Cells That Rebuild

Read research evidence about regeneration and medical treatment

BIO.1E.4 "Enrichment: Use scientific literature to investigate the role of stem cells in regeneration and asexual reproduction, and research applications of stem cells used to solve human medical conditions.*"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two results from the planarian experiment, circle one outcome that clinical studies track, and put a star beside one limit on what the planarian study can prove. These marks will help you separate evidence from claims.

From Split Worms to Stem Cell Treatments

1. A freshwater planarian can reproduce without a mate by splitting into two pieces, a process called fission. Each piece can then replace missing structures, including parts of the head or tail. These are separate events: splitting makes two individuals, while regeneration rebuilds each individual afterward. Planarians contain adult stem cells called neoblasts that divide and produce specialized cells. Scientists ask whether these cells make rebuilding possible, rather than simply appearing near an injury. To test that question, researchers need evidence that links neoblast activity to the return of missing tissue.

2. In a 2011 study published in Science, Wagner, Wang, and Reddien used radiation to destroy dividing neoblasts in planarians. Irradiated worms could not replace lost tissue. The researchers then transplanted single neoblasts into irradiated worms. Some transplanted cells multiplied, produced several types of specialized cells, and rescued their hosts. This experiment gives stronger evidence than merely finding neoblasts near a wound: destroying the cells disrupted rebuilding, and transplanting a cell sometimes restored that ability. The study supports a role for neoblasts in regeneration after fission, but it does not show that neoblasts initiate the split.

3. Human stem cells also make specialized cells, but a planarian experiment cannot prove that people can regrow limbs. One established medical use is transplantation of blood-forming stem cells for some patients with leukemia. After intensive treatment damages diseased bone marrow, transplanted stem cells can settle in the marrow and make new blood cells. Clinical studies track whether blood-cell production returns and whether complications occur. Donor cells may attack a patient's tissues, so treatment carries risks. When reading research, distinguish what each study directly tested: planarian experiments explain rebuilding in worms, while human clinical evidence evaluates a treatment in people.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the planarian study support a role for neoblasts in the regeneration that follows fission?

2. Why does transplanting a single neoblast provide stronger evidence than finding neoblasts near an injury?

3. Compare what stem cells do in the planarian study and in the medical treatment described. What evidence do clinical studies track that the planarian study does not?

4. A headline claims that the planarian experiment proves stem cells can regrow human limbs. Evaluate the claim using the limits of the evidence in the passage.

3 YOUR TURN

Your own words

Choose a human medical condition not named in the passage. In four or five sentences, propose a search of scientific studies: name the condition, identify what stem cells might do, describe two kinds of evidence you would seek, and explain why the planarian study alone cannot establish that the treatment works.

ANSWER KEY

Cells That Rebuild

PART 1 · READ AND MARK

Underline two results from the planarian experiment, circle one outcome that clinical studies track, and put a star beside one limit on what the planarian study can prove. These marks will help you separate evidence from claims. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the planarian study support a role for neoblasts in the regeneration that follows fission?	**Irradiated worms without dividing neoblasts could not replace tissue, while some worms given a transplanted neoblast regained that ability.**
2	Why does transplanting a single neoblast provide stronger evidence than finding neoblasts near an injury?	**The transplanted cell multiplied, made specialized cells, and sometimes rescued a worm whose own dividing neoblasts had been destroyed. Finding cells near an injury alone would not show that they help rebuild tissue.**
3	Compare what stem cells do in the planarian study and in the medical treatment described. What evidence do clinical studies track that the planarian study does not?	**Neoblasts produce cells that rebuild missing planarian tissue; transplanted blood-forming stem cells make new blood cells in patients. Clinical studies track the return of blood-cell production and complications.**
4	A headline claims that the planarian experiment proves stem cells can regrow human limbs. Evaluate the claim using the limits of the evidence in the passage.	**The claim is not supported. The experiment tested tissue regeneration in planarians, not limb regrowth in humans; evidence from worms cannot establish a human treatment.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would search scientific studies on stem cell treatments for severe corneal damage. I would investigate whether transplanted stem cells replace damaged cells on the eye's surface. I would look for studies measuring changes in patients' vision after treatment. I would also look for reports of complications, such as infection or unwanted cell growth. The planarian study alone cannot show that a treatment works in human eyes.

Accept accurate paraphrases that distinguish fission from regeneration and experimental evidence in worms from clinical evidence in humans. For Part 3, accept a plausible stem cell function framed as a question to investigate, not an unproven claim of success.