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Discuss the factors facilitating the movement of sperm in the female reproductive tract

1. The pH of the vagina: The vagina is open to the exterior and thus to infection, especially at the time of coitus; therefore, it is well equipped with antimicrobial defenses. These defenses include acidic pH and immunological responses and can damage sperm as well as infectious organisms. To enable fertilization to take place, both the female and the male have adopted mechanisms for protecting sperm. In humans, semen is deposited at the external part of the cervix so that sperm can quickly move out of the vagina. Human sperm must contend, however briefly, with the acidic pH of vaginal fluid. The vaginal pH of women is normally five or lower, which is microbicidal for many sexually transmitted disease pathogens. Evidence indicates that the acidity is maintained through lactic acid production by anaerobic lactobacilli that feed on glycogen present in shed vaginal epithelial cells (Boskey et al., 2001). Lowering pH with lactic acid has been demonstrated to immobilize bull sperm. The optimal pH for sperm viability is between 7.0 and 8.5, and a reduction in sperm motility is seen at a PH less than 6.0. Normal vagina pH is only 3.5 to 4.0 and the acidic environment of the vagina is thus toxic to sperm. However both seminal fluid and cervical mucus present within the posterior vagina are alkaline and act as buffers. facts has shown that the vaginal pH rises to 7.0 within just seconds after ejaculation and this decrease in acidity can be maintained for up to two hours after ejaculation. Males may also overcome female defenses by inseminating many sperm. This strategy is particularly effective for overcoming cellular immune responses.

2. STRUCTURAL FACTORS THAT FACILITATE MOVEMENT OF SPERM IN FEMALE REPRODUCTIVE TRACT INCLUDE:

- I) The ciliated epithelium of the vagina and cervix
- II) The mucus of the vagina is receptive to sperm
- III) Contraction of the uterus also helps sperm moves up
- IV) The spermatozoa has flagella that propels it forward
- V) Fructose in semen responsible for energy for the sperm
- VI) Prostaglandin also helps the uterus contract

3. The Cervix facilitate movement of sperm in the female reproductive tract

The cervix supports the passage of normal motile sperm while discouraging passage of microbes and sperm with abnormal form or motility. Normal, fresh, motile sperm can avoid the area most populated by neutrophils and they appear to be resistant to leukocytic phagocytosis anyway, as discussed above. In

descriptions of human cervical anatomy, mention is made of cervical crypts that are thought to entrap and store sperm (Fawcett and Raviola, 1994; Harper, 1994). On the other hand, scanning electron microscopy of the human cervix indicates that mucosal grooves forming a preferential pathway for sperm could be present as in the bovine (Figure 2). A comprehensive study of the human cervix is needed to determine whether sperm follow mucosal grooves to traverse the cervical canal,

Radio-opaque fluid and also human serum albumin radiolabelled with technetium 99 could be seen rapidly passing through the cervix and filling the uterine lumen after deposition in the cranial vagina at estrus. Sperm of humans and cattle enter the cervical canal rapidly where they encounter cervical mucus. Under the influence of estrogen the cervix secretes highly hydrated mucus, often exceeding 96% water in women (Katz et al., 1997). The extent of hydration is correlated with penetrability to sperm (Morales et al., 1993). Coitus on the day of maximal mucus hydration in women is more closely correlated with incidence of pregnancy than coitus timed with respect to ovulation detected using basal body temperature

4. Males should avoid smoking to facilitate movement of sperm in the female reproductive tract

Sperm needs a suitable internal and external environment to complete several physiological links such as occurrence, development, maturity, and transportation. Some physical and chemical factors can lead to the damage of the testis and accessory glands, the disorders of the internal environment, and spermatogenesis dysfunction to some extent. As we know, smoking is associated with variable diseases, including respiratory diseases, cardiovascular diseases and cancer of the lung, kidney, urinary bladder, pancreas, and so on. The relationship between smoking and infertilities has been studied for several years.

A vast amount of studies showed the negative effects of smoking on various parameters of semen analysis. In an experiment conducted in Denmark from 1987 to 2004, 2562 men participated; researchers found that heavy smokers had a 19% lower sperm concentration than nonsmokers. Moreover, in another cohort study which involves 1786 men, researchers proved that smoking was associated with a significant decrease in sperm density, total sperm count, total number of motile sperm, and citrate concentration. In addition, sperm vitality, ejaculate volume, and fructose concentration were slightly but nonsignificantly affected. In other aspects, smokers had a significantly decreased semen volumes, sperm motility, and viability compared with nonsmokers. All sperm motion parameters were lower in the smokers except for beat-cross frequency (Hz). Further, the percentage of normal morphology sperm was decreased significantly in smokers, and the sperm morphology was worse with increasing degree of smoking. The experiments have already shown that smoking in daily life damages the semen quality.

5. Reduced Alcohol Consumption also facilitate movement of sperm in the female reproductive tract

Excessive alcohol intake is always thought of as a cause of liver diseases, kidney diseases, and so on. In addition, alcohol consumption is considered to have an adverse impact on reproductive function. It has a negative influence on the sperm parameters and the endocrine.

There was an interesting case report showing that an azoospermic patient regained normal sperm parameters 3 months after the discontinuation of alcohol consumption, which strongly supported the

negative impact of alcohol consumption on male infertility. Firstly, available literatures stated that alcohol consumption may give rise to spermatozoon morphological changes and the changes including breakage of the sperm head, distention of the midsection, and curling of its tail. Moreover, in an experiment conducted by researchers in Argentina, which involved 537 men, it was found that alcohol consumption evoked a tendency toward diminished sperm concentration, motility, viability, and normal morphology.

As for its effect on the endocrine, there are masses of such studies reminding people of the impact of alcohol consumption that might cause structural testicular changes, decreased level of testosterone, which might be involved in the phenotype of hypogonadism and feminization. Alcohol and its metabolite acetaldehyde can cause a reduction in luteinizing hormone (LH) binding to Leydig cells, which may inhibit the enzymes involved in the formation of sex hormones. With regard to the mechanism of its negative effects, alcohol seems to exert a dual effect on the HPG axis by directly inhibiting testicular steroidogenesis and by blocking the release of LH-releasing hormone/LH from the hypothalamic-pituitary axis

6. Good dieting also facilitate movement of sperm in the female reproductive tract

Scientists found that our daily consumption of cereals, fruits, and each meal a day had a strong bearing on semen quality. Taking proper amounts of minerals, antioxidant vitamins, and essential amino acids can maintain and improve it effectively. There was also a case report conducted in Spain which showed that frequent intake of lipophilic foods like meat products or milk may negatively affect the semen quality in humans, whereas some fruits or vegetables may maintain or improve semen quality.

High-energy diets, especially poor nutritional food intake with lots of unhealthy fat negatively affect semen parameters and fertility. It was described that the intake of processed meat, a source of saturated fats, is associated with poor semen quality. In a cohort study conducted in the America, researchers found high intake of saturated fats was negatively related to sperm concentration whereas higher intake of omega-3 fats was positively related to sperm morphology. However, studies with larger sample size are required to confirm these findings. High-energy diets may alter testicular metabolism. Testis provides an environment that nurtures the germs cells, ultimately ensuring spermatogenesis and fertility. However, the overconsumption of high-energy diets enables the increase of fatty acid supply within testicular milieu and consequently compromises the key testicular metabolic mechanisms that ultimately compromise germ cells fate. High-energy diets intake disturbs whole-body metabolism and the normal function of the male reproductive axis. Existing data showed that metabolism and reproduction are closely connected.

7. Males should avoid high temperature to facilitate movement of sperm in the female reproductive tract

Some people who work under an environment with a high temperature such as blacksmith and kettleman or who had to wear clothes which are too tight for them, both factors bring about heat stress to men's testis. The process of spermatogenesis is closely related to the appropriate temperature and occurs optimally at temperature slightly lower than that of the body. Adequate adjustment of the temperature is imperative to maintain a proper testicular temperature. Raised testicular temperature has a harmful effect on spermatogenesis and the resultant spermatozoa. Therefore, thermoregulatory failure leading to heat stress can compromise the sperm quality and increase the risk of infertility, Both

the epididymal sperm and testicular germ cells are sensitive to damage by heat stress, which leads to the apoptosis and the damage of DNA.

8. Males should reduce contact with radiation to facilitate movement of sperm in the female reproductive tract

Cell phone usage is an indispensable part in people's daily life. As a result of which, several researchers have conducted a lot of experiments. There is a study investigating an association between characteristics of cell phone usage and semen quality. It showed that talking for ≥ 1 h/day and during device charging was associated with higher rate of abnormal semen concentration. Among men who reported holding their phones ≤ 50 cm from the groin, a non-significantly higher rate of abnormal sperm concentration was found. Multivariate analysis revealed that talking while charging the device and smoking were risk factors for abnormal sperm concentration. It suggests that certain aspects of cell phone usage may bear adverse effects on sperm concentration.

Concerning the usage of wireless internet, researchers have demonstrated that continuous Wi-Fi exposure with 2.45 GHz affected the testes of growing rats. Avendano et al. divided the motile spermatozoa, from 29 healthy donors, into two aliquots and one of them was exposed to a Wi-Fi computer but not the other. 4 hours later, research findings showed that the sperm motility and the sperm DNA fragmentation in Wi-Fi group were significantly decreased and increased, respectively