SELECTION OF THE GENETIC MATERIAL NECESSARY TO FERTILIZE THE OVUM-

Points of view

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The testicular Leydig cells synthesize androgenic hormones and are sensitive to the stimulation of gonadotropic hormones. The Sertoli cells located in the seminiferous tubules are the site of spermatogenesis.

The pituitary gland, by luteinizing hormone (LH) production, stimulates the synthesis and secretion of testosterone by Leydig cells, and by follicle-stimulating hormone (FSH) acts, synergic with testosterone, on Sertoli cells, thus stimulating the spermatogenesis (1).

The transition of spermatogonia in the maturation process is performed every 16 days, and the transition from spermatogonic stem cells to mature sperm cells is accomplished within 75 days (2).

By mitotic division, spermatogonia forms diploid spermatocytes, which, through meiosis, transform into haploid spermatids, which contain 23 chromosomes, which will later fuse to form a zygote. (3)

Through the process of spermiogenesis, the spermatids mature by condensing their nucleus thus forming the flagellum and acrosome. The spermatozoon reach the seminiferous tubules in the epididymis, where, progressively, their maturation continues, within 2-6 days, in the vas deferens (4).

The spermatic fluid is a complex product, consisting of seminal plasma and sperm cells. White-yellowish seminal plasma with a specific, pungent odor, consists of secretions from the epididymis, vas deferens (approximately 10%), seminal vesicles (approximately 55%), prostate (approximately 25%), bulbo-urethral glands and testicular secretions, all these ensuring the sperm survival and motility.

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The sperm cells generated by the convoluted seminiferous tubules fertilize the ovum, triggering the division of the zygote, respectively the development of the conception product during the 9 months of gestation (5).

The uterine mucosa, consisting of simple ciliated epithelium, has tubular glands, which produce a smaller amount of secretion, but yet active in the cervix cavity.

This secretion is gelatinous and rich in mucus, blocking, by accumulation, the external orifice of the cervical canal (Kristeller's mucous "plug"), in fact this being a means of protection against the microbial ascension from the vagina, but at the same time favorable for sperms in order to enter the uterus due to the alkaline pH of the cervical mucus that exerts a positive chemotactism on the sperms deposited in the acidic vaginal pH.

Cervical mucus contains glucose, sodium chloride, alpha-beta globulins, enzymes (amylase, lysozyme, lactoferrins), exfoliated epithelial cells, uterine-tubar and follicular-ovarian secretion fluid (6).

The mucus secretion appears under the action of estrogen and disappears under the action of progesterone, respectively, it changes in relation to the menstrual cycle.

Its amount is either high in hyperhormonal syndromes, absent in the presence of the yellow body in activity, or abundant in premenopause, in the phase of relative hyperfoliculinemia.

The fertilization process

Following sexual intercourse, the ejaculated fluid, consisting of sperms and seminal fluid, is stored in the vaginal cavity and on the surface of the uterine cervix.

The external orifice of the cervix is punctiform in nulliparous women and transverse and sometimes with irregular, scarred edges in multiparous.

In nulliparous, the length of the cervix canal is about 2.5-3 cm, decreasing progressively in multiparous, which is inversely proportional to the size of the uterine cavity, which increases in multiparous.

The sperm cell, after undergoing the capacitation process, becomes hyperactive, with wider and faster movements.

Thus, it approaches and passes through cumulus oophorus cells, that surround the oocyte, where the sperm acrosome releases hydrolytic enzymes by exocytosis (acrosomal reaction) (1).

After the acrosomal reaction, the sperm passes through the pellucid area, merging with the plasma membrane of the oocyte (7), in which case the oocyte discharges, by cortical reaction, at perivitelin level cortical granules that no longer allow its penetration by other sperms, respectively stop their passage through pellucid area, thus avoiding the polyspermia (8).

Discussions

The masculine gamete - the male reproductive cell - joins the ovum, forming the zygote, which is a cell with a complete normal set of 46 chromosomes.

The zygote develops and generates the product of conception.

The sperm cell contributes with about half of the nuclear genetic information of the diploid offspring.

When the sperm reaches the fallopian tubes, it must go through the capacitation stage before it enters the egg (4). The sperm's acrosome secretes spermolysin, an essential enzyme for the egg fertilization (9).

The spermatic fluid is alkaline, and the sperm cells reach their proper motility only when they reach the vagina, where the alkaline pH is neutralized by the vaginal acid secretions, a process that takes about 20-30 minutes.

During this time, the fibrinogen in the seminal vesicles provides protection for the sperms by forming a clot, just as the prostate, by fibrinolysin, dissolves the clot, thus the sperms becoming very mobile and gaining optimal advancement.

The DNA located in the sperm is at least 6 times more strongly condensed than that of other cells (7).

The human sperm cell contains at least 7,500 different types of protein (10).

Conclusions

Human sperm cells are very vulnerable to the action of free radicals and to DNA damage (11,12,13), in this complex evolutionary process, which can lead in particular to the appearance of aneuploid sperm, especially after exposure to insecticides (14, 15), benzene (16), smoking (17.18) or perfluorinated compounds (19).

Usually, sperm aneuploidy is associated with DNA damage, DNA fragmentation, and increased susceptibility of DNA to in situ denaturation (20,21).

Fertilization of the ovum with selected genetic material is the essential element of human procreation.

Conflict-of-interest statement:

The authors do not report any conflicts of interest.

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