Test Tube Babies: Teacher’s Guide

Grade Level: 9-12  Curriculum Focus: Life Science  Lesson Duration: Two class periods

Program Description
The past few decades have seen remarkable advances in helping infertile couples conceive children. From test tube babies to surrogate mothers to the selling of women’s eggs, each new step has been controversial. Will tomorrow’s innovations be available to everyone — or just to an elite few? And what are the ethical implications?

Onscreen Questions
Before watching the video

- The number of treatment options available to infertile couples is steadily growing. While some treatments have become commonplace, many remain controversial.
- As you watch the program, note the types of treatments that bypass nature and possibly challenge what society considers ethical.

After watching the video

- Hand-selecting sperm, eggs, and embryos to help postmenopausal women become pregnant is one way of manipulating nature with technology. Discuss whether we are in danger of altering the course of human evolution by actively interfering with this natural process.

Lesson Plan

Student Objectives

- Understand that in vitro fertilization is the union of an egg and sperm in a laboratory followed by implantation of the zygote, or fertilized egg, into the uterus.
- Learn that in vitro fertilization is an option for some infertile couples but that it raises many physiological, ethical, and legal questions.

Materials

- Science textbooks, encyclopedias, and other resources on the menstrual cycle, reproduction, infertility, and fertility treatments
- Computer with Internet access (optional but very helpful)
Procedures

1. Begin the lesson with a review of the menstrual cycle and fertilization; a brief summary follows. You may share this summary with your students.

An adult woman’s body releases certain levels of hormones at specific times throughout a month. As a result, an egg in one ovary matures each month. The egg is contained within a follicle, or a group of cells that surrounds and protects it. When ovulation occurs, the follicle ruptures, causing the release of the egg and the secretion of hormones that make the lining of the uterus thicken and develop more blood vessels. The changes in the uterus take place as part of the body’s preparation for pregnancy. Ovulation usually occurs in the middle of the menstrual cycle. After ovulation, the released egg is swept into the fallopian tube, where it begins to travel toward the uterus.

Fertilization, or the union of egg and sperm, usually takes place in the fallopian tube. If no sperm are present in the woman’s reproductive tract, the egg and the uterine lining are released as part of the menstrual cycle. But if fertilization does take place, the zygote, or fertilized egg, continues to move toward the uterus. There it may implant and develop into a fetus. In this case, menstruation does not occur. Instead, the uterine lining continues to thicken to provide nutrients for the developing zygote. This process relies on numerous hormones. Constant monitoring of hormone levels by the body provides chemical signals that ensure the proper production of eggs and the preparation of the uterus.

2. After reviewing the fertilization process, explain that not all couples are able to have a baby. A couple who have been trying to have a baby unsuccessfully for a year is considered infertile. Doctors perform many tests to discover the cause of infertility, including monitoring ovulation, hormone production, and hormone levels of the egg and the sperm donors. Doctors usually look for physical reasons through a physical examination and sonogram. They also determine sperm count, or the number of sperm secreted by a male, as well as sperm motility, or the way the sperm move. Infertility may be caused by inadequate hormone function of the man, woman, or both; blocked fallopian tubes; low sperm count; scars in the uterus caused by the condition called endometriosis; or age. Sometimes doctors cannot determine a cause.

3. Discuss the options an infertile couple has. Explain that over the last 25 years, physicians have developed the procedure known as in vitro fertilization, or IVF. It involves stimulating the ovaries to release multiple eggs through daily injections of fertility drugs. Then the eggs are removed, by laparoscopic surgery, through a small incision in the abdomen. A laparoscope is inserted through the incision and is guided to the ovary with the help of ultrasound. The eggs are placed in a petri dish with sperm, where they are incubated for about 24 hours. The fertilized eggs are then placed in a growth medium that allows them to divide. If the eggs develop normally, some of them (usually four) will be inserted into the woman’s fallopian tube or implanted into the uterus. Remaining embryos may be frozen for later use. It takes around two weeks to determine if a pregnancy has occurred.
4. Have students answer the following questions in class. Students may work individually or in pairs.

   (1.) How is in vitro fertilization, or IVF, performed?
   (2.) What tests are necessary before a doctor performs IVF?
   (3.) Should a doctor consider a woman’s age before recommending IVF? Does the woman’s age help determine if the procedure will be successful?
   (4.) Why are medications given in preparation for IVF?
   (5.) How much time is required for the entire procedure?
   (6.) What risks to the woman are associated with the procedure?
   (7.) If a procedure is unsuccessful, can a doctor perform it again on the same woman? How long would a woman have to wait before repeating the procedure?
   (8.) Can embryos created during the procedure be frozen for later use? How long can they be frozen?
   (9.) What is the success rate for first-time IVF procedures? Do the chances for success increase or decrease with repeated attempts?

For further research, they may wish to use the following Web sites:

   • http://www.urmc.rochester.edu/stronghealth/ivf
   • http://www.ccivf.com
   • http://my.webmd.com/content/article/1680.51210

5. When students have answered the questions, give them the following homework assignment. They will read a case study in which a doctor tells a couple about in vitro fertilization. Students will use the information gathered in class to write a script for a conversation between the couple and the doctor.

   Read the case study below. Using the questions you answered in class as background, write a conversation between the couple and the doctor. Consider important questions the doctor must ask and the couple’s concerns.

**IVF Case Study**

Mr. and Mrs. Taylor, both 35, enter Dr. Novak’s office anxiously. For the past year, they have had no success conceiving a baby. They hope Dr. Novak, an infertility specialist, can help them. Dr. Novak performs many tests, including a sperm count on Mr. Taylor, sonograms of Mrs. Taylor’s reproductive system, and blood tests measuring the hormone levels of both Mr. and Mrs. Taylor. The tests reveal that Mrs. Taylor’s fallopian tubes are blocked by scars, but everything else is normal. The doctor believes she is an excellent candidate for in vitro fertilization. The Taylors are excited and hopeful about the possibility of conceiving a baby, but they have a lot of questions about the procedure. In fact, they scarcely know where to begin.
Assessment

Use the following three-point rubric to evaluate students’ work during this lesson.

- **3 points:** Students answer all questions and produce a well-written script that includes much of the background information, several specialized terms, and key details that reflect the perspectives of both sides participating in the conversation.

- **2 points:** Students answer all or most questions and produce a mostly accurate script that includes most of the background information, a few specialized terms, and some key details that reflect some of the perspectives of both sides participating in the conversation.

- **1 point:** Students answer some questions and produce a somewhat accurate script that includes little background information, one or two specialized terms, and one or two key details that reflect the perspective of at least one of the sides participating in the conversation.

Vocabulary

**fertilization**
*Definition:* The fusion of a sperm and egg, which usually takes place in the fallopian tube
*Context:* After fertilization takes place, the egg moves toward the uterus.

**implantation**
*Definition:* The process by which a fertilized egg attaches to the lining of the uterus
*Context:* After implantation takes place, the fertilized egg begins to develop into a fetus.

**ovary**
*Definition:* The female reproductive organ in which eggs are formed
*Context:* Every month an egg in one of the two ovaries matures in preparation for fertilization.

**ovulation**
*Definition:* The process of releasing an egg from the ovary
*Context:* Ovulation usually takes place about 14 days before a woman begins menstruation.

**sperm**
*Definition:* The male reproductive cell
*Context:* It takes just one sperm to fertilize an egg.

**zygote**
*Definition:* A fertilized egg
*Context:* After the egg and the sperm have fused, the zygote may begin to develop in the uterus.
Academic Standards

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site: http://books.nap.edu/html/nses/html/overview.html#content.

This lesson plan addresses the following science standards:

- Science and Technology: Understandings about science and technology
- Life Science: The molecular basis of heredity

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit link: http://www.mcrel.org/compendium/browse.asp

This lesson plan addresses the following national standards:

- Science — Life Sciences: Understands the principles of heredity and related concepts
- Language Arts — Writing: Uses the general skills and strategies of the writing process, Gathers and uses information for research purposes
- Technology — Understands the relationships among science, technology, society, and the individual

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- http://school.discovery.com/teachingtools/teachingtools.html