

# Reproductive Technologies

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## Definition: What are Reproductive Technologies?

Reproductive technologies, also called assisted reproductive techniques (ART), are procedures designed to help women become pregnant by overcoming infertility .

### Infertility

As Americans continue to choose to delay marriage and the birth of their first child, infertility rates continue to rise and now affect 1 in 5 couples who want to have a baby. (Couples who have not been able to conceive after a year of unprotected intercourse are generally considered infertile.)

Infertility can be emotionally devastating to the couple. Treatment can be prolonged and expensive; and success is not guaranteed.

By their late 30s, most women have decreased fertility and an increased risk of miscarriage if they do conceive. By age 45, most women are infertile.

In addition to aging, diseases and disorders that directly affect female reproductive organs (fallopian tubes, uterus, and ovaries) and related hormones are also major causes of infertility in women. In addition, thyroid disorders, cancer treatment, smoking, and either being overweight or underweight can result in female infertility.

A woman may have difficulty becoming pregnant because her male partner is infertile. By age 35, male fertility gradually declines. In addition to aging, certain diseases, exposure to environmental components including heat and toxins (especially pesticides), substance abuse, smoking, and emotional stress can result in infertility in males. Obesity may also contribute to infertility in males, although not all research confirms this. New research is indicating that heat from the use of laptop computers may also contribute to infertility in otherwise healthy males.

Female reproductive disorders affect 55% of couples, male (sperm) disorders affect 35% of infertile couples, and 10% of couples experience infertility of unidentified origins.

**More than 4 million babies are born in the U.S. each year. Of these, more than 70,000 arrive through the use of assisted reproductive technologies or ART.**

Assisted Reproductive Technologies (ART) include the following:

- Artificial insemination (AI) – A medical procedure in which sperm is placed directly into a woman's uterus or cervix.
- Donor eggs or embryos – Using a surgical procedure, donor eggs are harvested from a fertile woman and undergo in vitro fertilization to generate donor embryos, which will be implanted in the infertile woman.
- Drug therapy – Physicians prescribe hormonal medications for women who are experiencing infertility to increase the chances of ovulation and conception.
- Intracytoplasmic sperm injection (ICSI) - A sperm cell is injected directly into an egg cell. This technique is helpful when other methods have failed, especially when failure is due to semen abnormalities.
- Intrafallopian transfer procedures – Depending on the technique used, either sperm and an egg (GIFT) or a fertilized embryo (ZIFT) are injected into the fallopian tube. Fertilization and/or implantation of the embryo then occur naturally.
- In vitro fertilization (IVF) - Unfertilized egg cells from a woman and sperm from a man are combined in a laboratory dish, resulting in generation of embryos. In vitro fertilization is the most common technique used to assist reproduction and can be utilized to overcome female, male, and unexplained infertility. In vitro is Latin for “in glass” and refers to events taking place outside the human body in an artificial environment.
- Natural family planning - Monitoring the ovulation cycle to optimize chances of conception. (Note: Because this method does not require a visit to a medical professional, it is probably not included in most studies and statistics about ART, including those in this article.)
- Surrogacy - A woman contributes eggs and/or carries a pregnancy for another person or couple who want a child.

### **GIFT/ZIFT—uncommon alternatives to IVF**

- Gamete intrafallopian tube transfer, or GIFT, is a technique in which sperm and unfertilized egg cells are either injected (through an incision in the abdomen) or transferred (through the vagina) into a woman's fallopian tubes (which lead from the ovaries to the uterus), where fertilization can occur. GIFT takes place right after the egg cells are retrieved from the ovary. Success rates are 25-35%
- A related technique is zygote intrafallopian tube transfer, or ZIFT. In this technique, a fertilized egg is transferred directly into the fallopian tube. It can be more successful than GIFT. (Even though healthy sperm and eggs are used in the GIFT procedure, fertilization may not occur after transfer.)

### **Medical Risks to Mother and Baby with ART**

Assisted reproductive technologies increases the occurrence of multiple births. According to the Centers for Disease Control and Prevention (CDC), multiple births increase health risks for both mother and infants. About half of babies born using ART have a twin or other siblings born at the same time. During

pregnancy and delivery, women pregnant with more than one child undergo an increased risk of hypertension, hemorrhage, and other complications. Risks to infants include: premature birth, low birthweight, infant mortality and long-term disability.

The chances of multiple births increase when women undergo ART procedures using freshly fertilized embryos. Even more significant, multiple embryo transfers increase the likelihood of multiple births. (In Europe, fewer multiple births are associated with ART than in the U.S. because fewer embryos are transferred during routine in vitro fertilizations.)

While the research results are not consistent, infants born through use of ART are considered to be at a potentially increased risk for some birth defects and developmental disorders. However, the President's Council on Bioethics notes that the overall incidence of these suggested risks is low and that ART clinicians should not dissuade their patients from pursuing fertility treatment because of them.

## **Costs**

In the U.S., insurance companies are unlikely to cover the cost of assisted reproductive technologies. The average cost of one IVF treatment cycle in the U.S. is about \$12,500. Repeated treatments are often necessary.

The high cost and lack of insurance coverage limit ART to those who can afford the services, usually Caucasian, middle-to-high-income individuals.

In Europe, infertility is viewed as a medical condition and treatments are more likely to be covered by public funding or insurance. Since 2000, Australia, Austria, Denmark, Finland, France, Germany, Iceland, the Netherlands, Norway, and Sweden provided public funding for IVF.

**“Why does IVF cost [in US dollars] \$10,000 in New York , \$3000 in London and \$2000 in Antwerp (for similar results)?”**

— Jan Gerris and Eric Van Royen in their article “ Avoiding multiple pregnancies in ART: A plea for single embryo transfer,” published in Human Reproduction , Vol. 15, No. 9, 1884-1888, September 2000. Online at <http://humrep.oupjournals.org/cgi/content/full/15/9/1884> . © 2000 [European Society of Human Reproduction and Embryology](#)

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## **Ethical Issues**

Perhaps because of the mystery and awe surrounding conception and childbirth, the issues surrounding assisted reproduction technologies are complex, confusing and interesting:

- Do people have a right to reproduce? If they do, should all means be used to assist conception? Should unmarried couples or single adults have the same rights as a couple?
- Is the need to overcome infertility a “socially constructed need,” as many U.S. insurance companies describe it, or a medical condition, as it is viewed in Europe? Should ART treatments be covered by insurance or should ART be the couple's or individual's financial responsibility?
- Sperm donors, egg donors, and surrogate mothers receive financial compensation. (Egg donors are often undergoing infertility treatment requiring IVF because of a male partner's infertility. Thus, their eggs are healthy and can be harvested for IVF procedures. In addition, they can donate some of their healthy eggs to an infertile woman. In return, the woman receiving the healthy eggs often compensates the egg donor by paying the costs of the donor's infertility treatments.) Is financial compensation for donation of sperm or eggs a good idea?
- After a couple goes through the IVF process, there are usually some embryos left over. What is the status of these embryos? Are they “spare”? Do they have rights?
- Should we limit the number of embryos to be transferred in an IVF procedure?
  - Current methods of ART often result in high-risk multiple pregnancies. Those once desperate to conceive can be abruptly confronted with the obligation “to consider termination of some embryos to allow the others to survive,” according to Liora Baor, MSW and Isaac Blickstein, MD in their article “En Route to an ‘Instant Family’: Psychosocial Considerations.” They report on the emotional upheaval the decision has on the mother. In addition, the technique of fetal reduction, in which fetuses are destroyed by injection to the heart “...is potentially associated with a number of adverse effects on the children who remain following the procedure,” including miscarriage and premature birth, according to the President's Council on Bioethics.
  - More multiple births occur after IVF treatments in the US (39%) than in Europe (26%), where multiple embryo transfers are not as popular. (For example, three or more embryos were used in 80% of IVF transfers in the US in 1998, compared to 51% in Europe; while 47% of IVF treatments in the US used four or more embryos, compared to only 9% in Europe.)
- The technique of Preimplantation Genetic Diagnosis (PGD) is used to screen for genetic disease: First, a couple at high risk of having a child with a genetic disease chooses IVF to fertilize the woman's eggs. Then, the fertilized eggs are tested for the genetic disease. Only those fertilized eggs not affected by the disease are implanted. Should we use PGD to choose:
  - A healthy child?
  - The sex of a child?
  - Other traits, including intelligence?
  - A child that will be a genetic match for a sibling and so can donate cells, tissues, and, when he or she is older, possibly donate organs?
- Are we encouraging pregnancy for profit with surrogacy options? If one woman donates the egg, another carries the pregnancy as a surrogate mother, and a third woman raises the child, should parental rights be shared?
- Should a child have the right to know his or her genetic history? Should a donor have the right to remain anonymous?
- Will ART affect the parent-child relationship?
- Will ART techniques lead to cloning of children?

**"Can we really control what kind of children we'll have? We can certainly try. The range of characteristics that can be tested is limited only by the results of advancing genetic research. While today parents may be able to test embryos for gender and the risk of a few diseases, it is only a matter of time before we'll see a menu of genetic tests available, for everything from diseases to physical traits such as eye and hair color, or behavioral characteristics such as personality, intelligence and athletic or musical ability. The longer the list becomes the more it begins to look like the menu of options on a new car—moving toward the ultimate commodification of the process of having children."**

—Jeffrey P. Kahn, Ph.D., M.P.H., Director and Maas Family Chair in Bioethics, Center for Bioethics - University of Minnesota. In: " High-Tech Sex Selection," published by CNN.com/Health, October 1, 2001. Available online at <http://archives.cnn.com/2001/HEALTH/10/01/ethics.matters/index.html>

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## Links

The American Society of Reproductive Medicine, a nonprofit organization for medical professionals, online at [www.asrm.org](http://www.asrm.org), provides information for the public on reproductive technologies.

The Genetics and Public Policy Center, online at: <http://www.dnapolicy.org/genetics/geneticsAndReproduction.jhtml.html>, offers information on genetics and reproduction, including material on Preimplantation Genetic Diagnosis.

RESOLVE: The National Infertility Association, a nonprofit organization that focuses on education, support, and advocacy for women and men seeking help with infertility, is online at <http://www.resolve.org/main/national/help/help.jsp?name=help>

The Society for Assisted Reproductive Technology, online at <http://www.sart.org/>, is a professional organization whose member clinics provide assisted reproductive technologies to patients. Online patient education resources are available.

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## Suggested Reading

"Childless couples look to India for surrogate mothers"

Chopra, Anuj. *Christian Science Monitor* April 3, 2006.  
<http://www.csmonitor.com/2006/0403/p01s04-wosc.html>

"Concern over 'spare part' babies"  
BBC News January 31, 2006  
Available online at <http://news.bbc.co.uk/2/hi/health/4663396.stm>

"Assisted Reproductive Technology Surveillance --- United States, 2001"  
Wright V. Schieve L. et al. *MMWR Surveillance Summaries*, April 30, 2004/53 (SS01).  
Available online at <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5301a1.htm>.

"Choosing Our Children's Future or Choosing Our Future Children?"  
Kahn, Jeffrey P. *CNN.com/Health*. March 4, 2002. Available online at <http://archives.cnn.com/2002/HEALTH/03/04/ethics.matters/index.html>.

"Diseases & Conditions: Infertility"  
*Mayoclinic.com*. Available online at <http://www.mayoclinic.com/invoke.cfm?objectid=5B0A05CB-053F-4FD3-9BE06955A15A3CD9&dsection=3>.

"En Route to an 'Instant Family': Psychosocial Considerations"  
Baor, L. Blickstein I. *Obstetrics and Gynecology Clinics* 32 (1).

*Ethics and Economics of Assisted Reproduction: The Cost of Longing*  
Ryan, Maura: Georgetown University Press (2003).

"High-Tech Sex Selection"  
Kahn, Jeffrey P. *CNN.com/Health*. October 1, 2001. Available online at <http://archives.cnn.com/2001/HEALTH/10/01/ethics.matters/index.html>.

"Informing Offspring of their conception by gamete donation"  
Ethics Committee of the American Society for Reproductive Medicine.  
In: *Fertility and Sterility* Vol.81, No.3, March 2004. Available online at [http://www.asrm.org/Media/Ethics/informing\\_offspring\\_donation.pdf](http://www.asrm.org/Media/Ethics/informing_offspring_donation.pdf).

"Italian Fertility Law"  
*BBC-Radio4-Woman's Hour*. 19 March 2004. Available online at [http://www.bbc.co.uk/radio4/womanshour/2004\\_11\\_fri\\_02.shtml](http://www.bbc.co.uk/radio4/womanshour/2004_11_fri_02.shtml).

"Reproduction and Responsibility: The Regulation of New Biotechnologies"  
The President's Council on Bioethics. (For information on reproductive technologies, see Chapter Two: Assisted Reproduction, available online at

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## **Facts & Statistics**

Female reproductive disorders affect 55% of infertile couples, sperm disorders affect 35% of infertile couples, and 10% of couples experience infertility of unidentified origins.

After age 30, women have a harder time conceiving and carrying a child full term.

Azoospermia is a condition in males in which no sperm is produced. Oligospermia is a condition in males in which very few sperm are produced.

More than 70,000 babies are born in the U.S. every year through the application of reproductive technologies.

The first baby in the world to be born through ART was Louise Brown in England in 1978. The first ART baby in the US was born in 1981.

About half of babies born using ART have a twin or other siblings born at the same time.

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