In summer 2003, toddler Kai Harriott of Boston was sitting on her porch, singing with her sister. A gang member shot into the air to scare Kai’s neighbors. Kai was hit by a bullet. After being shot, Kai was paralyzed. She could not move from the waist down. Because of her injury, Kai must use a wheelchair. But scientists have an idea that might help. They have a theory that stem cells can someday help people like Kai.

Stem cells are found in different parts of the human body, including in our blood. Stem cells are also found in fertilized human eggs, called embryos. Stem cells from embryos can develop into cells that do many different jobs in the human body. With more research, scientists may be able to grow replacement parts for humans from stem cells.

If doctors can grow spinal cord cells, people like Kai might walk again. New brain cells could help people who have had strokes or Alzheimer’s disease. Scientists might also learn to grow the cells that make insulin. This could help people with diabetes. But to obtain some stem cells, scientists must destroy a human embryo. Human embryos are usually obtained from unused fertilized eggs from In Vitro Fertilization (IVF). This is when a couple uses a reproductive specialist to help them have a child. For example, a couple has 10 eggs that have been fertilized but only uses four eggs to start their family. This couple then has six leftover embryos that can be donated to stem cell research.

Many people think that human life begins when an egg is fertilized. They think destroying a human embryo is like murder. They say scientists should only work with stem cells from adults. But most scientists find that stem cells taken from adults won’t grow into the many different kinds of human cells the way that stem cells from embryos do. Stem cells from embryos may be our only hope of curing some diseases.

Yet, however promising stem cell research is, many citizens oppose it. They object to having their tax dollars spent on something they think is unethical. Investigating stem cells and their medical benefits will take years and cost millions. Should researchers obtain funding from the government to investigate embryonic stem cells?
USE THE FOCUS WORDS

**embryo** (noun) fertilized egg in a mother’s womb

- *Sample Sentence:* Stem cells are found in fertilized human eggs, called embryos.
- *Turn and Talk:* Should scientists be allowed to destroy a human embryo for research that could save lives?

**paralyzed** (adjective) unable to move

- *Sample Sentence:* After being shot, Kai was paralyzed from the waist down.
- *Turn and Talk:* How do you think school would be different for a paralyzed student?

**theory** (noun) an explanation for a set of related facts

- *Sample Sentence:* Some scientists have a theory that stem cells can someday help people like Kai.
- *Turn and Talk:* Share your theory about extraterrestrial life (aliens).

**investigate** (verb) to try to learn about

- *Sample Sentence:* Investigating stem cells will take years and cost millions of dollars.
- *Turn and Talk:* What is a topic you would like to investigate?

**obtain** (verb) to get

- *Sample Sentence:* Scientists could not obtain federal money for research on embryonic stem cells.
- *Turn and Talk:* What do you have to do to obtain permission to hang out with your friends after school?
President George W. Bush restricted government funding of stem cell research. On August 9, 2001, he said that scientists
could not obtain federal money for research on embryonic stem cell lines created after that date. This paralyzed certain
areas of research. Some scientists investigating embryonic stem cells had to put their projects on hold.

President Bush believed he had a moral duty to stop new embryos from being destroyed. Each embryo, he stated, is a
potential human being. His theory was that using embryos for research cheapens human life.

President Obama presented a different moral theory. He said human beings have a moral duty to help people who are
suffering. Therefore, they should use science to fight disease. In 2009, President Obama lifted President Bush’s restrictions.

**Option 1:** Each embryo needed to start a stem cell line is made up of about 100 cells. Its mass is about one ten-millionth of
a gram. Which of the following shows one ten-millionth?

A. .0001  
B. .00001  
C. .000001  
D. .0000001

**Option 2:** Each embryo needed to start a stem cell line is made up of about 100 cells. Each person is made up of about 100
trillion cells. Write both numbers in scientific notation. How many orders of magnitude separate the two numbers?

\[ 100 = 10^2 \text{ and } 100 \text{ trillion} = 10^{14}. \]  
Each power of 10 represents an order of magnitude, so 12 orders of magnitude separate the two numbers.

**Discussion Question:** In 2009, the FDA approved the first clinical trial using embryonic stem cells. A company called
Geron Corp planned to inject embryonic stem cells into 8–10 people whose legs were paralyzed by a spinal cord
injury. The Geron scientists had a theory that these cells could help repair damaged nerves. Obtaining subjects for
the trial would take time, because the scientists wanted to inject the cells within a few days of the injury. They said
the trial was primarily an investigation into whether injecting stem cells would be safe. But they also hoped to see
whether the stem cells would help patients recover some movement in their legs.

Imagine that you are against stem cell research. What would you say to these researchers to convince them to give
up this project?
THINK SCIENTIFICALLY

Ms. Kahn’s class is discussing stem cell research.

“If a human life begins when an egg is fertilized, then obtaining stem cells from embryos is wrong,” says Gabriel.

“But think about all the good that can be done with stem cells,” says Toni. “People who are paralyzed or have other major medical problems could finally live full lives again!”

“Has anyone investigated other ways to retrieve stem cells other than from embryos?” asks Gabriel.

“Actually,” says Sylvia, “there are also stem cells in adult bone marrow, and scientists have some exciting theories about how these stem cells can help improve many health problems, such as heart attacks!”

“Fascinating,” says Ms. Kahn. “Let’s take a look!”

Ms. Kahn and her class found this topic very interesting and did some research on the internet. Sylvia took notes on information from a study that tested if bone marrow stem cells were effective.

Scientists theorized that injecting bone marrow stem cells would help the heart to heal and rebuild itself after suffering from a heart attack.

They collected 53 patients who had suffered a heart attack in the past. Half received bone marrow stem cells and half received a placebo (or a fake medicine that neither helps nor harms the patient). None of the patients knew whether they got the real injection or the fake one.

Six months after the treatment, the scientists tested the patients’ hearts to see if they had improved or noticed any differences. This is what they found.

<table>
<thead>
<tr>
<th></th>
<th>Stem cell patients</th>
<th>Placebo patients</th>
</tr>
</thead>
<tbody>
<tr>
<td># adverse events per patient</td>
<td>5.3</td>
<td>7</td>
</tr>
<tr>
<td>irregular heart rhythm</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>muscle size</td>
<td>Increased</td>
<td>Decreased</td>
</tr>
<tr>
<td>muscle strength</td>
<td>Increased</td>
<td>Decreased</td>
</tr>
</tbody>
</table>

Data Source: J. M. Hare et al (2009 - Journal of the American College of Cardiology)

Did the patients who received injections of stem cells instead of a placebo benefit from the treatment? If so, how?

Yes. They had fewer adverse events, regular heart rhythm, and increased muscle size and strength.

Stem cells from bone marrow are slightly different than stem cells from embryos; they cannot develop into as many different types of cells as embryonic stem cells can. Summarize your position on whether or not scientists should focus only on research that does not involve human embryos.

Answers will vary.

Why is it important that scientists use placebos when they test a new therapy?
DEBATE THE ISSUE
Pick one of these positions (or create your own).

A  The government should pay for embryonic stem cell research.

OR

B  The government should not fund embryonic stem cell research.

OR

CREATE YOUR OWN

Jot down a few notes on how to support your position during a discussion or debate.

Be a strong participant by using phrases like these:

Can you show me evidence in the text that...

You make a good point, but have you considered...

I believe that...

I agree with you, but...
TAKE A STAND

Support your position with clear reasons and specific examples. Try to use relevant words from the Word Generation list in your response.

embryo | paralyzed | theory | investigate | obtain

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