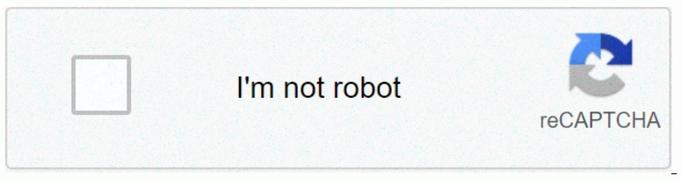

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Phage therapy in the us

Steffanie Strathdee and her husband Thomas Patterson were on holiday on a bucket list in Egypt in 2015 when she suddenly fell ill with what they thought was food poisoning. It was the beginning of a life-and-death battle with Acinetobacter baumannii, a super-insect resistant to all antibiotics. Desperate to find a cure after more than a dozen antibiotics had failed, Strathdee, an infectious disease epidemiologist at the University of California, San Diego, School of Medicine, stumbled upon sage cure: a mostly forgotten treatment discovered 100 years ago that uses viruses to kill deadly bacteria. Would he work for Thomas? The medical journey is chronicled in the couple's new book, The Perfect Predator: A Scientist's Race to Save Her Husband from a Deadly Superbug. Strathdee, 52, and Patterson, 72, shared their story in an interview with TODAY. One of the scary things is that even when you're healthy, you never know what's going to happen. On November 28, 2015, we were on the Nile on a ship. It was the last night of our holiday and we were in Luxor just across the Valley of the Kings. We had a lovely moonlight dinner and were looking forward to a wonderful day of exploration. I just woke up violently nauseous, sick, vomiting. I kept doing this all night and the next morning. A local doctor thought I could be cured just by giving me some antibiotics. But I kept getting sicker and sicker. On December 4, I was medevaced in Munich, Germany, where they discovered that I had passed a gallstones. I didn't know I had gallstones - I had no symptoms. It had gotten lodged in my bile duct and a large cyst had emerged from it, which I had for probably some time. It was as big as a football at that point. They examined this fluid and discovered that I had this very deadly infection. I was medevaced back to San Diego, California, on December 14. Scientist opens up about rescuing husband from deadly superbugMarch 1, 201906:05Strathdee: The gallstones caused this abscess to form before we went to Egypt. But the superbug was genetically sequenced and was found to be an Egyptian strain. So his body was a vessel for this superbug that found a lovely home inside this walled abscess where it could multiply under the radar. Acinetobacter baumannii is a bacterium that, until the last two decades, was thought to be quite wimpy. However, it has a very clever ability to steal antibiotic resistance genes from other bacteria - I call it bacterial kleptomane. It ends up not being killed like other bacteria is when you take antibiotics. In fact, once these other bacteria are killed, it moves into this space and takes over. We were flying. very heavy antibiotics in Tom's bacterial infection and this organism was just saying, Bring it up. We don't know how Tom took the bug, and we'll never know. We just know it was an Egyptian strain. It is not a very commonly acquired bacterium in the US. It's very common in the Middle East.It East.It sometimes get into his bloodstream, so he will develop sepsis, or septic shock. There's a 50 percent death rate for each episode, and Tom had seven cases of septic shock that we could count. He was delirious, losing weight and couldn't hold anything down so he was in a feeding tube. He lost 100 pounds during his illness. Just before we administered sage therapy, it was thought to have been within hours of death.'Nightmare bacteria' threat in the U.S., CDC says April 4, 201801:13Used doctors told us they had run out of solutions, I went online to look for alternative treatments. I found sage therapy was an option. The fagos are gods that have evolved naturally to attack bacteria. It's like nature's alternative to antibiotics. You have a tiny Godzilla, the bacteria, and we're sending a tiny King Kong to attack him. It is mainstream in parts of the former Soviet Union and in Poland, where it has been used for decades. When the fascinies were discovered 100 years ago, they were used to treat bacterial infections, but then, when penicillin came to the scene, it was considered to be a miracle drug. And of course it was, for a while. Bacteriophans were also meticulously considered because they had to be matched with bacterial infection. We've always thought of viruses as an enemy, but this time, we used viruses to be our friends. It's like the enemy of my enemy is my friend. I approached the head of infectious diseases at our university hospital. He said, if you can find fascals that match Tom's bacterial infection, I'll contact the FDA and get approval to use them for palliative use. In February 2016, I begged for help and a researcher from Texas A&M responded. We're going to have to send him Tom's bacterial culture, and he's been looking for food in his lab that would match it. He also looked at environmental samples, which essentially meant sewage, because wherever you find a lot of bacteria, you'll find the eat that hunts them. Fortunately, they managed to find four eaters who attacked his frogs. Colleagues from the Navy also found eaters that matched Tom's bacteria and agreed to help. Tom and I are both AIDS researchers and we've always thought of viruses as an enemy, but this time, we used viruses to be our friends. It's like the enemy of my enemy is my friend. Drug-resistant Superbugs are a fundamental threat to humans, he says Sept. 21, 201601:34Petterson: I was in a coma and I was hallucinating at that point that I was a snake. While you're in a coma, you can actually listen and then misinterpret what you're hearing. In that case, I was a snake. When Steff was trying to decide whether to For alternative treatments, she asked me to shake her hand if I wanted to live. I had to figure out how to shake her hand without hands since I was a snake, and I decided I had to wrap my snake's body around her arm and push. I wasn't sure if he could hear me. His eyebrows were. Was. That day so I thought maybe I could. I said, Honey, I know you're fighting really hard and you're very tired. It's okay if you want to leave it. But if you decide you want to live, please shake my hand and I won't leave any stone upside down. I waited about a minute and all of a sudden, he shook my hand very hard. It seemed that in that time, he was trying to figure out how to squeeze in. It wasn't a matter of him not listening to me. Sage therapy began on March 15, 2016. He woke up on March 20th. I remember when I got out of the coma, I saw my daughter standing over me and I lifted my head off the pillow and took her hand and kissed it. That was a magical moment. I was in the hospital for nine months, until August 2016. I had to go through a lot of rehabilitation to get my muscle strength back. I had to learn to talk, to swallow. I was in a wheelchair for a while. We had post-traumatic stress disorder. Now I'm up and about. We just returned from a holiday in Costa Rica, where we enjoyed birdwatching and some hiking. Life is good. Strathdee: One of the reasons we wrote this book is to make it easier for other people to get sage cure. Even though it's still experimental, we now have the Center for Innovative Game Applications and Therapeutics at UC San Diego. It is the first special eat therapy center in North America.The next step is to move this into clinical trials to see if the eat therapy works on a wider scale with a larger number of people. If it does, that's the kind of evidence the Food and Drug Administration needs to decide whether or not to approve and license alongside antibiotics as an alternative. Patterson: I am very privileged that so many people put so much energy and effort into saving my life. I was extremely lucky. We have a growing crisis of superbugs coming - antibiotic resistance is becoming a bigger and bigger problem. I represent the well-documented hope that this will really be part of the solution. In medicine these days, the word gene appears in all kinds of different contexts and conjugations. There's genetics, of course, and there's genomics. Then there's post-genomics - and don't forget genetic engineering, gene finding, and molecular genotype! It's easy to mix various distinct disciplines within the realm of DNA science, but if there's a subcategory that's worth straight to your head for years to come, it's gene therapy. What is gene therapy? Gene therapy is the use of genetic material as medicine. To get to exactly what this means, and why it could be so powerful, we need to start with a quick refresh of how genes actually do things. Genes sit in the protected genome of the cell, the library of profiles that lets every living thing run and rebuild properly. To put their code into practice, most genes need to be translated into a protein - the DNA code determines the order order amino acids to be added to a chain, which then folds onto a shape determined by this sequence. It is through this folded three-dimensional structure that the protein performs its function within the cell. This mouse had its genetic deafness partially reversed. So if you want to change something that happens in a cell, you can achieve this by changing the DNA it encodes for the protein shape that does something. And if there is a dosage problem, such as having only one copy of one gene instead of two, we could perhaps increase protein production by introducing a second copy of our own. In any case, we change the genes available in the normal protein production machines of the cell in order to change the way cells behave. In principle, it's easy - but is it easy to really do? Of course I don't. First, it is very difficult to actually get new or processed genes within the cells that you need to correct. The cells have evolved specifically to try to stop that from happening - and indeed, scientists had to hijack viruses, specialized, semi-living DNA syringes of evolution, for this purpose. It's still imperfect, however; each individual cell in your body has its own personal copy of your genome, complete and (mostly) identical to the others; If your problem is genetically hereditary, it means that every cell in your body also has the same defect, and there's no way we can change every cell in your body. Even if we successfully process millions of copies of your genome, we've still left billions more untreated. Thus, the first and even more important applications for gene therapy include test tubes - remove a sample of a patient's bone marrow and change a gene of interest, then inject the stable cells back into the host. This tends to work only if stable cells have better capacity or longer lives than the natural type, so they can over-compete disease cells and dominate the population. It is only now possible to edit genes within the body of a living patient. Gene therapy in vivo is currently best suited for problems affecting only one particular cell type, offering a limited number and physical distribution of targets. The genetic problem we wanted to address would still be in the other untreated cells, but if it is not used by them to function then it is not a medical problem. Examples of modern target cell types include certain types of liver cells, and cochlear cells of mammalian ear hair. In both cases, repeated treatment virus can infect a high enough percentage of a particular cell population with our therapeutic gene to have the effect we are looking for. Some gene therapy techniques simply insert the medical gene into the nucleus of the host cell where the genome lives, there to sit and make the protein alongside natural profiles. However, this only works in the long run in cells that are not divided over time, such as neurons. If cells divide, as most cells do, our gene must actually be spliced in the host cell or else be left behind every time the cell reproduces. The main technology to achieve this kind of welding is called CRISPR technology; means regularly separated short regressive repetitions, not that it matters. What is important is that by introducing our gene along with the CRISPR system of proteins and RNAs, the gene can be accessed into the genome wherever you want, and the original version spliced out. From that point on, the cells will divide and reproduce the imported gene as if it were there from the beginning. It is important to remember that by fixing a genetic problem, we have not changed anything about the heredity of the disease. Fixing someone's deafness by processing DNA into the cochlear cells of their hair, for example, will not make them less likely to pass the disease on to their offspring - although with gene therapy it is available to help address the problem, which may not be the biggest disadvantage in the world. Take one of the ExtremeTech Explanations series for more in-depth coverage. Cover.

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