# 豬膀胱製劑(細胞外基質),斷指重新長出來

# The amazing 'pixie dust' made from pigs bladder that regrew a severed finger in FOUR weeks

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Sponges can do it and so can starfish. For flatworms it is no problem, and both lizards and salamanders can pull off the same trick.

The trick in question is regeneration, the almost magical property possessed by some animals to regrow whole limbs, tails, other body parts or organs if they are lost in an accident.

This spontaneous regeneration has only recently begun to be understood and it involves an incredibly complex interplay of genes and tissues.

What is known is that regeneration does not - except to a very limited degree - occur in humans or, indeed, in any mammals. Cut off a man's leg or a rabbit's foot and the best you can hope for is a scar covered stump.

Cut off a finger-tip and, unless you find a surgeon to sew it back on again promptly, you will simply have to put up with one digit shorter than the rest.

That is, if reports are to be believed, unless you are Lee Spievack, a model aircraft enthusiast from Cincinnati in the U.S. who, in 2005, accidentally sliced an inch off the tip of his index finger with a model aeroplane propeller.

He was offered a tissue graft but refused when his brother Alan, a physician who has been researching tissue regeneration, persuaded him to sprinkle what is being termed "pixie dust" on the stump.

The dust, actually a collagen powder derived from pigs' bladders, appeared to provide a suitable "matrix" or framework, stimulating regrowth of the tissues and division of the cells, to enable Mr Spievack's finger to grow back - in just a month.


And not just a stump - flesh, tendon, skin, fingernail, fingerprints and all.

It is an extraordinary story because, if it can be confirmed, it will point the way to a breakthrough in one of medical science's greatest problems: the inability of humans to regenerate lost tissue.

One organisation with a keen interest in tissue regeneration is the U.S. Army. Military researchers are reported to be working with University of Pittsburgh scientists who developed the pixie dust to find a way to allow injured soldiers to regrow lost fingers, skin, and even whole limbs.

With hundreds of U.S. soldiers coming home injured from Iraq every month, such an advance would be leapt upon by the Pentagon.

Dr Stephen Badylak of the University of Pittsburgh is the scientist who developed the pixie dust. It consists of a mixture of protein and connective tissue which is already used by surgeons to repair tendons.

The U.S. Army has invested millions of dollars in regenerative medicine, and Dr Badylak - and Mr Spievack's brother - could become very rich men.

The powder, he has said, "tells the body to start the process of tissue regrowth".

But can it really be the case that a small and hitherto unknown team of medics has made a breakthrough that has had the world's mainstream researchers baffled for decades?

Or has something less dramatic happened? Could Mr Spievack's fingertip simply have been damaged badly, but not beyond repair?

Pain plane: Lee Spievack's model aircraft which was responsible for his injury

"It does all sound terribly anecdotal," says Dr Stephen Minger, an expert in tissue regeneration and stem cells at King's College in London. "We simply do not have enough information to know exactly what they have done."

According to Dr Minger, while it could be theoretically possible that a man has regrown his finger by sprinkling it with powdered pig bladder, it seems unlikely.

The problem is that a fingertip, while appearing simple, is actually a very complex structure. It consists of skin, fat, connective tissue, bone, tendon, nerves and blood vessels as well as the quite complex apparatus which grows the fingernail.

All these complex tissues would have to grow in the right order and in the right proportions and positions in relation to each other.

Somehow, the collagen dust would have to persuade the healing stump tissue not to simply form a scar but to trick it into behaving as it would have done when Mr Spievack's fingers were growing in his mother's womb.


Salamanders can do this. After losing a leg, say, skin grows over the stump, forming a cap which protects the regrowing tissue underneath.

What is effectively embryonic tissue - a "blastema" - starts to grow in the stump, activated by the same genes that 'told' the cells in the growing salamander to turn into skin, or bone, or muscle.

Nerves, muscles and blood vessels grow into the new limb and in a matter of a few weeks the animal is in possession of a perfect new limb.

This doesn't generally happen in mammals because, for unknown reasons buried in our evolutionary past, we have lost this mechanism to reprogramme cells in the body and make them able to form any tissue.

There is a strain of mouse, called the Murphy Roths Large, which appears to have retained some of the regenerative abilities of more primitive animals, capable of growing replacement skin and cartilage if damaged to an extent not seen in other mammals and certainly not in people.

But humans *can* regenerate some tissues. Skin and hair follicles are constantly growing, and the liver can completely regenerate itself even if three quarters of it is lost.

However, to regrow a human finger or leg without completely reprogramming the genetics of the tissue that forms the cut surface of the stump, you would need to provide some sort of matrix, an artificial scaffold to allow the cells to grow.

This has been done for some tissues: sheets of bladder tissue and heart valves have been grown in the laboratory.

Experimental biodegradable "scaffolds" have been made to encourage the growth of bone tissue and even form new joints.

But nothing as complex as a fingertip has been regenerated in a human. It is possible that the scientists who developed the powder which apparently repaired Mr Spievack's finger have stumbled upon an extraordinary breakthrough.

The fact that the U.S. military is pursuing this line of research - using the same Pittsburgh team involved in Mr. Spievack's case - means that this story cannot be dismissed out of hand.

What is needed now are clinical trials and cases properly written up in medical journals which can be verified and replicated in other patients.

Only then will we know that human beings have finally managed to copy a trick learned - and lost - by our watery ancestors countless millions of years ago.

Read more:
http://www.dailymail.co.uk/sciencetech/article-563099/The-amazing-pixie-dust-pigs-bladder-regrew-severed-finger-FOUR-weeks.html##ixzz0lzppryRU