Carson Bruns is a scientist, writer and artist. He has a PhD in chemistry, is an Assistant Professor of Mechanical Engineering at the University of Colorado and he directs the Laboratory for Emergent Nanomaterials.

Carson Bruns

Could a tattoo help you stay healthy?

Transcript:

I'd like to introduce you to an interesting person named Ötzi. He lives in Italy at the South Tyrol Museum of Archaeology because he's a mummy. This is an artist's rendition[1] of what he might have looked like when he was alive 5,300 years ago. You want to see what he looks like today?

(*Laughter*)

OK, brace yourselves[2], gross mummy pic coming at you.

So, he's not as handsome as he used to be, but he's actually in great shape for a mummy because he was discovered frozen in ice. Ötzi is the oldest mummy that's been discovered with preserved skin. 5,300 years is super old, older than the Egyptian pyramids and Ötzi's skin is covered in 61 black tattoos, all lines and crosses on parts of his body where he might have experienced pain. So scientists think that they might have been used to mark sites for some kind of therapy, like acupuncture.

So clearly, if the oldest skin we've seen is all tattooed up, tattooing is a very ancient practice. But fast-forward to today and tattoos are everywhere. Almost one in four Americans has a tattoo. It's a multibillion-dollar industry, and whether you love tattoos or hate them, this talk will change the way you think about them.

So, why are tattoos so popular? Unlike Ötzi, most of us today use tattoos for some kind of self-expression. Personally, I love tattoos because I love art and there is something so wonderful to me, almost romantic, about the way a tattoo as an art form cannot be commodified[3]. Right? Your tattoo lives and dies with you. It can't be bought or sold or traded, so its only value is really personal to you, and I love that.

Now, I tend to gravitate towards[4] really colourful tattoos because I'm obsessed with color. I teach a whole course on it at my university. But my very first tattoo was an all-black tattoo like Ötzi's. Yep, I did that cliché thing that young people do sometimes and I got a tattoo in a language I can't even read.

(*Laughter*)

[1] gengivelse
[2] *brace yourselves*: vær beredt
[3] gjort til en vare
[4] *gravitate towards*: være tiltrukket af

Ok, but I was 19 years old, I had just returned from my first trip overseas, I was in Japan, in the mountains meditating in Buddhist monasteries, and it was a really meaningful experience to me, so I wanted to commemorate[5] it with this Japanese and Chinese character[6] for "mountain".

Now, here's what blows my mind. My 14-year-old tattoo and Ötzi's 5,300-year-old tattoos are made of the same exact stuff, soot, that black powdery carbon dust that gets left behind in the fireplace when you burn stuff. And if you zoom way, way in on either my tattoo or Ötzi's tattoos, you'll find that they all look something like this. A tattoo is nothing more than a bunch of tiny pigment particles, soot in this case, that get trapped in the dermis[7], which is the layer of tissue[8] right underneath the surface of the skin. So in over five thousand years, we've done very little to update tattoo technology, apart from getting access to more colors and slightly more efficient methods of installation.

While I'm an artist, I'm also a scientist, and I direct a laboratory that researches nanotechnology, which is the science of building things with ultratiny building blocks, thousands of times smaller even than the width of a human hair. And I began to ask myself, how could nanotechnology serve tattooing? If tattoos are just a bunch of particles in the skin, could we swap those particles out for ones that do something more interesting?

Here's my big idea: I believe that tattoos can give you superpowers.

(*Laughter*)

Now, I don't mean they're going to make us fly, but I do think that we can have superpowers in the sense that tattoos can give us new abilities that we don't currently possess. By upgrading the particles, we can engineer tattooing so that it will change not only the appearance of our skin, but also the function of our skin. Let me show you. This is a diagram of a microcapsule. It's a tiny hollow particle with a protective outer shell, about the size of a tattoo pigment, and you can fill the inside with practically whatever you want. So what if we put interesting materials inside of these microcapsules and made tattoo inks with them? What sorts of things could we make a tattoo do? What problems could we solve? What human limitations could we overcome?

Well, here's one idea. One of our weaknesses as humans is that we can't see ultraviolet, or UV light. That's the high-energy part of sunlight that causes sunburn and increases our risk of skin cancer. Many animals and insects can actually see UV light, but we can't. If we could, we'd be able to see sunscreen when it is applied on our skin. Unfortunately, most of us don't wear sunscreen, and those of us who do can't really tell when it wears off, because it's invisible. It's the main reason we treat over five million cases of preventable skin cancer[9] every year in the US alone, costing our economy over five billion dollars annually. So how could we overcome this human weakness with a tattoo? Well, if the problem is that we can't see UV rays, maybe we can make a tattoo detect them for us. So I thought, why don't

[5] mindes
[6] skrifttegn
[7] underhud
[8] væv
[9] *preventable skin cancer*: hudkræft, som kunne have været undgået

we take some microcapsules, load it up with a UV-sensitive, color-changing dye[10], and make a tattoo ink out of that?

Now, one of the troubles of being a tattoo technologist is finding willing test subjects.

(*Laughter*)

And when it came time to test this tattoo ink, I thought it best not to torture my poor graduate students[11]. So I decided to tattoo a couple of spots on my own arm instead. And it actually worked. Check it up! I call these tattoos solar freckles[12] because they're powered by sunshine. And right now, they're invisible, but as soon as I expose them to UV light, acting as the sun – there they are, blue spots. Now, I'm not wearing sunscreen in this video, but if I was, those blue spots would not appear, and then when my sunscreen wore off later, the solar freckles would reappear in UV light and I would know that it was time to reapply sunscreen. So these tattoos act as a real-time, naked-eye indicator of your skin's UV exposure. And of course, I think there are lots of really cool, artistic things you could do with a color-changing tattoo like this, but I hope that it will also help us solve a big problem in skin protection.

(*Applause*)

(2018)

[10] farve
[11] *graduate students*: kandidatstuderende
[12] *solar freckles*: solfregner