



Photo: Wilho Worms

## Dr Roy Montijn: 'Always amaze yourself'

Two very special orchids adorn the window sill, one from the Philippines and one from the north of Australia; they just aren't flowering. Keeping orchids is an old hobby of molecular biologist Dr Roy Montijn. The team leader of the Microbial Genomics group of TNO in Zeist pours out two cups of green tea. A couple of months ago he and his colleagues found out that drinking green tea is good for intestinal flora.

### **So, drinking plenty of green tea is good for your health?**

'We discovered that by accident. We have developed a system of mini-intestines in which you can let intestinal flora grow steadily for a week and expose them, for example, to all kinds of substances. You extract this intestinal flora from human and animal faeces. There are probably more than a thousand different microbes present in humans. Prebiotics – the non-digestible ingredients in food, like certain sugars and fibres – can promote the growth and

activity of good intestinal microbes in the large intestine. Don't confuse prebiotics with probiotics, the yoghurt drinks with *good* lactic acid microbes. We examined the influence of known prebiotics on the composition of intestinal flora and, just for fun, included green tea – when we took a measurement we were surprised to find that the tea had a positive impact on the flora. Clearly it contains good ingredients.'

### **You know quite a bit about microbes.**

'Well, not directly. I'm not a microbiologist. My PhD study was on fungus, an area in which I worked for a year at TNO but it was only when the Microbiology department came calling in 1999 that I started to focus on microbes. I was responsible for sales, science and strategy and had to think about how we could breathe new life into microbiology. The flow of assignments was beginning to slow because our rivals were able to do the same as us for less money. We

had to modernise. We succeeded, too. Our innovations have put us on a sound financial footing. Look, unfettered by any deep knowledge of microbiology meant that I could then suggest all kinds of weird things...'

### **Like?**

'I teased our microbiologists a bit when I said: you're just doing the same as Louis Pasteur did a hundred and fifty years ago. Spreading a bit of food on a medium in a Petri dish, keeping it warm for a couple of days and seeing whether colonies of microbes start to grow on the medium. That's a time-consuming and expensive method. And then you just pick out the microorganisms for culturing: what about the organisms that you can't culture? And what kind of information does this test give you? Is the organism dead, half-dead or dead as a doornail? In any case, I and my colleague, Dr Frank Schuren, found this Pasteur method to be insufficiently informative. Frank is – like myself –

## PERSONAL DETAILS

### EMPLOYED AS:

Team leader of the Microbial Genomics group at TNO Quality of Life in Zeist

### BORN ON:

15 December 1958 in Amsterdam

### STUDIES:

1981-1986: teacher training in physics and biology, d' Witte Lelie, Amsterdam

1986-1990: biology, University of Amsterdam, specialising in molecular biology

### PhD:

1996: molecular biology, University of Amsterdam: 'Biogenesis of cell wall proteins in fungi'

### FORMER WORK:

1996-1997: postdoctoral molecular biology research at the University of Amsterdam

### JOINED TNO:

June 1997

### MARITAL STATUS:

in 2002 married Hansje Ran (44), documentary maker (TV, cinema)

### SON:

Marley (2)

### HOBBIES:

boxing, growing orchids, playing and composing guitar music, Brazil

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*'An organism is alive if it emits light; if there is no light, it is dead. This is a nice tool to be able to measure the effect of a treatment within twenty minutes.'*



genes is *switched on* – then you know that the microbe is not feeling well or is dying. We call this method *transcriptomics*. We have also developed a quick and cheap method of analysing the entire genome of a microbe: *genomotyping*. All these methods together form our generic *microbial genomics toolbox*.'

### **Generic means that the toolbox can be used for all kinds of problems?**

'That was our intention. We can use the toolbox to help make food even healthier and safer, develop new antibiotics and combat infectious diseases. (see page 14) The toolbox is a sort of revolution in the microbial world, the result of my own experience that tells me to not always trust dominant opinion and allow it to divert you from your own dissenting thoughts. My motto is straightforward: follow your heart, believe in yourself and in your own results. And always amaze yourself. That was our take on microbe spores, a kind of sleep mode in which a microbe can survive a long period of dryness or heating at 120 °C. Everyone told us that you couldn't measure anything in a spore but it appears that everything can be measured! If you heat a spore, molecules also change. And you can predict whether a spore has really been killed off or is still a live. OK, we are really good at measuring things but we do need others that have very specific knowledge of certain micro-organisms, which is why we work with scientists outside of TNO.'

### **So what about a couple of future developments in your particular field.**

'One challenge is to rapidly measure and immediately be able to say something about the viability and potential of a micro-organism to develop. This is important for organisms that you can't culture. Think about monitoring the quality of the air in hospitals. In such situations these *real-time viability assays* are vital. Via fluorescence, classical microbiology has already given us a method to measure that viability of microbes. An organism is alive if it emits light; if there is no light, it is dead. This is a nice tool to be able to measure the effect of a treatment within twenty minutes. Dr Remco Kort of our team is currently occupied with this. We also want to breach out into viruses and help in the development of new antibiotics.'

### **What is your main concern?**

'Deforestation in South America and Southeast Asia – if it continues, the problems for the world and its economy will simply mount up. But if people need to eat, you can't stop them from farming a bit of their land. I visit Brazil a lot with

my wife, so this third world problem affects me deeply. I fear that we are not dealing with third world problems. Good education is often the basis for a better existence. Furthermore, I would like to see a kind of micro-science innovation system for third world countries, comparable with the micro-credit system. While there is a lot of good work being done for poorer countries within TNO, I think we have to use much more knowledge for robust mini-solutions for all kinds of problems.'

### **If you weren't doing what you are doing now, what would you have done?**

'I would have studied orchids. As a child I always went looking for rare and special plants with my brother. I later specialised in orchids and began to grow them myself, at one point having quite a big collection. But I had to dispose of them when we moved. Growing and looking after them is very time-consuming but my love of orchids has remained with me to this day.'

a molecular biologist and expert on fungus, and he is now our team's senior scientist. We were after more information. We were always looking to know what the organism was *feeling* when being heated. Do they like it and begin to propagate? Or is it so unpleasant that it does not grow but die? Or does it have a near-death experience? Can I give it a little shove in the direction of its grave? And if that is the case, can I think of a more mild form of preservation? In any case, a combination of microbiology, molecular biology, biostatistics and DNA microarray technology helped us to find out more about the *inner life* of micro-organisms. We were real pioneers in this field and were able to patent our ideas; thirteen of them so far.'

### **Microarray technology?**

'You could also think of a microarray as a DNA chip that enables you to look at the genes of a micro-organism. If I change its environment – through heating, for instance – then specific genes will also be switched on or off. Those genes are my biomarkers and so I can use a micro-organism as a kind of sensor that describes its environment. If you see a certain gene expression profile – in other words, a set of