

## **ASSISTED REPRODUCTIVE TECHNOLOGY**

### Setting the Stage: Questions to Think About

Assisted Reproductive Technology (ART) is the technology that can be used to help men and women have children. There have been many scientific advances affecting ART in recent years. These new advances have also added to the ethical dilemmas associated with Assisted Reproductive Technology.

Are the increased medical risks to women undergoing ART therapies worth it?

Once an embryo is created, does it have moral status as a human being or is it just someone's property?

What happens to an embryo if the "parents" divorce or one of them dies?

Is there an age when men and women are simply too old to become parents?

### **INTRODUCTION**

Assisted Reproductive Technology (ART) is the technology developed to aid in the conception of children. Women or men who are unable to have children due to some physical limitation (infertility) can be helped with one of the several methods of ART. Infertility is defined as the inability to conceive for a one-year or greater period or a period of 6 months if a woman is over 35. Also included in the definition is the inability to carry the baby to term or having had 2 or more miscarriages in the past. Recent statistics show that infertility has been diagnosed in approximately 17% of all couples.

The reasons for infertility vary and can be seen in both males and females. The most common causes of infertility in males are low sperm count, immobile sperm, previous STDs (sexually transmitted diseases), prostate infection or testicular injury. For women, causes of infertility are various and include problems with ovulation, blocked fallopian tubes, previous STDs, polyps or fibroids, endometriosis, previous IUD (intrauterine device used for contraception), infections and age (over 35). There is also 5 – 10% rate of unexplained infertility.

There are several different approaches to ART depending upon the physical needs and/or difficulties assessed. Artificial insemination is the procedure that positions sperm that has been previously treated either into the cervical canal, the uterus, the fallopian tubes or the ovarian follicle by mechanical means such as the use of a syringe. The most common form of artificial insemination is intrauterine insemination (IUI). IUI is usually done in the office setting and takes just a few minutes. A catheter is inserted through the vagina and into the uterine cavity where the sperm are injected. Unlike in vitro fertilization the physician cannot immediately tell if fertilization has taken place and the woman is pregnant.

In vitro fertilization (IVF) is the process of combining an egg with sperm in a petri dish where fertilization takes place. (The success rate is approximately 20% to 25%). This process results in an embryo. The embryo is then implanted into the woman's uterus via a non-surgical vaginal approach. All forms of in vitro fertilization require preparation of the woman and sometimes the sperm and eggs. To prepare for IVF the woman is first stimulated into ovulation through the use of hormones. Then the eggs are retrieved either vaginally or through laparoscopic surgery. Fertilization then takes place in the lab (Petri dish). After fertilization the embryo is transferred into the uterus.

Another form of IVF is gamete intrafallopian transfer (GIFT). As in IVF the woman is given fertility medication to stimulate egg production after which the eggs are retrieved. The sperm is also collected from the man as in IVF. Then sperm and egg are surgically placed into the fallopian tube of the woman where hopefully fertilization will occur. Zygote intrafallopian transfer (ZIFT) occurs much like IVF and GIFT in the preparatory phases. However, the difference is that with ZIFT a zygote, which is a fertilized egg at the 2-cell stage, is transferred into fallopian tubes. Intracytoplasmic sperm injection (ICSI) is used when there is severe male infertility. This procedure uses microscopic instrumentation to fertilize a specially prepared egg with one sperm. The fertilized embryo is then transferred into the uterus of the woman as in IVF. There are several more variations of assisted reproduction. However, the purpose here is only to inform the discussion.

The rapid rate of new scientific technology brings with it new ethical dilemmas. Ethical questions that affect ART are the subject of this module. A few scenarios that will be shared that will engage you in critical thinking regarding a subject that most, at some point in their life, will encounter, either personally or anecdotally.

There have been several studies that have presented information on increased medical risks to women undergoing ART therapies and pregnancies as well as increased risk of low birth weight and disease for infants. The question can be asked whether it is morally acceptable to subject families to this increased risk of harm with insufficient scientific data on reproductive technologies available? One can also ask if patients are not fully aware of all risks can a truly informed consent be made. On the other hand, nearly 20% of couples currently feel the anguish, shame, and frustration of not being able to get pregnant. With the technology available since 1978 is it cruel not to grant access to those who need ART to further their quest for biological children of their own?

The list of ethical concerns grows when donors are used in ART. With young women being paid \$5,000 – \$10,000 per ovulation cycle sale of human eggs is becoming a booming business. Some additional questions to ask are:

- Will this lead to exploitation of young, low-income women?
- What are the long-term effects of multiple cycles of hormonal treatment and egg retrieval?
- Once embryos are made do they have moral status or do they become property?
- What are the legal implications of divorce or death on embryos in storage?  
Whose rights take precedence husband or wife?

Women who are past the physical childbearing age can now use ART to become impregnated. Recently women in their 60s have delivered babies and begun their roles as parents. To date, the oldest woman to give birth is 66 years old. In these cases opinions greatly differ on questions such as:

- Is 60 too old for a woman to give birth?
- Is it too old for a man to become a father?
- Is this a chance of a lifetime for a woman who has been unable to give birth until now?
- Will the current trend of postponing childbearing and thereby increasing age gap affect society as a whole? If so, how? If not, why not?

These concerns and many more have come up as there are now over 3 million ART babies since the birth of the first test-tube baby, Louise Brown, in 1978. Answers are coming slowly, mostly on a case-by-case basis as these issues arrive in the legal system. Some see regulation as an answer to some of the current ethical dilemmas; fertility centers are currently not regulated in the U.S. Most centers only undergo self-monitoring on guidelines given by organizations such as ASRM (The American Society for Reproductive Medicine). There are also those who feel that government interference will only hold back the practice of medicine and scientific progress in the area of ART. As current high school students you soon will likely aid in the process of defining or redefining the ethics of ART.

## **EDUCATIONAL OBJECTIVES**

- Become familiar with the uses and methodology of Assisted Reproductive Technology (ART)
- Develop an understanding of the types of ethical issues raised by the rapid advances in scientific technology
- Grasp several core values utilized in the process of ethical decision-making
- Broaden critical thinking abilities
- Formulate an ethical position concerning at least one ethical conflict in ART

Core Subject Areas and Grade level: Biological Sciences - Grades 10 - 12

## **CORE VALUES EMPHASIZED IN THIS MODULE**

### ***Fairness***

Treating people impartially, not playing favorites, being open-minded, and maintaining an objective attitude

	toward those whose actions and ideas are different from our own.
<b>Honesty</b>	Dealing truthfully with people, being sincere, not deceiving them nor stealing from them, not cheating nor lying.
<b>Integrity</b>	Standing up for your beliefs about what is right and what is wrong and resisting social pressure to do wrong.
<b>Kindness</b>	Being sympathetic, helpful, compassionate, benevolent, agreeable, and gentle toward people and other living things.
<b>Respect</b>	Showing regard for the worth and dignity of someone or something, being courteous and polite, and judging all people on their merits. It takes three major forms: respect for oneself, respect for other people, and respect for all forms of life and the environment.
<b>Responsibility</b>	Thinking before you act and being accountable for your actions, paying attention to others, and responding to their needs. Responsibility emphasizes our positive obligations to care for each other.

## KEY CONCEPTS AND VOCABULARY

The key concepts and vocabulary listed below are explored in the case studies and activities.

Case Study/Activity #1 - IVF Mix-up explores compassion, veracity, right to privacy, non maleficence and altruism.

Case Study/Activity #2 - Divorce and Embryos explores autonomy, altruism, compassion, beneficence, identity and right to privacy.

Case Study/Activity #3 - Egg Donor explores informed consent, autonomy, altruism, veracity, distributive justice, and non-maleficence.

- **Autonomy** – The right of an individual to make knowledgeable decisions for themselves without coercion.
- Veracity-Truthfulness
- **Beneficence** – **To provide benefit; enhance quality of life**
- **Non-maleficence** – **To do no harm**
- **Distributive justice (Fair opportunity)** – The fair and equal distribution of resources in society.
- Altruism – Acting solely for the benefit of others
- **Compassion**—having sympathy for others’ suffering with a desire to alleviate that suffering.

- **Informed Consent**—To consent to a medical intervention after fully understanding the problem, procedure, risks and benefits of the procedure and alternative treatments.
- **The Right to Privacy** – The right of an individual not to be touched, observed or imposed upon
- **Fidelity**—To keep promises, fulfill agreements and/or fiduciary obligations.

## VOCABULARY

**AI** (Artificial Insemination) - The placement of sperm within the female reproductive tract by a method other than sexual intercourse

**AID** – Artificial insemination with a donor other than the husband.

**AIH** – Artificial insemination by the husband.

**ART** (Assisted Reproductive Technology) - All treatments that assist in human reproduction by way of special handling of eggs, sperm and/or embryos

**EGG DONATION** - The process of retrieving a human egg from a donor and then fertilizing with sperm in the laboratory and transferal of the embryos to the female recipient.

**EMBRYO** – The developing organism after fertilization.

**FALLOPIAN TUBES** – The pair of tubes that connect ovaries to the uterus and conduct the eggs to the uterus.

**FERTILIZATION** – The process of joining male and female gametes (eggs & sperm) to form a new individual.

**GAMETE** – Male and female reproductive cells (eggs & sperm)

**GIFT** (Gamete Intra-fallopian Transfer) - The combining of collected egg and sperm with immediate placement into the fallopian tubes to achieve fertilization

**ICSI** – (Intracytoplasmic sperm injection) - A procedure whereby a single sperm is injected through the cell wall directly into the ovum in the laboratory.

**IVF** – Fertilization outside of the body, usually in a laboratory Petri dish.

**IUI** – Artificial insemination of prepared sperm into the uterine cavity.

**LAPAROSCOPY** – A surgical procedure in which a tiny scope is inserted into the abdomen through a small incision.

**OVUM (OVA)** – The female reproductive cell produced each month by the ovary (egg).

**OVARY** – One of two small oval bodies situated on either side of the uterus in which the ova (eggs) are developed and released during ovulation.

**OVULATION** – The discharge of a ripened ovum at about the midpoint of the menstrual cycle.

**PGD** (Pre-implantation Genetic Diagnosis) The screening of embryos prior to implantation for genetic abnormalities

**SPERM** – The male reproductive cell, which is produced in great numbers in the testes.

**SURROGATE** – A woman who is either artificially inseminated (genetic surrogate) or undergoes IVF with donor embryo (gestational surrogate) and carries a baby to term for others.

**UTERUS** – The female organ designed to lodge and nourish the developing baby until the time of birth.

**ZIFT** – Zygote intra-fallopian transfer. IVF with transfer of zygote into fallopian tube

**ZYGOTE** – A single diploid cell resulting from the fusion of male and female gametes at fertilization.

## **BACKGROUND FOR THE TEACHER**

The basics of ART are given in beginning background section. Once familiar with the material the teacher can assess how much general knowledge the students have in ways to make a baby. A brainstorming activity will be a good exercise to assess level of familiarity.

The information below was obtained from <http://www.drmlpani.com/makeababy.htm>

*A TV program produced in the USA in 2002 described 18 ways to make a baby.*

*These included:*

*Natural sex*

*Artificial insemination -- of mother with father's sperm*

*Artificial insemination -- of mother with donor sperm*

*Artificial insemination -- with egg and sperm donors, using surrogate mother*

*In vitro fertilization (IVF) -- using egg and sperm of parents*

*IVF -- with Intra-Cytoplasmic Sperm Injection ([ICSI](#))*

*IVF -- with frozen embryos*

*IVF -- with Preimplantation Genetic Diagnosis (PGD)*

*IVF -- with egg donor*

*IVF -- with sperm donor*

*IVF -- with egg and sperm donor*

*IVF -- with surrogate using parents' egg and sperm*

*IVF -- with surrogate and egg donor*

*IVF -- with surrogate and sperm donor*

*IVF -- with surrogate using her egg, sperm from baby's father*

*IVF -- with surrogate using egg and sperm donors\**

*Cytoplasmic transfer*

*Nuclear transfer and cloning*

*If you now add additional options such as [TESA](#) ( testicular sperm aspiration) and [PESA](#) ( percutaneous epididymal sperm aspiration);assisted [hatching](#) and embryo fragment removal, the list becomes even longer !*

Case studies and activities will bring a sense of reality to the ethical issues involved and aid students in formulating their own ethical position. Relevant ethical issues include:

- Implications of infertility on women, men, families, orphans
- Possible complications and their role in ethical decision-making;
  - ◆ Medical - miscarriages, increased risk of ovarian cancer
  - ◆ Clinical - error in embryo placement (wrong parent/s)
  - ◆ Societal - unregulated centers, embryo theft, sale of embryos
- Children born of deceased parents
- Childbearing in old age
- Surrogacy (altruism or profit)

### **ACTIVITY #1. Case Study: In Virto Fertilization Mix-Up**

Reproduce and distribute this case study to each student.

Mr. and Mrs. A have had trouble getting pregnant (conceiving). They decided to try ART at Clinic X in England. Their treatment is successful and Mrs. A conceives and gives birth to a set of twins. However, there is a problem. Both Mr. and Mrs. A are Caucasian and their twins are of mixed ethnicity. How could this be?

Mr. and Mrs. B have also been having difficulty conceiving and they also went to Clinic X. Although they have undergone treatment, they have not been successful in conceiving a child. Mr. and Mrs. B are Black.

Aware that there must have been an error in the IVF procedures Mr. and Mrs. A return to Clinic X seeking clarification. After DNA testing it was found that Mrs. A is genetically the mother of the twins but Mr. A. is not the father. Mr. B was determined to be the genetic father. The mix-up that occurred combined the egg from Mrs. A with the sperm from Mr. B.

Mr. and Mrs. A love their twins and would like to keep their family intact. British law gives the woman who gives birth in ART the legal status, thus, Mrs. A is the legal mother. The laws on paternity are not as clearly defined and a legal battle was waged between the couples - both wanted custody of the twins.

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Spriggs, M. (2003). IVF Mixup: White Couple Have Black Babies. *Journal of Medical Ethics*, 29, 65. Available from <http://www.jme.bmjournals.com>

Read the case study with the students. Write the following list of “stakeholders” on the board.

### STAKEHOLDERS

- Mrs. A
- Mr. A
- Mr. and Mrs. A as a couple
- Mr. B
- Mrs. B
- Mr. and Mrs. B as a couple
- The twins

Summarize the case as follows: Legal case in England involving 2 couples seeking IVF. Couple A is Caucasian. Couple B is Black. Couple A becomes pregnant with biracial twins. Mr. B is the biological father. Both couples want the twins.

Now, ask the students to discuss each of the following ethical issues and conflicts:

- What are the rights of the parties involved?
  - Mrs. A
  - Mr. A
  - Mr. and Mrs. A as a couple
  - Mr. B
  - Mrs. B
  - Mr. and Mrs. B as a couple
  - The twins
- Whose parental rights take priority?
  - Should this be determined individually or per couple?
  - If it is determined that both genetic parents have equal rights what effect will that have on the children?
- What, if anything, should the children be told?
- If the twins remain with couple A should they be told about genetic father B?
- Should genetic father B be given visitation rights?

- Should genetic father B be held financially responsible to some degree?
- If there are additional mixed race embryos left over whose are they?
- Should Mrs. B have the right to implant the additional embryos since she has no children?
- Should Mrs. A have the right to implant if she wishes additional children since she is the egg donor?
- Should IVF babies have DNA testing to ensure their lineage?
  - If yes, who should pay?
  - If mix-up found, what are consequences to clinic?

NOTE TO TEACHER: The British government stated that Mr. B is the legal father. However, the children remain with couple A.

SEE the Extension Activities at the end of this module for more ways to use this case study.

### **Activity #2. Case Study: Divorce And Embryos; Who Gets Custody?**

Reproduce and distribute the following case study to each student.

(Davis v Davis) Mary Sue and Junior L. Davis married and lived in Tennessee. They wanted children but Mary Sue experienced 5 pregnancies in her fallopian tubes. (These are very dangerous for the mother and will not result in long-term pregnancies). Eventually Mary Sue had to have removal of her fallopian tubes. This surgery left her unable to conceive. The couple tried to adopt but the birth mother changed her mind. Other attempts at adoption were too expensive so the couple decided to try ART. They went through the IVF procedures and implanted the retrieved eggs on seven different occasions with no pregnancy. However, there were seven remaining frozen embryos at the clinic.

The couple started having marital problems and Junior filed for divorce before they could try IVF again. As the embryos were still in the clinic they became part of the divorce settlement. Mary Sue wanted to keep the embryos with the hope of becoming pregnant at some later date. Junior objected and wanted the embryos destroyed. Junior did not want to have children outside of marriage, nor did he want parenthood forced upon him whenever Mary Sue wished. The situation was brought to the legal system.

The court decided to give Mary Sue custody of the eggs based on the fact that they were human beings and had the right to live. Junior fought the decision and the Court of Appeals overturned the decision on the grounds that the embryos status could not be determined. There was no ruling that gave them status as persons. The court agreed with

Junior that he had a right not to become a parent (established through the right of privacy).

The status of the embryos would be difficult to establish. If they had the same rights as persons it would overturn the right to abortion established in Roe v Wade. However, treating them as human tissue did not seem adequate either. Although they had no defined status the Court of Appeals agreed that the embryos should be given respect greater than human tissue but less than persons.

While the court battle continued both Mary Sue and Junior went on with their lives. They both remarried and Mary Sue moved out of state. She no longer wanted to implant the embryos and become pregnant but she also did not want the embryos thrown away. She now asked the court to give the eggs up for adoption. Junior did not agree and wanted the eggs discarded. The court agreed that Junior's right not to have biological children (that he would have no relationship with) was greater than Mary Sue's right to donate the eggs. Since the couple could not agree on what should be done with the embryos they decided on continued storage. As the eggs will eventually fail over time in storage Junior's right to privacy will be upheld.

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Davis v Davis (2002), First Embryo Disposition Case. Available from [http://biotech.law.lsu.edu/cases/cloning/davis\\_v\\_davis.htm](http://biotech.law.lsu.edu/cases/cloning/davis_v_davis.htm).

Summarize the case with the students:

Mr. and Mrs. Davis are divorcing and the 7 embryo they currently have in storage is at issue. Mr. Davis wants to dispose of them, Mrs. Davis wants to implant them. Because of the length of the court battle both Mr. and Mrs. Davis have married and the situation has changed. Mary Sue no longer wishes to implant the embryo but rather wishes to donate them. Mr. Davis still would like them disposed of.

Since the circumstances have changed and the court is now deciding on whether to donate as opposed to dispose.

Classroom debate focusing on whether to embryos should be donated or disposed of:

·  
Divide the class into two groups: one for donation, one for disposal. Have them prepare their position and choose a team to present their points in the debate. Conduct the debate.

At the conclusion of the debate, let the class know that the court took the position that it could not violate Mr. Davis, right to privacy in that he did not wish to be the biological parent of the embryos. The decision was made to keep the embryos in storage.

### Activity #3. Case Study: Egg Donor Needed

Reproduce and distribute the case study to each student/

A young woman reading the *Yale Daily News* came upon an ad which stated, “EGG DONOR NEEDED” placed by a couple in search of an egg donor for the purposes of ART. They were willing to pay \$25,000 for just the right eggs. They were looking for a tall (5’5” – 5’9”), beautiful, athletic, Jewish scholar (SAT of 1500 or better).

She was curious. She felt she qualified for all but one of the criteria, SAT score, and so she emailed the couple for more information and to inquire about the SAT score. She received a response that same day. The husband stated that they were open to minor changes in their criteria except donor health and beauty. He requested a picture, which she sent.

A week later she received a reply. His wife had not yet seen her picture but he was pleased. He inquired about her high school, the subjects she was taking at Yale and how she was doing academically. She answered all truthfully – she was average.

After his wife had seen her picture she received an email that stated his wife was basically not impressed. He was going to keep one of her photos in case they reconsidered but for now, thanks but no thanks.

Cohen, Jessica. Grade A: The Market For A Yale Woman’s Eggs. *The Atlantic Monthly*, December, 2002. Available from <http://www.theatlantic.com/issues/2002/12/cohen.htm>.

- Summarize the case with the students: After reading a want ad in her college paper regarding egg donation a young woman offers her information and picture as a possible donor. If chosen she would be reimbursed \$25,000. Review who the main stakeholders are: the potential embryo donor; the embryo recipient (couple).

Discuss the following ethical issues and concerns with the students:

- In England purchasing human eggs is illegal. Women are allowed to donate eggs to those in need. There are also “egg sharing” programs at clinics where women who donate eggs to those without have their IVF procedures at reduced cost. Most often they only pay the price of medications and supplies. Do you believe that we should allow the sale of eggs in the United States?
- Most Fertility clinics pay on average \$5,000 - \$10,000 per cycle for egg donations do you believe that it is OK for those who can afford it to advertise and pay top dollar to get exactly what they are looking for?
- Since science is not yet sure of the long-term effects of egg donation on women should they be allowed to donate multiple times?

- Do you feel women with little money would feel pressured into egg donation as a means to make ends meet? If so, is this an acceptable arrangement?
- What do women without eggs and without funds do and is that an ethical concern?
- Is selling eggs for implantation comparable to the selling of organs needed for transplantation?

Currently, there is no regulation of egg donation. Ask each student to prepare a plan for the regulation of egg donation. Ask them to address what processes they would regulate (Age, pricing, screening, number of donations, quality of services, licensing, etc.). After reading a want ad in her college paper regarding egg donation a young woman offers her information and picture as a possible donor. If chosen she would be reimbursed \$25,000.

#### EXTENSION ACTIVITY

#1. Ask students to develop an Ethical Regulatory Plan on the following issue:

Should IVF centers be regulated? If so, what aspects should be regulated?

- A) Clinic certification
- B) Donor limitations
- C) Age restrictions for recipients
- D) Counseling
- E) Commercialization of gametes
- F) Embryo disposal
- G) Embryo storage
- H) Embryo adoption
- I) Embryo experimentation

#2. Debate: Have four students portray the two couples in the Case Study in Activity #1 in the main module. The debate question is: Why would the twins be better off in their custody than with the other couple?.

#3 Have students play the part of the twins (in the Case Study in Activity #1 in the main module) at 15 years of age, expressing their feelings (can be presented as one who cares about his genetic make-up/one who doesn't see a problem).

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## WEBSITES

About, Inc.

<http://infertility.about.com>

Provides information and resources on infertility, i.e. newsletters, articles, Q&A, book referrals

American College of Obstetrics and Gynecology

[http://www.acog.org/from\\_home/publications/press\\_releases](http://www.acog.org/from_home/publications/press_releases)

Physician professional organization supplying free news releases and articles on issues in OB/GYN in addition to member resources.

American Journal of Bioethics

<http://bioethics.net>

American Journal of Bioethics on-line edition supplying articles and news on issues in bioethics

American Society for Reproductive Medicine

<http://www.ASRM.org>

Physician organization site offering free information on all aspects of reproductive medicine

BBC News

<http://www.news.bbc.co.uk/1/hi/health/2137980.stm>

Article on IVF mix-up in Britain.

Ethics Updates

<http://ethics.acusd.edu/>

Resources for instructors and students on various ethical issues; provides lectures and power point presentations.

Fertilinet

<http://www.fertilinet.com>

Sells products used in infertility, i.e. ovulation kits and pregnancy tests – also carries articles on overcoming fertility.

Kaiser Network

<http://www.kaisernetwork.org>.

Kaiser Daily Women's Health Policy - Reproductive Health Services. Articles on IVF and women's health issues.

Medical News Today

<http://www.medicalnewstoday.com/medicalnews.php?newsid=45995>.

Article on the Boston Globe's Examination of ethics and standards of egg donation.

Resolve – National Infertility Association

<http://www.resolve.org>

Education and support for those experiencing infertility as well as publications for professionals

Scotsman

<http://www.news.scotsman.com/topics.cfm?tid=459>

Scottish on-line newspaper presenting articles on IVF treatment

Surrogate Alternatives

<http://www.surrogatealternatives.com>

Organization that assists couples in “third party reproduction” through surrogacy

## FACILITATOR PREP

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