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**An Evaluation of Novel Sperm Selection Methods to Reduce DNA  
Damage**

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**ABSTRACT**

Sperm DNA integrity plays a crucial role in successful fertilization, embryo development, and healthy pregnancy outcomes. High levels of DNA damage or fragmentation in sperm are associated with male infertility, poor fertilization rates, and increased risk of miscarriage. Therefore, selecting sperm with intact DNA is an important step in assisted reproductive techniques such as in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). In recent years, several novel sperm selection methods have been developed to reduce DNA damage and improve reproductive outcomes. These advanced techniques focus on identifying and isolating high-quality sperm based on their physical, biochemical, and functional characteristics. Methods such as microfluidic sperm sorting, magnetic-activated cell sorting (MACS), and hyaluronic acid binding assays have shown promising results in selecting sperm with lower DNA fragmentation. Microfluidic devices mimic the natural environment of the female reproductive tract, allowing only the most motile and healthy sperm to move forward. Similarly, MACS helps remove apoptotic sperm that may carry damaged DNA. Compared to conventional sperm preparation techniques, these modern approaches reduce oxidative stress and mechanical damage during sperm processing. As a result, they improve sperm quality and enhance the chances of successful fertilization and embryo development. The evaluation and integration of these novel sperm selection methods in clinical practice may significantly improve the effectiveness of fertility treatments and overall reproductive success.