



CASE TEACHING NOTES for "Saving Superman: A Look into Stem Cell Research"

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INTRODUCTION / BACKGROUND

This case study was written to teach students about the main concepts of stem cell research and therapy: embryonic vs. adult stem cell isolation, scientific applications, political and ethical issues, public vs. private funding, and potential abuses.

The case begins with a synopsis of Christopher Reeve's accident and his support of stem cell research, with hopes that tying in a well-known individual will spark student interest in the topic. There are two parts to the case. Part I follows a directed case format while Part II uses a role-play/jigsaw approach. The final question posed in the case is open-ended and encourages student discussion.

The purpose of using the jigsaw method in this case is to encourage peer learning and to prevent students from focusing on only one aspect of the topic. In this method, several groups are constituted and each group assigned a unique role. New groups are then formed comprised of one member from each of the original groups. Thus, each member of the newly formed groups has different information/opinions to contribute. Because students are forced to take on a role and represent a specific viewpoint, even if it is one they do not personally agree with, they are able to see the issue from a different perspective. It is an eye-opening experience.

It is helpful if students have a general understanding of prenatal development, although it is not required. This case can be used in a general biology class, an ethics class, or a public policy class. The case introduces and explores such topics as autoimmune diseases and illnesses, mutation, blastocyst formation and cell specialization, cell mitosis and replication, organ transplantation, the physiology of paralysis, in-vitro fertilization, abortion, somatic cell nuclear transfer, human cloning vs. stem cell therapy, and FDA policy.

This case was designed for two 50-minute lecture class periods, although modifications could be made. Ideally, a class of around 30 to 50 students would work well, especially for the role-playing aspect of the case. Part I of the case could easily be used in a large lecture hall, with students working in pairs to answer the directed case questions; then, perhaps each student would individually turn in a position paper.

Objectives

When students have completed this case, they should be able to:

- Define the three types of stem cells.
- Understand the differences between embryonic and adult stem cells.
- List some pros and cons with adult stem cell usage and embryonic stem cell usage.
- Describe the methods of embryonic stem cell isolation.
- Identify various applications of stem cell research.
- Understand how public and private funding can affect research.
- Understand the ethical concerns surrounding stem cell isolation and research.
- Understand how the issue of abortion arises with embryonic stem cell isolation.
- Understand the potential of stem cell therapy.
- Defend a position on this issue.

CLASSROOM MANAGEMENT

Part I—Background

1. Hand students a copy of Part I with the *Background* information on Christopher Reeve the class before the case is taught so that the students have a basic idea of what's to come and perhaps will be influenced to read more about his accident and his foundation on their own. The day of the case, hand out the rest of the case as the students enter the class. Inform students that they will be working in pairs for this class session.
2. Allow **10 minutes** to read *The Basics* and to answer the concept check questions that follow in pairs. Circulate around the room and answer any questions.
3. Using an overhead, having students respond, or by any means desired, review the questions as a class (**5 minutes**). It is critical that students differentiate between embryonic stem cells and adult stem cells. Invite comments, especially concerning their ideas on the ethical issues.
4. Next, allow **10 minutes** to read *Pluripotent Stem Cell Isolation* and to answer the concept check questions that follow. Most likely you will need to provide some explanation of somatic cell nuclear transfer, especially if the students have no genetics background.
5. As before, review the answers to the questions (**5 minutes**). It is critical that students understand that somatic cell nuclear transfer in this case will not be used as a form of cloning. Students may be tempted to spend a lot of time on the topic of abortion. Unless time permits, perhaps save this discussion for the role-play. Also, it is important for students to see how public and private funding can have different effects on research.
6. Next, allow **10 minutes** to read *Stem Cell Applications* and to answer the concept check questions that follow. Review the answers as a class (**5 minutes**) and invite comments, especially if students have read about any new developments not mentioned. The last question is intended as a take-home message for each individual.
7. Finally, if the instructor decides to carry out the role play aspect of the case, hand out Part II. Organize the pairs now into groups (six is ideal for this case) and assign each group a role (1 of 6). Explain that each group, except for the "senators," will have until two class periods to meet and come up with a position paper in defense of their role. In addition, they will have to brainstorm several questions that could be addressed during the "public meeting" (**5 minutes**). A few examples of possible questions to address are:
 - a. What if women intentionally undergo extra ovulatory cycles or intentionally become pregnant and abort for monetary compensation?

- b. If fertility clinics are able to dispose of excess embryos, why is the use of these embryos for stem cell research met with opposition?
- c. ES cells do not have the potential to become human beings unless placed in a proper nutrient-enriched environment. They do not possess the same capabilities as totipotent stem cells. Many still consider the study of these cells immoral. Explain the basis for this argument.
- d. How can equal access to stem cell therapy occur if indeed this science becomes a reality?
- e. What if private companies sell people's stem cells or use them for human cloning and other unauthorized practices?
- f. Because nuclear transplantation uses an unfertilized egg, how does it threaten life?

Emphasize that although the "senators" will not have to write a position paper for Part II of the case, they will be responsible for "running" the public meeting and writing a policy paper for the group's final decision. Thus, it is highly recommended that they understand the information.

A few peer group work tips:

- a. Each student in a group (jigsaw or not) should have a chance to convey his/her ideas. Teachers should circulate and discourage one student from running the show.
- b. Have one student act as a recorder.
- c. Emphasize that students must take on the "role" they are assigned, even if they do not agree with its views.

Part II—Role Play/Jigsaw

1. Groups will sit and review their position papers and choose a member to make a brief 30 second statement. Also, each group will decide on two questions to submit to the "senators," indicating to which other group(s) the questions are directed (**7 minutes**).
2. Each group will make a brief statement (up to **5 minutes**).
3. Next, the senators will ask the questions. This should take up the bulk of the class period. This is where the role-playing really takes shape and students show a real knowledge of the facts. A student(s) other than the person who initially spoke must answer the questions. It is encouraged that once one group answers a question, others add to the argument or refute it. Instructors should be aware of group members who don't participate. If this occurs, encourage a comment from him/her. If the questions posed do not cover the important issues, such as abortion, the ability to avoid immunosuppression, the possible dangers of exclusive private research funding, etc., the instructor should raise these issues (**25 minutes**).
4. Next, take **3 minutes** to jigsaw the groups so that each new group contains a senator, a researcher, a pharmacologist, an ethicist, a right-to-life supporter, and a patient (the numbers will most likely not work out perfectly so adjust accordingly, perhaps by having two or three senators per group).
5. Use the remainder of the class period to allow the jigsaw groups to talk over the key statements made and come up with a policy concerning stem cell research and whether embryonic research and/or adult stem cell research should continue and how (public and/or private funding, duration, limitations, applications, etc.) (**10 minutes**). The senators in each jigsaw group are responsible for writing this policy paper, which will be due next class.
6. Anything mentioned in this case study or brought up in the role-playing portion of the case is fair game for a test. Definitions are key; Number (5) in the "[References](#)" gives a great list of definitions to choose from.

ANSWER KEY

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to [the key](#). You will be prompted for a username and password. For the username and password, contact the National Center for Case Study Teaching in Science administrator at answerkey@sciencecases.org.

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