# Quicker and Easier Testing for Sperm DNA Fragmentation

Damage to the DNA within sperm cells has been linked to infertility and miscarriage, but selecting healthy sperm with undamaged DNA could improve conception and pregnancy outcomes for couples.

Laboratory testing for the presence of DNA fragmentation is now easier and quicker with the introduction of the QwikCheck® DFI Kit from Medical Electronic Systems.

## The Significance of Sperm DNA Fragmentation

Disturbances in the genetic material of sperm cells are commonly associated with sperm DNA fragmentation (SDF).

The presence of SDF has been [shown](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6125150/) to be higher in infertile men. With IVF and ICSI making pregnancy possible with even a small quantity of sperm, selecting healthy sperm could improve outcomes for couples undergoing fertility treatment.

The types of DNA fragmentation damage identified [include](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7502318/) a mismatch of bases, loss of base, base modifications, crosslinks, pyrimidine dimers, and single or double strand breaks. All of these alterations can reduce the chance of both natural conception and success with assisted reproductive technology.

Furthermore, in addition to reducing the likelihood or implantation, there is some [evidence](https://www.sciencedirect.com/science/article/pii/S0015028219302468) that SDF may be associated with miscarriage and recurrent pregnancy loss.

SDF can be triggered by extrinsic factors, such as smoking, heat exposure and environmental pollutants, or intrinsic factors including oxidative stress and defective germ cell maturation. These factors lead to defective processes during spermatogenesis.

Identifying the presence of SDF on extended semen analysis can therefore alert clinicians to the possibility of a significant underlying pathology or an environmental factor. Addressing laboratory findings could lead to clinical intervention that supports conception and increases the likelihood of healthy embryonic development. The WHO 6th Edition also notes that investigating SDF could “represent an important addition in the work-up of male infertility, becoming one of the most…promising biomarkers in basic and clinical andrology”.

## Testing for DNA Fragmentation

The presence of DNA fragmentation, and its potential impact on fertility, can be assessed by evaluating how susceptible sperm DNA is to acid denaturation. Using a sperm chromatin dispersion (SCD) method, intact sperm chromatin will form dispersion halos after being exposed to acid and a lysing solution.

The initial, basic method focused on whether a halo was present once the SCD method had been completed. The appearance of a large halo corresponds to relaxed, long, undamaged DNA loops which are released once nuclear proteins are removed. Conversely, the presence of DNA breaks or fragmentation leaves the genetic material susceptible to denaturation, preventing dispersion and leading to the absence of a halo.

## Modern Classification of Halos

More recently, halo classification has become more detailed. The most up to date SCD method still looks to identify the presence of a halo, but also assesses halo size and overall staining of the core.

The 6th Edition classifies sperm halos based on the [criteria](https://pubmed.ncbi.nlm.nih.gov/16213830/) produced by Fernandez et al.

* Large halo – the halo width is a similar size to, or larger than, the minor diameter of the core
* Medium halo – the halo size is between those with large or small halos
* Small halo – the halo width is a similar size to, or smaller than, one third of the minor diameter of the core
* Without halo – no halo can be seen
* Without halo-degraded – no halo is seen, and the core is stained in an irregular manner or only weakly stained. This indicates severe damage to the DNA and protein compound.

Once the SCD process is complete, evaluation of the halos of at least 200 sperm is required to generate the DNA Fragmentation Index (DFI). DFI looks at the percentage of sperm in the sample with fragmented DNA to ascertain whether SDF levels are elevated across the sample. It is calculated by dividing the total number of small halo, no halo and without halo-degraded sperm by the total number of cells counted, and multiplying by 100.

Elevated and severely elevated levels of DNA fragmentation (15-29.9% and ≥30% of sperm respectively) [indicate](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10056107/) that fertility potential may be impacted. In these cases, treatment with ICSI is either recommended or required.

## Medical Electronic Systems DFI Kit

Medical Electronic Systems (MES), the worldwide leader in automated semen analysis for more than 20 years, is pleased to introduce the new QwikCheck® DFI Kit. The kit uses the SCD method to ascertain DFI based on WHO 5th or 6th methodology.

The QwikCheck® DFI Kit makes it easier to quickly assess sperm fragmentation without compromising on accuracy. It has been developed to make the laboratory process of creating slides simpler, so that all laboratory technicians can accurately report DFI.

Each DFI kit includes the necessary reagents to complete 10 tests. Compared to traditional analysis which may take more than 50 minutes, results can be obtained in under 30 minutes using the QwikCheck® DFI kit.

The test is both CE and FDA registered.

## Combining SQA-Vision with QwikCheck® DFI Kit

Using an automated system such as the SQA-Vision makes the QwickCheck® DFI test both easier and faster.

Evaluation of the halos of at least 200 sperm cells as part of the DFI calculation can be completed manually using a microscope at 400X magnification, or automatically utilizing the SQA-Vision DNA Fragmentation Assessment tool. The SQA-Vision DFI Counter reports the five halo categories as defined in WHO 6th Edition, and provides a final DFI Score.

## Final Thoughts

DNA fragmentation is associated with infertility and possible poorer outcomes in pregnancy. Assessing sperm DNA using the sperm chromatin dispersion method, and then calculating the DNA Fragmentation Index can assist with clinical decision making.

The introduction of the QwikCheck® DFI Kit from MES makes it easier for laboratory technicians to assess DFI in line with WHO 6th Edition guidelines. With slide preparation simplified, automatic DNA fragmentation results can also be generated automatically using the SQA-Vision Automated Sperm Quality Analyzer, or by traditional analysis under a microscope.