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IVF and Preimplantation Genetic Testing (PGT) in the context of inherited cancer

If you or your reproductive partner has a pathogenic variant (gene change) associated with an increased chance of developing cancer, you may wish to consider reproductive options that reduce the chance of a future child inheriting the gene change.

One such option is in vitro fertilisation (IVF) combined with preimplantation genetic testing (PGT). The specific type of PGT used in this context is PGT-M (the 'M' stands for 'monogenic' which refers to gene changes that are inherited on a single gene that are associated with a particular condition).

PGT-M involves creating embryos through IVF and then testing them before a pregnancy is established. The aim is to identify which embryos have inherited the genetic change that runs in the family, so that embryos predicted not to have this change can be considered for transfer to the uterus. PGT-M has been available since the 1990s and is now an increasingly accessible option for people with inherited cancer predispositions. It was previously known as preimplantation genetic diagnosis (PGD), and you may still see this term used in older resources.

Before deciding whether to pursue IVF and PGT-M, it is important to have detailed discussions with your genetics team, treating doctors, and a fertility specialist. They can help you understand whether PGT-M is suitable in your situation, what approach would be used in your case, and what the process involves. While PGT-M is a well-established reproductive option, it does involve additional medical steps and costs and may not be appropriate or feasible for everyone depending on individual health, fertility factors, and timing of cancer treatment.

How does PGT-M work?

PGT-M 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-M 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 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-M?

Although each situation is unique, the general steps involved in IVF with PGT-M include:

1. Attend specialised genetic counselling
Meet with a genetic counsellor to discuss your reproductive options and understand the PGT-M process in detail. To access Medicare rebates for PGT-M in Australia, you are also required to consult with a clinical geneticist.

2. Provide DNA samples for test development
Provide DNA samples so the laboratory can develop a personalised test for the genetic change in your family. This usually involves samples from the egg and sperm provider and may also require samples from other family members who have the familial gene change.

3. Complete fertility investigations
Undergo fertility testing to help estimate the chance of success with IVF. This may include blood tests, a pelvic ultrasound, and semen analysis.

4. Undertake an IVF cycle
Complete an IVF cycle, which involves hormonal stimulation of the ovaries, monitoring with ultrasounds and blood tests, egg collection under anaesthetic, and fertilisation of eggs with sperm.

5. Have embryos tested
Allow embryos to grow in the laboratory for 5–7 days before a small number of cells are removed (biopsied) for genetic testing. Embryos are frozen while testing on the biopsied sample is completed.

6. Transfer an embryo
If suitable embryos are available, one may be selected for transfer based on the PGT-M results. Embryos are usually frozen while testing is completed, with transfer occurring in a later cycle.

7. Consider prenatal testing during pregnancy
Consider prenatal diagnostic testing during an ongoing pregnancy to confirm the genetic status of the pregnancy.

What are the chances of achieving an ongoing pregnancy through IVF?

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 approximately 50%.

A useful resource is **yourivfsuccess.com.au**, which shows average success rates for patients in Australia based on a range of factors that vary from person to person. It is important to note that this website provides general IVF success rates and does not take into account the additional steps involved in preimplantation genetic testing (PGT-M), which may affect the number of embryos available for transfer in a given cycle.

How do I know if the PGT-M 'worked?'

In most cases, prenatal testing (testing during pregnancy) will be offered to patients who have an ongoing pregnancy after PGT-M. This is because, while PGT-M is highly accurate, no test is 100% accurate.

Current evidence suggests that the chance of misdiagnosis following modern PGT-M is very low — estimated to be less than 1 in 200 pregnancies (less than 0.5%), with some newer techniques reporting rates below 0.1%. [1] Because only a small number of cells are tested from the embryo, confirmatory prenatal testing is still recommended. Prenatal testing can provide very high reassurance by testing directly for the specific genetic change during pregnancy. This may involve procedures such as amniocentesis. It is important to note that these procedures carry a small chance of pregnancy loss.

How much does PGT-M cost?

The IVF, test design and embryo testing involved in PGT-M 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-M and it may take multiple cycles to achieve a pregnancy, which can take a significant physical, emotional and financial toll.

IVF and PGT-M in different cultural, social, and identity contexts

Decisions about IVF and preimplantation genetic testing (PGT-M) can be shaped by a range of cultural, social, spiritual, and identity-related factors. For some people, reproductive decision-making is closely linked to cultural or religious beliefs about family, conception, genetics, or the moral status of embryos. In some cultural or faith traditions, there may be specific guidance, rules, or reservations about the use of assisted reproductive technologies such as IVF or genetic testing of embryos, while in others these approaches may be supported or accepted under certain conditions.

Because these beliefs and practices vary widely, it can be helpful to explore what is meaningful in your own cultural or spiritual context, and how this may influence your decisions. Some people find it helpful to speak with spiritual leaders, cultural advisors, or elders who are supportive of their values and familiar with these types of reproductive options.

In some communities, there may also be expectations or pressures—spoken or unspoken—about having children, continuing a family line, or making particular reproductive choices. These influences can add complexity to decision-making, and it is important that they are acknowledged and discussed in a supportive environment.

For LGBTQIA+ individuals and couples, IVF and PGT-M may be part of diverse pathways to building a family, including through donor conception, surrogacy, or shared reproductive decision-making. Fertility and genetics services are experienced in supporting a wide range of family structures and identities, and care can be adapted to reflect your specific situation and needs.

Whatever your background or identity, you should feel supported to ask questions, explore your values, and make decisions that are right for you and your family.

What are the alternatives to IVF with PGT-M?

PGT-M is one of many reproductive options available if you or your reproductive partner has been shown to have a genetic change that predisposes to cancer. Other options include:

- Accepting the chance that a child may inherit the gene change, with the option for them to consider genetic testing later in life.

- Conceiving naturally, with the option of diagnostic genetic testing during pregnancy (prenatal diagnosis). This approach means you may need to consider what the results mean for your pregnancy, including whether or not to continue the pregnancy if the genetic change is found to have been inherited.

Note: Non-invasive prenatal testing (NIPT) is currently not available for the single-gene changes associated with inherited cancer conditions.

- Using donor eggs, sperm or embryos.
- Considering alternative parenting options such as fostering or adoption.
- Choosing not to have any (or 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.

Frequently Asked Questions

I am having fertility preservation as part of cancer treatment. I do not know if I have a genetic change associated with inherited cancer. Can I still have PGT-M?

PGT-M can only be performed when the specific genetic variant in a family has been identified through genetic testing. This is because the laboratory must develop a personalised test to determine which embryos have or have not inherited the familial genetic variant.

However, if you are undergoing IVF before genetic testing is complete, it may still be possible to preserve future reproductive options. Depending on the fertility clinic and laboratory processes, embryos may be biopsied and frozen while awaiting genetic test results, allowing PGT-M to be considered later if a pathogenic variant associated with an inherited cancer condition is identified. In some situations, embryos that were frozen without biopsy may also be able to undergo biopsy and testing at a later stage.

Different IVF providers are likely to approach this differently, and so it is always recommended that you discuss what is available through your specific provider. I am the first person in my family to have a genetic change causing inherited cancer (a 'de novo' variant). Can I still have PGT-M?

In most cases, you will still be able to have PGT-M. 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.

Different IVF providers are likely to approach this differently, and so it is always recommended that you discuss what is available through your specific provider.

For more information and support

If you would like more information about IVF and PGT-M for your situation, you can **contact the team at Inherited Cancers Australia** for individualised support and resources to help you understand your options.

It is also important to speak with a specialist fertility (IVF) clinic. IVF clinics have doctors, nurses, and counsellors who are experienced in discussing PGT-M and can provide tailored advice about how IVF and genetic testing would work in your specific situation, including practical steps, costs, and likely outcomes. Your genetics team or treating doctor can usually help refer you to an appropriate clinic if needed.

References

[1] Hardy T. The role of prenatal diagnosis following preimplantation genetic testing for single-gene conditions: A historical overview of evolving technologies and clinical practice. *Prenat Diagn.* 2020 May;40(6):647-651. doi: 10.1002/pd.5662. Epub 2020 Feb 17. PMID: 32037566.