ANDREA PRUIJSSERS:

‘This really won’t be the last epidemic’

A phone call early in 2020 marked the start of a taxing year for Andrea Pruijssers in Nashville, Tennessee. She and her colleagues had to pull out all the stops to get blood analyses done for the first test phase of the Moderna vaccine. ‘We saw in May that the vaccine did activate antibodies that potently neutralized the coronavirus. Fantastic!’

TEXT RIK NIJLAND **PHOTOGRAPHY** MAX GUNTHER

It was the beginning of January 2020, and Andrea Pruijssers was out shopping with some girlfriends when her phone rang; it was her boss Mark Denison on the line with an alarming story: people were dying in China of what might be a novel coronavirus. He was about to join a conference call and asked her to come into the lab as soon as possible to make plans.

‘That was the first time I heard about SARS-CoV-2,’ says Andrea Pruijssers, research assistant professor at Vanderbilt University Medical Center in Nashville, Tennessee. ‘The research group I work for has been doing research on diseases such as SARS and MERS for a long time; coronaviruses are our specialism. When it became clear that this was serious again, we knew it was time to roll up our sleeves.’

That phone call heralded the start of a taxing 2020. During the first test phase of the Moderna vaccine developed in the US, Andrea and her colleague were responsible for the blood analyses. ‘From February through June, I worked seven days a week. There was a lot of pressure on us, the whole world was watching, and of course, with the pandemic going on there was no time to lose. At the same time, we had to work carefully: whether this vaccine could continue to the next phase depended partly on us; it was our job to establish whether the first 45 test subjects developed a strong neutralizing antibody response.’

> ‘There was a lot of pressure on us, the whole world was watching’

UNEXPECTED LEADING ROLE

Although it was hectic, she wouldn’t have missed that period for all the world. ‘It was a dream come true to work on something so important; that’s what all your training was for. Until then, my work on viruses was something that might possibly bear fruit one day; now the impact was enormous,’ she explains in mid-January, just as the first Moderna vaccines arrive in the Netherlands. From the lab – Tennessee is in lockdown too, but she gets to carry on her work – she describes the roundabout route that led her to this unexpected leading role.

At secondary school in Waalwijk in the Netherlands, Andrea only excelled in biology; even then, she was intrigued >

by viruses. ‘I read an article about Ebola; people in Africa were dying of something you couldn’t see; and it was also the period of avian flu outbreaks. I thought it would be incredibly interesting and important to do research on that.’
She had heard good things about Wageningen from a former schoolmate, so she came to an open day. ‘I was positive about VU Amsterdam University too, but I thought studying in Wageningen would be more fun. And I have fond memories of it: drinking beer at pavement cafes, dancing at Unitas, and of course, my degree programme too – I enjoyed that a lot as well. Zoology, plants: it was all equally interesting to me. For that reason, I found it hard to decide which direction to take, but in the end I chose Molecular Biology and eventually Virology.’

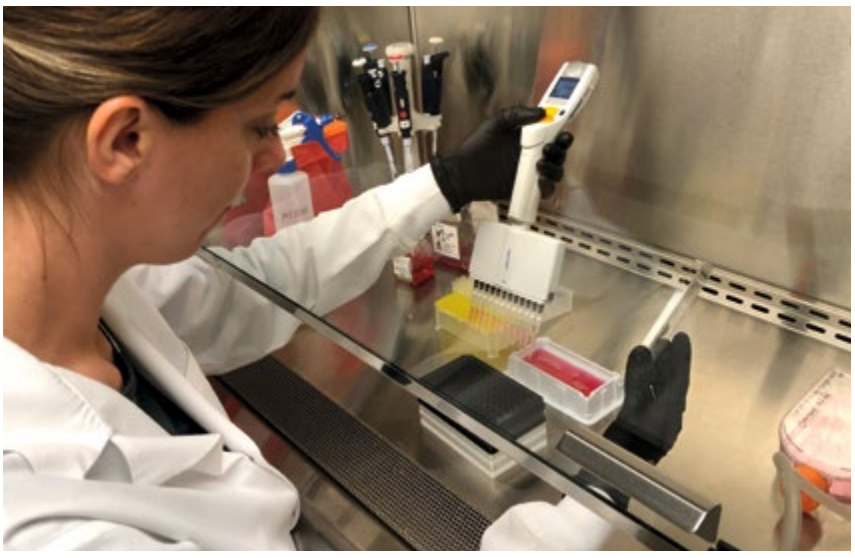
RESEARCH ON PARASITES

To get an internship she had to improvise. Her planned trip to South Africa to do research on the AIDS virus was cancelled at the last minute. Through contacts of someone in her student house – ‘Het Geflipte Heelal’ on Stationsstraat – She could get a place at the University of Georgia at short notice. ‘Not for research on viruses but on parasites. Oh well, I thought, they cause infectious diseases too.’
‘Normally, you go back to the Netherlands after an internship to look for a job, but I was really enjoying life in Athens, and I felt at home socially too. I soon had a big group of friends and I loved the area. Because I had learned a lot about insect viruses from my thesis supervisor at Virology, Gorben Pijlman, I got to stay at Georgia for a PhD with Michael Strand, a big shot in Entomology.’ In Strand’s lab, she studied the pathogenesis of a polydnavirus, a virus that causes a kind of AIDS in insects. She also characterized a group of genes that code for the enzymes that make the insects sick.

> ‘After MERS, our lab started developing antiviral drugs against coronaviruses’

BRAIN VIRUSES

Because her American boyfriend Max – a musician and PhD student of psychology and now her husband – was going to Nashville for an internship for a year, she decided to look for a job there after her PhD graduation in 2008. She became a postdoc at Vanderbilt University Medical Center (VUMC) tasked with studying how viruses infect the brain, in encephalitis, for example.



Andrea Pruijssers investigates the Moderna vaccine at Vanderbilt University Medical Center in Nashville, Tennessee.

'Because my team leader moved the research to Pittsburgh, and I wanted to stay in Nashville, I was then project manager for a year in an international consortium that seeks to accelerate the development of new vaccines, diagnostics, and treatments. That was interesting, but I was sitting at the computer all day telling people what they should do and how much money they could spend. In terms of the research itself, I was standing on the sideline, and I missed the lab work.' Until in 2017, Mark Denison of VUMC, an authority on coronaviruses for more than 30 years, asked her to take over the day-to-day management of his laboratory. This was a chance to combine laboratory work with project management.

REMDESIVIR

Drugs for controlling coronaviruses are a big priority. 'In the outbreak of MERS that started in 2012, the number of casualties remained limited,' says Andrea. 'It is true that one third of the hospitalized patients died, but the coronavirus that caused that disease was not easily transmitted from human to human. But Denison did wonder whether we would be so lucky next time. So our lab started then to develop antiviral drugs against coronaviruses. The first result was Remdesivir, which is now the only antiviral drug approved for use in Covid patients.'
A phase 2/3 trial is ongoing on a successor: Molnupiravir. This drug offers an important advantage, says Andrea. It can be taken orally while Remdesivir can only be administered through a drip, which means staying in hospital. 'You can take a pill when you've only just fallen ill, which is probably much more effective.'

Is there still any point in antiviral drugs now mass vaccination campaigns have started?

'It's going to take a long time still before there are no more Covid patients in hospital, so you do need drugs as well. Besides, research on antiviral drugs is an investment in the future. This really won't be the last epidemic of a novel coronavirus.'

How did you and your colleagues get involved in the research on the Moderna vaccine?

'Moderna is the manufacturer, and puts it on the market, but the vaccine was developed by the Vaccine Research Center (VRC), a government institution that we have worked with regularly. The VRC asked us to assist in the phase 1 trial: to find out if the vaccine was safe, what the right dose was, and whether the body developed a neutralizing immune response. Blood was taken regularly from the 45 test subjects, and one of my colleagues and I did the analyses.
'In May, we saw that the vaccine really did induce antibodies that neutralize the virus. Fantastic! We felt like shouting it from the rooftops, but everything was top secret. We had to stay out of the limelight and out of political debates, and avoid having the media descend on us.'

Last year you tweeted Dolly Parton, who is from the city where you live: 'I hope to give you a hug as soon as that is safe again!' Is country music the reason you live in Nashville?

'Oh no. Max is a musician, but country is not our taste in music. Dolly Parton donates a lot of money to charity, and at the start of the pandemic, a doctor from the hospital where I work put in a good word for our research. Dolly then donated one million US dollars to our institution. A lot of research is done with government financing, and then you are told exactly what you can spend the money on. In the case of this donation, we got to decide for ourselves how to spend it, so we could invest in for example the development of tests to demonstrate the presence of the new virus and trace antibodies. We needed those later for our own vaccine research too.'

Have you benefited personally from your research; have you already been vaccinated?

'When the call came for volunteers to take part in the phase 3 trial of the Moderna vaccine, I didn't hesitate for a moment. Because I was working in a hospital, I fulfilled the condition that you had to run a high risk of contracting the virus.
In the end 34,000 people took part. No, I didn't find it scary to be a guinea pig. I think the 45 people who participated in the phase 1 trial were the real heroes, because they didn't know whether there would be side effects. Of course, I didn't know whether I had received the vaccine or the placebo. When the vaccine proved to be 95 per cent effective, Moderna was obliged to tell the test subjects which group they were in, and give the placebo group the option of receiving the vaccine. I heard yesterday that I had in fact had the vaccine. Of course, it would have been dead easy to find that out in our lab by taking some blood, but I was reluctant to do that. It might sound odd for someone who does research on vaccines, but I'm not very keen on needles.' ■

ANDREA PRUIJSSERS

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