

PATIENT INFORMATION

SPERM DNA DAMAGE AND ITS IMPLICATIONS FOR SUCCESSFUL PREGNANCY

What is DNA and sperm DNA damage?

DNA is the genetic make-up of an individual. You inherit half your DNA from your mother (from her egg) and half from your father (from his sperm).

It appears that human sperm quality is declining and this may be contributing to the increasing rates of infertility throughout the world. Many factors have been implicated in this (smoking, dietary deficiencies, environmental pollutants, cancer therapy) and it is thought one important factor is related to *reactive oxygen species*. These are potent reactive chemicals which damage the DNA of the sperm.

There is always some damage (fragmentation) of the sperm DNA. Normally when the sperm enters an egg, the egg has the ability to repair some of it. This is especially true if the woman is young (and so her eggs are healthier) but, as a woman gets older, the ability of the eggs to repair the damaged DNA in the sperm is reduced.

Now that we can measure sperm DNA damage, it has become clear that increasing sperm DNA fragmentation is associated with:

- decreased fertilisation of eggs
- poorer embryo quality
- reduced ability of the embryo to implant
- increased risk of miscarriage

Evidence for this is reported by Lewis & Simon, 2010, and Kennedy *et al*, 2011

What if the sperm count is normal? Can testing for sperm DNA damage help decide what treatment is best for you?

The evidence is growing and shows that there is little correlation between a traditional semen analysis result and the amount of sperm DNA damage. Hence, there can be a lot of DNA damage in the sperm *even if* a man has a “normal” sperm count (Simon *et al*, 2011, Kennedy *et al*, 2011). This means that just because the man has a normal semen analysis, it doesn't mean that he and his partner will be able to get pregnant. Sadly, this applies to IVF treatment as well, because high degrees of sperm DNA damage are associated with lower pregnancy rates.

If there is more than 25% sperm DNA damage, there is a high chance of infertility. Furthermore, if the degree of DNA damage is greater 50% then using ICSI for fertilization, rather than IVF, will improve the chances of good fertilisation, increase the pregnancy rate and also reduces the chances of miscarriage.

What can I do?

Can dietary supplements help?

There is some evidence that prolonged vitamin and mineral supplements can improve the quality of the sperm in men with *existing* poor sperm counts (as assessed by traditional semen analysis). This is thought to be due to a reduction in the *reactive oxygen species* chemicals. Whilst it does not change the requirement for ICSI, it reduces the amount of sperm DNA fragmentation, which in turn can increase the pregnancy rate and the live birth rate (Ross *et al*, 2010; Showell *et al*, 2011).

If ICSI has already been recommended, it may be worthwhile taking supplements for *at least* 3 months prior to, and during your IVF/ICSI treatment.

Unfortunately, there are many different vitamins and minerals that have been investigated and no one knows which *individual* supplement would be best. Hence, it's probably best to take a combination of supplements and these are commercially available. It must be emphasised that whilst they *might* make a difference to the quality of the sperm, they may make no difference at all, but at least we know that at these levels they won't do any harm.

Who else should be tested?

- Unexplained infertility,
- If you have a “normal” sperm count, and you are over 40 years old,

- you and your partner have a history of miscarriage,
- if the fertilisation and/or embryo quality with IVF is poor, it might be worthwhile testing for sperm DNA damage.

What if fertilisation and embryo quality with ICSI is poor?

Sperm production and maturation is a “conveyor belt” system from production in the testicles until the sperm is ejaculated. There is now good evidence to show that the DNA damage in sperm gets progressively worse as it goes through its maturation process in the tubal network of the testis and that sperm retrieved surgically directly from the testicle has lower rates of DNA damage (Greco *et al*, 2005).

As such, if the embryo quality with ICSI was poor, then surgical sperm retrieval might yield better quality sperm - which in turn will increase the chances of ICSI working. However, this is an invasive procedure so should not be entered into lightly, although it may give you a better chance of success.

Unfortunately, if ICSI fails with ejaculated sperm and you do not wish to have sperm retrieved surgically, the only alternatives are to keep trying with ICSI using ejaculated sperm or to use donor sperm.

What do I need to do to get my sperm tested for DNA damage?

You will make an appointment at GCRM to complete the test consent form and produce a sperm sample. The laboratory staff will then freeze a portion of the sample and arrange for this to be sent to Queen’s University in Belfast where it will be analysed. They will issue a report outlining the degree of sperm DNA damage and the recommended subsequent treatment steps (IVF or ICSI). These results will be discussed at a review consultation with the Doctor at GCRM.

How much does the test cost?

Please refer to the current GCRM price list.

If you have any further questions, please do not hesitate to ask.

References

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