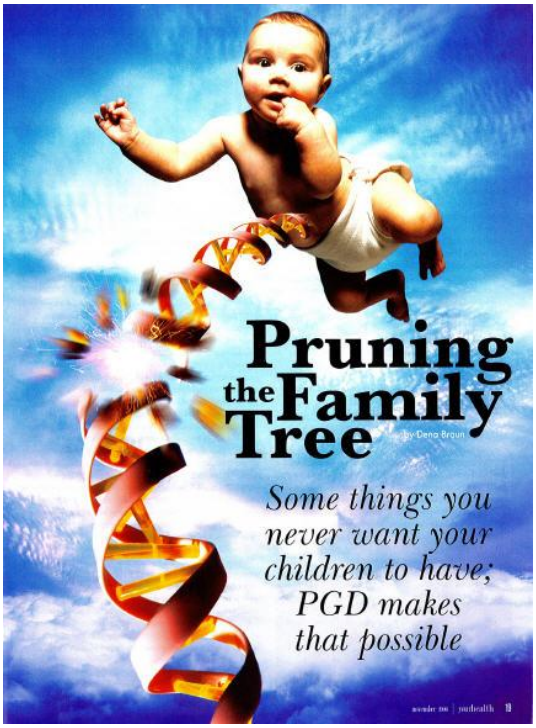
Pruning the Family Tree: Some things you never want your children to have; PGD makes that possible

By Dena Braun



Like most couples, Stacy and Mitch Brookhyser dreamed of their future with children. They hoped the child would share their love of music and imagined the day when Mitch would first teach the child how to surf. But more that anything they hoped their child would simply be healthy, but for the Brookhyser's there was a 50 percent chance that wouldn't happen.

Huntington's Disease ran rampant in Stacy's family; she had seen it affect her grandma, mother and aunt, and she knew if she shared the same gene mutation and passed it down, her children would face the same fate.

Genetics 101 tells us that if both parents have brown eyes, it is unlikely to have a child without brown eyes. Brown is a dominant gene, we've known this since high school. What most people don't know is that disease can also be dominant- Huntington's is. A genetic test revealed that Stacy was carrying the gene.

Stacy decided it was time once and for all to prune Huntington's disease out of her family tree using a revolutionary process called Premplantation Genetic Diagnosis. (PGD).

"We didn't want to just plunge ahead and have kids; we felt that wasn't responsible," Stacy say. " It was difficult to deal with the results of the news, but we were still driven to have kids."

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>
> —Dr. Mark Hughes

Expectant couples may hope for a certain hair and eye color, and certain facial features, but the most important thing is a clean bill of health and until recently this basic desire was an uncertainty for couples with a family history of disease. Getting pregnant was quite literally a roll of the genetic dice. But thanks to improvements in PGD, these high- risk couples can virtually assure a disease-free child.

PGD was developed in the 1980's and the first successful live births using the technology occurred in 1989.

"PGD came out of pure frustration," say Dr. Mark Hughes, of the Genesis Genetics Institute and one of the doctors who developed the technology. "I got tired of having to meet with couples who just had a baby with a horrible disease and explain to them how it happened and that their future children had a 25 percent chance of having the same disorder."

Initially, PGD screened only for cystic fibrosis, but today more than 240 diseases can be checked.

The Brookhyser's turned to Lawrence Werlin of the Coastal Fertility Medical Center in Orange County, CA.

It makes a huge difference if you have a great doctor with a great lab., " says Stacy. "Dr. Werlin made a difficult process comfortable for us."

PGD involves testing embryos for genetic mutations or chromosomal defects before using IVF to implant them in the womb. Doctors in Europe, and now some in the United States, are starting to separate the two types of testing, referring to chromosome screening as Preimplantation Genetic Screening (PGS) and leaving PGD to cover genetic mutations. The idea is that because chromosome abnormalities are random, a single test can be used to screen any in-vitro patient, whereas a genetic mutation is specific to each family and individualized tests must be constructed. A recent study in the journal *Fertility and Sterility* showed that 20 percent of IVF patients used PGD in 2005, with two-thirds testing for chromosome problems and 12 percent testing for genetic mutations.

Surprisingly, a abnormality in one of the 23 pairs of chromosomes humans carry is not uncommon. A study using embryos from the Huntington Reproductive Center in Pasadena, CA, analyzed 289 embryos from 22 egg donors and found chromosomal abnormalities in 42 percent. PGS allows doctors to determine if an embryo has too few or too many chromosomes. Currently 80 percent of all defects can be caught.

What Can PGD Detect?

Currently, nearly 250 genetic disorders and chromosome abnormalities can be detected with Preimplantation Genetic Diagnosis (PGD). "The PGD field is constantly being improved as we learn more about the genetic basis for diseases," says Dr. Kate Schoyer of Weill Cornell and Northern Westchester Hospital in Kentucky.

PGD can also be used to screen for some adult-onset diseases such as Alzheimer's, and certain types of cancers, including a screen for the BRCA 1 and BRCA 2 genes that are strong predictors of breast cancer. Because these diseases don't occur until later in life, there is some debate about whether it is ethical to discard an embryo for a disease they couldn't get until middle age. However, a 2004 report from Johns Hopkins University's Genetics and Public Policy Center showed that nearly 60 percent of Americans approved of using PGD for adult-onset disorders.

While chromosomal abnormalities are a fluke, genetic mutations are the results of the parents carrying a recessive , dominant or X-linked flawed gene. In a dominant disorder, like Huntington's disease, if one parent has a defective gene that dominates its natural counterpart, it leaves their offspring with a 50 percent chance of developing the disease. In recessive disorders, like cystic fibrosis, if both parents carry one defective gene and a normal counterpart, their offspring have a 50 percent chance of being a carrier and a 25 percent chance of contracting the disease.

" People don't come in for PGD for trivial diseases," says Hughes, "They've made a conscious decision to prune a disease out of the family tree forever."

The first step in PGD is to test the parents to see if they carry any defective genes that could get passed along to the child. In many cases, a family history lets doctors know what they're looking for, but other times, a couple will test simply because their ethnicity is a

predisposition to certain diseases. If the parent's blood test indicates any genetic mutations, DNA samples are taken from the couple and any family members who may already have had the disease. This allows doctors to craft a test specific to the family's particular mutation to screen the embryos.

Once the lab has created the specific test, the woman is started on a standard cycle of IVF, where multiple embryos are produced and doctors can separate the ones containing mutated genes and defective chromosomes from ones that don't. Then, doctors, will implant disease-free embryos in the woman, and hopefully, a pregnancy will begin. Despite the high accuracy of PGD testing, which is 90-95 percent accurate, women still need prenatal screening to ensure that the PGD results were correct. This happens three days after fertilization.

Stacy produced nine embryos with IVF. The PGD testing showed that three embryos were unaffected by Huntington's disease and those embryos were implanted. Two weeks later a pregnancy test revealed that Stacy was carrying twins. Now Stacy is working on a campaign in the Huntington's community to let more people know about PGD and had launched a website, www.hdfreewithpgd.com.

Since 2001, PGD has also been used to conceive "savior siblings". If a couple already has a child affected by a disease, a test known as human leukocyte antigen (HLA) typing can be done on the embryo. HLA's are used by the body to identify what cells belong and which cells don't. The more in common people's HLA's are, the more likely that they are a donor match. The sick child could benefit from a new siblings cord-blood stem cells or a bone marrow transplant after birth.

While there is some concern that PGD could be misused in an effort to create "designer babies" public support for PGD is strong. A 2004 report from Johns Hopkins University's Genetics and Public Policy Center found that 70 percent of Americans think it is ethical to screen embryos for gene mutations and the same percentage support "savior siblings". The poll also showed that 80 percent feared that PGD could increase discrimination against the disabled and 66 percent worried that it would bring about an imbalance of the sexes. A majority surveyed was against using PGD solely for sex selection.

Can you be an egg donor?

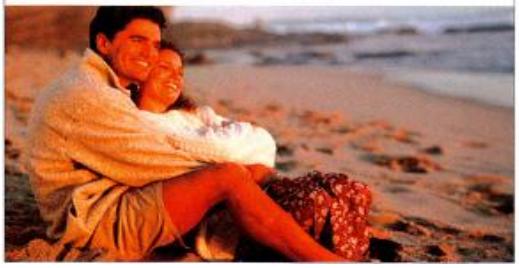
It's not as simple as one, two, three. There is a very detailed process to donate your eggs.

Initially, you may be interviewed over the telephone, or be sent an application to fill out. Based on your responses, the program may decide that you are unlikely to be chosen, and you may not hear from them again.

If the program decides that you are a good candidate, you may be invited to proceed with the selection process. The New York State Department of Health states that before you are accepted as an egg donor, you will be required to undergo several types of screenings.

The general medical screening includes a physical examination, including a pelvic exam to test for gonorrhea and chlamydia. Then blood will be drawn to test hormone levels and all sorts of diseases. An ultrasound will be used to examine your uterus, ovaries and other pelvic organs.

You will then complete a detailed medical and psychological history about yourself and close blood relatives. It will include questions about your use of cigarettes, alcohol, and prescription and illegal drugs. Many programs conduct unannounced drug tests during the screening and donation process. The psychological screening requires you to confront complex ethical, emotional and social issues about egg donation. The screening process should help you evaluate your desire to donate and to think through these issues.



PGD adds about $3500 to the cost of an IVF cycles and is not usually covered by insurance. Despite the additional costs, many couples believe that it is a small price to have a healthy child.