Antibiotics starting to backfire? Here's one possible solution

Lawrence Brandt, a Professor of Medicine and Surgery at the Albert Einstein College of Medicine, had treated plenty of patients with diarrhea. But this one was different. She appeared totally healthy until she took a course of antibiotics for sinusitis; but then nothing could shake the resultant *C. difficile* infection that was making her so sick.

Brandt figured that the initial antibiotic treatment must have killed a species of bacteria that was living in her gut that was keeping her regular. He didn't know what strain it was, though, so to replace whatever bacteria it was that the antibiotic destroyed he transplanted stool from her husband. That very night she was fine – for the first time in six months.

This first fecal transplant, in 1999, highlighted both the importance of an intact microbiome as well as the dangers of broad-spectrum antibiotics that kill not just the bug causing the problem but all the bacterial species it encounters and antibiotic resistant bacterial strains.

Many scientists believe that the profligate overuse of broad-spectrum antibiotics is gradually obliterating the healthy microbial communities in our guts and spurring the evolution of dangerous antibiotic resistant germs. They say we need a new class of antibiotics able to combat the pathogens that harm us while leaving the innocent bystander bugs alone. A Dutch company named Micreos recently announced that it may have just the thing.

The new drug works differently than traditional antibiotics, like penicillin and amoxycillin that are prescribed for strep throat. It is actually an enzyme, called an endolysin, that has been isolated from a bacteriophage – a virus that infects bacteria. Because these viruses evolve along with the bacteria they infect, it is generally thought that it will be much more difficult for bacteria to become resistant to endolysins than to the antibiotics that we've used to date. Their therapeutic potential has been recognized for some time, but this is a great proof-of-concept that they can work well in people.

Six patients with skin infections (eczema and dermatitis) were treated with the new drug, marketed as Staphefect. It cleared up the skin of five of them. Researchers at the company documented two very important features in its use: it killed the *Staphylococcus aureus* that was causing the infection, but left the other bacteria on the skin alone; and it is just as effective at killing methicillin-resistant *S. aureus* (MRSA), one of the fatal antibiotic-resistant bacteria that has arisen recently, as at killing the methycillin- sensitive strain.

Dealing with newly emerging antibiotic resistant strains is essential to continued public health . Most people don't realize how many aspects of modern medicine have become reliant on effective antibiotics, and how drastically their loss would impact the quality of life we take for granted.

Maryn McKenna, author of Superbug: The Fatal Menace of MRSA and a blog of the same name, noted all the things we'd lose along with the ability to treat infections should antibiotics become less effective due to drug resistance:

> The ability to treat cancer, and to transplant organs, because doing those successfully relies on suppressing the immune system and willingly making ourselves vulnerable to infection. Any treatment that relies on a permanent port into the bloodstream — for instance, kidney dialysis. Any major open-cavity surgery, on the heart, the lungs, the abdomen. Any surgery on a part of the body that already harbors a population of bacteria: the guts, the bladder, the genitals. Implantable devices: new hips, new knees, new heart valves. Cosmetic plastic surgery. Liposuction. Tattoos.
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> We'd lose the ability to treat people after traumatic accidents, as major as crashing your car and as minor as your kid falling out of a tree. We'd lose the safety of modern childbirth: Before the antibiotic era, 5 women died out of every 1,000 who gave birth. One out of every nine skin infections killed. Three out of every 10 people who got pneumonia died from it.
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> And we'd lose, as well, a good portion of our cheap modern food supply. Most of the meat we eat in the industrialized world is raised with the routine use of antibiotics, to fatten livestock and protect them from the conditions in which the animals are raised.

If it sounds dire – well, it may be, at least according to some experts. Staving off this post-antibiotic age certainly seems like a worthwhile goal, so the development of endolysins as alternative drugs seems like a step in the right direction.

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Additional Resources:

- Targeted antibiotic treatments–What's on the horizon?, Genetic Literacy Project
- Preventing antibiotic resistance: Bacterial-toxin catcher snatches lethal infections, Genetic Literacy Project
- Human obesity and livestock growth: Are antibiotics the link?, Genetic Literacy Project