What Mitosis Has to Do with Families

By ReadWorks

On a warm summer night, Lily's parents turned off the television and invited her to look at some old family photos. The three of them began by flipping through a large album of old printed photographs, each one taken with a film camera during the 1980s. The man and woman in the pictures were much younger than the mother and father sitting beside their daughter, turning each page in the album.

Still, Lily could recognize her parents easily. Through the faded colors and strange-looking clothes, the bright shock of red hair on her mom's head stood out in almost every shot. Although her father's hair changed quickly in the pictures, from a sandy gold to a salt-and-pepper grey, his blue eyes looked almost as sharp at the age of 50 as they did when he was 20. Lily wondered why her hair wasn't red like her mother's, and why her eyes weren't blue, like her father's.

Lily's mom, Kate, picked another photo album off the bookshelf in their living room. With a smile from ear to ear, she turned to a page filled with pictures of Lily as a newborn. From photo to photo, the tiny babe in her mother's arms grew rapidly into a wide-eyed baby, reaching out from her crib. On the following page were photos of a rambunctious toddler, laughing at the camera and stumbling towards Lion, the family dog. Another page revealed photos of a 5-year-old Lily who was wearing a "Dora the Explorer" backpack on her very first day of kindergarten.

Before long, Lily's dad, Tom, took out his phone to show Lily a photo he had taken at her tenth birthday party, just one week before.

"I can't believe how quickly you're growing!" he exclaimed. "Before long you'll be six feet tall."

"I can't believe how small I used to be!" answered Lily. "Look at this photo from the hospital.

My hand was barely big enough to fit around your finger, Mom."

"You and me both," said Kate with a chuckle. "But, you know, all people start out even smaller than you are in this album. A lot happens before a baby is even born. Every one of us actually comes from one microscopic cell."

"You mean I was even smaller than I was in that picture? The one you took right after I was born?" asked Lily in disbelief.

"Even smaller than when I was pregnant, and your entire body fit inside of me!" explained Kate. "It's kind of a miracle that our entire bodies develop from a single egg."

Mitosis: How One Cell Becomes Many

A long series of events has allowed Kate, Tom, and their 10-year-old daughter Lily to grow from newborn babies into the family they are today. Everything started, however, with a fertilized egg in the mother's womb.

Lily, along with her parents and every other human being on the planet, grew from that egg into the girl she is today. She will keep growing until she is an adult, and maybe even a mother who has a daughter of her own. She grows because she is what scientists call a multicellular organism—a living thing that is made from many cells.

While we usually think of a person as having one body, that body is actually a collection of many, many cells. In fact, the average human body contains trillions and trillions of cells. Among the vast numbers of cells are many different types of cells, which all have different shapes and functions.

One of the most important functions of a cell is to divide itself into two cells. This action is called mitosis, and when we talk about a baby girl who will one day grow up to be a woman, we're talking about hundreds of cells splitting into two, then splitting into two again, then splitting into two again, until there are thousands of cells.

As time goes on, mitosis continues. Thousands of cells continue splitting into two, becoming millions of cells, then billions of cells, then trillions of cells, all of which come together to form various parts of the human body.

One Organism, Many Organs

Many of these body parts, including the heart, the eyes, and even the skin, are known as organs. Organs, built from specific kinds of cells through the process of mitosis, are what allow people to breathe, see, use the restroom, and protect themselves from danger, among other things. While every organ is extremely tiny to start, mitosis allows organs to grow bigger and do more to support the human body.

Mitosis also helps human beings heal some of their organs when they are damaged. At her birthday party, Lily accidentally cut her finger on a sheet of wrapping paper as she was unwrapping a gift. By the time she was looking at photos with her family, the paper cut had completely disappeared; the skin cells in her finger had multiplied to replace the ones that were broken.

Even without being hurt, the cells in Lily's body are dividing all of the time to help her grow. When she needs to buy bigger shoes, it's because mitosis is causing the bone cells in her foot to make copies of themselves, making her toes longer and her sole wider. When she needs a haircut, it's because mitosis is causing the cells in her hair to multiply, resulting in longer and thicker hair. As more and more new cells are added to each body part, the older cells eventually die, replaced by the new cells they've produced.

Humans aren't the only organisms that depend on mitosis for growth. Lily's dog, Lion, was once a puppy that could fit in her arms. After just a few years, he's grown into a full-sized German Shepard, almost big enough to carry Lily on his back. Lion's feet and fur have grown in exactly the same way as Lily's feet and hair—though Lion, with his sturdy paws, has never had a particular need for a pair of new sneakers.

The same goes for the trees in their backyard, where Lily and Lion play fetch and roll in the grass on hot summer days. Every Fall, leaves on the elm trees that sit at the edge of the yard and line the street turn to bright shades of orange and red, then fall to the ground as the weather gets colder. In Spring, tiny buds begin to sprout on the elms' bare branches. When the cells in those buds split into two and begin to multiply, they grow into brand new leaves, marking the start of a new season.

The Color of Her Hair

"Why isn't my hair red, like Mom's?" asked Lily, pointing to one of the old photographs of her parents. She glanced in the mirror, trying to figure out whether any of her hair cells would ever turn red when they multiplied.

Tom ruffled his fingers through the girl's hair. "You take after your old man," he said with a chuckle. "I guess the redhead gene wasn't exactly dominant."

Lily used the family computer to look up the phrase "dominant gene," and discovered that people don't always pass on their own hair color to their children. The fertilized egg that marks the starting point of human development contains chromosomes from both parents. These chromosomes, made of DNA, contain all of the physical characteristics from each parent. When the chromosomes from Tom and Kate combined to create a new blueprint for Lily, different pieces of each parent made it into that blueprint. Some didn't make it all. Others became part of the blueprint, but were never activated in Lily's own cells.

Looking in the mirror again, Lily noticed that while her hair was blonde, it didn't look exactly like her dad's hair in the photo album. She also noticed that her eyes were brown, like her mom's, but their shape didn't seem to match either of her parents'. The more Lily thought about all of the cells and where they came from, the more confused she became. If Lily's chromosomes came from Tom and Kate, why didn't any of her features match up to either parent? After all, not everyone at school had "his father's eyes" or "her mother's nose."

"Never forget!" Kate reminded Lily. "You're our girl. You'll always have pieces of us, but you are totally unique. When our chromosomes combined, they created an entirely new organism. And when you have your own children, they'll be unique, too. Family members may look alike in some ways, but there will never be another Lily that's exactly like you."

"What about Pete and Greg, down the street?" asked Lily. "They're identical twins."

Tom rolled his eyes and joked, "We're going to need another reading passage to explain that one."

Name: _____ **Date:** _____

1. What does Lily wonder?

A) Why her father's blue eyes looked almost as sharp at the age of 50 as they did when he was 20.

B) Why her mother's hair was red, why her father's eyes were blue, and why her father's hair was sandy gold.

C) Why her hair wasn't red like her mother's, and why her eyes weren't blue, like her father's.

D) Why her father's hair color turned from a sandy gold to a salt-and-pepper grey.

2. How does the author organize the information in this passage?

A) The author describes mitosis and the organs of children.

B) The author describes a setting, characters, a problem, and a solution within a plot line.

C) The author describes scientific concepts within a story.

D) The author describes a series of developments and inventions in gene science.

3. Which details from the story provide evidence that mitosis occurs in living things?

A) Lily's dog has grown; tiny buds sprout on trees

B) Lily looks up "dominant gene" on the computer; Pete and Greg live down the street

C) Lily has brown eyes; Lily's hair is not the same color as her mother's

D) Lily once fit in her mother's womb; Lily's father's hair has changed color over the years

4. What can be concluded about the importance of mitosis in repairing cuts on the skin?

A) Mitosis is helpful but not necessary in repairing cuts on the skin.

B) Mitosis slows down the process of repairing cuts on the skin.

C) Mitosis is a necessary step in repairing cuts on the skin.

D) Mitosis is not involved in repairing cuts on the skin.

5. What is this passage mostly about?

A) what mitosis is, how it works, and the ways it affects humans and other living things

B) the ways in which mitosis creates new organs and replaces old ones

C) one girl's struggle to understand how she is related to her parents

D) the importance of mitosis in understanding gene dominance, identical twins, and the changing of the seasons

6. Read this sentence: "Among the **vast** numbers of cells are many different types of cells, which all have different shapes and functions."
What is the meaning of the word **vast** in this sentence?

A) strange
B) small
C) unchanging
D) very large

7. The question below is an incomplete sentence. Choose the answer that best completes the sentence.
_____ the idea of cells splitting apart may sound harmful, the process of mitosis actually repairs parts of the body.

A) Except
B) Although
C) Because
D) However

8. Mitosis helps to build the human body.
Use evidence from the text to support your answer.

9. Describe what Lily looks like, including the color of her hair.

10. Explain why Lily does not look exactly like her mother.