There is no boring virus: Portrait of the virologist Tim Skern

Tim Skern in the lab, Bild: Felix Kreppler, Max Perutz Labs (CC-BY-SA 3.0 AT)

Open Science asked Tim Skern for an interview. The passionate virologist from Vienna talks about his field of research, his passion for viruses in general, the new coronavirus SARS-COV-2 and the pandemic it caused.

Viruses - fascinating beings

- **Tim, you initially studied biochemistry. When did you take notice of viruses for the first time, and how did you become a virologist?**

I heard about viruses for the first time when I contracted measles as a small child. That was before the vaccine was available. I also heard my father talk about how wonderful the poliovirus vaccine was.

I became a virologist by chance. I was looking for a post-doc in Vienna and I wrote to two or three labs and asked what research they were doing. The group of Ernst Kuechler were working on the common cold virus and they invited me to join them. I found viruses fascinating and decided to stay in the field.

- **What exactly fascinates you about viruses?**

I find it amazing that a virus that may be 1000 times smaller than a cell and only have 10-15 proteins can hijack a cell and turn the cell into a virus-producing factory within a few hours. Viruses need the help of a cell or host organism to reproduce themselves and are therefore generally not considered to be “alive”. The ability of viruses to outwit the highly advanced host immune system for this purpose is astonishing.

My group has researched into the above topics using proteins of different viruses, including the common cold virus.

- **In the course of COVID-19 there has been a lot of discussion about epidemics and pandemics in the media. What is the difference between these two?**

An epidemic is an outbreak that is limited to a certain region, for example a continent, whereas a pandemic is a worldwide outbreak.

- **There have been many pandemics in the history of humanity, claiming millions of deaths in some cases. But the thing is: Viruses don't want to kill their hosts. Can you briefly explain this paradox to us?**

Viruses like Ebola virus or SARS-CoV-2 have a host organism in which they copy themselves without causing disease. In both cases, that seems to be one or more species of bats. The viruses are adapted to their host and copy themselves without harming the host. When these viruses infect humans, they are not adapted to us and thus propagate themselves and cause damage to the host. In the case of Ebola, this is always a serious, often fatal disease. With SARS-CoV-2, the disease severity depends on the age and health status of the infected person.

- **Viruses are generally being associated with negative things. Are there positive aspects of viruses as well? If so, in which context?**

Viruses are responsible for the destruction of algal blooms in the sea and in general for making carbon sources in the sea. Without the enzymes of bacteriophages and the reverse transcriptase of retroviruses, there would be no gene technology at all. Viruses are being used as vectors for gene therapy and in vaccines. Several vaccines against SARS-CoV-2 that are being tested are based on adenoviruses.

- **Do you have a favorite virus? If so, which one is it and why?**

I find every virus astonishing and worthy of investigation. I have never known a boring virus.

New coronavirus SARS-Cov-2 pandemic

- **What can you tell us about the new coronavirus SARS-CoV-2? What are the most important facts one should know?**

The most important things to know about the virus is how to lower the chance of infection. Well-aired rooms, masks in enclosed spaces, physical distancing all considerably reduce the risk. This is especially so for the risk groups such as the over-60s, the overweight and diabetic individuals.

- **Where did SARS-CoV-2 arise?**

Coronaviruses per se already exist for quite a while. The first members of this family of viruses were described in the mid-sixties. SARS-CoV already caused a pandemic in 2002/2003, and the MERS-CoV-epidemic started in 2012.

SARS-CoV-2 was described for the first time in 2019 and evolved from the recombination of two or more coronaviruses, probably in bats in China.

- **This winter is marked by the new coronavirus, and many people are afraid of the upcoming flu season. Is the fear justified?**

We have to learn to live with SARS-CoV-2 and find the most effective ways to stop the transmission. The effect of the influenza season is still unclear but it is reassuring that so many people are being immunised this year.

- **Is it possible to get infected with the new coronavirus and the flu at the same time? Or a more scientific question: Can SARS-CoV-2 and the Influenza-virus infect a host at the same time, or do they exclude each other?**

At present, there is evidence that if one respiratory virus is circulating, others will not be so effective. If there is a flu epidemic, there are fewer common colds. I suspect this will be true for SARS-CoV-2 but whether this virus or influenza will dominate is an open question.

- **What happens with the new coronavirus in our body when symptoms disappear? Is the virus completely eliminated, or is there a possibility that SARS-CoV-2 embeds itself into the host-DNA and stays there?**

SARS-CoV-2 may persist but not in the host DNA. We need more data on long-term infections to see how long and where in the body the virus remains.

- **What is the present state of knowledge: Can one get re-infected with the new coronavirus after having recovered from a first infection?**

We need more data here too. There seem to be some cases of re-infection but the actual number of genuine re-infections remains to be determined accurately.

- **It is said that the new coronavirus mutates quickly, and we are experiencing this right now in London. What are the consequences?**

All viruses mutate. The question is whether they evolve to have new properties. It is possible that the D614G mutation that arose early in the pandemic made the virus more transmissible but that remains to be proved. At present, we have to investigate the mutation found in London in more detail, but until now there is no evidence that the virus is becoming more aggressive.

- **The whole world has been waiting for a vaccine against the new coronavirus eagerly. Several vaccines have now been developed, and the first rounds of vaccinations just started. Will there be a vaccine against SARS-CoV-2 on the long run, or will we have to find other ways to cure COVID-19?**

The virus was first isolated in January or February and we were testing vaccines 5 months later. That is amazing, absolutely amazing. I think that some of the 170 vaccines being developed will be safe and effective, but it is hard to tell which ones will give long-lasting protection of the individual and also prevent transmission.

It is better to prevent viral infections than cure them. Safe and effective drugs will be difficult to make and the problem of resistance must be overcome.

- **What types of vaccines against SARS-CoV-2 are the most promising ones in your opinion?**

The vaccines based on adenovirus from Oxford and Russia seem to be making progress but the data on efficacy is not yet available. The mRNA vaccine produced in Germany is reported to have reduced the number of infections but results with more participants are required. We have no data on how long an immune response lasts with this new technique. Data which will be collected in the next six months should illuminate which vaccine candidate is the best prospect.

- **What is your prediction: How will the Coronavirus develop? When will SARS-CoV-2 and COVID-19 be over?**

As I said, we will have to learn to live with this virus. It will not go away for some considerable time. I cannot at present make any prognosis when it will no longer affect our world. As Niels Bohr said, “Predictions are difficult, especially when they concern the future.”

Work in the lab and engagement in science communication

- **How did you get involved in science? Has it always been your dream to become a scientist?**

I found biology and chemistry fun at school. Biochemistry seemed to combine the two and I didn’t think that chemistry had much future in research so I decided to study biochemistry at university. I wanted to find a job after my bachelor but the careers advisor told me to do a PhD so I did. I wasn’t convinced that I was good enough to do a career in research but I realised I wasn’t trained for anything else so I kept

applying for positions and kept being offered them. At some point, I realised I was becoming a research scientist with some interesting publications to my name.

I was the first person in my family to go to university so I certainly never dreamt of becoming a scientist.

- **Please describe your typical workday.**

Write, read, prepare teaching, discussions with colleagues from my lab, organisation of my division and so on. The order differs every day.

- **In your opinion, what is the biggest challenge in science communication today?**

The challenge to debunk conspiracy theories, the challenge of so-called "anti-vaxxers" and the challenge to bring sense to the discussion on the origin of SARS-CoV-2

- **Can you tell us about your best experience in science communication?**

This was the Science week 2000 (I think) in the Lugner City with Dialog Gentechnik. I think I reached so many people that week who would never normally be interested in science and gene technology.

- **Which scientists impress you in particular, and why?**

Of the well-known scientists, Rosalind Franklin and Francis Crick. Franklin was an expert in the fields of X-ray crystallography and the chemistry of coal. Crick was a genius – how did he know in 1953 that the DNA strands were anti-parallel? The scientist who I found most inspiring for my work was Michael Rossmann, a titan of structural virology.

- **What is your favorite object in your lab or your office? What do you use it for?**

The programs that I use to analyse, compare and visualise the structures of proteins to understand how they are related and how they work. My pencil for writing entries in my diary.

Personal details

Prof. Dr. Tim Skern studied biochemistry in Liverpool and London and has been doing research on viruses since then. In 1995 he received his habilitation from the University of Vienna. He teaches biochemistry, virology and scientific English at the University of Vienna and the Medical University of Vienna. Since the early 1990s, the expert on

viruses leads a research group at the Max Perutz Labs at the Vienna Bio Center where he the interaction of viruses with their host.

Science communication

Tim Skern has been an honorary board member of Open Science for many years and is actively engaged in science communication since a long time. He has been working with Open Science (formerly Dialog Gentechnik) for 13 years, was involved in the foundation of the Vienna Open Lab and accompanied the exhibition „Gentechnik Pro & Contra“ in five Austrian cities. Tim Skern’s activities in science communication include several Science Weeks in Vienna, lectures and movie nights at the VHS Wien, visits of schools as a Young Science Ambassador, educational work concerning HIV and AIDS in South Africa and Vienna as well as many interviews in newspapers, radio and television.

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