Physiology

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Spermatogenesis is a complex process involving mitotic cell division, meiosis and the process of spermiogenesis. The regulation of spermato- genesis involves both endocrine and paracrine mechanisms. The endocrine stimulation of spermatogenesis involves both follicle stimulat- ing hormone (FSH) and luteinizing hormone, the latter acting through the intermediary testosterone, produced by the Leydig cells in the testis. Since the germ cells do not possess receptors for FSH and testosterone, the hor- monal signals are transduced through the Sertoli cells and peritubular cells by the production of signals that have yet to be defined. Although the hormonal signals are essential for successful spermatogenesis, there is increasing evidence that a multiplicity of growth factors and cyto- kines are involved in local control mechanisms influencing stem cell renewal by mitosis and the complicated process of the two meiotic cell divisions. The final complex metamorphosis which converts a round cell into the complex structures of the spermatozoa is well defined at a structural level, but the control systems regulating this process still remain to be elucidated.

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Key words: Sertoli cell/spermatids/spermatocytes/ spermatogenesis/spermatogonia

Introduction

Male fertility requires the production by the testis of large numbers of normal spermatozoa through a complex process known as spermatogenesis. This process can be subdivided into three major steps:

(i) the multiplication of spermatogonia by the process of mitosis; (ii) meiosis, which reduces the chromosome number from diploid to haploid and commences with the entry of type B spermatogonia into the prophase of the first meiotic division. These cells, now called primary spermatocytes, divide to form secondary spermatocytes, and then divide again to form round spermatids; (iii) the successful transformation of the round spermatid into the complex structure of the spermatozoon, this phase being called spermiogenesis.

Each of these steps represents a key element in the spermatogenic process. Defects which occur in any of them can result in the failure of the entire process and lead to the production of defective spermatozoa and reduction or absence of sperm production. It is therefore essential that our under- standing of these processes is expanded to provide information concerning the regulatory mechan- isms.

Semen

Semen is a greyish white bodily fluid that is secreted by the gonads of male animals. It carries sperm or the spermatozoa and fructose and other enzymes that help the sperm to survive to facilitate successful fertilization.

The whitish opalescence is due to the large amount of protein that it contains and its slightly turbid appearance is due to the spermatozoa contained within it.

Process of ejaculation

Semen is released during the process of ejaculation and is processed in the seminal vesicle in the pelvis, which is where it is produced.

How does ejaculation occur?

Ejaculation is controlled by the central nervous system and occurs when there is friction on the genitalia and other forms of sexual stimulation. The stimuli lead to impulses that are sent up the spinal cord and into the brain.

Two phases of ejaculation

Ejaculation has two phases:

Phase 1: emission in which the vas deferens (the tubes that store and transport sperm from the testes) contract to squeeze the sperm toward the base of the penis through the prostate gland and into the urethra. The seminal vesicles release their part of the semen that combine with the sperm. The ejaculation is unstoppable at this stage.

Phase 2: ejaculation in which the muscles at the base of the penis and urethra contract. This leads to forcing the semen out of the penis (ejaculation and orgasm) and this phase also has a bladder neck contraction. The bladder neck contracts to prevent the back flow of the semen into the urinary tract. Dry orgasm can occur even without delivery of semen (ejaculation) from the penis. Erection declines normally following ejaculation.