

Menstrual cycle

DEFINITION

Rhythmical series of physiological changes that occur in fertile women

➤ The menstrual cycle averages **28 days**

➤ **Variations** between **21 and 35** days are **normal**

➤ **Irregular** and **infrequent** cycles may occur for a few months after puberty and in the few years preceding **the menopause**

The endometrial cycle (menstrual cycle)

Menstrual cycle is under the control of the ovaries

➤ Remember that the primary, secondary and graafian follicles all contain **theca interna** and **granulosa cells** which secrete **estrogens**

Also remember that the ovulated egg leaves behind it;

1- **The cells of theca interna**

2- **Granulosa cells**

attached to the walls of the ruptured follicle.

which stay in the ovaries in fertilization

These cells become **vascularized** and under the influence of LH hormone they develop *a yellowish pigment and change*

yellow ← *مصفوف*
into **lutean cells**, which form

the corpus luteum

Corpus luteum starts to secrete **estrogens** and **progesterone**

Both **estrogen** and **progesterone** control and maintain the menstrual cycle

How?

Remember that:

The endometrium is made of two layers:

1- **Stratum basalis**: Adjacent to the myometrium

layer

-Unresponsive to hormonal stimulation

-Remains intact throughout the menstrual cycle

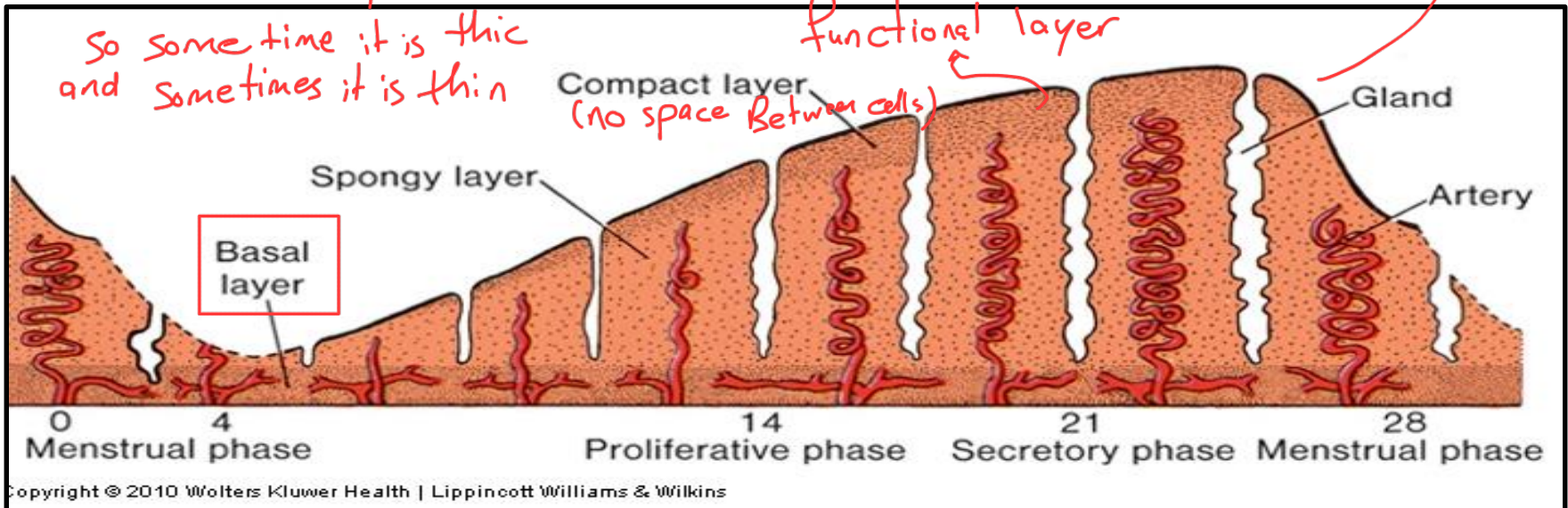
2- **Functional layer** made of

designed to receive the embryo

A) STRATUM SPONGIOSUM

B) STRATUM COMPACTUM

(endometrium)
epithelial layer



Menstrual cycle consists of three phases;

primordial primary and secondary follicles

Because it is a cycle!

which will be secreted by

1- Follicular or proliferative phase

which under influence of FSH which wakes up follicle which secret estrogen

A) Begins at the end of the menstrual phase

B) Is under the influence of estrogen

C) Parallels growth of the ovarian follicles.

2- Secretory progesterational phase

which under influence of LH which

Begins approximately 2 to 3 days after ovulation in response to progesterone produced by the corpus luteum.

maintain

3- Menstrual phase (bleeding)

if non- of this hormones are produce we have this phase

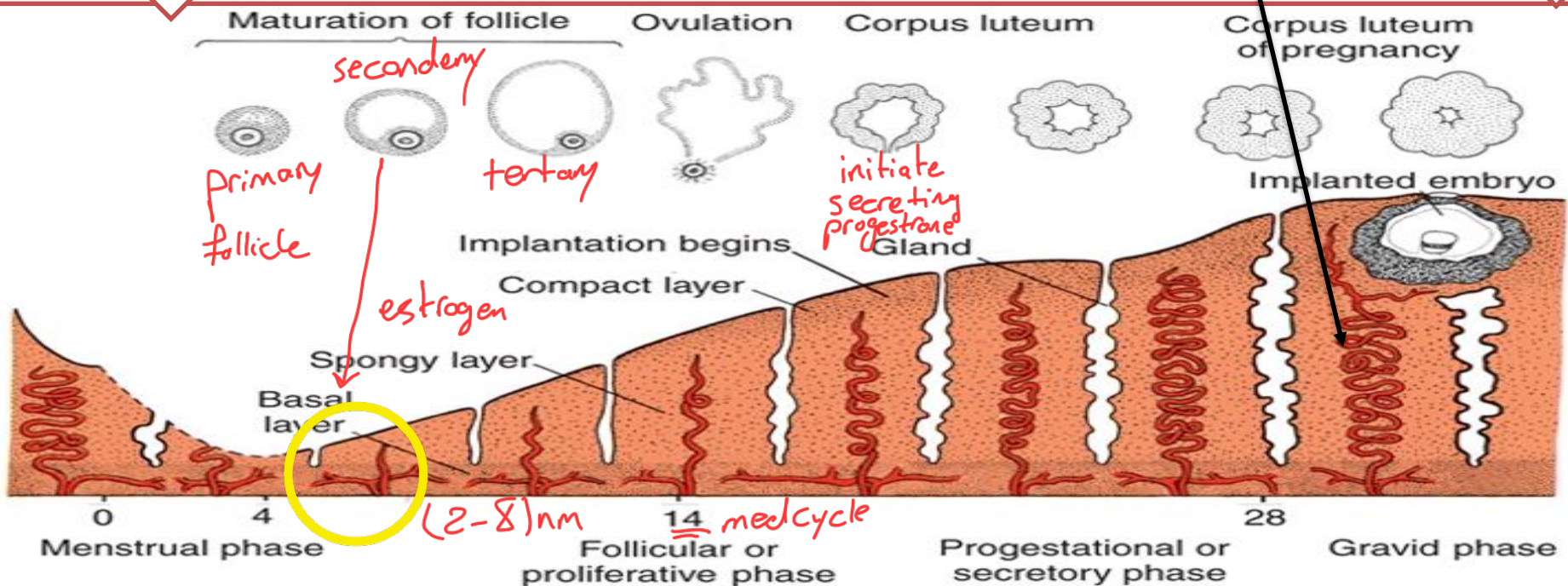
So the size will increase

1-Follicular /proliferative phase

Estrogen ⇒ mitotic activity in the glands & stroma ⇒ Area of yellow color
↑ endometrial thickness from 2 to 8 mm
(from basalis to opposed basalis layer)

2-Luteal /secretory phase

Progesterone ⇒ - Mitotic activity is severely restricted
- Endometrial glands produce then secretes glycogen rich vacuoles
- Stromal edema
- Stromal cells enlargement
- Spiral arterioles develop, lengthen & coil
to give the embryo the nutrients



3-MENSTRUATION

- Periodic desquamation ^{تَقَشِير} of the endometrium
 - The external hallmark of the menstrual cycle *because Bleeding*
 - Just before menses the endometrium is infiltrated with leucocytes
 - Prostaglandins are maximal in the endometrium just before menses *(bleeding)*
 - Prostaglandins ⇒ constriction of the spiral arterioles
⇒ ischemia & desquamation ^{تَقَشِير} → *lack of oxygen and nutrients*
- Followed by arteriolar relaxation, bleeding & tissue breakdown

أين الله ؟

قال الإمام مالك رحمه الله:
الله في السماء، وعلمه في
كل مكان، لا يخلو من
علمه مكان.

مسائل أحمد رواية أبي داود «1699»

صفحة التوحيد والسنة

الله في السماء: أي فوق السماء، وكلمة "في" معناها "على"، كما قال الله ((هو الذي جعل لكم الأرض ذلولاً فامشوا في مناكبها)) أي عليها، إذ أنه لا يوجد أحد يمشي في باطن الأرض

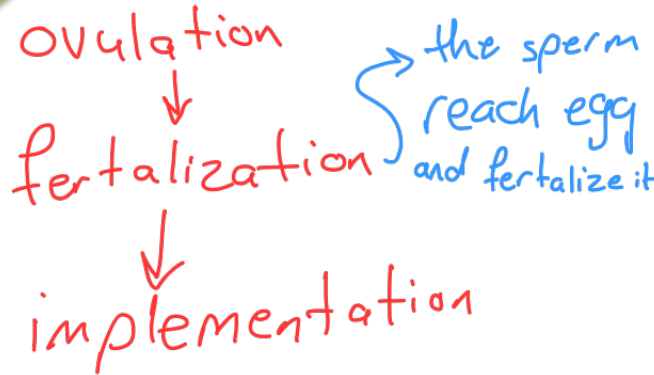
علمه في كل مكان: ذكر الإمام مالك هذه العبارة لأن الله يقول عن نفسه ((وهو معكم أينما كنتم))، والمقصود بالمعينة هنا أن الله معنا بعلمه أينما كنا، فهو يعلم عنا كل شيء حتى لو كنا في مكان بعيد عن الناس فذكر الإمام مالك هذه العبارة حتى لا يتوهم أحد من الآية السابقة أن الله بذاته في كل مكان، فالله في السماء وفوق العرش كما تقدّم ذكره

menstrual cycle has two options:

- ① the menstruation (if no pregnancy)
- ② pregnancy (if there is embryo)

IMPLANTATION AND FIRST WEEK OF DEVELOPMENT

in general



emergence of cumulus oophorus at Day 14

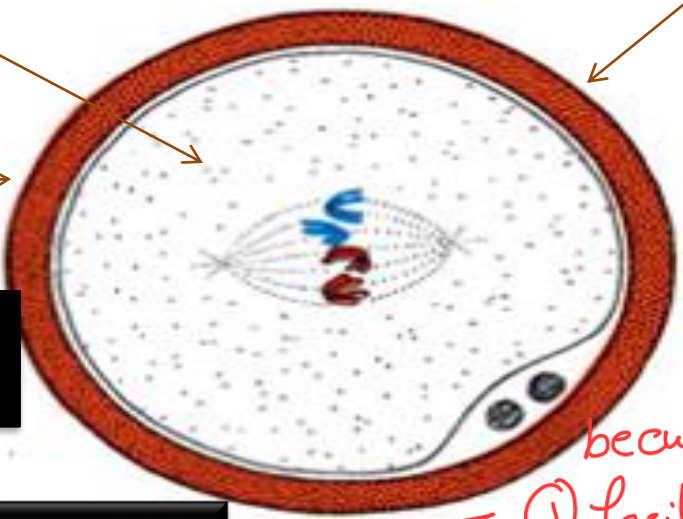
So ...

What we HAVE at the end of fertilization ?!



Fertilized Oocyte covered by Zona pellucida

THE ZYGOTE



Zn, single structure

why zona pellucida still here?

because the its third function

- ① facilitate entrance one sperm
- ② prevent poly spermia
- ③ Prevent fertilization from other species such as animals 🤪

Why does the zygote need zona pellucida?

To prevent early implantation. And and prevent the attachment of zygote to the fallopian tube

The Zygote's Journey to the Uterus

➤ Takes approximately **3 to 4 day**

➤ In this journey the zygote undergoes a series of mitotic divisions called **Cleavage**, that results in an increase in cells number.

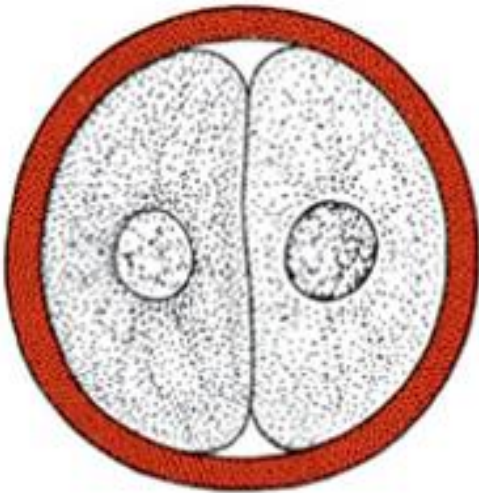
The two cellular stage. (two cells)

Four-cell stage

Eight-cell stage

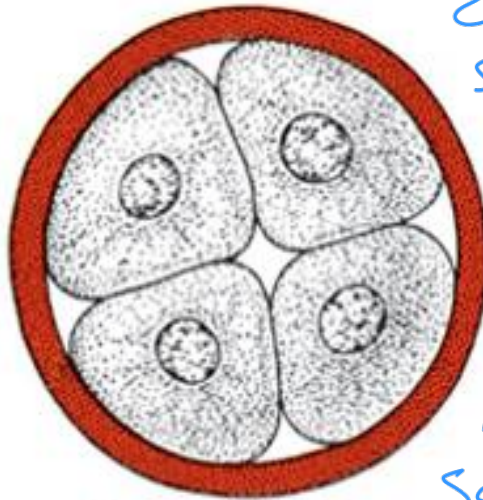
These cells are called **Blastomeres**

still have
zona pellucida
so the size
does not
change
but the
number
is increased
so the same
cytoplasm

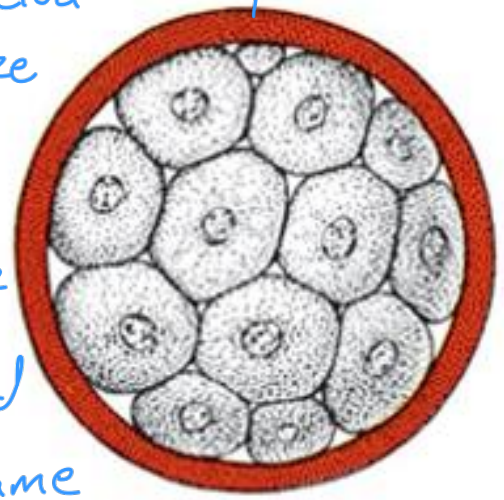


Two-cell stage

blastomeres



Four-cell stage



Morula

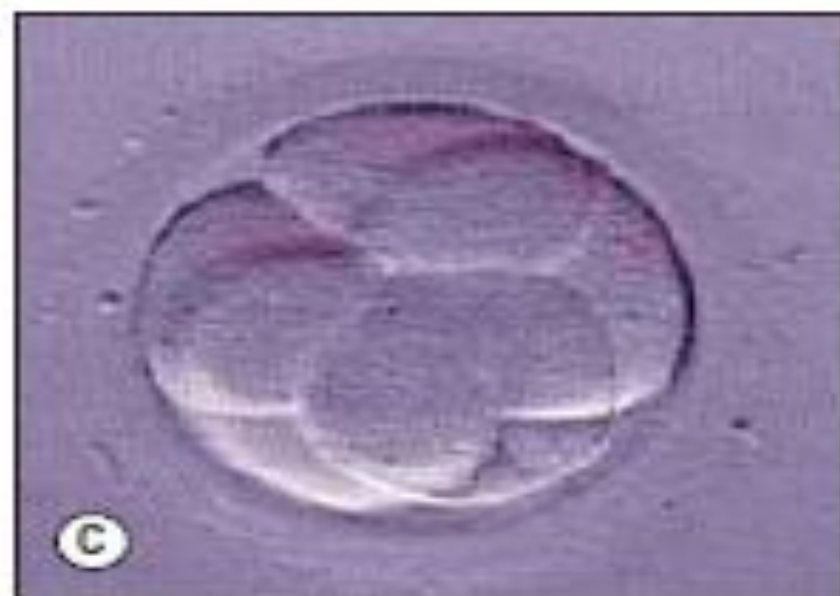
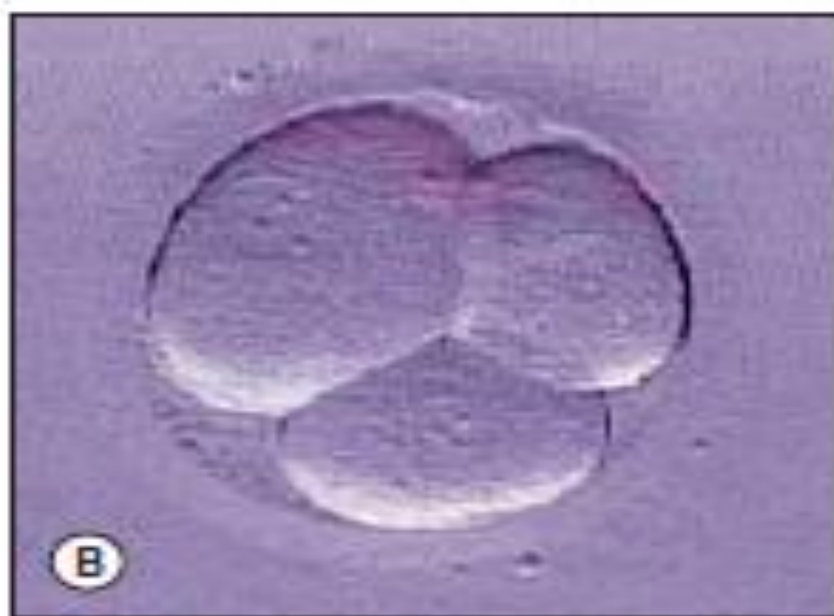


Fig. 8.6 Successive stages of cleavage of a human ootid. **A**, Two-cell stage; **B**, three-cell stage; **C**, five-cell stage; **D**, eight-cell stage.

which is two cells, I refer to it before two slide

➤ Approximately 3 days after fertilization, the **Blastomeres** divide again to form a **16-cell morula (mulberry)**. ! (too many cells they push out the zona pellucida, zona pellucida bulges here and there and it becomes full of bulgings which look like mulberry, but we will call it **morula** from Latin. التوت

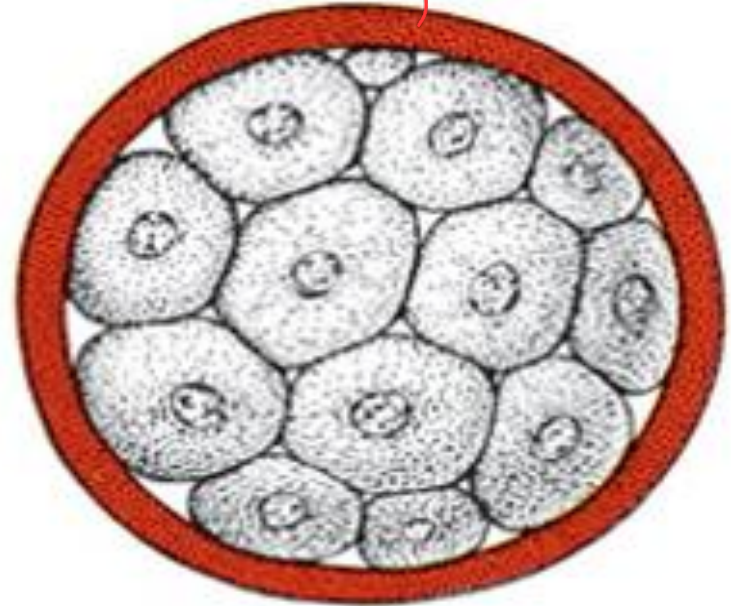
➤ Inner cells of the morula constitute **the inner cell mass** *which will be embryo*

➤ The surrounding cells compose **the outer cell mass** *future blood center*

➤ The inner cell mass gives rise to tissues of **the embryo proper**

➤ The outer cell mass forms the **trophoblast**, which later contributes to the **placenta**.

transparent ←



Morula



Fig. 8.7 Human embryos. Formation of a morula and blastocyst within the zona pellucida and blastocyst hatching from the zona pellucida. **A**, A ball of cells, the morula, with the cells undergoing compaction; **B**, the blastocyst cavity is developing and the inner cell mass can be seen on one side of the cavity; **C**, the blastocyst is beginning to hatch from the zona pellucida.

The morula is heading to the uterus! *in Day 19*

In which stage is the mucosa of the uterus?

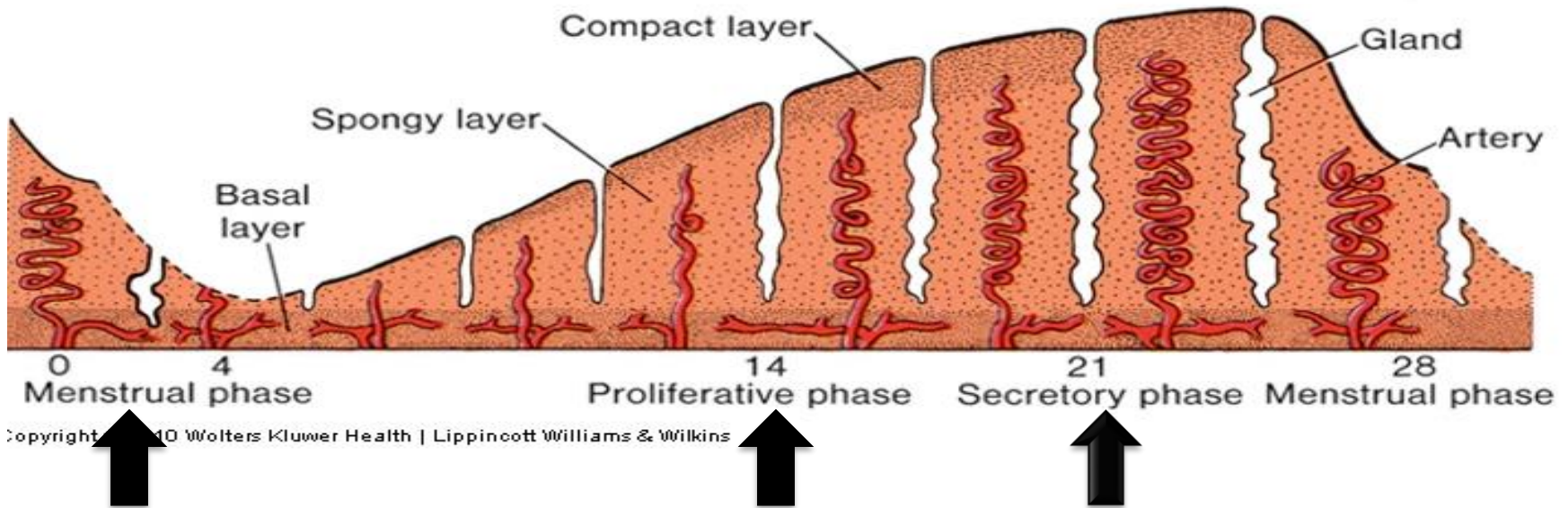
in menstrual cycle

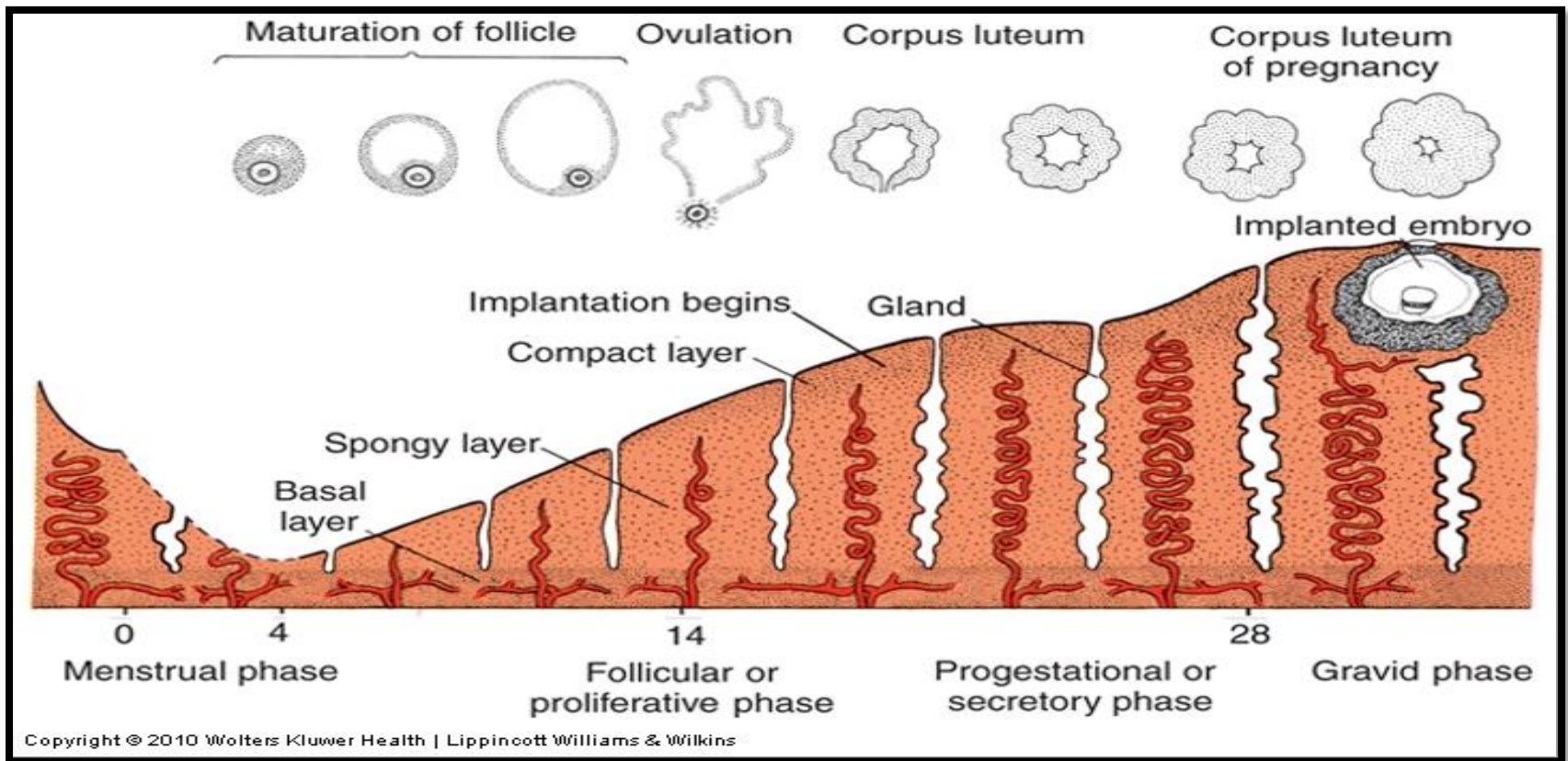
The endometrium is made of two layers

1- **Stratum basalis**

2- **Functional layer** made of

- A) **STRATUM SPONGIOSUM**
- B) **STRATUM COMPACTUM**





At the time that the morula reaches the uterus, the **mucosa** of the uterus is in the **secretory phase** during which: **Uterine glands** and **Arteries** become **coiled** and the tissue become **succulent**.

The morula enters the uterine cavity

Day 4 after fertilization

- Uterine fluid begins to penetrate through **the zona pellucida** into the intercellular spaces of **the inner cell mass**.
which is full in Uterus
- Gradually, the intercellular spaces become **confluent**, and a **single cavity, the blastocele**, forms.

➤ At this time, the embryo
is a blastocyst.

➤ Cells of the inner **cell mass**, now called the **embryoblast**, are at one pole, and those of the outer cell mass, or **trophoblast** flatten and form the **epithelial wall of the blastocyst**

➤ *The zona pellucida disappears to allow implantation*

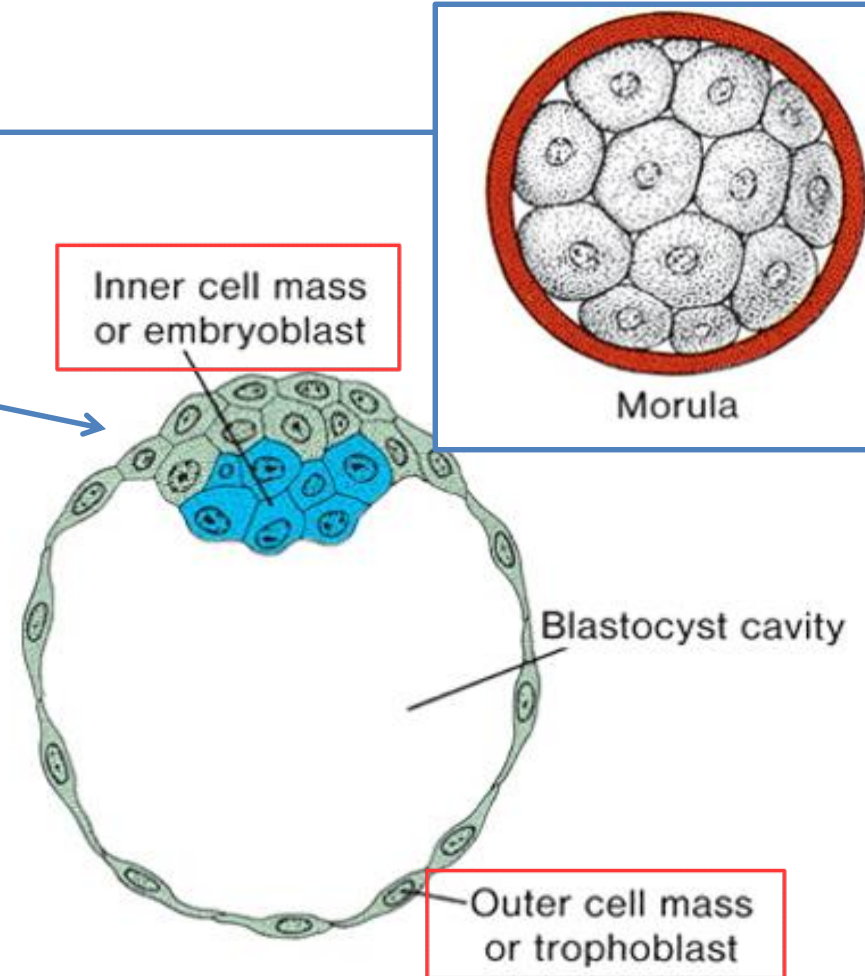




Fig. 8.8 Human blastocyst nearly completely hatched from the zona pellucida. The blastocyst can now expand to its full size.

Day 6 after fertilization

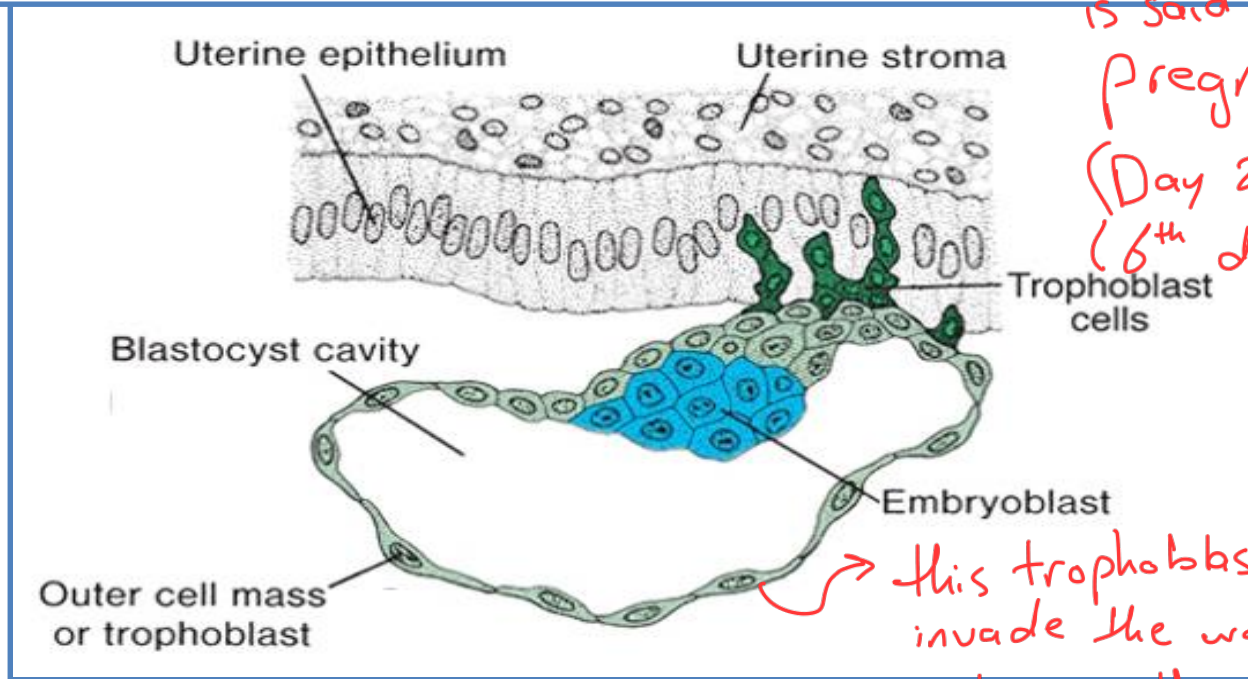
Trophoblastic cells over the embryoblast pole begin to *penetrate* between the epithelial cells of the *uterine mucosa* on about *the sixth day* (*Early implantation*)

from now the female is said to be

Pregnant

(Day 21 of cycle)

(6th day for the embryo)



→ this trophoblast does not invade the wall because it is not over the embryoblast

Pregnancy starts at *Day 6* when Blastocyst loosely attached to endometrium.

So the embryo spent their first week in Fallopian tube (5 day)

If fertilization does not occur, the **corpus luteum** reaches maximum development approximately 9 days after ovulation. Subsequently, the corpus luteum shrinks because of degeneration of luteal cells and forms a mass of fibrotic scar tissue, the **corpus albicans**. *white*

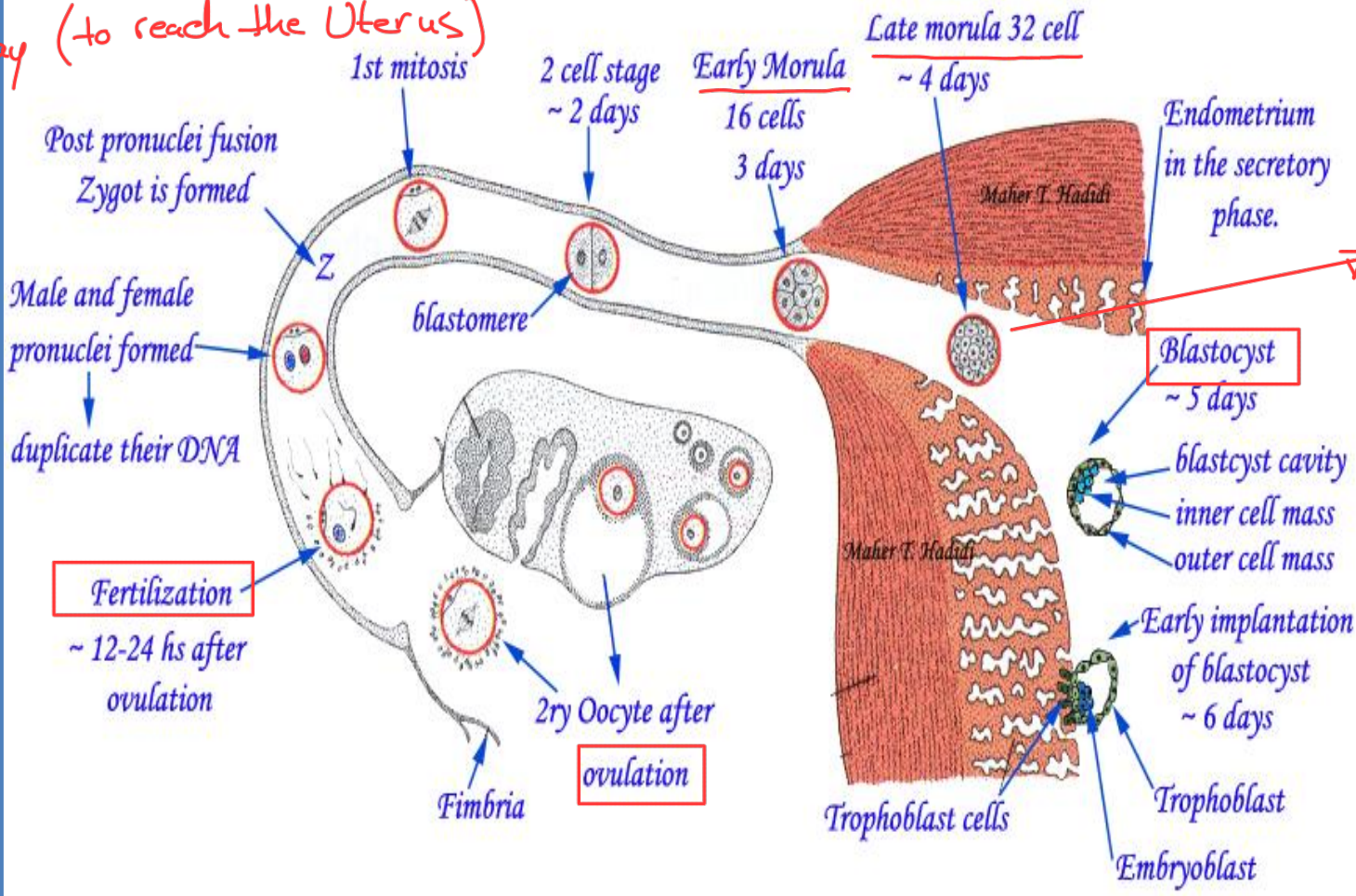
If the oocyte is fertilized, degeneration of the corpus luteum is prevented by **human chorionic gonadotropin (hCG)**, a hormone secreted by the *message* **syncytiotrophoblast of the developing embryo**. The corpus luteum continues to grow and forms the **corpus luteum of pregnancy (corpus luteum graviditatis)**.

By the end of the third month, this structure (**corpus luteum graviditatis**) may be one third to one half of the total size of the ovary. Yellowish luteal cells continue to secrete progesterone until **the end of the fourth month**; thereafter, they regress slowly as secretion of progesterone by the **trophoblastic component of the placenta becomes adequate** for maintenance of pregnancy.

Summary of first week (from Dr. Maher Alhadidi)

Events during first week of development

4 day (to reach the Uterus)



here we want to get rid of zona pellucida