### Spermatozoa production



## Spermatozoa production

The tubules themselves are lined with cells called spermatogonia. These cells turn into spermatozoa and also undergo mitosis to replenish their number.



Inside the tubules, the process of the spermatogonia turning into spermatozoa takes place as the cells move from the edge of the tubule (basal lamina) to the center (lumen).

During this process the developing spermatozoa is attached to a cell called Sertoli Cell, which provides nutrients and has other functions.



Once in the lumen of the seminiferous tubule they move along it and towards the storage cavity of the testicle called the epididymis.





The sperm has a flagellum, a nucleus and some mythochondria.

An organelle called acrosome in the head of the sperm contains hydrolitic enzymes such as hyaluronidase (and other things). This organelle has two functions:

1. Allow the sperm to go through the zona pellucida of the egg

2. Carry out the acrosome reaction (later described)

\* Only the nucleus, acrosome, mitochondria and flagellum are required.

## **Oocyte production**

One transcentent feature of mammals is that every oocyte is partially formed at birth

During the embryonic development of the female, some cells in the tissues that will become the ovaries start to differenciate into oogonia, and the cells surrounding them develop into a follicle.

The whole structure is called a primary follicle, each of which contain one single primary oocyte that has started meiosis I but the process is in stand-by (arrested)



The primary follicles start their development and mature in the ovary, therefore the ovary at all times contains primary follicles at different stages of maturation.

At the late stages of maturation the primary follicles become dependent on hormones and a few of them finish meiosis I. At this point the cells surrounding the oocyte (now called secondary) have multiplied and starting the generation of two concentric layers separated by fluid.



The follicle is called Graafian follicle if the cell layers have separated and generated a gap between called antrum. The antrum will soon contain a jelly-like fluid attached to the corona radiata.

When ovulation occurs, the Graafian follicle will rupture and the jelly blob will be expelled to the peritoneum, dragging the secondary oocyte.

It is subsequently caught by the fimbriae and carried along the fallopian tube.



The cells of the Graafian follicle that made up for the outer layer stay in the ovary and continue to multiply until they make up for a yellow corpuscule called the corpus luteum

The corpus luteum secretes progesterone, which will prevent the endometrium from decaying. It also secretes some estrogen.

The corpus luteum is also very sensitive to a hormone called human chorionic gonadotropin.



The egg that has been release into the fallopian tubes is a secondary oocyte, that is, it still hasn't finished meiosis.

When the sperms reach it, they release the enzymes present in their acrosomes to break through the corona radiata and zona pellucida

The cortical reaction is a series of events that "make sure" only one sperm deposits its nucleus' content into the secondary oocyte.



As a consequence of the cortical reaction, the secondary oocyte finishes meiosis II and releases another polar body. Then and only then, the nucleus of the sperm fuses with that of the egg.

The zygote reaches the endometrium about a week later and, by then, it is about 100 cells (not bigger)

This entity called blastocyst has a bubble of cells called the trophoblast. Attached to a side there is the "inner mass cell" (self explanatory) and most of the volume is just fluid.

When the blastocyst touches the endometrium, the membranes will interact and, as a result of this, the blastocyst will be "implanted".



The zygote will soon start releasing human chorionic gonadotropin, which will tell the corpus luteum to grow bigger and produce more progesterone.

The cells of he blastocyst proliferate obtaining nutrients from the endometrium. This process is slow at first but then a structure called placenta forms.

The placenta accelerates the exchange of nutrients between the mother's blood and the foetus'

Two blood vessels carry blood from the foetus to the placenta, where they branch into capillaries that intertwine with the mother's capillaries.



The placenta is extremely "careful" when it comes to allowing passage to substances. Nothing bigger than a protein usually goes trough, except in cases of trauma.

It also takes over for the production of progesterone (the corpus luteum eventually dies) during the second and third trimesters.

Another function of the placenta is to produce oestrogen, which makes the uterine muscle sensitive to the hormone oxytocin.

The cells of the placenta come from the trophoblast and therefore have genetic material from the foetus.



During the pregnancy, progesterone supresses the uterine contractions, but as the placenta and the foetus grow, the placenta eventually secretes enough oestrogen to counteract the effect of progesterone. This causes some contractions and a positive feedback loop occurs.



# Any Questions?