

Chromosomal Translocations

It is estimated that 1 in 625 individuals in the general population carry a balanced chromosomal translocation. Other chromosomal translocations may occur more frequently in the general population. Individuals that carry a balanced chromosomal translocation contain all of their genetic information; however, pieces of some chromosomes have switched places. Individuals that carry chromosomal translocations are typically healthy; however they are at an increased risk for infertility, miscarriage, stillbirth, and/or having a child with birth defects. Preimplantation genetic testing for chromosomal translocations is able to distinguish between chromosomally normal and abnormal embryos. Currently, this is the only way to determine whether the embryo is chromosomally normal or “balanced”, prior to pregnancy.

What is preimplantation genetic diagnosis?

By definition, preimplantation genetic diagnosis (PGD) is diagnosis of a genetic condition prior to achievement of a pregnancy. PGD was first performed in the early 1990’s as a way for couples to prevent the pregnancy of a child with genetic disease. Currently, we are able to perform PGD for many genetic conditions including single gene disorders and for chromosomal abnormalities. At the Reproductive Genetics Institute, we have been performing PGD since it became available in 1990. We pioneered the polar body removal technology and nuclear conversion technology and are one of the most active centers offering PGD in the world. Our laboratory technicians are well trained in the techniques involved.

What is IVF?

IVF is an abbreviation for in vitro fertilization. This refers to a process by which the eggs are retrieved from the ovaries of a woman before they are released, and fertilization of the eggs occurs in the laboratory. The resultant embryos are placed back into the woman’s uterus several days later. An IVF cycle includes the woman taking injectible medications to stimulate the ovaries to produce more than one egg at a time. As one can imagine, this is a fairly complicated process which requires a number of physician visits and monitoring. IVF is required when an individual chooses to have PGD testing performed.

How can PGD and IVF help my family and me?

PGD can allow the laboratory to select for those embryos that are known to be either “balanced” or normal, thus avoiding achieving a pregnancy with an unbalanced set of chromosomes. Many couples in which one member is a translocation carrier have experienced miscarriages or have had to face difficult decisions when learning about a pregnancy with an “unbalanced” result. PGD can reduce the likelihood of couples having to deal with these particular circumstances by knowing prior to conception that the embryo(s) being transferred are not unbalanced for the translocation.

How is the testing performed?

There are two basic types of preimplantation diagnosis—polar body analysis and embryo analysis. Both types of testing have advantages and limitations. Polar body testing

focuses on the maternal contribution, and is an earlier method of testing. Generally, polar body testing is performed only in cases where the female partner of the couple carries a chromosome rearrangement. However, it is frequently necessary to do confirmatory testing on the embryos in the case of a maternal chromosome rearrangement. Embryo testing accounts for both maternal and paternal genetic contributions but occurs later. Therefore, this testing is performed in cases of the male partner having a chromosome rearrangement. In some instances, testing for a female translocation may be limited to embryo testing as well (usually to accommodate the couple).

What are polar bodies?

Polar bodies are the by-products of the egg's division. As an egg matures, it goes through a two-step division process, dividing once at the time when ovulation would occur and again at the time of fertilization. The two polar bodies are the products of this division which are essentially being discarded by the egg (oocyte). By analyzing the polar bodies, it is possible to infer the genetic status of the oocyte. When testing for a translocation, it is critical to have information from both polar bodies to get a clear picture of the chromosome make-up of the oocyte.

What is an embryo biopsy?

When an embryo becomes a 6-10 celled mass (approximately 3 days after egg retrieval), it becomes possible to directly test the embryo through removal of a single cell. Removal of this cell is usually not detrimental to the embryo, as all the cells are equivalent and no cell differentiation has occurred. The cell that is removed may then be analyzed to determine directly the genetic status of the embryo. Following embryo biopsy, a special technology is utilized (conversion) which allows our laboratory to see the whole chromosomes in a fashion similar to how blood samples are analyzed for chromosome studies.

What is F.I.S.H. analysis?

F.I.S.H. (fluorescent in-situ hybridization) is technology that allows the laboratory to determine the presence or absence of particular chromosomes or chromosome segments. Probes labeled with fluorescent signals are used to identify certain chromosome segments and the probes light up, or fluoresce, in the presence of that chromosome region. Different colors are used to identify different chromosomes. The laboratory will require a blood sample from the individual who carries the chromosome rearrangement so that a specific system of probes can be designed for that specific rearrangement. Once a system of probes has been created for the family, the laboratory tests it on the blood sample to assure that the signals are clear and all pieces can be identified in a single cell setting.

What is nuclear conversion?

Nuclear conversion is a new technology that enables us to better visualize the chromosomes in the 2nd polar body and in the blastomere cells (embryo cells). This technique is typically used for couples with a history of chromosomal translocations or inversions. For these individuals, we are able to distinguish between eggs or embryos that have a balanced translocation, like their parent, from embryos that have an unbalanced chromosomal translocation. Therefore, we can distinguish between

chromosomally normal, balanced and unbalanced embryos. Hopefully, this will increase the number of embryos that may be recommended for transfer, leading to the birth of a healthy child.

When do I get results?

Results are generally given on day five, at the time of embryo transfer. On occasion, a day three transfer may occur in the setting of a female translocation carrier. Due to the complex nature of the conversion technique and testing, it is difficult to have results prior to day five. In some instances, day four results are available following embryo biopsy (for purposes of embryos which are traveling to another site for transfer).

What is the accuracy of the testing?

F.I.S.H. technology is widely available in modern medicine and has a published accuracy rate of 95%. Although there have been no studies on preimplantation genetic diagnosis and use of F.I.S.H., the accuracy would be considered to approach this number. It is important to keep in mind that the testing focuses only on the chromosomes involved in the rearrangement, and it is not possible to check for all chromosome problems at this early stage of embryo development.

What is the cost?

Please ask one of our genetic counselors for our updated pricing information.

Does PGD replace prenatal testing?

No, PGD does not replace prenatal testing. PGD is a research-based test allowing for a similar diagnosis to those available by prenatal testing. However, prenatal testing, such as chorionic villus sampling or amniocentesis, is recommended to confirm the PGD test results, as prenatal diagnosis is the standard-of-care. Our genetic counselors can discuss what prenatal testing options are available to you.

Frequently asked questions

Will my insurance cover the costs of PGD?

Because PGD testing is performed on an investigational basis, most insurance carriers will not cover the cost of preimplantation genetic diagnosis (PGD). As insurance policies vary, it is always to your benefit to check with your insurance carrier. It is your responsibility to contact your insurance carrier regarding your coverage.

How do I get more information about PGD?

To receive additional information, please contact our office at (773) 472-4900. You can also send an email request to rgi@flash.net.

How do I get started?

Please contact one of our genetic counselors for an initial consultation at (773) 472-4900. They will provide the necessary information to begin the process for your family.

What are the limitations of PGD?

As with prenatal testing, PGD is aimed at reducing your chances of having a child with an unbalanced set of chromosomes; however, it does not test for all birth defects. Every couple, regardless of their ethnic background and family history, has a 3-5% risk for birth defects, with each pregnancy.

Can you also test for chromosome problems such as Down syndrome?

In many cases, we are also able to screen for age-related chromosomal abnormalities, such as Down syndrome, in addition to testing for the specific genetic condition running in your family. There is an additional fee for this testing. Please talk with our genetic counselor to see if this testing is an option for you.

Is there a waiting list?

No. As soon as our center receives the necessary information, samples and laboratory set-up fee, we begin working on your case immediately.