

Blastulation Rate and Sperm DNA Integrity: A Crucial Link in Assisted Reproduction



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Introduction: Sperm DNA fragmentation is an important indicator of sperm quality and can significantly impact male fertility. A clear correlation exists between high sperm DNA fragmentation and an increased rate of miscarriages, difficulties in conception, and poor embryo quality. However, the direct influence of sperm DNA fragmentation on the blastulation rate remains a topic of debate.

Objectives: The aim was to study the sperm DNA fragmentation in 43 couples undergoing assisted reproductive techniques at the Maternal and Child Department Gynecology and Obstetrics Unit Couple Sterility Center, Naples, Italy. Semen samples were collected on the day of the oocyte pickup and DNA fragmentation index (DFI) was analyzed before and after Percoll density gradients in order to determine the efficacy of semen treatment to reduce the percentage of sperm with fragmented DNA before prior to insemination/injection.. Consequently, the impact of sperm DNA fragmentation was correlated to fertilization and blastulation rate. Additionally, in a set of 20 samples, we aimed to test the automated gel electrophoresis system to quantify DNA fragments and assess the degree of fragmentation.

Results: The data showed a significant reduction of sperm with fragmented DNA following treatment with Percoll density gradients, with a lower DNA fragmentation index (DFI) compared to untreated ejaculate ($p < 0.0001$). However, no significant correlation was found between DNA fragmentation and fertilization rate. Instead, an inverse correlation between the DFI and blastulation rate was observed ($p = 0.005$). In addition, the fragmentation index and the DNA Integrity Number, tested with automated gel electrophoresis, showed comparable data.

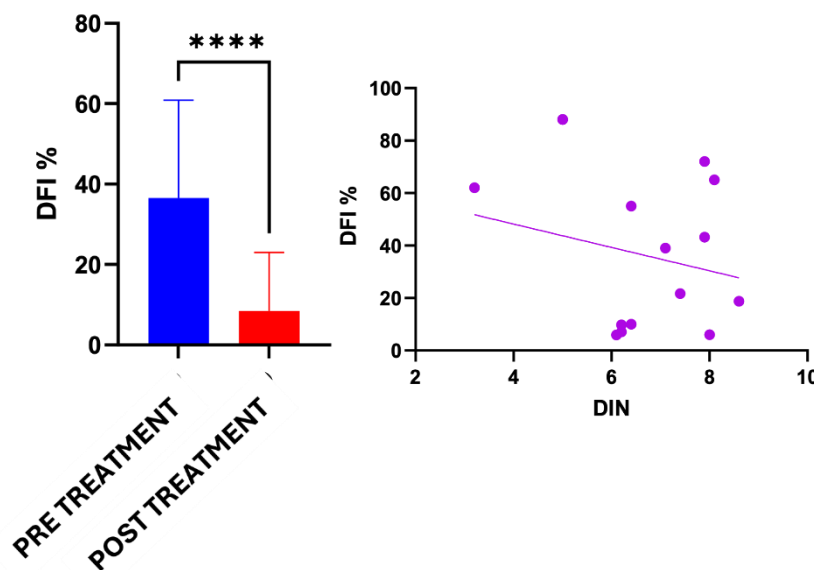


Figure 1 – Sperm DNA Fragmentation Index (DFI) before and after Percoll gradients ($p < 0.0001$)

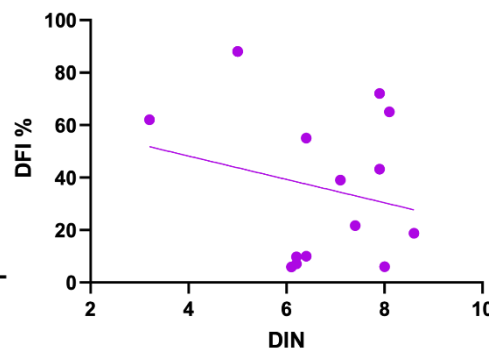


Figure 2 – Distribution of sperm DNA fragmentation index (DFI) values in relation to DIN

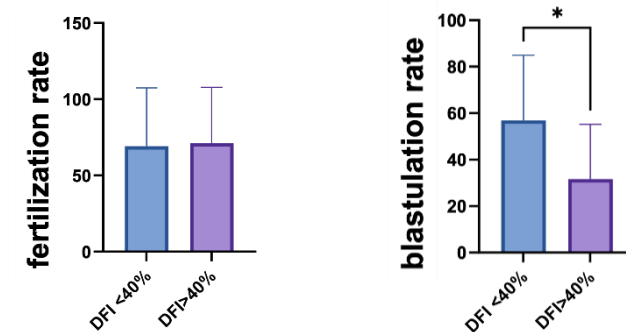


Figure 3 – Correlation between fertilization, blastulation rates and sperm DNA fragmentation index ($p = 0.005$). DFI= DNA fragmentation index.

Conclusion: The results suggest that sperm DNA fragmentation may negatively affect embryonic development up to the blastocyst stage. Testing the sperm DNA fragmentation allows for early intervention with antioxidants to improve clinical outcome. This is highly relevant, as the selection of sperm with intact genetic structure not only increases the blastulation rate but may also reduce the risk of genetic issues in the embryos. Finally, the evaluation of sperm DNA integrity with a system that is independent of operator during the post analytic procedure plays an important role in in vitro fertilization laboratory, but future high-quality clinical trials and assay standardization will required.

References

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