

# Investigation & Experimentation

S E R I E S

## STEM CELL RESEARCH TWO PATHWAYS FOR A CURE?

### GOAL OF ACTIVITY:

The goal of this activity/exercise is to have students understand the differences between two types of stem cell research and understand the potential impact that each type of research has on improving the quality of human life. In addition, students will consider the complexities and issues surrounding stem cell research by thinking about it on a personal level first, and then extrapolating their thoughts about the issues to make a decision or state a final opinion based upon selected research and the knowledge acquired from various sources.

### DESIRED OUTCOMES:

Students will be able to:

- 1) Know the characteristics that distinguish stem cells from other types of cells
- 2) Describe the advantages and disadvantages of embryonic and adult stem cell research and the impact those advantages have on humanitarian and scientific efforts
- 3) Know how stem cells are derived
- 4) Understand the scientific, humanitarian, and economic importance of stem cell research
- 5) Write a concise position statement

### PREREQUISITES:

Prior to conducting this exercise, students should have successfully completed California State Board of Education academic content standards in cell biology.

### PROCEDURE:

1. Introduce the goal of the activity to the students and briefly discuss the importance of investigation and experimentation.
2. Ask students what they have heard about stem cell research and have them discuss/list the sources of their information.
3. Review the *Societal Statement* by having one student read it aloud.
4. Review the *Key Terms* with students.
5. To get students to understand the benefits and weigh the issues, we must start where they are most familiar – with themselves and their surroundings. Ask students to list three illnesses or diseases that have personally affected them or family members. Then, to ensure each disease has a face or name associated with it, ask the students to indicate next to the disease or illness the students' relationship to the person affected by the disease (e.g., sister, father, cousin, etc.).
6. Determine whether students wish to share their lists with other members of the class. This will help other students understand the scope of certain illnesses even though they may not personally have the illness.
7. Make a short list of diseases/illnesses by asking the students to provide what is on their respective lists.
8. Assign students to do research to find some basic information about the diseases. Information on some selected diseases can be found on the *Disease Sheets* available from CSBR. Ask the students to find out how many people are afflicted with the disease/illness that they are assigned. Also, where applicable, ask the students to find out what the survival rate is or life span is for those with the disease/illness. Also, make sure students know what occupations are associated with stem cell research.
9. Once everyone has completed the assignment in #9, determine which students are pro-embryonic stem cell research, pro-adult stem cell research, or both. You may wish to ask the students to write their names and affiliations on a separate sheet of paper and turn them in.
10. Divide the room into "congressional districts". Have one district with a majority of pro-embryonic stem cell students. Similarly, have another district with a majority of pro-adult stem cell students. Last, if numbers permit such, have a district with a mixed proportion of pro-adult and pro-embryonic stem cell research students.
11. Select students based upon their position to represent each district, but have a passionate pro-adult stem cell research student represent the pro-embryonic stem cell group. Have a passionate pro-embryonic stem cell research student represent the pro-adult stem cell group. Pick any student to represent the district with a mixed proportion of pro-adult and pro-embryonic stem cell research students.

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12. Inform all students about the following scenario that they will respond to.
13. Scenario: Elected members of congress will be voting on important legislation to decide whether the Federal government will provide funds to support research in your state involving embryonic stem cell research. There will be many high tech research jobs moving into your area if your congressman/woman votes appropriately. Each congressperson is to speak with their constituents and inform them as to their position and why. The constituents (students) will be allowed to debate/ask questions of the congressman/woman and try to sway the congressman/woman to change their position.
14. Determine which congressional district will go first and allow the students to discuss their positions such that all students may hear the discussions.
15. After all discussions are completed, ask questions using the *Student Discussion Questions*.

### To the elected officials:

1. Do you think you could stand behind something that you are opposed to? Why or why not?
2. What, if anything, swayed you to change your mind regarding stem cell research?

### To the Constituents:

1. How does it feel to have an elected official not listen to you? Or not vote in accordance with your wishes/or the wishes of the majority?
2. Has your position regarding stem cell research changed? Why or why not?
3. If your relative could receive life saving treatment or an improved quality of life as a result of embryonic stem cell research, would you change your position?
4. If the research showed that a cure for your relative's disease/illness could be developed ten years earlier if embryonic stem cells are used, would your position change?
5. How did it feel to know that a potential cure for your relative may not be investigated due to perceived moral or ethical reasons?

### To all students

1. What affect do you think another country using embryonic stem cell research to cure diseases like Parkinson's or eliminate partial paralysis would have on the U.S. research community? Or health care in the U.S.?
2. Is it important for U.S. researchers to investigate all potential sources of treatment? Why or why not?

### SOCIETAL STATEMENT:

Stem cell research represents one of the most promising forms of medical research. It holds the potential to cure everything from diabetes to Parkinson's disease to Alzheimer's. There are ethical concerns and conflict, however, among members of the public about the nature and form of the process of stem cell research. Researchers are still attempting to define the limits of stem cell research, which appears to have almost infinite applications, while society addresses these ethical concerns.

### KEY TERMS:

- Embryonic stem cells
- Blastocyst
- Adult stem cells
- Trophoblast
- In vitro
- Cell culture
- Culture medium
- Cell differentiation
- Stem cell line

### FOLLOW-UP ASSIGNMENTS:

1. Have students define the key terms and describe their importance in stem cell research
2. Have students search for information on stem cell research and have them to write concisely why stem cells are so important. Students should consider using the Research Questions as a starting point. All references should be properly cited in their paper.
3. Assign students to write a brief position paper addressing the following:
  - a. Their position
  - b. Supporting statements for their position (this will be acquired through researching information on the subject)
  - c. Potential economic and humanitarian impact of stem cell research

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### STUDENT DISCUSSION QUESTIONS

1. How does it feel to have an elected official not listen to you? Or not vote in accordance with your wishes/or the wishes of the majority?
2. Do you think you could stand behind something that you are opposed to? Why or why not?
3. Has your position regarding stem cell research changed? Why or why not?
4. If your relative could receive life saving treatment or an improved quality of life as a result of embryonic stem cell research, would you change your position?
5. If the research showed that a cure for your relative's disease/illness could be developed ten years earlier if embryonic stem cells are used, would your position change?
6. How did it feel to know that a potential cure for your relative may not be investigated due to perceived moral or ethical reasons?
7. What, if anything, swayed you to change your mind regarding stem cell research?
8. What affect do you think another country using embryonic stem cell research to cure diseases like Parkinson's or eliminate partial paralysis would have on the U.S. research community? Or health care in the U.S.?
9. Is it important for U.S. researchers to investigate all potential sources of treatment? Why or why not?

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### RESEARCH QUESTIONS

These questions are designed to provide students with a starting point for initiating research, discussion, or debate issues.

1. What are the two characteristics that distinguish stem cells from other types of cells?
2. What is the difference between embryonic and adult stem cells?
3. Where are adult stem cells found?
4. What are the advantages of using embryonic stem cells?
5. What are the advantages of using adult stem cells?
6. What are the disadvantages of using embryonic stem cells?
7. What are the disadvantages of using adult stem cells?
8. What is the size of a stem cell?
9. Why are stem cells so important to researchers in treating diseases and injuries?
10. What is a stem cell line?
11. What is cell differentiation?