How Are These Vaccines Like Ramen Noodles?

An interview with **Keith Pardee**, Pharmaceutical Scientist
University of Toronto

The big idea in our lab is that we can run gene circuits outside of cells. And we do that by basically making a soup out of bacteria. So there's no cells, it's just all the machinery that makes a cell work, and we use that machinery to run gene circuits in a test tube.

What's the future promise of your research?

For protein-based drugs like vaccines, the challenge often is that you have to keep the vaccine refrigerated from the time it's made, all the way overseas, on a truck all the way to a village where it's going to be used. There's parts of the world where that's just not possible.

With our system, we've freeze-dried the ability to make that vaccine, and you ship it just like you can do with ramen noodles or soup. And you just add water at the end, and you put the DNA that codes for the vaccine protein in and warm it up to your body temperature. And in a few hours you'll have the vaccine.

As the world's population is growing, we have billions of people who need healthcare, but many of them live on under three dollars a day. So what we use this for is to extend the reach of healthcare to populations that don't have access currently.

In the case of an outbreak, or for global health anywhere in the world, you could respond with hundreds of thousands of doses in a short period of time. But also, the potential to have things that are normally only available in hospitals or the doctor's office, happen at home, essentially so you could do it in your pocket. That's the idea.

What is an impact your lab has made already?

We're providing diagnostics. We basically use the genome of the pathogen as a barcode. That lets us detect anything. Things that we've been working on are the Zika virus. Two years ago we published a rapid diagnostic that detected the Zika virus, which was really important because the diagnostics available in Latin America at the time were quite limited and restricted to just the larger urban centres where there's clinical labs.

Coming in in the morning and starting to work on things that have never been done before, and that can make an impact on human health and environmental integrity is really exciting.My big idea is to figure out what we've missed in biochemistry. This space is so exciting because we are at a moment of new technology coming to bear on an old problem. Now, with the advent of high-resolution mass spectrometry, we can bring a whole new method to bear on these questions and measure things that were absolutely impossible to measure before.