

Wiles, "but schools can choose to leave it out, or parents can opt to remove their children from class".

Most pressingly, we need new antibiotics. Following the antimicrobial gold rush of the 1940s-50s, the hunt for new antibiotics has become a "game of diminishing returns". Between the 1960s and 80s, just three new antibiotic classes were discovered from microbial sources. New chemically synthesised derivatives of existing antibiotics, the so-called "me-too" antibiotics, and recent advances in microbiology and bacterial genomes have yet to yield major advances.

Universities and institutions throughout the country are researching bacteriophages (viruses that infect specific strains of bacteria), better vaccines and treatments for TB, new antimicrobial surfaces and new antibiotics – Wiles' team is trying to develop new antibiotics from a collection of fungi held at Landcare Research.

"People have been predicting antibiotic resistance for a decade, but developments over the past five years show the time is now."

"But no one antibiotic is going to solve this. We need another whole cupboard full as well as more vaccines and potentially different ways of treating infection."

But competition for research funding is fierce; applications are costly and time-consuming. Of the \$365 million allocated for applied medical research to improve human health from the Health Research Council between 2012 and 2016, less than 10% went to infectious diseases research. And although death rates from infectious disease are not much lower than those from cancer, the subject does not attract the same strong charity or philanthropic backing that other illnesses get.

Wiles admits to a vested interest – as a scientist, she makes a living from research. "But I have a family and friends – I really don't want people dying of this stuff. And we clearly need more money for research, because this is something the private sector is not picking up."

NEW IDEAS NEEDED

In 2006, the University of Otago's Professor

Staying safe

The infectious microbes plaguing society – *Campylobacter* and other food- and water-borne micro-organisms, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Chlamydia trachomatis* and *Mycobacterium tuberculosis* – are very different from each other and spread in very different ways. But by taking precautions, we can reduce our susceptibility.

- wash and dry hands properly
- avoid unwashed fruit and vegetables
- keep raw meat away from fresh vegetables
- cook meat properly
- avoid swimming in risky rivers and lakes
- get vaccinated
- use condoms and dental dams if sexually active
- get tested for asymptotically sexually transmitted infections



Kurt Krause led a bid to create a Centre for Molecular Biodefence Against Infectious Pathogens, bringing together practitioners, researchers and public-health officials to mount "a comprehensive response to the needs of infectious disease".

"We need new antibiotics, new vaccines and good surveillance to put New Zealand on the front foot. People have been predicting antibiotic resistance for a decade, but developments over the past five years show the time is now. We have to learn about the antibiotics, we have to husband those very carefully and we have to make some



Professor Kurt Krause: "We need to put New Zealand on the front foot."

smart decisions about using antibiotics on livestock," says Krause.

Although the bid failed, there is still a need, Krause says, for a clearer understanding of biology and disease mechanisms in order to develop new treatments. "We can't do the same old approaches over and over again – we need new ideas."

Malign bacteria and their ability to develop resistance to whatever we throw at them are here to stay. Recent exploration of caves in New Mexico, isolated from the rest of world for thousands of years, has found organisms that produce antibiotics and organisms that resist those antibiotics.

"So it is clear organisms use these amazing medicines themselves," says Wiles. "And where they are used, through the natural process of mutation, mutants arise and when it is a chance for them to have an advantage, then those organisms flourish. But we have massively accelerated this by our use of them."

She likens antibiotic resistance to climate change, a "slow-burning crisis that took a long time before it became less of a fringe issue and something the vast majority of people take an interest in".

Our understanding of antibiotic resistance now, she says, "is where climate change was 15-20 years ago. People might have heard the phrase but don't really know what it is. I'm assuming in the next five to 10 years it will become much more prevalent, partly because many more people will be dying or more people's operations will become more risky." ■

ANTIBIOTIC RESISTANCE: THE END OF MODERN MEDICINE?, by Siouxsie Wiles (Bridget Williams Books, \$14.99), on sale from April 10.