NYU Grossman School of Medicine

DIVISION OF MEDICAL ETHICS
HIGH SCHOOL BIOETHICS PROJECT

Reproductive Technology

Overview

Assisted reproduction has become more widely used as technological advancements have expanded the definition and possibility of parenting. Career-oriented women, gay and lesbian couples, single parents, and infertile couples are among those who can benefit from such procedures. With the broadening possibility of becoming a parent, should there be any restrictions, or does everyone have a fundamental right to have children? How much control should people have over the conception of their children, and are there any scenarios in which the technologies should not be used? What are some of the rising ethical questions as a result of the widespread use of assisted reproduction methods? This module will provide background on some of these technologies and how they work, present some of the ethical issues that arise, and facilitate the formulation of opinions about the issues.

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Learning Outcomes

1. Understand the different technologies, how they work, and why they are used
2. Think critically about what characteristics and genetic traits should be in the parent's control
3. Formulate ethical opinions on genetic control, savior siblings, and what to do with unused embryos

Procedures and Activities

This unit uses a student-centered and interactive approach to teaching. Activities are designed to allow for a maximum degree of student participation and collaboration. Each activity is marked as an individual, partner, or group activity, or as a teacher-directed class discussion.

The following terms are used to designate the different types of activities:

- Individual Activity
- Partner Activity
- Group Activity
- Teacher-Directed Class Discussion

1. Introduction to Topic

Individual Activity

Students should answer these questions individually at the start of the unit. The purpose of the activity is to collect the student's individual thoughts before being presented with any information in the unit, so teachers should avoid answering too many questions about terminology that is used.

1. What reproductive technologies, if any, are you familiar with and do you have any strong opinions about their use?

2. What characteristics would you want to be able to select in a child? Would this selection be ethical?
3. Under what circumstances is it inappropriate to use these technologies? Should we place restrictions on science?

2. Philosophical Dimensions

Teacher-Directed Class Discussion

The purpose of this section is to provide students with a philosophical background to help frame their decisions about the ethics of these reproductive technologies.

Basic Views

Natural Law View

This view comes from the teachings of the Roman Catholic Church. Natural law theory says that God embedded moral values in the natural world, and so we are under an obligation to respect the natural order of things. Under this view, all technologies for controlling human reproduction are wrong, for they subvert the natural order.

Even though children are usually expected in marriage, if no measures are "wrongfully taken" to frustrate the possibility of birth (such as contraception), the use of artificial insemination or in vitro fertilization is intrinsically immoral. One reason for this is that most reproductive technologies separate the sex act from conception. The natural order is such that conception and reproduction cannot happen naturally without sexual intercourse. Thus, it is wrong to separate the two. The inseparability thesis prohibits sex that is not open to reproduction (i.e. with birth control) as well as reproduction that occurs without sex. Additionally, many of the technological processes themselves involve other objectionable acts. For example, artificial insemination involves masturbation, which is prima facie wrong.

Utilitarian View

Utilitarianism holds that the best course of action is that which maximizes the overall good of society. In this view, no reproductive technologies are in

themselves objectionable. The ethical permissibility of reproductive technologies in this view depends on the specific procedure and whether it is likely to produce more good than not. It is reasonable to assume that philosophers that hold this viewpoint will likely approve of most, if not all procedures. Rule utilitarianism is a branch of the broader utilitarian view that deems actions as moral if they follow a set of rules that lead to the greater good. Instead of looking at each situation independently, every case is assessed by the same set of rules. A philosopher holding this view might oppose many or all the procedures. "If there is strong evidence to support the view that the use of reproductive technology will lead to a society in which the welfare of its members will not be served, then a rule utilitarian would be on firm ground in arguing that reproductive technology ought to be abandoned" (Munson, 383).

Kantian Ethics

Kant's ethical theory revolves around the idea of the "Categorical Imperative." Categorical imperatives are good in and of themselves and must always be followed. To put it more simply, they are the "golden rules" of morality. The most fundamental categorical imperative is to never use someone as a mere means to an end. The categorical imperative does not provide grounds to reject reproductive technologies but "the maxim involved in each action must always be one that satisfies the categorical imperative" (Munson, 383). That is, each action must treat humanity—whether in oneself or in one's child—always as an end and never as means to something else.

Per this view, some cases of IVF, artificial insemination, and cloning would be deemed immoral: those that aim to conceive simply as means of saving or curing other children (see "Savior Siblings" below).

Ross's Ethical Theory

W.D. Ross's ethical theory is based on the idea that the only prima facie duty we hold is to promote duties of beneficence. In other words, we are obligated to help others better their lives. Sometimes this might conflict with other important values or principles; for example, we may have to break a promise to meet our friend in order to help someone in need. Or we may have to violate the natural order of things in order to achieve some other good. Reproductive technologies are ethical under this view when they promote the well-being of others, even if their use stands

at odds with competing values or principles. Most of the technologies listed below are unobjectionable because they help satisfy a shared desire and help a couple in need, even if they may violate, for instance, principles of justice.

3. Reproductive Technologies

Teacher-Directed Class Discussion

The purpose of this activity is to provide students with an overview of the technologies available and their usages. This segment of the lesson may be used in conjunction with an overview of the maturation of gametes, fertilization, and pregnancy. You could also assign different technological methods to each student or group of students and ask them to present to the class what the method involves, and how fertilization and pregnancy occur using each technology.

Artificial Insemination

A semen specimen is placed in a syringe that is attached to a catheter (a long tube). The catheter is inserted into the cervical canal and the semen is slowly injected into the uterus. The overall success rate is 85% to 90%.

IVF: In Vitro Fertilization

The woman is given reproductive hormones that cause the ova to ripen. Several mature eggs are then taken and placed into a nutrient solution to which sperm is added. The fertilized eggs are then placed into another solution where they undergo cell division. Once this is complete, the embryo is implanted into the uterus, usually 1 to 5 days after fertilization.

GIFT: Gamete Intrafallopian Transfer

This technique is like IVF but instead of waiting until an embryo is formed for implantation, the ova and sperm are inserted directly into the fallopian tubes through an incision in the abdomen. Fertilization then takes place inside the woman's body, rather than externally.

ZIFT: Zygote Intrafallopian Transfer

The egg and sperm are fertilized externally, and then the zygote is inserted into the woman's fallopian tubes. This procedure is based on the belief that the fallopian tube is the safest environment for embryo development. As in natural reproduction,

the embryo will travel to the uterus. Pregnancy begins when the embryo implants in the uterus. Like GIFT (above), ZIFT more closely simulates a natural pregnancy, since during natural fertilization, the zygote is formed in the fallopian tube and then travels to the uterus within a few days of conception.

IVC: Intravaginal Culture

Mature ova are retrieved (using the same technique as for IVF) and placed in a small tube. The tube is then inserted into the vagina and kept next to the cervix using a diaphragm-like device. Normal intercourse can take place while the tube is in place. When intercourse occurs, it is hoped that ejaculated sperm will fertilize the eggs contained in the tube. After two days, the tube is removed, the contents separated, and any fertilized ova are transferred into the uterus.

ULER: Uterine Lavage Embryo Retrieval

Used by women who have a functioning uterus but who are unable to ovulate or do not wish to use their ova (e.g. she is the carrier of a lethal gene). Another ovulating woman is inseminated with donor sperm and the fertilized egg is washed out of the uterus after around five days, before it becomes embedded in the uterine wall. Once retrieved, the embryo is implanted into the woman being assisted. The main issue with this treatment is the possibility that the embryo might not be washed out before it embeds on the uterine wall. If this happens, the donor needs to decide whether or not she wants to have an abortion. This process allows women who do not produce viable ova to use a donor egg, but fertilization occurs in the fallopian tube rather than in vitro.

PZD: Partial Zona Dissection

Involves using micro-techniques to drill holes in the zona, the protective membrane of the ovum, to make it easier for sperm to pass through. This reduces the egg's resistance to penetration.

ICSI: Intracytoplasmic Sperm Injection

This technique can help 50% to 60% of infertile men become fathers. Sperm is examined microscopically and the best-shaped and most active one is injected directly into the egg cell. The technique identifies which sperm will most likely be able to fertilize an egg.

CD: Cytoplasmic or Mitochondrial Transfer

The cytoplasm (including mitochondria) is removed from a younger donor egg and injected into an older egg or an egg whose mitochondrial DNA are compromised. Certain diseases affect the mitochondria. Since mitochondrial disease is passed from mother to baby, some mothers decide to use mitochondrial transfer to make sure that their offspring do not have the same disease. The egg created with the mother's nuclear DNA and donor cytoplasm is fertilized in vitro with sperm, and then implanted into the gestational carrier (usually that of the woman who provided the recipient egg and nuclear DNA). This is a very new technique, but data shows that this will increase the developmental success of the recipient egg. These have been called "three parent babies" because the resulting child has DNA from three different parents: mitochondrial DNA from the donor, nuclear DNA from the egg, and nuclear DNA from sperm.

Surrogacy

Surrogacy is when the gestational carrier differs from the parent who will raise a child. Gestational carriers become pregnant through myriad ways: artificial insemination (when the gestational carrier is also an egg donor), in vitro fertilization, GIFT, or ZIFT. Surrogacy allows women who have non-viable uteruses to have children that are biologically related to them, as the gestational carrier is often fertilized with an embryo created from the gametes of one or both of the parents who will raise the child.

Student Questions:

1. Which procedure do you believe to be the most natural?
2. Did your thoughts on the role of the parents change after learning about these technologies?
3. Do any of these technologies seem to be controlling nature with too substantial an influence? Should some of them not be permitted?

4. The Ethics of Offspring Selection

Individual Activity or Group Activity

Pre-implantation genetic diagnosis (PGD) provides IVF patients with the ability to select the most desirable embryo. PGD may be performed before implantation when an embryo is formed by IVF. Doctors get a tiny sample and map an embryo's DNA to see if the embryo has a genetic defect or it will be more susceptible to certain diseases. Usually, many embryos are created at once during IVF. PGD allows parents to choose which ones they want to implant. Parents may also discover the sex of the baby, eye color, and other hereditary traits at this point.

This activity will help the students think about what characteristics can ethically be selected for and against. Students should complete the chart individually and then discuss as a group.

CHARACTERISTIC	Yes	No (because…)
Eye Color		
Hair Color		
Sex		
Height		
IQ/Intelligence		
Sexual Orientation		
Down Syndrome		
Cancer Predisposition		
Alzheimer's Disease Susceptibility		
Obesity		
Nearsightedness		

Children as Commodities?

Teacher-Directed Class Discussion

In this activity, lead the class in discussions about the following topics:

a. Designer Babies
   Would the ability to select embryos that have certain traits undermine the unconditional love between parent and child? Would it force parents to look at their children as designed products instead of human beings?

b. Selective Abortion
   Which traits should legitimately be selected against? Should parents be able to just "try again" and search for another, "better" embryo to use if the disorder is not fatal? Parenting is all about being prepared for anything that might happen. Why should conception be any different? Would selective abortion of embryos with disabilities lead to further inequality and discrimination of existing people with disabilities?

For more reading:

Reville, William. "Are 'Designer Babies' Something We Really Want?" Irish Times 2020 July 6. https://www.irishtimes.com/news/science/are-designer-babies-something-we-really-want-1.4287235

Dreger, Alice, and Joseph A. Stramondo. "Selective Parenting." *Bioethics Forum Blog*. The Hastings Center, 23 Oct. 2007. https://www.thehastingscenter.org/selective-parenting/

5. Savior Siblings

Sometimes parents use reproductive technology to conceive a child even when they can have a child naturally in order to create a "savior sibling" for another child who has a life-threatening disease. PGD also allows for the possibility to screen for tissue matching, typically to provide an existing child with the genetic means to overcome a fatal disease. Parents are typically encouraged to do everything that is best for their children, but is it possible to take it too far? Is it ethical to have another child simply for the purpose of saving a current one?

1. To introduce this topic, watch the following film: *My Sister's Keeper.* Dir. Nick Cassavetes starring Cameron Diaz, Abigail Breslin, and Alec Baldwin.

i. Storyline: In Los Angeles, the 11-year old Anna Fitzgerald seeks the successful lawyer Campbell Alexander, trying to hire him to earn medical emancipation from her mother, Sara, who wants Anna to donate her kidney to her sister. She tells the lawyer the story of her family after the discovery that her older sister Kate has leukemia, how she was conceived by in vitro fertilization to become a donor, and the medical procedures to which she has been submitted since she was five years old in preparation of donating to her sister. Campbell accepts work pro bono, and Sara desperately decides to go to court to force Anna to help her sister (http://www.imdb.com/title/tt1078588/)

ii. This film accurately portrays the ethical issues and family problems that result from decisions of savior siblings and should give the class good background information.

2. Debate/Discussion

Group Activity

Students should read the following articles:

King, David, "Why We Should Not Permit Embryos to Be Selected as Tissue Donors," *Bulletin of Medical Ethics*, Vol. 190 (2003): 13-15

S. Sheldon and S. Wilkinson. "Should Saviour Siblings Be Banned?" *Journal of Medical Ethics*, Vol. 30 (2004): 533-537

i. Consider this excerpt from the section entitled "Means, Ends and Commodification" in Munson's book *Intervention and Reflection: Basic Issues in Medical Ethics*:

ii. Another objection to this argument is that it does not adequately distinguish between creating a child as a savior sibling and creating a child for some other 'instrumental' purpose-for example, completing a family, being a playmate for an existing child, saving a marriage, delighting prospective grandparents, or providing an heir. "Perhaps these things are different from creating a savior sibling but, if they are, the difference isn't that they are any less instrumental for in all these cases, the child is used as a means" (Munson, 417).

iii. Split the class into two groups to debate the following statement: "Pre-implantation genetic diagnosis (PGD) should not be used to find embryos to be savior siblings because this uses the child as a means rather than an end."

6. Excess Embryos

Individual or Group Activity

Ask students to read:

Gurmankin, Andrea D., Dominic Sisti, and Arthur L. Caplan. "Embryo Disposal Practices in IVF Clinics in the United States." *Politics and the Life Sciences 22.2 (2004)*: 4-8.

One of the main ethical issues involved with IVF and PGD treatments is the existence of excess embryos. The most plausible solutions to this problem include: cryopreservation (freezing), donating the embryos for reproductive use by other couples, disposal, or donation for scientific research or training
There are as many as 400,000 frozen embryos in storage in the US alone.

Have everyone choose a partner to discuss the following questions:

1. What is the best way to deal with excess embryos?
2. Is it ethical to dispose of them?
3. What should be done if the couple gets divorced? Who should get the rights to the embryo?
4. What should be done if both members of the couple die? Who should get the rights to the embryo?

Krimmel, Herbert T. "The Case against Surrogate Parenting." *The Hastings Center* 13.5 (1983): 35-39. Web.

7. In the News

Group Activity or Teacher-Directed Class Discussion

The purpose of this section is to present the students with actual news stories about ethical issues involving reproductive technologies while also having them formulate their own opinion. Split the class up into groups, one for each article (or have them choose an article, depending on the size of the class). They should read and prepare a presentation for the class that includes the following:

- Brief summary of the story
- How it relates to the topics learned in this section
- Their opinion on the topic

1. Meet the Twiblings
   http://www.nytimes.com/2011/01/02/magazine/02babmaking-t.html
2. IVF Lottery Raises Eyebrows in U.K.
   http://abcnews.go.com/Health/ivf-lotteryraises-eyebrows-uk/story?id=14021901
3. Who's on the Family Tree? Now It's Complicated
   http://www.nytimes.com/2011/07/05/us/05tree.html
4. The Two-Minus-One Pregnancy
   http://www.nytimes.com/2011/08/14/mag-azine/the-two-minus-one-pregnancy.html

- **Conclusion**

Teachers should have students return to the original questions:

1. Do you have any strong opinions about the use of certain reproductive technologies learned about in this lesson?
2. Would the characteristics you would want to be able to select for be considered ethical?
3. Under what circumstances is it inappropriate to use these technologies? Should we place restrictions on science?

Based on the activities of the unit, have their answers changed?

9. References and Additional Resources

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Fiore K. IVF lottery raises eyebrows in U.K. ABC News. 8 July 2011. http://abcnews.go.com/Health/ivf-lottery-raiseeyebrows-uk/story/story?id=14021901

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Padawer R. The two-minus-one pregnancy. New York Times Magazine. 10 Aug 2011. http://www.nytimes.com/2011/08/14.magazine/the-two-minusone-pregnancy.html

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ex-nick-loeb-loses-final-appeal-ruling-that-he-cant-use-embryos-without-actresss-consent/

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Themstrom M. Meet the twiblings. New York Times Magazine. 29 Dec 2010. http://nytimes.com/2011/01/02/magazine/02babymaking.html

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