

# Preimplantation Genetic Diagnosis (PGD) in Halacha

By Rabbi Aaron E. Glatt, MD

Halachic issues related to fertility are among the most complicated, controversial, and clinically important subjects that modern day *poskim* face. From the great debates half a century ago regarding rudimentary artificial insemination *shailos* (questions), the science of reproduction has advanced technologically so much so that cutting edge *shailos* nowadays involve every aspect of parentage, genetics, and both chromosomal and mitochondrial DNA issues. And we are at the dawn of an entire new stage of questions as Hashem permits us to develop new advances—true artificial wombs, CRISPR (a powerful tool for editing genomes), and halachic issues revolving around stem/pluripotential cell lines. We will no longer be asking “*who* are the parents”, but instead, “*are* there parents”? However, for this article, I will focus on a new but already medically and halachically established technology, preimplantation genetic diagnosis (PGD).

Preimplantation genetic diagnosis (PGD) is a relatively new reproductive technology used as part of an in vitro fertilization (IVF) process to increase the potential for a successful pregnancy and delivery of a healthy non-genetically impaired child. It has brought tremendous happiness to many distraught couples with previously insurmountable medical dilemmas, yet it raises many interesting and provocative questions.

Until PGD, parents carrying various genetic abnormalities would automatically pass these abnormal genes onto their offspring. The clinical manifestations would be dependent upon whether a gene was dominant, recessive, or a mosaic, and upon many other factors. While donor sperm or donor eggs were available, it was impossible to address the underlying genetic abnormality. Thus, until PGD, for couples who wanted children but had abnormal genes, there were limited options, including: a) using donor eggs or sperm; b) prenatal testing with possible termination of a pregnancy (allowable in selected situations according to some halachic decisors); c) no prenatal testing and possibly bringing a genetically abnormal child to term delivery; d) adoption.

However, with the development of PGD, we can now perform genetic testing on cells removed from in-vitro fertilized embryos, to help select the “best” (i.e. non mutated or impaired) embryo(s) to achieve a healthy pregnancy, and avoid the genetic disease or medical issue for which the couple was at risk. The process works as follows: Via in-vitro fertilization, eggs and sperm form embryos in the laboratory, and the embryos mature from a single cell to a blastocyst embryo with differentiation of the ectoderm, mesoderm, and endoderm, after growth for five to seven days. PGD is then performed on appropriately developing embryos by removing just a few cells from the trophectoderm, the outer layer of the blastocyst embryo.

While this removed trophectoderm is being tested for genetic abnormalities, the embryos remain stored in cryopreservation, awaiting test results. When testing is complete and confirmation of embryo viability (i.e. without genetic abnormality) is determined, healthy embryo(s) can be implanted in the mother with the hope that she will become pregnant and carry her child to birth.

Data from many years of PGD in animals and several hundred thousand live births in humans since PGD's inception in 1990, indicate that PGD does not lead to an increase in birth defects. Follow-up evaluation of PGD-born children does not show any evidence for a detrimental effect of the process on growth or neurological development over the first several years of life. Indeed, in embryos where chromosomal PGD testing is performed, one expects *fewer* pregnancies ending in miscarriages due to chromosomal disorders since most abnormalities are identified prior to transfer of the embryos to the uterus. Removal of a few of the trophectoderm cells of the early embryo does not alter the ability of that embryo to develop into a complete, normal pregnancy.

## What halachic issues are present with PGD?

Firstly, what is the halachic status of a fertilized egg in a test tube? *Poskim* have ruled that if the electricity/power to refrigerated embryos is shut down on Shabbos, one is not permitted to transgress a Torah prohibition to save those soon-to-be unfrozen embryos. Ergo, they are not considered alive and there is no *pikuach nefashos* (life threatening) consideration to be *mechalel* (desecrate) Shabbos to save them. Therefore, since an embryo is not considered “life”, unused embryos may be destroyed without any *retzichah* (murder) concerns, a position at odds with some other rulings.

## What are the halachic indications for PGD?

Any characteristic that is genetic and has been identified can be selected for via using PGD. Thus, if you wanted blue eyes instead of brown eyes, tall stature instead of short stature, girl versus boy or vice versa, these are all traits or characteristics that PGD could select for. However, just because we *can* make “designer babies” does not mean that we *should*, ethically or halachically.

Indeed, under normal conditions, *poskim* forbid using artificial technologies such as PGD that force one to bypass the normal reproductive process without a good halachic reason. Leaving aside discussions about cost and potential risk taking efforts involved in doing PGD, it would be forbidden (without a good halachic reason) because one is not permitted to utilize contraception to have a “designer” PGD child. Preventing normal husband-wife conception is never something that should be undertaken without serious discussion with a competent halachic authority. However, there are many situations where it

is halachically acceptable to perform PGD even though it requires contraception, and even if conception could occur naturally.

HaRav Elyashiv *zt”l* was asked whether PGD should be allowed to select embryos to prevent serious or life-threatening genetic disorders. His definitive response, that it is permissible, has led to hundreds if not thousands of healthy babies being born under halachic auspices. At such hospitals in Israel, a committee reviews every PGD request to ascertain that it is medically, as well as halachically, appropriate. They take into consideration many medical and social factors, including prior children and gender, severity of the condition being addressed by PGD, and mental states of the parents. Even in hospitals not bound by *halacha*, PGD is often restricted to what are felt to be “appropriate” situations.

One of the most common reasons for PGD is gender selection. In the December 2014 issue of the Israel Journal of Health Policy Research, it was reported that three-quarters of their 308 PGD requests were related to gender selection, and they came from couples where there were already  $\geq 4$  children born of one gender. Incidentally, of these applicants, 100% of the Arab and 63% of the Jewish couples were specifically asking to have a son produced by PGD.

In such a situation, both HaRav Mordechai Elyahu *zt”l* and HaRav Ovadia Yosef *zt”l* permitted PGD to be used for gender selection in cases where there were, respectively, five or six children of one gender already born (and none of the other gender). While these *poskim* allowed PGD in these situations, it must be reiterated that there is no halachic obligation to do so, even to fulfill the *mitzvah* of “*piryah verivya*” (procreation, and more specifically, having a boy and a girl, according to some *poskim*). The famous Gemara in Shabbos (127a) states that we will all be asked six questions when we reach 120 years of age. One will be “did we engage in *piryah verivya*”? HaRav Moshe Feinstein *zt”l* explained that does not mean did we have children, but did we try.

Incidentally, the Maharsha says the question is asking, did we help make *shidduchim* (marriages)? Maybe we can even suggest expanding on that Mahrasha and take the question to its natural conclusion. Maybe Hashem is asking us, did we do everything we could to assist couples unable to naturally have healthy children, to be able to now have healthy children using technology. May it be G-d's will that all people answer that question with a resounding “yes”.

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