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 proceeding **the menopause**

The endometrial cycle (menstrual cycle)

Menstrual cycle is under the control of the ovaries

➢**Remembe**r that the primary, secondary and graafian follicles all contain theca interna and granulosa cells which secret **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.

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

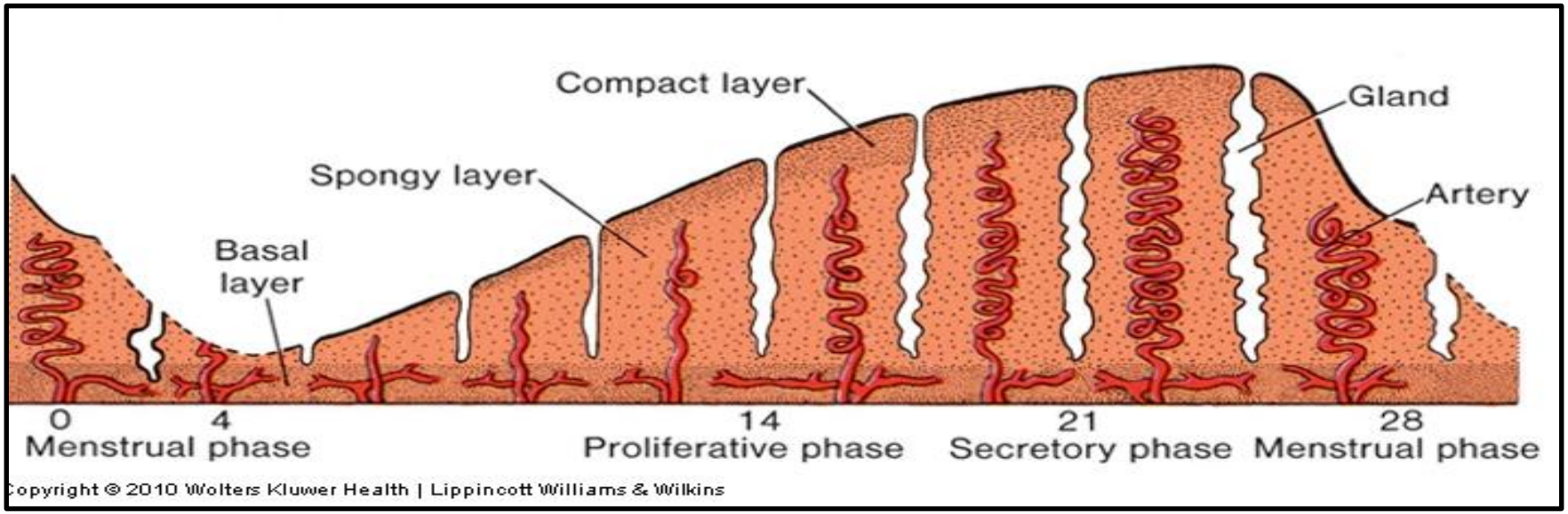
1- **Stratum basalis:** Adjacent to the mometrium

-Unresponsive to hormonal stimulation

-Remains intact throughout the menstrual cycle

2- **Functional layer made of** **A) STRATUM SPONGIOSUM**

B) STRATUM COMPACTUM



Menstrual cycle consists of three phases;

1- Follicular or proliferative phase

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 progestational phase

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

3- Menstrual phase

1-Follicular /proliferative phase

Estrogen ⇨ mitotic activity in the glands & stroma ⇨

↑ endometrial thickness from 2 to 8 mm

(from basalis to opposed basalis layer)

2-Luteal /secretory phase

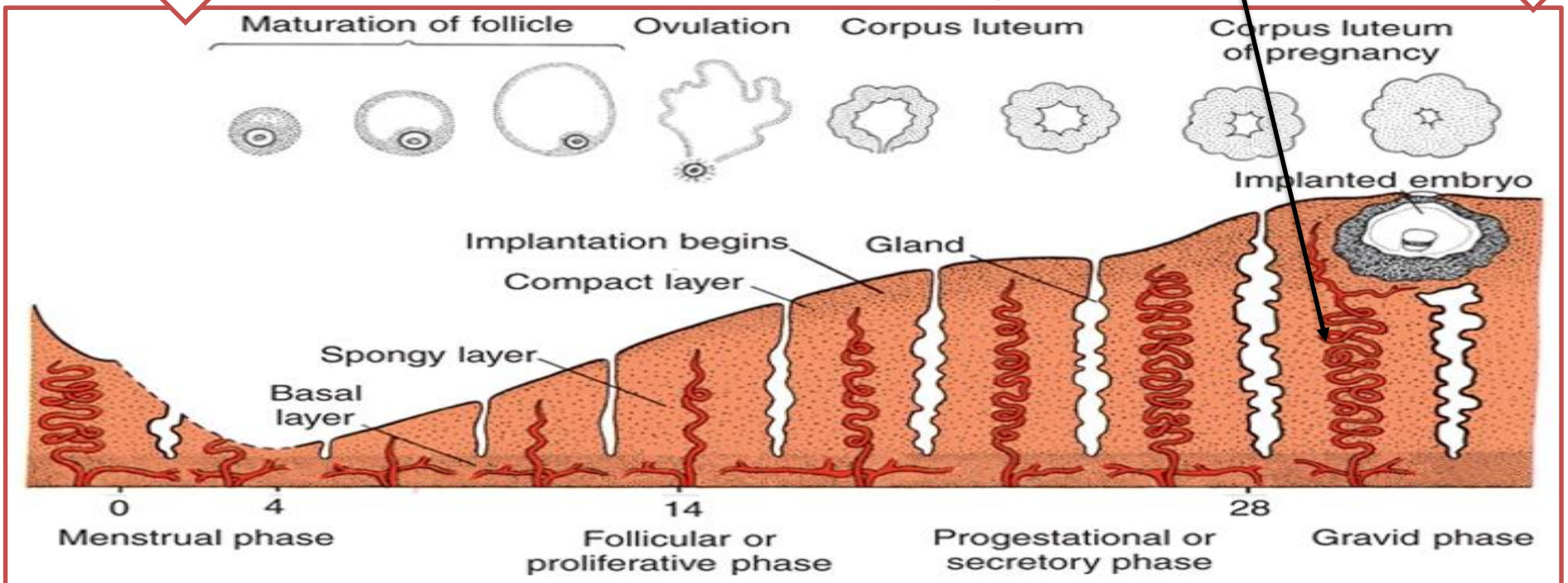
Progestrone ⇨- Mitotic activity is severely restricted

-Endometrial glands produce then secretes glycogen rich vacules

-Stromal edema

-Stromal cells enlargement

-***Spiral arterioles develop, lengthen & coil***



3-MENSTRUATION

- Periodic desquamation of the endometrium
- The external hallmark of the menstrual cycle
- Just before menses the endometrium is infiltrated with leucocytes
- Prostaglandins are maximal in the endometrium just before menses
- Prostaglandins ⇨ constriction of the spiral arterioles ⇨ischemia & desquamation

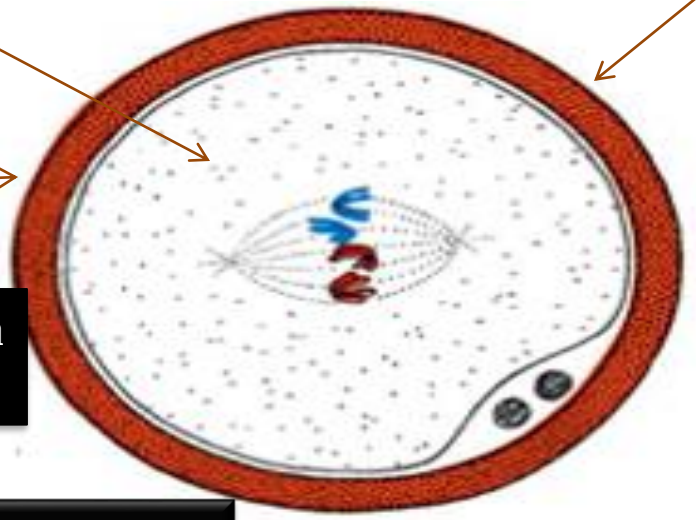
  Followed by arteriolar relaxation, bleeding & tissue breakdown


IMPLANTATION
AND
FIRST WEEK OF
DEVELOPMENT

So …

What we HAVE at the end of fertilization ?!

Fertilized Oocyte covered by Zona pellucida



THE ZYGOTE

Why does the zygote need zona pellucida?

To prevent early implantation. And …….

The Zygote's Journey to the Uterus

➢Takes approximately **3 to 4 day**

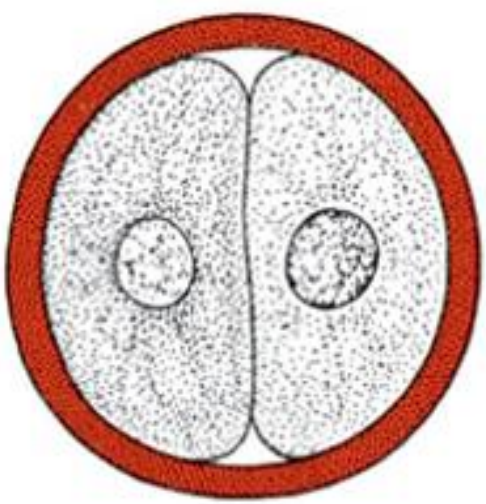
➢**In this journey the zygote undergoes** a series of mitotic divisions called **Cleavage,** that results in an increase in cells number.

The two cellular stage. (two cells)

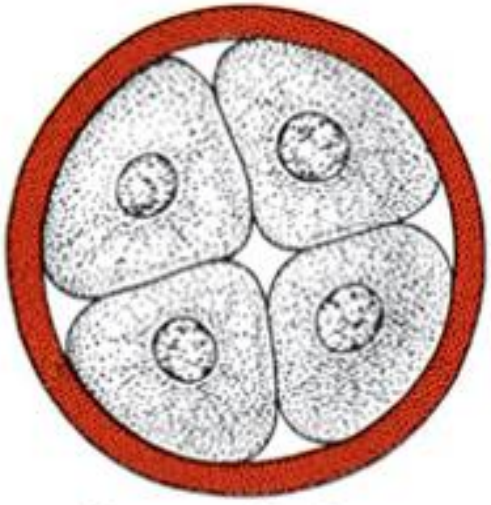
Four-cell stage

Eight-cell stage

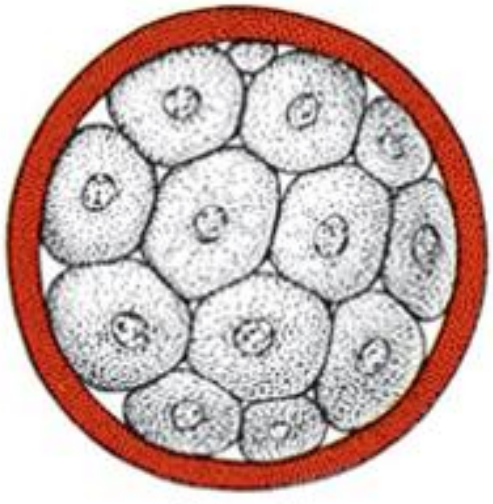
These cells are called Blastomeres



Two-cell stage



Four-cell stage



Morula

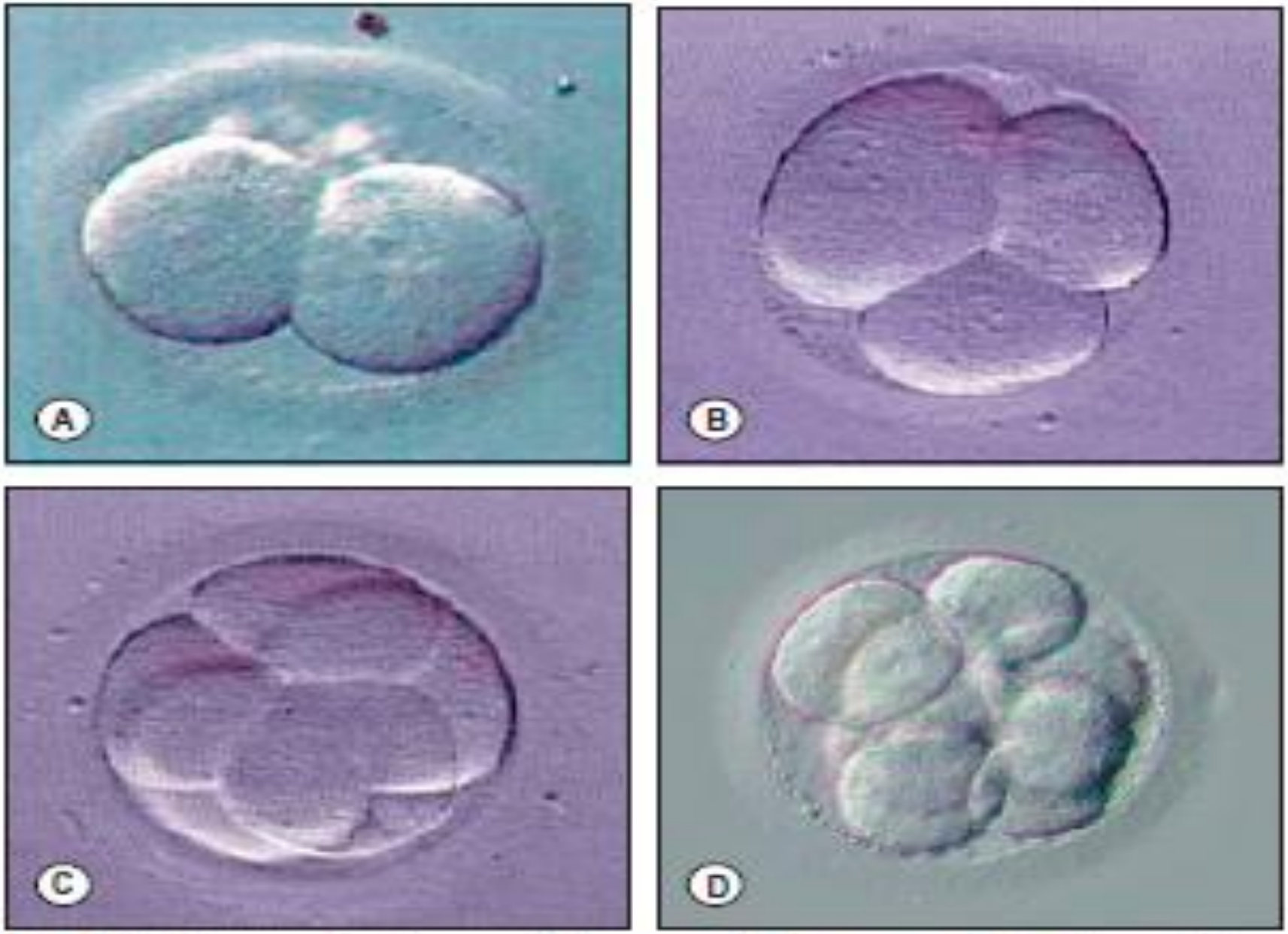


Fig. 8.6 Successive stages of cleavage of a human ootid. **A**, Two-cell stage; **B**, three-cell stage; **C**, five-cell stage; **D**, eight-cell stage.

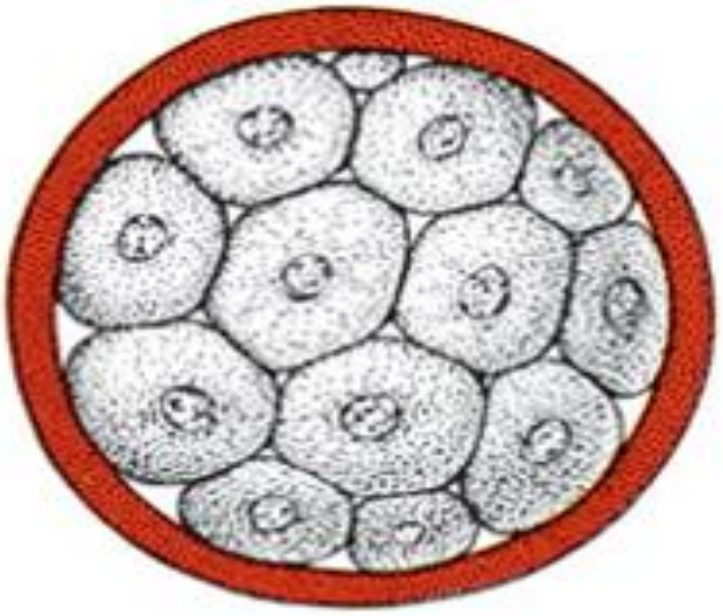
➢Approximately **3 days after fertilization, the <u>Blastomeres</u>** divide again to **form a 16-cell morula (mulberry). !** (too many cells they push out the zona pellucida, zona pellucida bulges here and there and it becomes full of bulgings which look like **mulberry**, but we will call it **morula**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

➢Inner cells of the morula constitute

the inner cell mass

➢The surrounding cells compose

the outer cell mass



Morula

➢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.

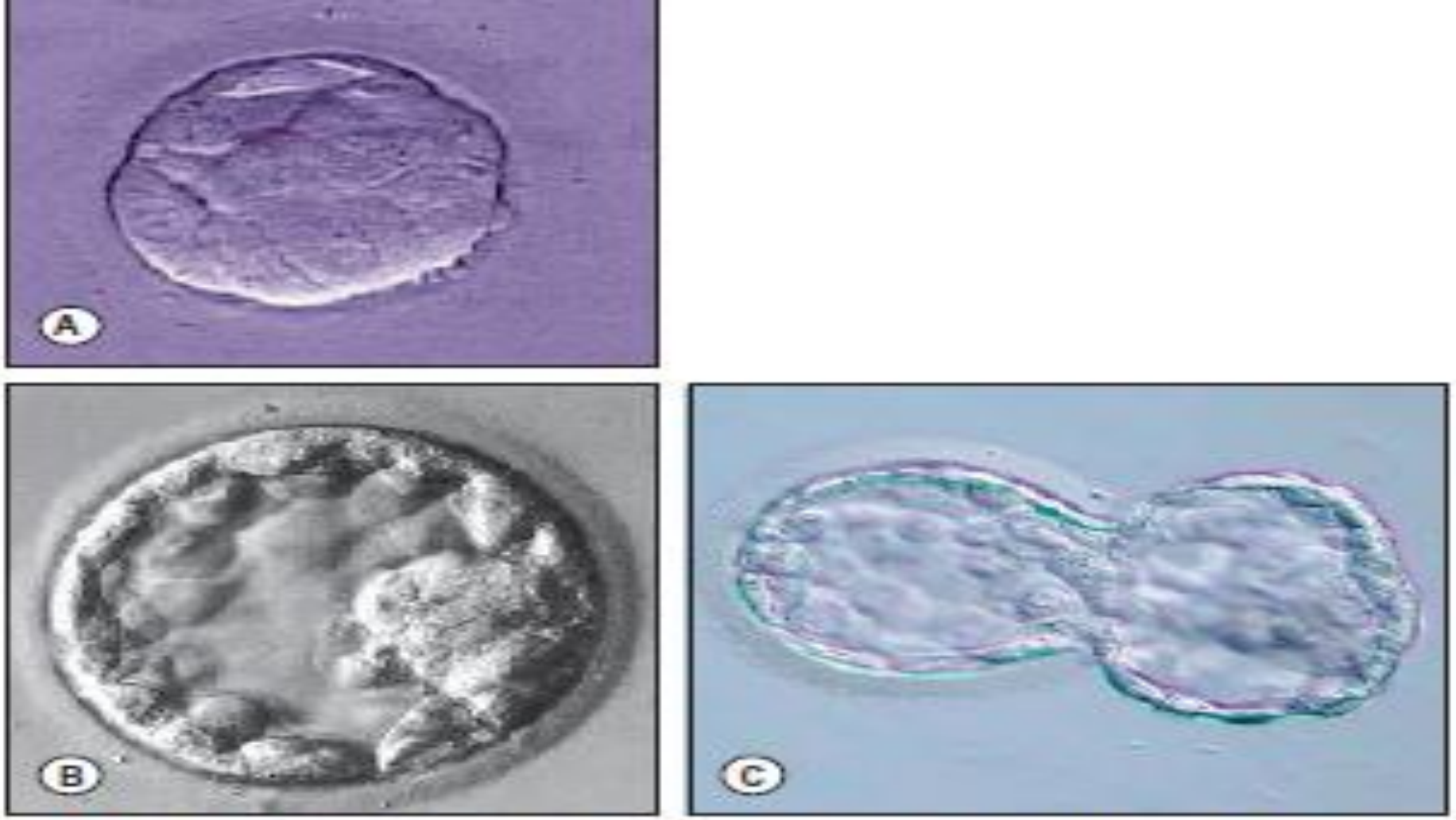


Fig. 8.7 Human embryos. Formation of a morula and blastocyst within the zona pellucida and blastocyst hatching from the zona pellucida. **A**, A ball of cells, the morula, with the cells undergoing compaction; **B**, the blastocyst cavity is developing and the inner cell mass can be seen on one side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

The morula is heading to the uterus!

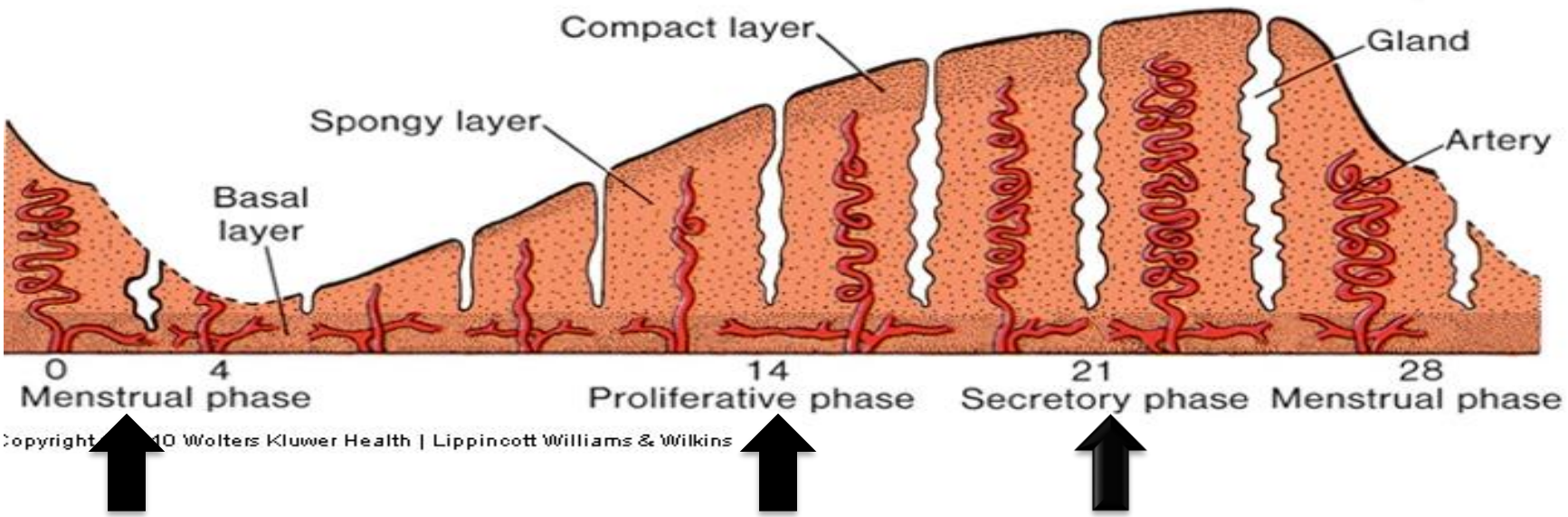
In which stage is the mucosa of the uterus?

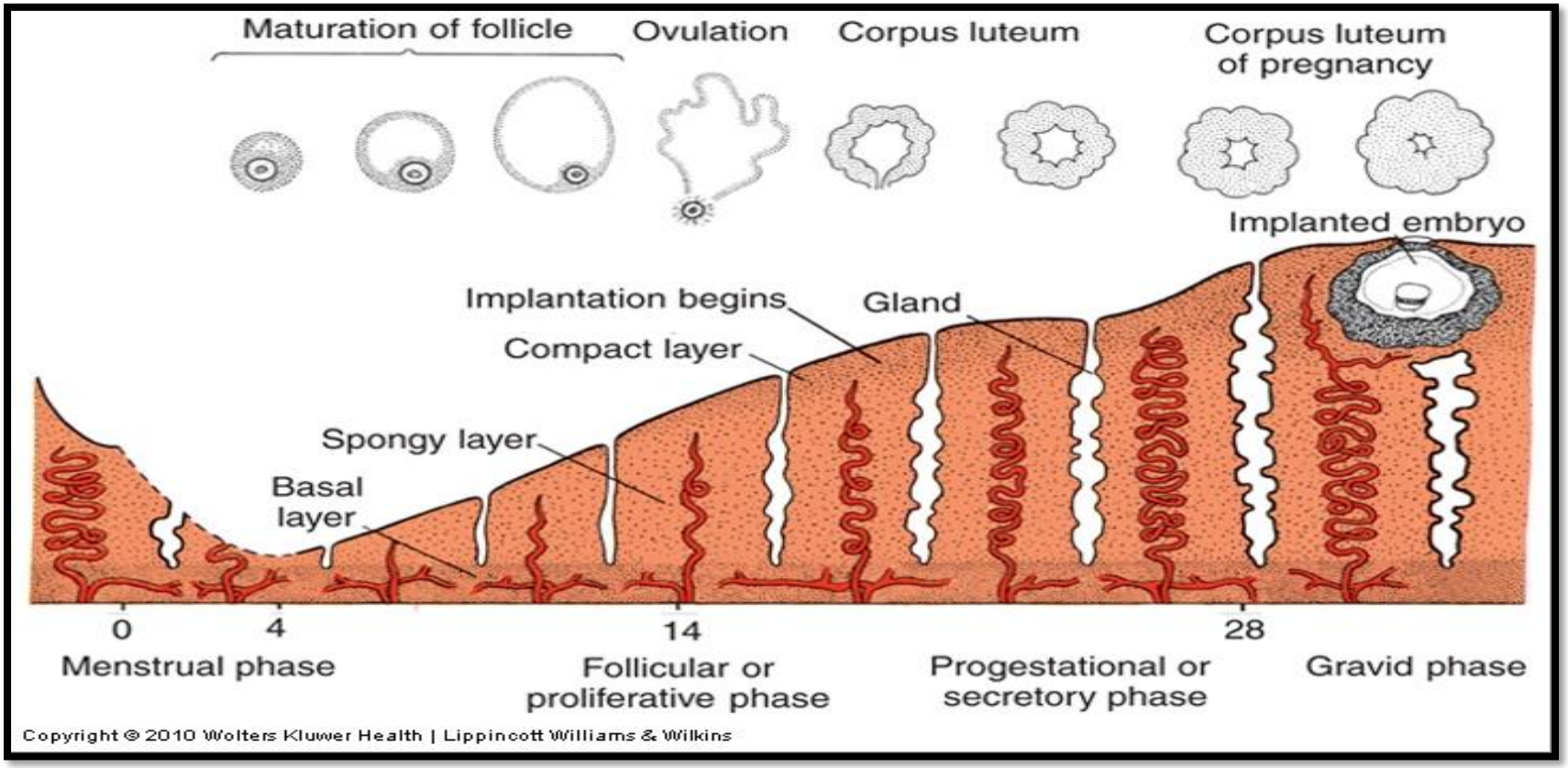
The endometrium is mad of tow layers

1- **Stratum basalis**

2- **Functional layer made of** **A) STRATUM SPONGIOSUM**

B) STRATUM COMPACTUM





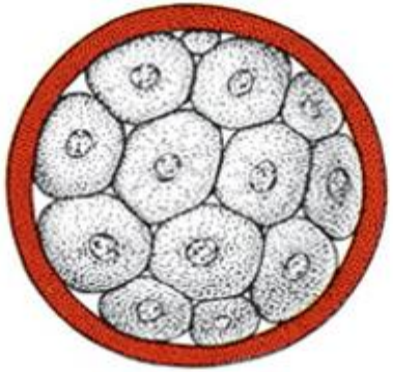
At the time that the morula reaches the uterus, the mucosa of the uterus is in the secretory phase during which:

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**.
- Gradually, the intercellular spaces become **confluent, and a single cavity, the blastocele, forms.**

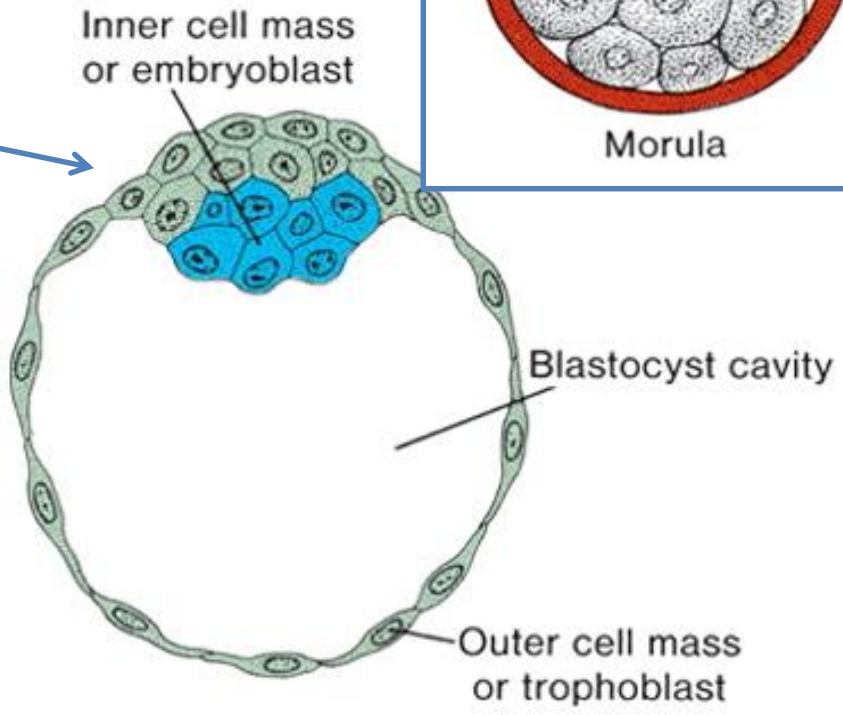


Morula

- 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**

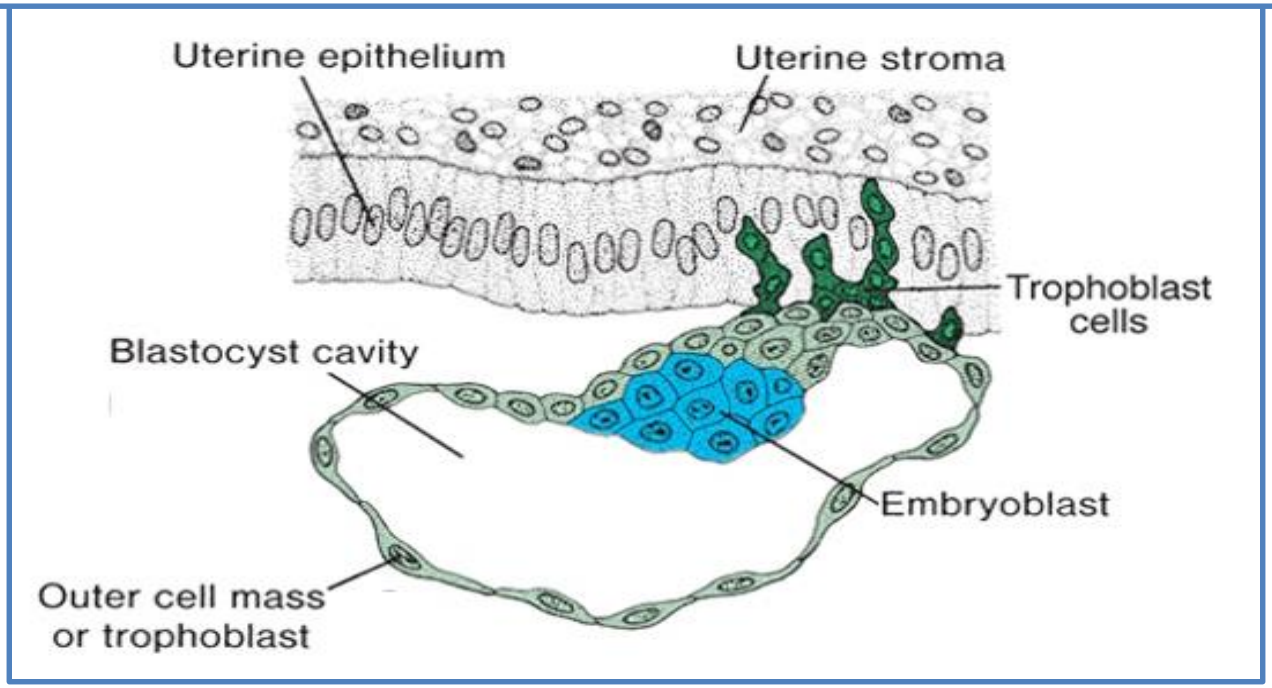


- ***The zona pellucida disappears to allow implantation***

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)*



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

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 lutean cells and forms a mass of fibrotic scar tissue, the **corpus albicans**.

If the oocyte is fertilized, degeneration of the corpus luteum is prevented by **human chorionic gonadotropin (hCG),** a hormone secreted by the **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.

Events during first week of development