SERTOLI CELLS

The cell in seminiferous epithelium responsible for nutrition and development of germ (sperm) cells.

Gender: ♂ Male

About Sertoli cells

Function

A Sertoli cell is a kind of cell, that secretes chemical substances necessary for the development and management of germ cells, resulting in the sperm cell production. It also blocks the interaction of blood with germ cells to prevent any damages done by the body immunity to its own germ cells and contrariwise it prevents the germ cells to provoke an immunological reaction in its own body.

One of the main parts of a testicle is the seminiferous (germinal) epithelium of seminiferous tubules responsible for the sperm cells production. There can be found very specific type of cells with utmost importance for development of sperm cells at different stages, called Sertoli cells. Sertoli cells have fundamental importance to the development and maintenance of spermatogenesis. There is a proportional numerical relationship of Sertoli cells to the sperm cell production. Sertoli cells secrete signaling molecules that promote sperm production and can control whether germ cells (“young” sperm cell stages) live or die. Sertoli cells take elongate form branching all stages of developing sperm cells, they physically extend themselves around the germ cells.

Other function of Sertoli cells

Sertoli cells do not only control the process of spermatogenesis, but they are also responsible for creating so called immunologically privileged area in the testicles. It means, that Sertoli cell manage to keep blood separated from seminiferous tubules through the connection between them, called tight junction. Tight junction keeps bloodborne substances from reaching germ cells, so all stages of germ cells are protected from the body immunity. Tight junction also keeps surface antigens found on developing germ cells from eluding into the bloodstream so no autoimmune reaction could happen. Since Sertoli cells form the block between the blood and lumen of seminiferous epithelium, they are also in control of the entry and exit of nutrients, hormones and other chemicals into the tubules of the testis.

Secretory function of Sertoli cells

Following substances are secreted by Sertoli cells to manage the sperm production:

1. Anti-Müllerian hormone (AMH)
   - secreted during the early stages of fetal life, necessary for development of male gonads
2. Inhibin and activins
   - secreted after puberty, and work together to regulate FSH secretion
3. Androgen binding protein (also called testosterone binding globulin)
   - increases testosterone concentration in the seminiferous tubules to stimulate spermatogenesis
4. Estradiol
   - converts testosterone to 17 beta estradiol to direct spermatogenesis
5. Transferrin
  - a blood plasma protein for iron ion delivery

Development

Sertoli cells are required for male sexual development. Once fully differentiated, the Sertoli cell is unable to proliferate. Therefore, once spermatogenesis has begun (during puberty), no more Sertoli cells are created. Recently however, some scientists have found a way to grow these cells outside of the body. This gives rise to the possibility of repairing some defects that cause male infertility.

Management of Sertoli cells

Sertoli cells itself need an activation signal to start working properly. The triggering hormone activating Sertoli cells is called follicle stimulating hormone (FSH). FSH belongs to the group of hormones called gonadotropins, by the name it is clear, that the purpose of this group of hormones is to stimulate the function of gonads. In a male organism this hormone influences the sperm cell production through Sertoli cells.

Reproduction disorders related to Sertoli cells

1. Sertoli cell-only syndrome
  - also known as Del Castillo syndrome and germ cell aplasia
  - defined by the complete absence of germ cells in testicular tissues and always results in male infertility
  - a disorder characterized by male sterility without sexual abnormality

2. Sertoli cell tumour
  - Sertoli cells tumour normally occur only in the testis, but it may also rarely occur in the ovary of females

Related diseases

Sertoli cell-only syndrome, Sertoli cell tumour

Find more about related issues

Diagnoses

Azoospermia
Complete absence of sperm in the ejaculate of a man.
Learn more at: www.fertilitypedia.org/therapy/diag/azoospermia

Undescended testes
In the case of cryptorchidism one or both testes are absent from the scrotum. It is is the most common etiologic factor of azoospermy in the adult.
Learn more at: www.fertilitypedia.org/therapy/diag/undescended-testes

Ejaculatory disorders
A class of sexual disorders defined as the subjective lack of normal ejaculation.
Learn more at: www.fertilitypedia.org/therapy/diag/ejaculatory-disorders

Thyroid disorders
A medical condition impairing the function of the thyroid.
Learn more at: www.fertilitypedia.org/therapy/diag/thyroid-disorders
Kallmann syndrome
A genetic condition where the primary symptom is a failure to start puberty or a failure to fully complete puberty.
Learn more at: www.fertilitypedia.org/therapy/diag/kallmann-syndrome

Sperm autoantibodies
Antibodies that bind to sperm, inhibiting their movement, stopping recognition and entry into the egg.
Learn more at: www.fertilitypedia.org/therapy/diag/sperm-autoantibodies

Testicular cancer
Cancer that develops in the testicles.
Learn more at: www.fertilitypedia.org/therapy/diag/testicular-cancer

Obstructive azoospermia
Absence of sperm in the ejaculate despite normal spermatogenesis, caused by an obstruction of the genital tract.
Learn more at: www.fertilitypedia.org/therapy/diag/obstructive-azoospermia

Orchitis
An inflammation of the testes, involving swelling and heavy pains.
Learn more at: www.fertilitypedia.org/therapy/diag/orchitis

Testicular torsion
Emergency medical condition occurring when the spermatic cord twists and cuts off the testicle's blood supply.
Learn more at: www.fertilitypedia.org/therapy/diag/testicular-torsion

Testicular failure
The inability of the testicles to produce sperm or testosterone.
Learn more at: www.fertilitypedia.org/therapy/diag/testicular-failure

Sertoli cell-only syndrome
The absence of any developmental stage of sperm cell in the testes.
Learn more at: www.fertilitypedia.org/therapy/diag/sertoli-cell-only-syndrome

Organ
Testes
Male gonads which produce both sperm and androgens, such as testosterone, and are active throughout the reproductive lifespan of the male.
Learn more at: www.fertilitypedia.org/edu/organs/testes

Reproductive functions
Spermatogenesis
Process in which spermatozoa are produced from male primordial germ cells in testicles by way of mitosis and meiosis.
Learn more at: www.fertilitypedia.org/edu/reproductive-functions/spermatogenesis

Gallery
Sertoli cells

Labelled diagram of the organisation of Sertoli cells (red) and spermatocytes (blue) in the testis. Spermatids which have not yet undergone spermiogenesis are attached to the luminal apex of the cell.

Sources

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