IVF and Preimplantation Genetic Testing (PGT)

If you or your partner have been diagnosed with an inherited cancer, or are known to carry a gene change that predisposes you to an inherited cancer when planning for a family, you may be offered IVF and genetic testing of embryos to reduce the chance of passing on the genetic change in your family. This type of testing is known as **preimplantation genetic testing or PGT**. This type of testing has been available since the 1990s and is an increasingly accessible option for people with an inherited susceptibility to certain types of cancer. It used to be referred to as preimplantation genetic diagnosis or PGD, and you may still see this term used in lots of websites and materials.

Before you decide to embark on a journey of IVF and PGT, it is important to have a discussion with your genetics team, treating doctors and a fertility specialist about whether PGT would be available in your situation, and what the process would involve. Although PGT is a popular reproductive option, there are additional costs and steps involved, and it may not be suitable based on fertility factors or in conjunction with your treatment.

How does PGT work?

PGT involves taking a small sample of cells from an embryo to detect whether it has a high chance or low chance of inheriting a specific genetic change. In the case of most inherited cancers, there will be a 50% chance of inheriting the copy of the genetic instruction that causes the condition.

In most cases, PGT is performed on an embryo which is 5-7 days old, at which point there are around 100 cells in the embryo. A few cells are removed (biopsied) from the outside layer of the embryo which goes on to form the placenta. Embryos are then frozen (vitrified) while the lab performs a test on the embryo. Embryos which are shown to have a low chance of the genetic condition are stored and can be later individually transferred to the uterus to achieve a pregnancy.

What are the steps involved in PGT?

Although each case is unique, the general steps that are required to undertake IVF with PGT are:

1. Undergo further genetic counselling to understand the reproductive options available and the process of PGT in detail. To access Medicare rebates for PGT, it is a requirement that you have also consulted with a clinical geneticist.
2. The laboratory designs a test for the genetic change in your family, typically requiring a DNA sample from the egg and sperm provider and often samples from other family members (e.g. a parent with the same inherited cancer)
3. Have fertility investigations to provide information about the chance of success using IVF, including a pelvic ultrasound, blood tests and semen analysis
4. 4.Undertake an IVF cycle with stimulation of the ovaries, monitoring with ultrasound and blood tests, egg collection under anaesthetic, and fertilisation of eggs with sperm
5. Biopsy embryos which have continued growing for 5-7 days and freeze any embryos while the laboratory performs the genetic test
6. Transfer embryos which have a low chance of the genetic condition in a later frozen embryo transfer cycle

What are the alternatives to IVF with PGT?

PGT is one of many reproductive options available if you or your partner have been shown to have a genetic change that causes inherited cancer. Other options include accepting the chance of having a child with the genetic condition allowing them to test later in life when they can choose for themselves, conceiving naturally and having diagnostic testing in pregnancy (prenatal diagnosis), using donor eggs, sperm or embryos, considering alternative parenting options such as fostering or adoption, or choosing not to have any more children. Each family's situation is unique, and the role of genetic counsellors is to help you to find an option that is suitable for your values and beliefs.

What are the chances of success in PGT?
The chance of an IVF cycle being successful will depend on many factors, including the age of the egg provider, the number of eggs obtained, and the number of embryos biopsied. In each cycle, by chance, there may be very few or no embryos available for transfer. In most cases, by the time an embryo is identified as suitable for transfer after genetic testing, there is a pregnancy rate per transfer of approximately50%. A useful resource is yourIVFsuccess which shows the average success rates for patients in Australia based on a number of factors that will differ from person to person. It is important to note that this website does not indicate the impact of PGT on cycle success.

Do I have to have prenatal testing after I have PGT?
In most cases, prenatal testing (testing during pregnancy) will be offered to patients who have an ongoing pregnancy after PGT. The reason is that the test process is not 100% accurate, and testing for the specific genetic change in a pregnancy sample (usually at 11-12 weeks) will provide near 100% reassurance.

Prenatal diagnostic procedures such as amniocentesis have a small (<1/500) chance of pregnancy loss. Non-invasive prenatal testing (NIPT) is not available for the genetic changes that cause inherited cancers.

How much does PGT cost?
The IVF, test design and embryo testing involved in PGT have Medicare support, but in most cases, there are out of pocket expenses. Costs will vary according to the clinic and your individual situation. It is important to remember that there are many factors involved in the success of an IVF cycle with PGT and it may take multiple cycles to achieve a pregnancy.

I **am having fertility preservation for a diagnosis of cancer but do not know if I have a genetic change causing inherited cancer. Can I have PGT?**
PGT cannot be performed unless the genetic change in a family has been identified by standard genetic testing. However, if you are having IVF with the creation of embryos it is possible to biopsy and freeze the embryos to allow PGT in the future. If you receive a positive genetic test result showing you have a variant in an inherited cancer gene, then a test can be designed retrospectively for the embryos.

WI am the first person in my family to have a genetic change causing inherited cancer (a 'de novo' variant). Can I still have PGT?

In most cases, you will still be able to have PGT. Rather than take samples from additional family members to design the test for your embryo, the laboratory will design a test that is specific for the genetic variant which has been identified in your other testing. This may add time and cost to the standard process but in most cases will still be possible.

Who do I contact for more support?

If you would like more information about IVF and PGT for your situation, please contact the team at Inherited Cancers Australia and we can provide individualises support and resources for you to understand the options available.