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The regrown finger of Lee Spievak
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[Finger Regenerated Using Pig Bladder Extract](#)

Is it real or just a hoax?

The process of regenerating fingers would not benefit only injured soldiers or hurt civilians, but could also be a first step on the way of regenerating entire limbs or damaged parts of skin (in the case of scars), hearts and spinal cords. Some animals can regenerate their limbs naturally, like the salamanders (starfishes and octopuses are less relevant in studies aimed towards future human applied technologies). Up to about age 2, people too can consistently regrow fingertips but in adults, this rarely occurs. A salamander can regrow a missing limb in a few weeks; they do not form a scar on the wounded place but a tissue called blastema that regenerates the limb. If the blastema is removed and displaced on the back or on any other place on the salamander's body, a limb will grow there. If a nerve is rerouted on another spot on the limb, a blastema and a new extra-limb will emerge there. Engineered mice can develop blastemas instead of scars, but they do not regenerate digits back. Precisely because of this, a great stir was caused by the 2005 case of Lee Spievak, 69, from Cincinnati, who sliced off a fingertip and grew it back, after using an extract of pig bladder on it. Spievak lost his fingertip to a spinning plastic propeller, leaving just a portion of the nail bed. He used an extract of pig bladder powder, at the recommendation of Alan Spievak, his brother and a former Harvard surgeon who owns a company that promotes healing and tissue regeneration. The powder is made of mostly collagen and a variety of substances from the extracellular matrix (the support structure for cells in animal and human tissue), without any pig cells. Spievak applied it every two days and, in four weeks, the digit had its original length; in four months from the accident, it looked like a normal one, as bone, tissue, skin and nail grew back. The nail continues to grow at twice the speed of the rest of his nails. The pig bladder extract is employed in horses for the re-growing of ligaments and is marketed for human use. Dr. Alan Spievak used it too, on a neighbor who'd cut his fingertip off with a tablesaw. The man's fingertip grew back over a period of four to six weeks. "(The pig bladder) forms microscopic scaffolding for incoming human cells to occupy, and it emits chemical signals to encourage those cells to regenerate tissue. Those signals don't specifically say 'make a finger,' but cells pick up that message from their surroundings. We're not smart enough to figure out how to regrow a finger. We are very uninformed about how all of this works," said Dr Stephen Badylak, a regeneration expert at the University of Pittsburgh, who collaborates with Alan Spievak. However, this miraculous regeneration is facing a lot of skepticism right now, as the case is not sustained by a research published in peer-reviewed journals. "At the moment, people are trying to figure out how to make heart, brain and liver cells. I don't see how they could re-grow a fingertip by sprinkling on extracellular matrix," said Professor Stephen Minger, an expert in stem cell and regenerative medicine at Kings College London. As far as Spievak is concerned, he said he even regained feeling in his finger. But, "when people have a fingertip reattached, the nerves don't re-grow and people have no sense of pressure or of pain," Minger argued. Because of all this, Lee Spievak is even suspected to have had experienced a very common or garden-related, mundane fingertip injury which had not affected the bone or nerve. "It appears to regenerate because new skin grows over the end of the finger - that's a normal recovery. It can be utterly surprising how well it repairs after what appears to be a ghastly injury but it's what you might expect from the most peripheral part of the body." Simon Kay, professor of hand surgery at the University of Leeds told BBC News.