



# SALAMANDER SUPERPOWERS

## A Question of Regeneration

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From above, all that could be seen was their two heads pressed together—two masses of brown curly hair. Normally they refused to stand within five feet of each other. Or rather, if they did, their mother wouldn't allow it, for the sake of her sanity. As usual, their closeness only lasted a few seconds.

“Get out of my way, I can't see,” whined Andrea as she shoved her brother out of the way. But Jake was persistent and he scrambled right back next to his sister to examine their treasure.

“He's all slimy,” Jake said, wrinkling his nose up in disgust.

“You little dork, that's the way it's supposed to be. It's so it can breathe through its skin.”

“Unh, uh. You're lying,” Jake said. “It doesn't breathe through its skin, it breathes through its mouth.”

“No, I'm not,” Andrea insisted. “It's true, my teacher told me.”

Jake decided to accept it, or rather to just agree with Andrea. It was a lot easier to just agree with her.

The object of their attention rested in the bucket they were presently peering into. Inside was a flat rock resting in a small pool of water, and on the rock was a salamander.

“Jake, you're blocking all the light,” Andrea complained as she shoved Jake away again and then grabbed the bucket. “Let me look at it for a minute.”

Jake stood defeated on the grass, the object of his attention having been ripped from his hands. He couldn't wait until he was bigger than Andrea. Then things would change. Now he could hardly reach the top of her head; she could squash him in a second.

“I think we should name her Sally the Salamander,” Andrea declared.

“No,” Jake proclaimed. “He's not a girl. His name is ... is Kermit.”

“You can't name a salamander Kermit,” Andrea protested. “Kermit is a frog's name, stupid.”

“I don't care. I like it, and I found it. So, I get to name it.”

As usual, their arguments faded away as they got bored with fighting. The salamander climbed up onto the side of the bucket and peered at them.

“See, he likes the name,” Jake said in defiance.

Andrea completely ignored her brother’s statement. “You know he can grow back his leg if you cut it off,” she said.

“What!” Jake said, taking his eyes off the salamander for the first time. “You’re lying.”

“Nu-uh. It’s the truth. They can regenerate. They’re the only animal that can, too. I’ll prove it,” Andrea said, the excitement rising in her voice. She reached down to grab the salamander. Jake squealed in alarm, grabbing the bucket. But it was too late. Andrea had Kermit. She held him in her hand, his poor little tail sticking out through her fingers.

“Give him back!” shouted Jake. But Andrea just dangled Kermit in front of Jake’s face and then raised him up as high as she could when Jake made a move to grab him.

“He’s mine now,” Andrea taunted, “and I’m going to pull his legs off one by one just so that I can watch them grow back.”

“Noooo, you’re going to hurt him!” Jake was pounding his sister in the back as she ran away with the salamander above her head. His hitting had no effect on Andrea. She seemed to be enjoying it. Jake still had one power though, and it worked every time. It was the one advantage of being the little brother, the baby.

“Mooooommmmm!” Jake screamed at the top of his lungs. Andrea stopped in her tracks. She turned around and faced him.

“You’ll get it later,” she snarled at him, returning the salamander to the bucket. As soon as Kermit was back, their mother appeared at the doorway.

“Inside, kids, let’s go,” their mother said.

Grabbing his bucket, Jake skipped to the door.

“Mom, look what I found!” Jake exclaimed.

“Oh, my,” his mother said, backing away from the bucket. She had never been able to develop a fondness for reptiles or amphibians.

“His name is Kermit, and I found him,” Jake stated as he glared at his sister who had snuck into the room and was sulking in the chair at the kitchen table. “Andrea stole him and was going to pull his legs off. She said they would grow back, but I know it’s not true. Right, Mom?”

Andrea had remained silent the entire time. She knew how things worked. If she opened her mouth, she was likely to get into more trouble. She was older. She was supposed to know better. She was an influence on her younger brother, and so on. She had memorized *that* speech long ago.

“Well, actually,” their mother began, “Andrea is right.” Andrea was shocked her mother was taking her side, even though she knew that she was right. “At least to some extent she is. Salamanders can regenerate. Which means that if one of their legs or their tail gets broken off, they can grow it back.”

“Really?” Jake said, still suspicious of the truth. He thought about it. It was like his salamander had superpowers. He pulled his bucket closer to him, eyeing Andrea the entire time. “Well, I don’t care if he can grow them back. If Andrea gets anywhere near Kermit’s legs I’ll pull hers off and see if *she* can grow them back.”

“Well, Jake,” his mother began smiling, “I wouldn’t try that just yet. They’re working on it, but they haven’t yet figured out how humans can re-grow a leg. At least not like salamanders can.”

“Well, Andrea can be their first experiment,” Jake said making a run for the door.

## Questions

1. What is regeneration?
  1. What are stem cells?
  2. What is the difference between totipotent, pluripotent, and unipotent cells? Which would be used in regeneration?
2. How do salamanders regenerate?
  1. What can salamanders regenerate?
  2. Define cell dedifferentiation, blastema, and transdifferentiation.
3. What approaches have been made to see if humans could regenerate?
  1. What is Hydra Biosciences?
  2. What is *msx1*?
4. What would be the advantages of using “natural regeneration” over stem cell transplants?
  1. What problems still exist in using “natural regeneration”?

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