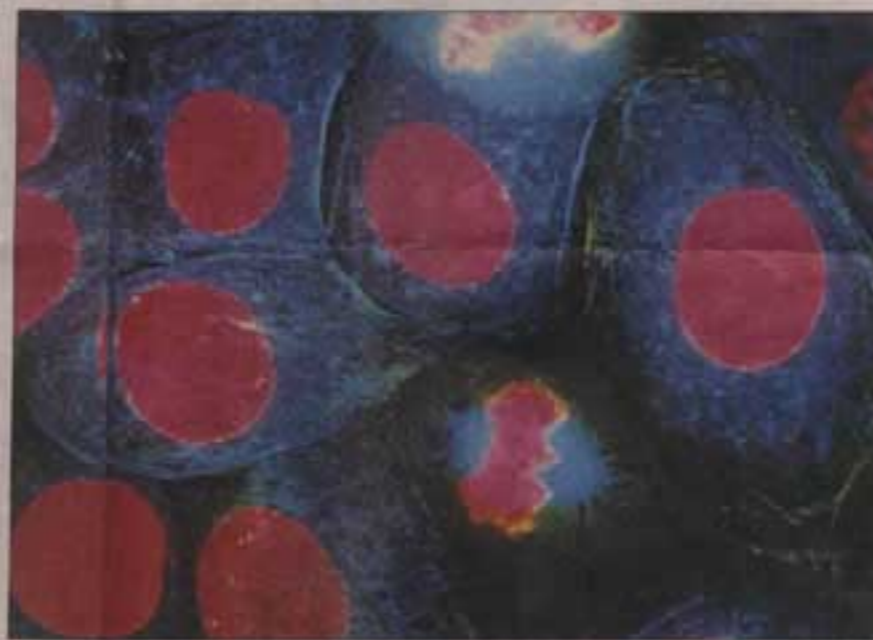


Cocktail that cures

Medical science has begun to acknowledge the emergence of drug resistant bacteria, a fact made more ominous when one realises that no fundamentally new antibiotic has been discovered for more than 30 years. Are we losing the battle?



HOW far away are we from a return to time when people die from a sore throat? At a press conference on May 23, 1997, scientists finally acknowledged the arrival of untreatable bacteria they had feared for years – bacteria that resist antibiotics. Drugs which have kept us safe for 50 years were beginning to fail, they said.

Today, superbugs look triumphant and this is a serious situation. Over the last five years, scientists have clearly seen a change in their ability to tackle what should have been easily treatable infections, because bacteria are developing the ability to resist antibiotics. And the more antibiotics we use, the more resistant bacteria become.

Every year, more than five million people die from infections that do not respond to antibiotics. Things are going to get worse. Staphylococcus, one of the most dangerous bacteria, now has only one antibiotic to keep it in check – Vancomycin.

This year, Japanese doctors saw the world's first case of infection with Vancomycin-resistant staphylococcus – a baby boy in hospital for major heart surgery. When antibiotics failed, doctors had to pour strong disinfectants directly into the wound on his chest. It was quite shocking because the outcome of that infection was quite hideous. The patient suffered a lot.

Terrible bacteria will inevitably spread, and when they do, being in hospital even for minor surgery, or a hip operation or to have a baby, could be lethal. If even the smallest wound becomes infected, bacteria would most probably kill you. It would be very hard to conduct major surgery that we have got used to. Transplants, cancer chemotherapy, are all dependent on the ability to kill off bacteria which may infect patients. We will lose all that.

It is hard to understand why no new drugs have been developed to save mankind. Pharmaceutical companies should have come to grips with the situation. But they thought that that was not profitable a decade ago. Now, it is too late.

Even today, drug companies do not promise a new class of antibiotics for at least 10 years and they may never discover one. They have already exhausted traditional chemistry and computer drug design. Today, they analyse the genes of the bacteria, hoping to find new strategies. But the frightening truth is that no fundamen-

tally new antibiotic has been discovered for more than 30 years.

One begins to worry that we are indeed moving into what some people have called the post-antibiotic era, where bacteria are supreme.

But there is a major remedy that kills even the most resistant bacteria.

Unknown to the rest of the world, in a small country in the heart of the Caucasus Mountains, south of Moscow and north of Turkey, scientists in the Republic of Georgia may have the answer against superbugs.

In the central hospital in the Republic of Georgia, a former Soviet State, patients recover like elsewhere. They are weak and vulnerable and would probably die if they caught an infection.

The doctors here know that there is a problem. It has become the breeding ground for particularly nasty bacteria, which they suspect are resistant to all the antibiotics they have. They are taking samples from every surface in the ward to know exactly what they are up against. Some of the samples have traces of staphylococcus strains.

Anywhere else in the world, this



would be a death sentence. But here in Georgia, the doctors are not too worried because they have an answer – a unique medicine that still works on antibiotic-resistant infections. The same amazing potion is used to treat both patients and wards. It has a remarkable effect on bacteria.

Two flasks contain bacteria. A few drops of the Georgian medicine have been added to one and it has a magical effect. The bacteria have all been killed. This astonishing effect is caused by something we usually fear – a virus, and one that comes from sewage. Says Dr. Teimuraz Chanishvili, Institute of Bacteriophage, Tbilisi, "This happened 51 years ago. It was the first experiment I did here. I took the culture of bacteria and added sewage to it, just ordinary sewage water from the drains. I first saw this a long time ago, when I was still a student. We were all very enthusiastic about it."

The first to spot what happened was an irascible French-Canadian called

Felix d'Herelle. In 1917, he suggested that the viruses which killed bacteria in the bottles could be used to treat disease. An ardent Communist, d'Herelle was enticed to Russia by Stalin, who wanted this magic medicine for his army. And in the Finnish war of the 1930's, and even in World War II, it was used to protect the Red Army from the dysentery and gangrene that plagued the battlefield.

With Stalin's blessing, d'Herelle founded an institute in Tbilisi, the capital of Georgia, that was dedicated to the study of these magical viruses and the way they cure infections. D'Herelle named these healing viruses as bacteriophage, which means "bacteria eaters". There is a phage to kill every kind of bacteria. Just as bacteria attack people, these tiny viruses attack them, and they are found wherever bacteria thrive, most often in sewage.

Phage have an extraordinary structure. Their bulk is a head in which their genes are stored. They have six legs or filaments, which attach themselves to the bacteria and a tail that works like a hypodermic syringe to infect it with their genes. Inside the bacteria, the phage viruses grow and multiply. Sometimes as many as 5,000 grow in a single cell.

When the new phage burst out, they kill the bacteria and then each goes on to find another victim. Each phage only grows on a particular kind of bacteria. That is why when we talk of Staphylococcus phage, it is known that it reproduces only on Staphylococcus.

But being specific makes phage tricky to work with. Over the years, the institute has trained specialists to find phage, grow them and turn them into medicine. In the 1970s when antibiotic-resistant bacteria became a serious problem in Soviet hospitals, phage became the saviours.

A decree was issued that all bacteria resistant to antibiotics and local phages must be sent to the institute, where a new preparation was made. It was very difficult to organise, but everything was done under one roof. The centralised Soviet system was ideal for the labour-intensive work

needed to make phage effective. Together, Communism, phage and the institute thrived.

Phage medicine had its heyday in the 1980s. It was manufactured in factories across the Soviet Union and the Tbilisi Institute. At that time, Teimuraz Chanishvili and Miran Meipariariani ran the institute.

Remembering those days they say, "We used to inject phage into one, two, three, four vats. There were 500 litres in each vat, and remember we had to take orders on top of that. We produced tablets and bottles. We made phages for the Soviet Union. They were not only for dysentery but typhoid and salmonella too. Most were for intestinal infections. Phages are our daily bread. We have devoted

our lives to them. The prospects for phage are tremendous. There is no question that phage medicine can be extremely effective."

An old woman recalls how phage helped cure her son, "My son became ill when he was young. They checked his throat and nose and found Staphylococcus. I went to the institute and they gave him phage and cured him. Phage medicine is a wonderful thing. It works against dysentery. They even give you phage in an enema."

Today, when people in Georgia get an infection, they take antibiotics at times. Often the doctors prescribe phage. There is a pharmacy on the grounds of the Tbilisi Institute. Everyday, people who choose to use phage, rather than antibiotics, go

there to have their infections diagnosed and to pick up prescriptions for medicines, tablets and creams made of phage.

They rub the healing viruses into their wounds, drink them for a bad stomach, or swirl a solution in their mouths to cure a gum infection. A woman developed gangrene in a wound on her thumb. The doctors cut away most of the infected tissue, the rest they treated with phage. If the resistant bacteria rife in the hospital got into this woman's wound, it would have caused fatal blood poisoning. Phage does not work well in the bloodstream.

Being a virus, it is fought off by the immune system. But the surgeons make sure infection does not take hold in the first place, by using phage to sterilise the room and equipment as well as the wound. The doctor in attendance says, "We think that the phage that was used during the first operation helped the wound to be in such good condition." Phage works wonders in Georgia and given the chance, it could do the same everywhere."

A unique library of phage medicine exists in Tbilisi. It is a national treasure, built up over 50 years when problem bacteria was sent here from all across the Soviet Union. Phages were found to fight every new infection and then they and the bacteria they killed were stored separately, for future research. It is the biggest collection of phage medicine in the world.

Phage therapy has been so successful in the Soviet Union for so long, that it is hard to understand why people in the West have never even heard of it. To scientists like Dr. Chanishvili, it seems incredible that this medicine, once used daily right across the Soviet Union, has been ignored by the West. But the reasons are woven tightly into history.

In Britain today, very few people know anything about phage therapy, but those that do are clear about how it became discredited in the West in the 1930s.

Some of the claims made for some of these bacterial phages which are

isolated were, quite frankly, barmy. There was one commercial preparation, for example, called Enterofagos, which supposedly had miraculous powers against both herpes infections and eczema.

These claims were not fraudulent. In fact, a lack of understanding plagued most phage work done around the world in the early days. In India in 1935, even the British army tried it out on the local population during a cholera epidemic.

It has to be said that some of the clinical trials that were carried out were of exceedingly poor quality. For example, in some of the early work on cholera phage in the 1920s and the 1930s, there were no control groups. So it was impossible to see whether the phage had worked.

And some of the trials consisted merely in pouring bacteriophage down drinking wells in a village and see whether it had any effect with no understanding of dosage or the mechanisms whereby bacteria produced the diseases.

Some of the problems with early studies though is the best phages for the job were not selected. They did not check whether the organism was sensitive to the phage. By 1941, phage was still thought to be too unreliable to be useful by researchers in the West. When powerful antibiotics arrived a few years later, it was quickly forgotten. Meanwhile, unknown to the outside world, the Georgian scientists went on working.

Research that proves the worth of phage medicine was published by the Georgian scientists, but only in the Soviet Union.

And even today, it is ignored because of a strange phenomenon that is true across the world of science. The articles were published either in Russian or in Georgian. Thus, language has proved to be the final barrier. So, perhaps the real problem was not because the science was bad, but because the findings could not be read. And so the West could not get acquainted with it. ●

Modern medicine faces a crisis as new strains of antibiotic-resistant bacteria threaten advanced treatments and intensive care. But there is an unlikely saviour – a virus derived from sewage that can kill bacteria. To learn more about this unlikely saviour watch "Vital Breakthroughs", Sunday from 7 to 8 p.m., on the Discovery Health Block, only on Discovery Channel.

Information and picture courtesy Discovery Channel