MICROSCOPIC MENACE

From fighting microbial infections to preparing for pandemics, Brett Finlay is discovering how the body's own defenses could boost our chances in the battle against infectious diseases

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Black Death. Spanish Flu. Asian Influenza. History is littered with prominent examples of devastating pandemics. Beyond their shared ability to decimate populations on a grand scale, these infectious outbreaks have also demonstrated the capacity to resurface at a curiously consistent frequency. For scientists today, the question is not a matter of if a pandemic will strike, but when.

Most experts predict the Avian Flu – which has already killed over 140 people worldwide without mutating to a human-to-human strain – will be the next disastrous pandemic. Whatever the strain, UBC Vancouver professor of microbiology and immunology Dr. Brett Finlay isn't waiting around to find out.

Part of Finlay's strategy to prepare for the next pandemic is to work on boosting the body's innate ability to fight off disease so that we are more resilient when we encounter disease in the first place.

"We learned with SARS, if you're going to fight something, you have to have the engine running before it hits," Finlay explains. "That was a very valuable lesson because we realized we needed to have the capacity already built in order to address the next threat, whatever it may be."

Instead of focusing solely on how foreign agents infect host cells, Finlay and his colleague UBC Vancouver microbiology professor Dr. Bob Hancock quickly realized a third component of the infection process was being ignored: the body's own defense mechanisms. Although the human body regularly comes into contact with infectious agents, infection is relatively rare because the human body possesses innate defenses in the form of healthy bacteria to deal rapidly with nearly all microbial infections. In order for an infection to occur, successful pathogen bacteria must infiltrate these barriers. By understanding the mechanisms with which the body

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protects itself, Finlay hopes to translate those findings into new means to battle viral and bacterial infections.

Boosting the body's natural immunity can help more than in pandemic situations. The human tragedy inflicted by infectious diseases is felt around the world, especially in developing nations. One third of the 50 million people who die worldwide each year are due to infectious diseases. Until recently, many of these diseases were treated successfully with antibiotics. But antibiotic resistance has dramatically reduced our ability to treat disease effectively – and is growing at an alarming rate. Many infectious agents that were once eliminated by antibiotics are now 20 to 40 per cent resistant to them, a shift that Finlay finds increasingly troubling.

"We have about a 10-year window before it becomes a horrible problem," Finlay says. "Every year, resistance increases. Every year, there are less and less antibiotics. Pharmaceutical companies have completely pulled out of antibiotic production so we have to find alternative ways to treat and control infectious diseases."

This desperate need for alternative ways to tackle infectious diseases has led Finlay to dedicate his career to understanding how microbial infections work. And his research has been more than promising. Last year, he and his team of scientists received an unprecedented $8.7-million USD grant over five years as part of a $450-million pledge towards world health issues made by the Bill and Melinda Gates Foundation and the Foundation for the National Institutes of Health in the US, a competitive process that drew more than 1,500 applications worldwide. Using salmonella and a type of E.coli as models for the way bacteria behave, Finlay and his research team have set their sights on changing the way infectious diseases are treated worldwide.

"When we started doing this, I had no idea it would actually end up getting anything. But I think the reputation of the scientists, the idea and the preliminary data we had all added to make a very compelling proposal," he says.

For those living in developing countries, a breakthrough in the treatment of infectious disease would bring immeasurable relief. Most lethal cases of typhoid fever, gastroenteritis, meningitis, urinary tract infection and kidney disease in these areas are a direct result of salmonella and E.coli infections. At the end of five years, Finlay hopes to produce a product that has made it through clinical trials and can be taken to the developing world for immediate treatment and prevention of these afflictions.

"As a scientist, the capacity to actually impact immediately is extremely exciting," Finlay acknowledges. "The idea that I actually helped people is really rewarding in science. I think that's ultimately what drives us."

In addition to his work with the Bill and Melinda Gates Foundation, Finlay is continuing to pursue research on developing salmonella and E.coli vaccines for chickens and cows. His work with Genome BC also strives to identify the key hubs in pathogen bacteria to initiate the successful collapse of these organisms. Although his research spans multiple projects, Finlay ultimately sees an overlap that will help work towards a greater goal: "My research is twofold," he explains, "it's working on controlling infectious diseases in our society but I also see it as an exercise that, as an offshoot, we can apply immediately to whatever the next threat is going to be through rapid response."

Finlay's contributions to the field of science have not gone unrecognized in the country where his scientific ambitions began. In 2006, he was one of two UBC professors who received Canada's highest honour – the Order of Canada. Appointed as an Officer, Finlay was recognized for "a lifetime of achievement and merit of a high degree, especially in service to Canada or to humanity at large." This recognition is particularly special for Finlay who became the second person in his family, after his mother, to receive the title.

Finlay has come a long way since spending his childhood looking down microscopes and cleaning dinosaur bones at the University of Alberta with his parents. Aside from potentially helping millions of people around the world, Finlay sees educating the public about the power of scientific inquiry as another important mission he is more than willing to champion.

"The idea of hiding in your ivory tower where you don't have the time to talk to anyone, I disagree with that completely," he says. "Science impacts on every aspect of our everyday lives. The more people who appreciate science and know a bit about the process, the better the world will be."

Dr. Brett Finlay receives funding for his projects from the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), Howard Hughes Medical Institute, the Michael Smith Health Research Foundation, the Canadian Association of Gastroenterology and Genome Canada in addition to his $8.7-million USD grant from the Bill and Melinda Gates Foundation and the Foundation for the National Institutes of Health.