Students' Corner
Letter to the Editor

Think before giving zinc — a two edge sword for sperms

Madam, nature's way of propagation of living things is still an Eldorado for scientists. Sperm derived from male partners always fascinate the researchers due to its unique characteristic of motility. In humans there is evidence that successful fertilization can take place even if ejaculation occurs 5 days before ovulation.[1] Sperm undergo two changes in preparation for fertilization: capacitation and hyperactivation that together may serve to firstly detach spermatozoa from their isthmic 'reservoir' and then speed sperm movement to the ampulla as the time of ovulation approaches. Capacitation involves changes in the plasma membrane and Hyperactivation is a change in flagellar beating that typically involves an increase in the flagellar bend amplitude.[2] This hyperactivation depends on a number of factors and one of the most important is alkalinization of the internal milieu of sperm to increase their motility. During sperm capacitation and interaction with the egg coat, the sperm cytoplasm becomes alkaline. In a recent study, scientists found that the proton channel HV1, which is sensitive to both the membrane potential and the pH gradient, is the predominant mechanism used by sperm to achieve intracellular alkalinization.[3] In response to alkalinization, KSPER (SPERm Specific K+ Channels) channels open to allow for K+ efflux and hyperpolarization of the cell, while CATSPER channels (CATion channel of SPERm Protein) open to allow for Ca2+ entry to trigger hyperactivated motility. A Na+-H+ exchanger, pumps H+ out to maintain alkalinization.[4] CATSPER, KSPER, and the Na+-H+ exchanger are all sperm-specific. Zinc has been found out to be the potential inhibitor of HV1 channel,[4] scientists in 1992 found that a concentration of > 100 μM of zinc in seminal fluid decreases the sperm motility but many studies support the evidence that zinc has a positive impact on sperm count and it activates the NF-κB which is anti apoptotic and helps in immature sperm survival and zinc deficiency leads to gonadal dysfunction decreases testicular weight and courses shrinkage of seminiferous tubules.[5] So we can say that zinc on lower concentration has good impact on seminal biology and at higher concentrations it is Thanatos for sperms.

Muhammad Naeem,[1] Nasir Ali Rahimnajjad,[2] Muhammad Kazim Rahimnajjad[3]

4th Year MBBS, Dow Medical College, Dow University of Health Sciences,[1,2] Department of Orthopaedic Surgery, Liaquat National Hospital,[3] Karachi.

References

1. Wilcox, AJ, Weinberg CR, Baird DD. Timing of sexual intercourse in relation to ovulation. Effects on the probability of conception, survival of pregnancy, and sex of the baby. N Engl J Med 1995; 333: 1517-21.
2. Ho HC, Suarez SS. Hyperactivation of mammalian spermatozoa: function and regulation. Reproduction 2001; 122: 519-26.
3. Lishko PV, Botchkina IL, Fedorenko A, Kirichok Y. Acid extrusion from human spermatozoa is mediated by flagellar voltage-gated proton channel. Cell 2010; 140: 327-37.
4. Wang D, King SM, Quill TA, Doolittle LK, Garbers DL. A new sperm-specific Na+/H+ exchanger required for sperm motility and fertility. Nat Cell Biol 2003; 5: 1117-22.
5. Oteiza PI, Clegg MS, Keen CL. Short-term zinc deficiency affects Nuclear factor- ?B nuclear binding activity in Rat Testes. J Nutr 2001; 131: 21-6.