**Sertoli cells functions:**

1)sertoli cells are critical for spermatogenesis (development of sperms).

2)sertoli cells phagocytos the excess cytoplasm resulted from the transformation of spermatids to sperms as well as, the damaged (dead) germ cells.

3)provide structural/physical support and nutrition for the sperms (as many as 6-12 spermatids are attached to one sertoli cell ).

4) secrete fluids and assist in Spermiation(the release of sperms into the lumen).

Note : don’t confuse between spermatogenesis and spermiation.

\*spermiation may involve plasminogen activator, which converts plasminogen to plasmin, a proteolytic enzyme that assist in the release of mature sperms into the lumen .

5)sertoli cells also synthesis also large amounts of transferrin , an iron transport protein important for sperm development.

6)sertoli cells also produce glycoprotein hormones ( inhibin ,activin ,follistatin) that regulate the secretion of FSH.

-After the production of the sperms ,they spend some time (1 day-10 days) to mature in the epididymis

-Look at the picture of the epididymis at page 2 in the booklet.

\*if sperms are taken immediately after production ”from the **head** of the epididymis”, they will be immotile (they need to spend enough time in the epididymis to mature)

Maturation includes changes in the metabolism , morphology and motility , consequently gaining the capability to fertilize the ovum .

\*sperms taken from the **body** of the epididymis are motile, almost 50% of them are motile.

\*sperms taken from the **tail** of the epididymis “adjacent to vas deferens” ,are totally motile.(can fertilize the ovum).

-After maturation ,sperms will be stored : the majority in the vas deferens and the ampulla of vas deferens ,Little amount in the epididymis

-Normal functioning of the epididymis and vas deference and other accessory sex organs depends on the normal functioning and normal concentration of androgens specially from the testes .

-please read about the Storage of sperms”page18”

-motility is obviously important in vivo , but not that important in vitro because immotile sperms can be injected into the ovum and the process works .

-the ability to move forward ,which is acquired in the epididymis, involve the activation of unique protein called catSper located in the principal piece of the sperm tail .

-this protein is a calcium ion channel that permits cAMP generalised calcium influx.

-in addition sperms express olfactory receptors and ovaries provide odorant-like molecules "as a signal to attract the sperms" (these molecules and receptors interact to promote the movement of the sperms toward the ovary)>>chemotaxis.

-when the sperms are ejaculated into the female reproductive system , they gain the capability to fertilize the ovum (this is called capacitation).

-the capacitation is facilitatory rather than obligatory for the fertilization(it’s not essential), because in vitro it’s not needed (they can fertilize the ovum even from immotile sperm) , fresh sperms (uncapacitated) may reach the ovum but they move very slow)

-sperms can survive many weeks in the genital ducts of the testes , and in the female reproductive system for about 2 days .

-read the (Hormonal Factors That Stimulate Spermatogenesis) “page 19”

\*\***Some notes about page19:**

**\***meiosis does not occur in the absence of testosterone.

**\***hormone and their receptor are like the key and the lock, there are receptors bind to prolactin as well as LH, all these receptors are similar to accept those hormones, THE DIFFERENCE is the affinity, when the receptor binds LH, in structure there is no difference between this receptor and that receptor which bind prolactin "the difference is the affinity" (but we do NOT know how the affinity works).

SO if two hormones bind to the same receptor ,the structure of them must be the same, and the difference is in the affinity e.g.: prolactin binds the receptors of LH, BUT prolactin,s receptors does not has any affinity to the LH .

**\***Estrogens produced from the testosterone under the effect of the aromatids enzymes in the sertoli cells.

**-other factors that affect spermatogenesis** :

1.most of the other hormones , specially insulin and thyroid hormone are essential for normal spermatogenesis .

\*in thyroid cancer …..infertility occurs.

2.also ,diet affect spermatogenesis ,, in complete starvation the spermatogenesis arrested .

3.radiations.

4.vitamins "E, B, A and C" are essential for spermatogenesis.

5.diseases may affect spermatogenesis , specially that rise the body temperature (mumps, typhus)

-in the last 3 months of pregnancy testosterone and insulin-like hormones from leyding cells promote the descending of the testis into the scrotum , before that(in the first 6 months) ; the testis were in the abdominal cavity.

-if the testis remain in the abdominal cavity ; this’s known as **(cryptorchidism)**

\*this’s due to deficiency of testosterone and insulin-like hormones.

\*\*cryptorchidism occurs in 30% of premature babies "premature: means delivered after the 7th month of pregnancy", and occurs in 1-3% in full-term babies that are delivered after 9 months of pregnancy.

-the testis have to descend into the scrotum because the temperature is low there and this’s the proper medium for spermatogenesis.

-the testes is the site for sperm formation ;**specifically in the scrotum** because of :

1. counter current mechanism in the testis in the scrotum (arteries bring warm blood while cooler venous blood leaving the testis)

2.the The cremasteric muscle which responds to changes of temperature by moving the testis closer or farther away from the body.

-so if the testis remain in the abdominal cavity , spermatogenesis doesn’t occur.

-for boy’s with cryptorchidism , Most of the time, a boy’s testis descend by the time, when he’s 1 year old without operations.

The doctor showed graph for testosterone concentration in plasma during different ages.

-the testosterone levels in fetal life are relatively very high(between 8-18 weeks of gestation); important for the differentiation of male genital organs.

-leyding cells at this time are prominent and reaching their maximal steroidogenic activity at about 14 weeks of gestation.

-because of the fetal hypothalamic-pituitary axis is still underdeveloped , HCG (human chorionic gonadotropin) from the placenta “rather than LH from the fetal pituitary” ; controls the production of testosterone ; LH and the HCG bind the same receptors on leyding cells.

-also small amounts of HCG is secreted from the testis, pituitary gland and other non-placental tissues, the testosterone during this period under the effect of hormone of placenta HCG hormone binds with the receptors on the leyding cells.

-Testosterone is a prohormone (can be converted to other related hormones)

-testosterone presents as its original structure “testosterone” in: testis , pituitary , muscles.

-testosterone presents as “estradiol” in : fat , liver , skin , hair , CNS.

-testosterone presents as” dihydrotestosterone“ in : prostate ,scrotum, penis , bone.

\*the biological effect of dihydrotestosterone is about (30- 50) times higher than that for testosterone.

-testosterone presents as “ketosteroids” in : liver , kidney.

-also testosterone may be exist conjugated with enzymes in the liver and the kidney.

\*high concentrations of dihydrotestosterone may cause prostate cancer,,,remember that PSA is an indicator for the hypertrophy or hyperplasia of prostatic epithelial cells.

\*\*To stop hypertrophy or hyperplasia of prostatic cells :

-Drugs that inhibit 5-alpha reductase are currently used to reduce prostatic hypertrophy

-in addition to these drugs we can stop or reduce the testosterone functioning , by many methods , like de-sensitization of the receptors for GnRHs "that are FSH & LH".

\*\*\*several tissues beside the testis including adipose tissue ,brain , muscles ,skin and adrenal gland cortex ; produce testosterone and several other androgens…..these substances may be synthesized de novo or produced by peripheral convergence of precursors.

\*\*لم تتم كتابة أرقام "السلايدات" لعدم تواجدها في الدوسيه المقررة , كما أنه لا يتواجد معنا سوى "سلايد" واحد فقط من التي قام الدكتور بعرضها !! ☹

 