

Who Should Undergo PGT? In Which Situations Is PGT Recommended?

Couples Carrying Genetic Diseases: If a couple is at risk of carrying a specific genetic disease, it should not be decided immediately to perform PGT. Before planning IVF treatment, they should consult a genetic center.

Prevention of Recurrent Pregnancy Losses: For families experiencing recurrent pregnancy losses—especially at advanced maternal age—PGT-A may offer a chance for a healthy pregnancy. However, the causes of recurrent pregnancy loss should first be investigated.

Advanced Maternal Age: As maternal age increases, the risk of chromosomal abnormalities also increases. In such cases, chromosomal abnormalities in embryos can be evaluated using PGT-A. It is especially recommended for women over the age of 35.

Structural Chromosomal Rearrangements: When one of the parents carries a structural chromosomal rearrangement, embryos can be analyzed using the PGT-SR (Structural Rearrangements) method.

Improving the Effectiveness of Fertility Treatments: When combined with assisted reproductive techniques such as in vitro fertilization (IVF), PGT can increase the chance of pregnancy by selecting healthy embryos. Therefore, it is recommended in cases of repeated IVF failure.

Severe Male Factor: In identified cases, the risk of numerical chromosomal abnormalities is increased. PGT-A is recommended.

Detection of Chromosomal Abnormalities in Previous Pregnancies: Families should be provided with detailed information. Many chromosomal changes detected during pregnancy do not lead to a significantly increased risk in subsequent pregnancies. Therefore, based on the identified change, families should receive counseling from an experienced healthcare professional.

Carrier Status for Cancer, Neurodegenerative Diseases, and Inherited Cardiac Diseases: Families may not wish to pass on variants that predispose to serious diseases affecting quality of life. In such cases, testing can be planned to select embryos that do not carry these variants.

HLA-Matched Sibling: Families who have a child with a condition such as leukemia or another disease requiring bone marrow transplantation may choose an HLA-matched baby so that stem cells can be used for the affected child when needed.

Preimplantation Genetic Testing (PGT) allows genetic disorders to be identified before embryos are transferred to the uterus and enables the selection of healthy embryos that do not carry these disorders. The test, which is commonly described by the public as “filtering out bad genes,” actually works as follows: biopsies are taken from all embryos, and through genetic analysis, the healthy embryos are identified and selected for transfer. No treatment is performed on the embryo itself.

Today, worldwide, treating embryos—or even conducting research on embryos that will not be used—is not legally permitted. However, rapid advances in genetic science may change this situation in the near future, and embryo-based treatments may become a topic of discussion.

IVF combined with PGT is a highly successful and reassuring method that enables families to take home healthy babies when the indications are correctly defined. If there is a known genetic disease in the family, testing can be specifically planned for that condition. However, with current technologies, if a family is considering PGT for any reason, performing expanded genetic screening of both partners beforehand and identifying risks for other possible genetic diseases—and including these in embryo testing—can significantly reduce the likelihood of having a child with a genetic disorder.

It should be remembered that natural conception is always the preferred and healthiest process when no risks are present. Undergoing IVF solely to achieve a “healthier” pregnancy when there is no medical indication is not appropriate. Every pregnancy carries certain risks, and no one can guarantee that a baby will be born 100% healthy—this applies to both natural and IVF pregnancies. However, advanced prenatal follow-up methods, detailed screenings during pregnancy, and carrier screenings performed before pregnancy can significantly reduce the risk of disease in the baby.

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PREIMPLANTATION GENETIC DIAGNOSIS PGT



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What is PGT and When is it Performed?

Preimplantation Genetic Diagnosis (PGT) is a test conducted during in vitro fertilization to detect “known single-gene disorders in the family” and/or “chromosomal abnormalities” in embryos. PGT allows for the selection of genetically healthy embryos before embryo transfer. Different PGT tests are specifically developed for each family based on genetic risks:

PGT Setup Work:

The PGT setup work involves establishing the infrastructure required for genetic analysis in the laboratory and designing a patient-specific test. These studies help determine which chromosome pair contains the genetic alteration present in the family. Therefore, sometimes samples may need to be taken from the parents of the couple or other affected family members. Without these studies, it is not possible to distinguish whether the genetic change is on the chromosome from the mother or the father, and thus, healthy embryo selection cannot be performed. During this process:

- Preparations are made for the analysis of genetic diseases, considering the patient's and family's history.
- Relevant genetic analysis methods are determined.
- Tests are specifically designed for monogenic diseases.

The PGT setup work is a critical step to ensure the test results are accurate and that patient-specific risks are effectively managed.

PGT-M (For Monogenic Disease Diagnosis):

PGT-M is performed to detect the presence of a genetic disease in embryos of individuals with a family history of the condition. The process begins with a consultation with the family to determine the risks present. Families, especially those with consanguineous marriages, are informed about additional tests that can assess risks for other diseases besides the one that brought them to us. For families that do not wish to undergo these additional tests, preliminary studies targeting the reported genetic disease are conducted. A special study strategy is developed for that family. During PGT-M, both the variant causing the disease in the family and nearby markers are examined to increase the reliability of the test. To identify these markers, the "setup" work detailed above must be carried out with the family.

Embryos that are normal in the PGT-M study undergo aneuploidy testing (PGT-A).

PGT-A (for Aneuploidy Screening):

PGT-A is used to detect numerical chromosomal abnormalities in embryos (for example, Trisomy 21—Down syndrome, which involves an extra chromosome, or cases in which one or more chromosomes are missing). Aneuploidy is a genetic alteration that may lead to pregnancy loss, lack of embryo viability, or serious health problems at birth.

This method is also used when one of the partners carries a Robertsonian translocation. In such cases, the test evaluates whether the chromosome number is numerically normal. However, in this situation we additionally recommend performing a uniparental disomy (UPD) test for the two chromosomes involved, in order to (i) differentiate embryos that initially started as abnormal but later “rescued” themselves, and (ii) determine whether one of these chromosomes is of maternal origin and the other is of paternal origin. In order to perform this test on embryos, a preparatory study (setup study) is required. It is not known exactly at which stage of embryonic development “rescue” from trisomy or monosomy occurs. For this reason, even if the probability is low, we recommend performing this test. For families who do not wish to have this test performed during IVF, if pregnancy occurs, prenatal diagnosis (via amniocentesis or chorionic villus sampling) is strongly recommended, and UPD testing should also be performed at that time.

PGT-SR (Structural Rearrangement Testing):

This test is performed in individuals who are carriers of a balanced translocation or an inversion, to assess small chromosomal losses and gains that may occur in embryos. If one of the parents has a structural chromosomal alteration, this test is primarily recommended.

Combined PGT (Monogenic Disease Testing and Aneuploidy Screening):

Both chromosomal abnormalities and the monogenic disease(s) that pose a risk in the family are screened. Chromosomal disorders can arise at any time in IVF cycles. Some chromosomal changes that may be spontaneously eliminated in naturally conceived pregnancies can persist in embryos in IVF pregnancies. If there is a risk of a single-gene disorder in the family, because this risk is higher, embryos are first screened for that condition (PGT-M). Aneuploidy testing (PGT-A) is then performed on embryos that do not carry the single-gene disorder, i.e., embryos with a normal PGT-M result.

PGT-HLA (for HLA Typing):

PGT-HLA enables the selection of embryos with a tissue type compatible for transplantation. It is particularly used in situations where a sibling-to-sibling transplant is planned—that is, to select an embryo that is tissue-compatible with an affected child already in the family.

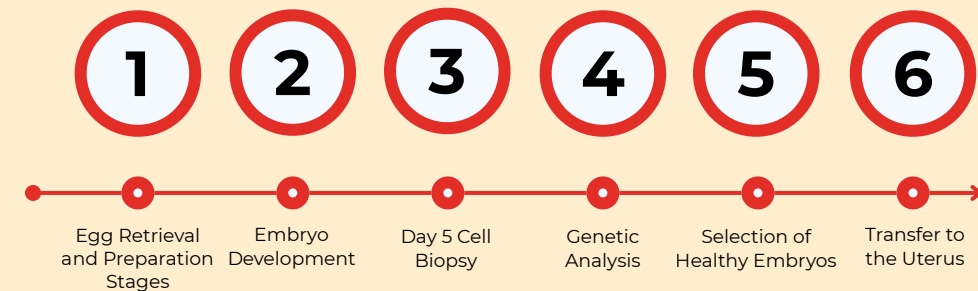
PGT-M-HLA:

PGT-M-HLA is a specialized test that allows simultaneous testing for both (i) the monogenic disease(s) that pose a risk in the family and (ii) HLA typing. In this test, PGT-M is performed for the familial disease, and among the embryos that do not carry the disease, an embryo that is HLA-compatible is selected.

How Is Preimplantation Genetic Testing (PGT) Performed?

How Does the Process Work?

Preimplantation Genetic Testing (PGT) is generally a process that includes the following steps:



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