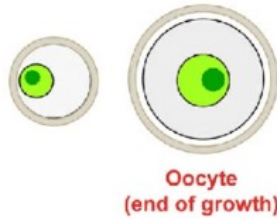


TO BE KEPT IN MIND

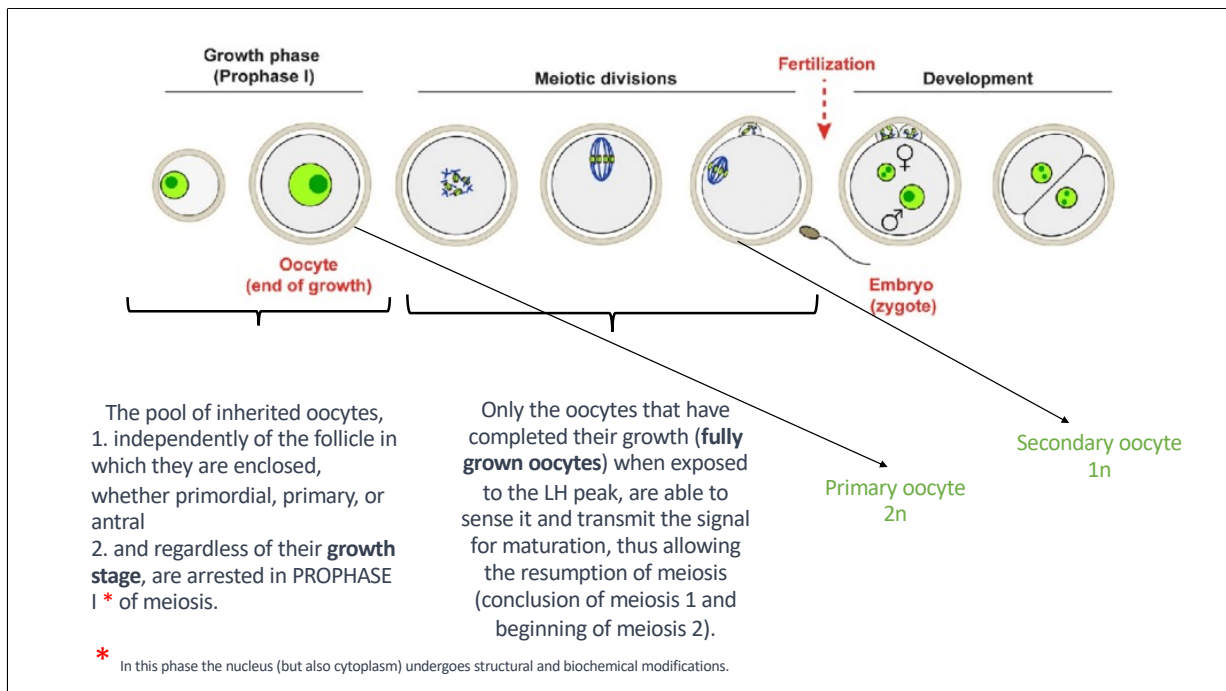
Structural and biochemical modifications discussed in this course module are associated with oocytes that, from a meiotic perspective, are arrested in **Prophase I of Meiosis I**.

These modifications are crucial for achieving the appropriate level of growth, involving the storage of lipids, proteins, and everything necessary to support subsequent phases like maturation and fertilization. Only oocytes that have accumulated all these resources can be considered fully grown, and only these oocytes can sense the LH surge and respond to it correctly.

**Growth phase
(Prophase I)**



https://www.google.com/search?sca_esv=945791448f04a98e&rlz=1C5CHFA_enIT909IT909&q=meiosis+i+and+ii+oocyte&tbm=vid&source=Inms&sa=X&ved=2ahUKEwj7y4OA0ZmEAXVISfEDHWBaBXkQ0pQJegQICxAB&biw=1354&bih=728&dpr=2#fpstate=ive&vld=cid:d5a93e81,vid:_AP3A39p8Z4,st:0



The pool of inherited oocytes,

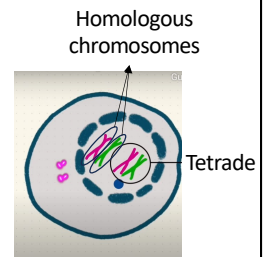
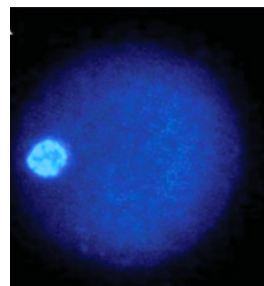
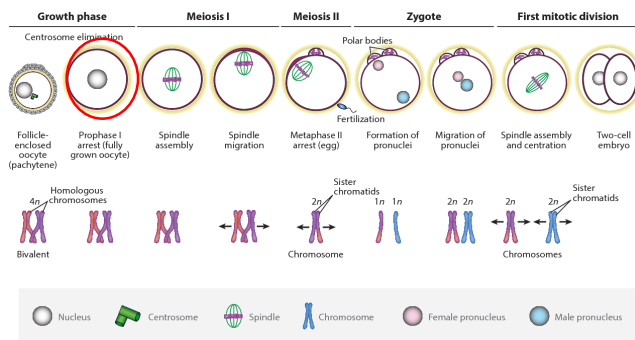
1. independently of the follicle in which they are enclosed, whether primordial, primary, or antral
2. and regardless of their **growth stage**, are arrested in PROPHASE I * of meiosis.

Only the oocytes that have completed their growth (**fully grown oocytes**) when exposed to the LH peak, are able to sense it and transmit the signal for maturation, thus allowing the resumption of meiosis (conclusion of meiosis 1 and beginning of meiosis 2).

Prophase I Greminal Vesicle (GV)

Leptotene
Zygotene
Pachytene
Diplotene
Diakinesis

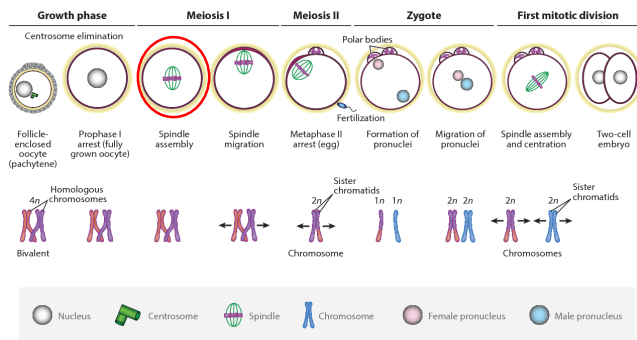
Chromatids start to condense
Homologous chromosomes find each other and pair up (through a process named synapsis). Two pairs together form a tetrad.
Chromatids from different pairs exchange genetic material (crossing over)
Formation of a chiasma (chromatids came very close) in the region of material exchange.



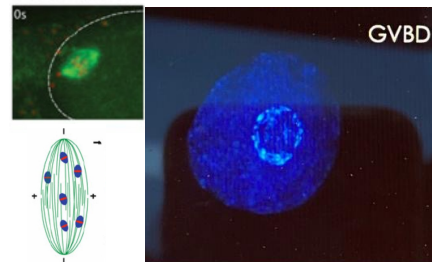
LH stimulus →

Meiosis I resumption Germinal Vesicle Breakdown (GVBD)

The nuclear envelope disassembles and a **spindle** machinery that is assembled from **microtubules** captures and aligns the liberated chromosomes at its centre.



Prometaphase

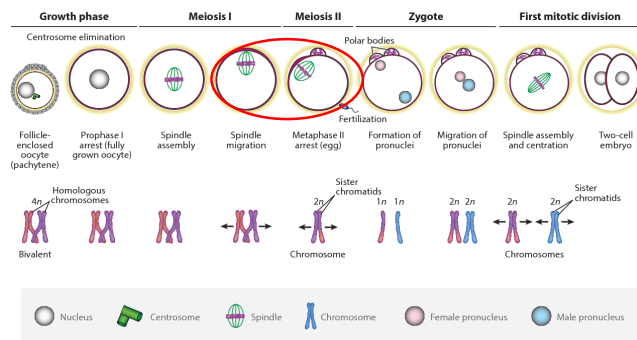
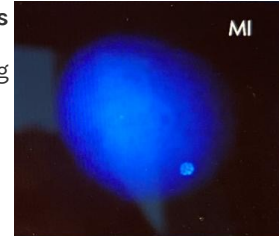


Meiotic resumption from the prophase of MI is morphologically characterized by the dissolution of the oocyte nuclear envelope, which is generally termed the "germinal vesicle breakdown" (GVBD).

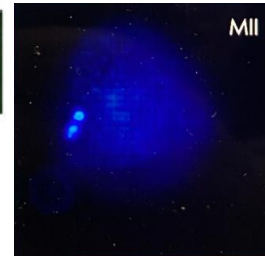
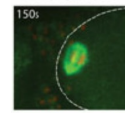
A **spindle** machinery that is assembled from **microtubules** captures and aligns the liberated chromosomes at its centre.

Ending to Metaphase II of Meiosis II Waiting for fertilization

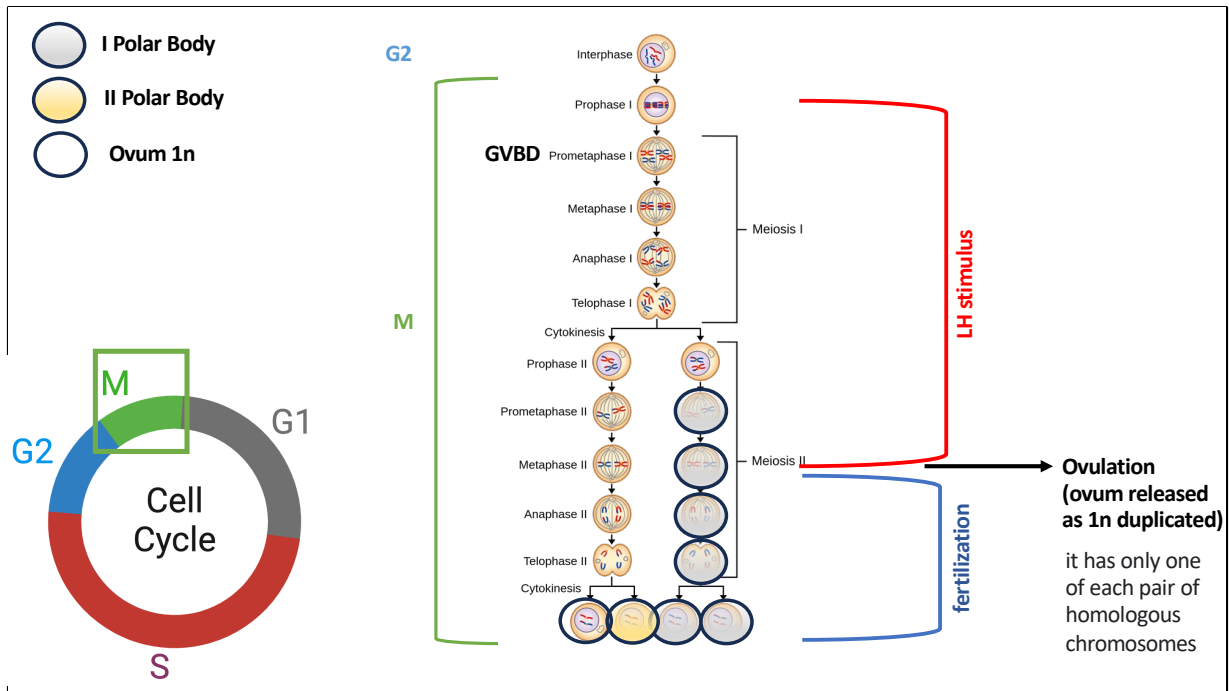
The spindle **asymmetrically** relocates to the oocyte surface where the **homologous chromosomes** are segregated at **anaphase I (MI image)**. Half of them are eliminated into a very small cell termed polar body. The remaining chromosomes are captured and aligned by the second meiotic spindle. **At this stage, the cell is called an egg** and awaits fertilisation.



Metaphase



Following GVBD and completion of MI, the oocyte enters meiosis II without an obvious S-phase (for this reason this meiosis is considered as «reductional») and arrests at metaphase phase II (MII) until fertilization. The spindle **asymmetrically** relocates to the oocyte surface where the **homologous chromosomes** are segregated at **anaphase I (MI image)**. Half of them are eliminated into a very small cell termed polar body. The remaining chromosomes are captured and aligned by the second meiotic spindle. At this stage, the cell is called an egg and awaits fertilisation.



The formation of the ovum consists of two events that are happening at the same time:

1. The first event is the meiotic event (oogenesis), where takes place meiosis one and two.
2. The second event that occurs at the same time is the development of the follicle.

During the fetal development, about 7 million primary oocytes sites are produced.

After birth, about 6 million of these will undergo apoptosis (programmed cell death). So, from the 7 million we now have 1 million primary oocytes remaining, and these primary sites will continue to die until the female reaches puberty. At puberty, primary all sites will reduce to about 300,000 and all are still at prophase I of meiosis I.

