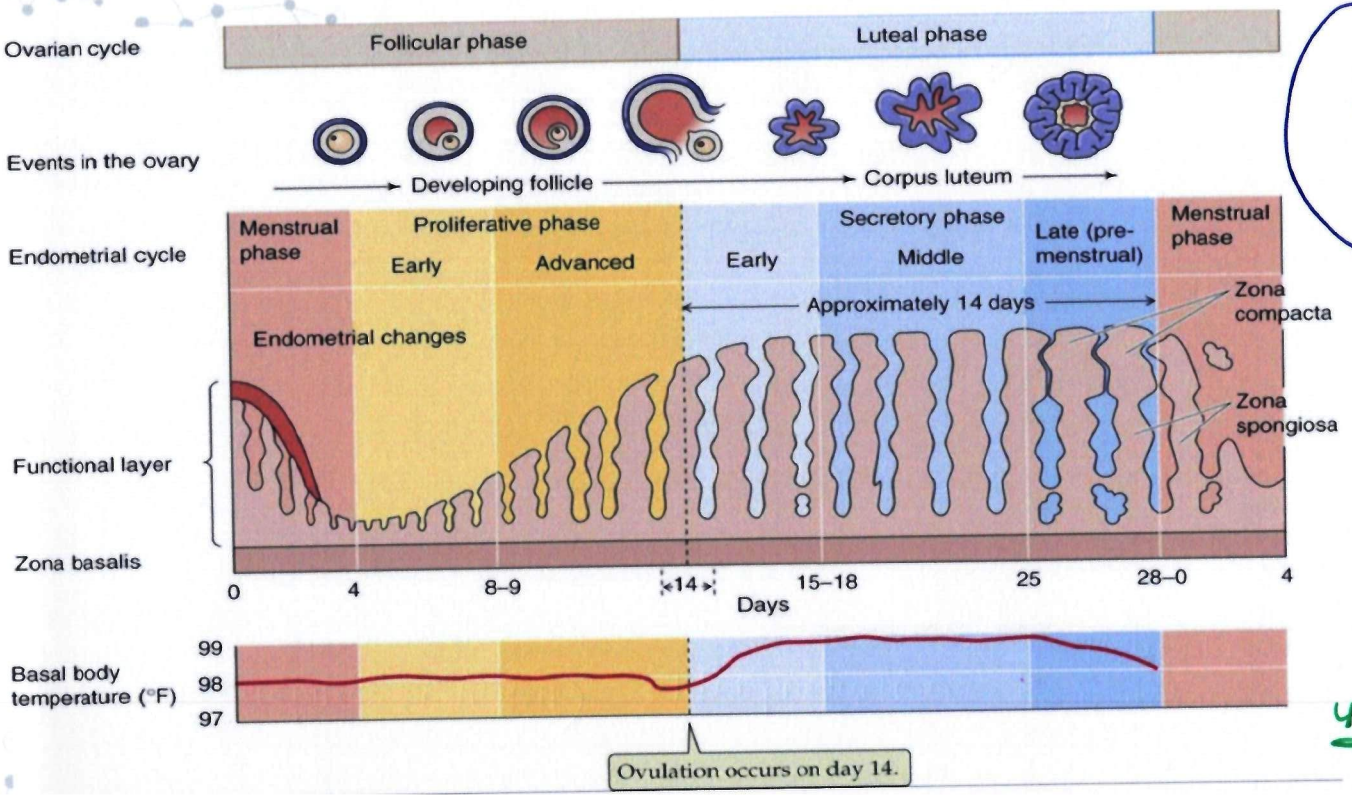
FSH → involved in release of estrogen and progesterone.

FSH → stimulates growth of ovarian follicle.

LH → Stimulates ovulation.

بالجسم آخر

immature follicle —FSH→ mature follicle



Ovarian Cycle

- The ovarian cycle has two phases: **the follicular phase (days 1 to 14) and the luteal phase (days 15 to 28 in a 28-day cycle)**

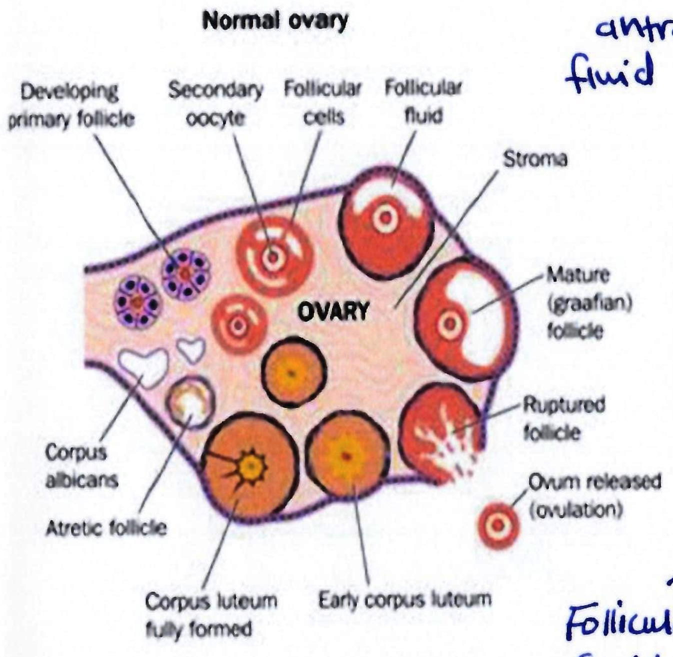
حكيت من رسمتي السابقة

a) Follicular phase:

- During the follicular phase, the immature follicle matures as a result of FSH. Within the follicle, the oocyte grows.
- A mature graafian follicle appears about the 14th day under dual control of FSH and LH. It is a large structure, measuring about 5 to 10 mm, and produces increasing amounts of estrogen.
- In the mature graafian follicle, the cells surrounding the fluid-filled antral cavity are called **granulosa cells**. The mass of granulosa cells surrounding the oocyte and follicular fluid is called the **cumulus oophorus**.

Graafian Follicle

1. appears at 14^{th} day.
2. grow under the control of FSH, LH
3. 5-10 mm
4. Produce Estrogen.
5. P + U (على رسمي)



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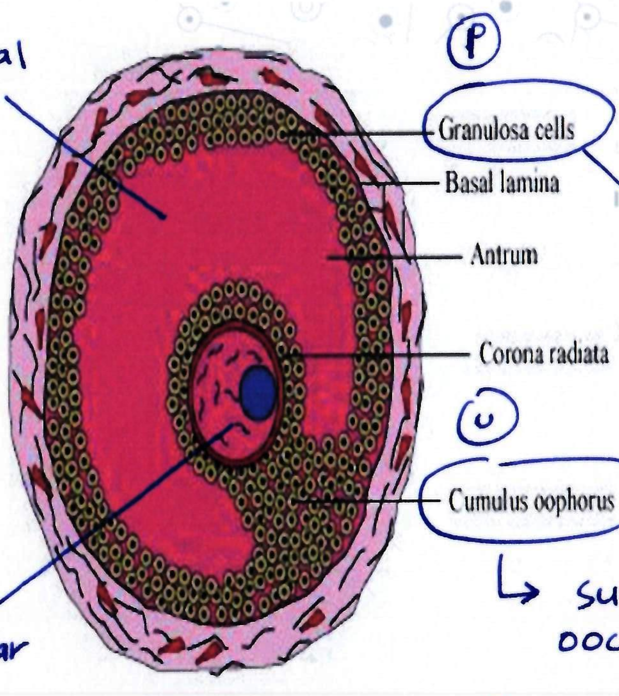


Structure of the Graafian follicle

antral fluid

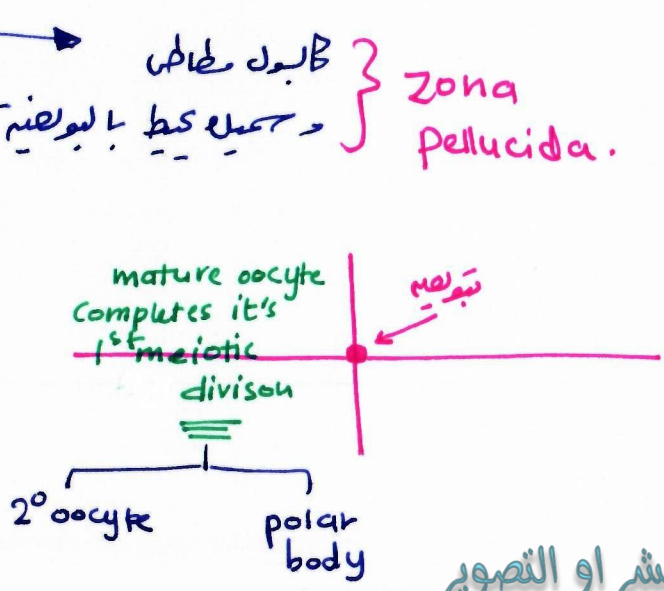
Follicular fluid

Granulosa cells → surround antral cavity

Cumulus oophorus → surround oocyte and follicular fluid

Ovarian cycle – Follicular phase…….contd

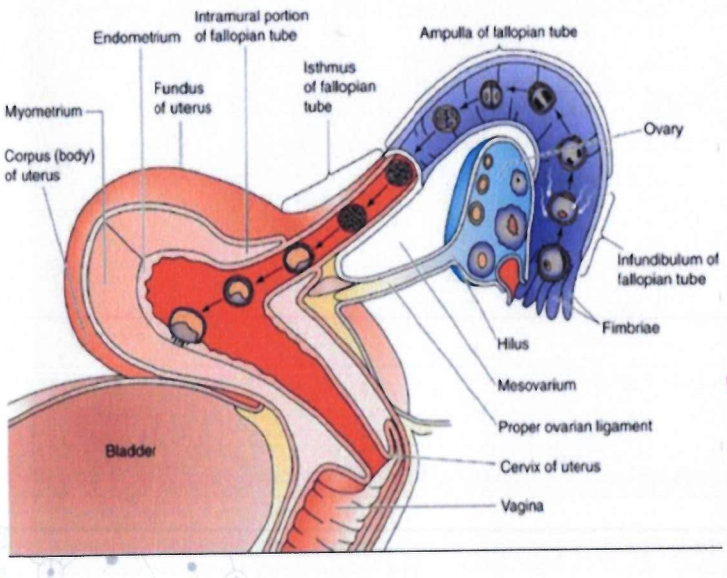
- In the fully mature graafian follicle, the **zona pellucida, a thick elastic capsule, develops around the oocyte**. Just before ovulation, the mature oocyte completes its first meiotic division.
- As a result of this division, two cells are formed: **a small cell called a polar body, and a larger cell called the secondary oocyte**. The secondary oocyte matures into the ovum.
- As the graafian follicle matures and enlarges, its walls thin and it travels outward to the surface of the ovary. This surface has a blisterlike protrusion 10 to 15 mm in diameter, where the secondary oocyte, polar body, and follicular fluid are pushed out.
- The ovum is discharged near the fimbria of the fallopian tube and is pulled into the tube to begin its journey toward the uterus.



Ovulation ……contd

- In some women, ovulation is accompanied by midcycle pain, known as **mittelschmerz**. This pain may be caused by a thick tunica albuginea or by a local peritoneal reaction to the expelling of the follicular contents.
- Vaginal discharge may increase during ovulation, and a small amount of blood (midcycle spotting) may be discharged as well.
- The body temperature increases about 0.3°C to 0.6°C (0.5°F to 1°F) 24 to 48 hours after the time of ovulation.

Ovarian cycle – Follicular phase…….contd



- Generally the ovum takes several minutes to travel through the ruptured follicle to the fallopian tube opening.
- The contractions of the tube's smooth muscle and its ciliary action propel the ovum through the tube.
- The ovum remains in the ampulla, where, if it is fertilized, cleavage can begin.
- The **ovum** is thought to be fertile for only **6 to 24 hours**. It reaches the uterus 72 to 96 hours after its release from the ovary

بعد 24 ساعة من التبويض البويضة تصبح غير صالحة للتلقيح.

Ovarian cycle….Luteal phase

- **The luteal phase begins** when the ovum leaves its follicle.
- Under the influence of LH, the corpus luteum develops from the ruptured follicle. ***
- Within 2 or 3 days the corpus luteum becomes yellowish and spherical and increases in vascularity. If the ovum is fertilized and implants in the endometrium, the fertilized egg begins to secrete **human chorionic gonadotropin (hCG), which is needed to maintain the corpus luteum**.
- If fertilization does not occur, within about a week after ovulation, the corpus luteum begins to degenerate, eventually becoming a connective tissue scar called the **corpus albicans**.
- With degeneration comes a decrease in estrogen and progesterone. This allows for an increase in LH and FSH, which triggers the hypothalamus.

قد يصبح الأصفر
corpus Luteum
- if ovum is fertilized → Fertilized ovum secrete hCG → hCG maintain corpus luteum
- if no fertilization → after 1 week of ovulation, corpus luteum degenerate → corpus albicans → ~~Estrogen & Progesterone & FSH & LH~~

Uterine (Menstrual) Cycle

- **Menstruation** is cyclic uterine bleeding in response to cyclic hormonal changes.
- Menstruation occurs when the ovum is not fertilized and begins about 14 days after ovulation (in an ideal 28-day cycle), in the absence of pregnancy.
- The menstrual discharge, also referred to as the **menses or menstrual flow**, is composed of blood mixed with cervical and vaginal secretions, bacteria, mucus, leukocytes, and other cellular debris.
- The menstrual discharge is dark red and has a distinctive odor. The duration of menses is from 2 to 8 days, with the **blood loss averaging 25 to 60 ml and the loss of iron averaging 0.5 to 1 mg daily.**

15

Table10-2 :Characteristics of Menstrual Cycle and Ovulation

Menstrual phase (days 1–6)	Estrogen levels are low. Cervical mucus is scanty, viscous, and opaque. Endometrium is shed
Proliferative phase (days 7–14)	Endometrium and myometrium thickness increases. **Estrogen peaks just before ovulation.** Cervical mucus at ovulation: Is clear, thin, watery, and alkaline; Is more favorable to sperm; Has elasticity (spinnbarkheit) greater than 5 cm; Shows fering pattern on microscopic exam. Just prior to ovulation body temperature drops; then at ovulation basal body temperature increases 0.3°C to 0.6°C, and mittelschmerz and/or midcycle spotting may occur
Secretory phase (days 15–26)	Estrogen drops sharply, and **progesterone dominates**. Vascularity of entire uterus increases. Tissue glycogen increases, and the uterus is made ready for implantation.
Ischemic phase (days 27–28)	Both estrogen and progesterone levels fall. Spiral arteries undergo vasoconstriction. Endometrium becomes pale. Blood vessels rupture. Blood escapes into uterine stromal cells.

8

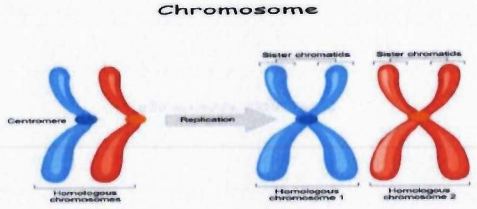
2.2: CONCEPTION & FETAL DEVELOPMENT

17

- Human (body) cells contain within their nuclei threadlike bodies known as **chromosomes,** which are composed of strands of deoxyribonucleic acid (DNA) and protein.
- **Genes** are regions in the DNA strands that contain coded information used to determine the unique characteristics—or traits—of an individual

- Every body (somatic) cell in the human body contains 46 chromosomes, referred to as the diploid number of chromosomes. These are divided into 23 pairs.
- There are **22 pairs of similar cells in both males and females, called autosomes,** and **one pair of sex chromosomes (XX in females, XY in males)**

23 pair of chromosome → 22 pair autosome
→ 1 pair sex chromosome.



18

9

Cellular division

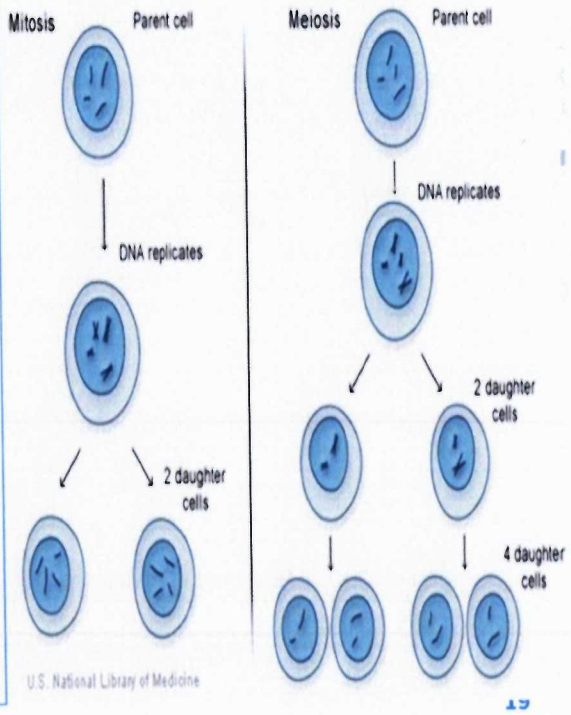
- Each human, begins life as a single cell called a fertilized ovum or zygote.

Mitosis :

- Produce cells for growth and tissue repair.
- Cell division characteristic of all **somatic cells**

Meiosis:

- Produce **reproductive cells** (gametes).
- Reduction of chromosome number by half (from diploid [46] to haploid [23]), so that when fertilization occurs the normal diploid number is restored.



15

Gametogenesis

تكوين الجاميطات

Is the process by which germ cells, or gametes (ovum and sperm), are produced.

Oogenesis

تكوين البويضة

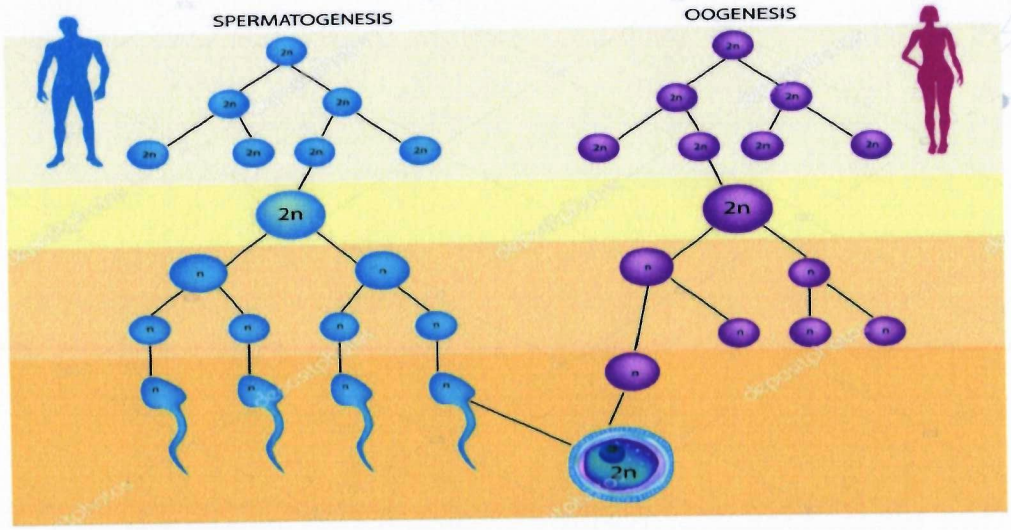
Is the process that produces the female gamete, called an **ovum (egg).**

Spermatogenesis

تكوين الحيوان المنوي

Is the process that produces the male gamete, called **sperm.**

10



HUMEN EGG (OVUM)