Sperm DNA damage and its role in fertility

One way or another, it takes two people to make a baby. Under normal circumstances, a sperm and an egg fuse to make an embryo however there are numerous occasions under which this process needs a little help. The effect of maternal age on the quality of the egg is still probably the most significant risk factor to fertility and thus the sperm is often considered to be a silent vessel whose only function is to safely deliver the father's genes. In this article, we demonstrate that this perception is far from the truth and the issue of compromised genetic integrity of sperm heads in infertile males needs to be a consideration. Typically, infertile men have been unable to conceive naturally (or even through regular IVF). Since a variant of IVF, so called intracytoplasmic sperm injection (ICSI), where the sperm is injected directly into the egg, was developed however effective treatment male factor infertility has been widespread in IVF clinics worldwide. Until recently, little concern has been raised about the genetic quality of sperm in ICSI patients and the impact that genetic abnormalities could have on fertility and embryo development.

This review highlights the importance of how the DNA packages itself into the sperm nucleus as essential for the establishment and maintenance of a viable pregnancy. Specifically, both fragmentation of the DNA and extra or missing DNA chunks (chromosomes) are serious considerations both for fertility and for the genetic health of future children. The sperm is critical for the promotion of normal fertilization and with infertility affecting approximately 1-in-6 couples in the western world, male factors contribute to around 50% of cases. There is a desperate need for further research into understanding the role(s) played by the sperm's unique and specialized DNA structure. The ultimate goal is the development of rapid reliable tests that can assess the integrity of sperm to be used in IVF/ICSI and to identify novel aspects that play a crucial role in fertilization and early embryogenesis. The development of such tests outlined in this chapter aims to further our understanding of the paternal contribution to the requirements for these processes. The goal is to create an "arsenal" of analytical tools to better facilitate the transfer of single normal embryos in an IVF settings. These will assist scientists, clinicians and couples undergoing assisted reproduction (e.g. ICSI) to allow more informed decisions to be taken regarding their reproductive choices.

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