“The Axolotl: A Cut Above the Rest” Transcript

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CHRISTIAN BAKER	This is an Axolotl, a large Mexican salamander. They're amphibious, they're about a foot in length, and while they are virtually extinct in the wild, they're bountiful in science labs-- mainly due to their unique ability to regenerate.
SUSAN BRYANT	The beauty of this animal is that it doesn't matter how many times you cut its leg off, it will regenerate perfectly. If it loses its arm, it will regenerate. And you won't even be able to tell later on. It can also regenerate its tail, legs, and gills. My research has always been on regeneration. I've never wanted to work on anything else. The skin is critical in regeneration in these things. All the information that you need is in the skin. The important layer in both development and regeneration is the fibroblast layer. They are the ones that have the information for how to build the structure.
BAKER	The process of regeneration is essentially enhanced wound healing. If you amputate a limb from an Axolotl, the wound forms a dome of cells from the connective tissue, also known as a "blastema." As the cells divide and migrate outward, they reform an identical, fully functioning replacement limb. But Susan Bryant and her team of researchers has taken this concept even further.
BRYANT	Cells will divide to eliminate any discontinuity between themselves and their neighbors. So if you have two cells that aren't normally next to each other, then they will insert what should be in between. The way we think about it is that the cells have positional information. What we've described it as is along this axis, the information-- we describe this with alphabet A through whatever-- and around the circumference is 12 through 1. If you put a 12 and a 6 next to each other what they do is they fill in, and it creates another whole limb.
BAKER	To illustrate this concept, Susan Bryant and her team conduct skin graft experiments.
BRYANT	Where you make a wound here. You have to deviate a nerve to the site. And then graft a piece of skin from another part of the circumference with an opposite positional value. If you do this, you've created a big discontinuity right there. And so you will get another hand in there to eliminate it. It's very strange.

BAKER	These new limbs are fully functioning, with bone and muscle tissue. In some cases, Axolotls will actually favor the new limb over the older one.
BRYANT	Regeneration is something that all animals make some attempt at, even us. But it must be that in these animals that regenerate, they keep the information that they used to build the structures in the first place-- they keep it accessible, whereas we've turned it off. I think what it is is these animals, because they regenerate, they maintain a strong grid-- what we call the "information grid." And the information grid works to fill in gaps, but it doesn't go crazy and make extra stuff. I think the difference is humans had that strong grid as embryos. And then we just maintain the integrity of what was made at that time, but we don't have the ability to recreate later on. We started out with some of the same abilities, but we lose it very fast. What we need to do is we need to know more about what happens in other animals before we go to humans. Other animals that don't normally regenerate that we can stimulate to regenerate, and then see what happens to them.
BAKER	For Science Friday, I'm Christian Baker.