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BioRegio STERN

BioGrafie – Prof. Dr. Petra Kluger

The courage to try something different

(Stuttgart) – Prof. Dr. Petra Kluger is Director of the University of Stuttgart's Institute of Interfacial Process Engineering and Plasma Technology (IGVP) and the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB). Prior to that, she was W3 Professor of Tissue Engineering and Biofabrication at Reutlingen University, where she was also Vice President until 2023. Kluger's research work focuses on the biofabrication of functional tissues for biomedical applications, and she is also heavily involved in developing cell-based foods for cultured meat. As she herself has found, people's attitude to exploring this field is not just a matter of personal taste. However, she believes it is important to be curious about trying new things – and not just when it comes to food.

Alongside her professorship at the University of Stuttgart, Kluger has also been Director of the Fraunhofer IGB since 2025. This institute, which has close to 400 staff, has become her own personal career incubator. After a brief flirtation with zoology, it was more than a fortunate twist of fate that took her to the IGB for her dissertation. "The institute was already developing skin models as an alternative to animal experimentation – and I'd realised I can't bring myself to kill animals. I still wanted to do something practical, though, and that's why I applied," she explains. Kluger was accepted, and the topic of her dissertation, which was about using stem cells from the skin to create skin models, was to take all her career plans in a new direction. "I immediately delved into the available literature, reading some 50 publications. It was an important, relatively new topic, and it was exactly right for me," she continues. As part of her doctoral studies, Kluger then focused on the question of how surfaces that have been modified topographically or chemically can influence the behaviour of keratinocytes, i.e. the cells of the epidermis – the top layer of the skin. This research was to be used as a basis for engineering implants or skin models. In 2013, Kluger was appointed head of the IGB's Cell and Tissue Engineering Department and, in

2017, she became Professor of Tissue Engineering and Biofabrication at Reutlingen University.

“When it comes to cultured meat, everyone is just muddling along”

“We did a lot of work with human adipose tissue and the cells it contains, which resulted in me being invited to a conference about tissue engineering for cultured meat in 2018,” reports Kluger. “I was surprised how few people from the biomedical sector were there. Many of the steps are similar, but less complicated, because the tissue that is grown is ultimately eaten and not implanted,” she explains. However, Kluger also observed that what mattered most to the conference delegates was how these developments could benefit society – and that they were prepared to think outside the box. “Ethical aspects were already an integral part of my biomedical research. I wanted to reduce the amount of animal experimentation or even replace it altogether, thanks to better cell and tissue models for processes such as approving drugs,” says Kluger. “At that conference, I realised there was an entirely different demand for my field of research. It was something of existential importance that I hadn’t even been aware of up to that point – the need to carry on feeding billions of people in the future,” she continues.

Kluger is disappointed that there are still very few researchers who would consider either switching from biomedicine to the food sector or exploring the field as an additional research area. “New centres of excellence are needed for joint research on using biotechnology to produce meat. Even though this technically qualifies as food production, it doesn’t fall under the umbrella of conventional agriculture. The topic of alternative proteins is extremely important for our future, especially in terms of security of supply. Centres of this kind already exist in other European countries as well as the USA, Israel and China. In Germany, though, when it comes to cultured meat, everyone has just been muddling along so far. That’s not efficient,” she emphasises.

After the 2018 conference, Kluger recalls having to recognise that this topic didn’t exactly open doors. Obtaining funding was – and still is – anything but easy. Together with her team at Reutlingen University, she nevertheless succeeded in developing an approach that encourages the precursors of muscle and adipose cells to join together as they are growing. This enables them to form aggregates comprising tens of

thousands of cells, which then develop into muscle and adipose cells that are identical to the ones in animal flesh. The scientists were already applying knowledge from the field of biofabrication to increase the mass of animal cells and scale up production. Kluger also thought about starting up a company at that time, but she ultimately decided against it, without completely ruling it out in the future. “I’d never start up a business alone, but I could imagine being a co-founder. My current position means I’m ideally placed to support start-ups,” she says.

Harmony and tact

Meat can be a sensitive subject in Germany, and Kluger had to learn that things can get political very quickly. “At one of my first public debates on the topic, I had to contend with a lot of criticism. Representatives of a farmers’ association were there, and I wasn’t yet aware that I needed to choose my every word carefully. Coming from a biomedical research background – where everyone thought it was great that better test models had made it possible to predict the efficacy of drugs more accurately – I wasn’t used to that kind of reaction,” she explains. Kluger finds it unfortunate that the topic is so polarising. “We really need to be open to technology, and we should let consumers decide what they want to eat. Cultured meat definitely wouldn’t be everyone’s choice, but many people would no doubt be glad that an animal didn’t need to die to produce the steak they’re tucking into,” she points out.

Kluger has since discovered that being out of the spotlight has its benefits, too. She recently joined a gospel choir to help her relax. “You are one voice amongst many, and everyone’s voice is important when it comes to creating a nice sound. In my everyday working life, I’m more of a conductor and am responsible for creating harmony and ensuring everyone is in tune,” she says. A mother of two girls, she always tries to tackle tricky situations with tact. “As a young woman with small children, I initially felt I was on trial in the leadership roles I took on, with people wondering if I would cope and whether I had simply been appointed as the token woman,” reveals Kluger. She made up her mind to prove herself through her work and trusted in the support of her family and colleagues. One supportive colleague is Prof. Katja Schenke-Layland, Director of the NMI Natural and Medical Science Institute at the University of Tübingen. The two women used to be joint heads of department at the Fraunhofer IGB and still keep in touch, despite both taking up even

more senior leadership positions. “It’s reassuring to hear that everything doesn’t just fall perfectly into place for colleagues, either,” says Kluger. “Especially in our field of research, where we are trying to replicate living tissue, we have to repeatedly acknowledge and accept that nature does it best. No matter how hard we try, we have to keep wondering whether we will ever be halfway successful. That can sometimes be frustrating,” she admits. However, giving up has never been an option for Kluger – quite the opposite, in fact. For example, she refers to her career misstep of deciding to study zoology as a “helpful failure”. “I studied technical biology in Stuttgart and often struggled with the large amount of theory. I definitely wanted to do something tangible and hands-on for my thesis. I opted for behavioural biology and very quickly regretted it,” she recalls. “I felt sorry for the hamsters we were to use for the experiments. I dropped out after a few weeks, even though that was awful for me because I had to start again from scratch,” she says. Kluger actually had her entire career mapped out and wanted to go into industry straight after completing her studies. Even at school, she loved biology – the theory of life – but the technical aspect and the practical relevance were always very important to her. Ultimately, though, the “wrong turn” on her career path took her to the very place where she is now hugely successful.

Kluger also tries to get across to her students at the university how important it is to persevere when faced with challenging situations. She wants to offer them a sustainable study experience. “Regrettably, I myself all too often only studied really hard right before the exams so I could get everything written down on the day. Two weeks later, I’d forgotten much of it again. We call that cramming, but the aim should actually be to come out of every lecture with new knowledge and take something away with you that you can really put to good use in life,” she says.

Hamster wheels and high-performance teams

The fact that her current tasks no longer leave her any time for laboratory work doesn’t frustrate Kluger at all. “Although I no longer spend time sitting at the microscope, I’m helping the next generation of scientists develop. I love discovering people’s potential and encouraging them. I make a point of looking for people who drive things forward and I put together high-performance teams. Lone wolves achieve little in science,” she emphasises. Kluger enjoys directing research but admits the associated administrative work is a bit of a challenge for her. “I’d rather be developing

new research ideas with my teams than dealing with forms. Sometimes, though, you just have to grin and bear it," she says. To unwind, Kluger enjoys exploring nature with her family as well as singing and doing yoga, albeit too rarely. "Making enough time for your private life is a constant challenge that many of us are familiar with. When it's you on the hamster wheel, you keep on making sacrifices until your body starts complaining," she comments.

Although it may sound like the 45-year-old is a typical career high-flyer, she says this isn't the case. Kluger decided early on to start a family and missed out on the lengthy periods abroad that typically feature on many people's CVs. She definitely doesn't regard remaining in the STERN BioRegion as a disadvantage, though. "This is exactly the right place for me, with ideal opportunities for networking with experts, companies and institutions. That includes making good use of the big list of companies on the BioRegio STERN website," she reveals. Kluger has already set her next goal. "I want to take the region forward and set up a biofabrication centre here, also moving in the direction of novel food. That will no doubt mean I'll have my hands full in the coming years," she adds.

Looking further ahead, Kluger also wants to actually try this food. She has eaten cultured meat in Australia and found it to be really tasty. "In Germany, even just tasting cultured meat involves a huge amount of regulatory red tape," she says. Even though – as Kluger herself admits – she approached things far too naively back in 2018, her goal has always been to work with companies to get cultured meat into the supermarkets in the near future. And she is far from alone. "If China's current Five-Year Plan incorporates significantly increasing the use of alternative proteins, including cultured meat, as a food source, this will happen. The only question is whether we here in Germany and Europe are willing to let someone else take the lead again. We must have the courage to try different, new things," she concludes. And as far as Kluger is concerned, that definitely doesn't just mean food.

About BioRegio STERN Management GmbH:
BioRegio STERN Management GmbH promotes economic development in the life sciences industry, helping to strengthen the region as a business location by supporting innovations and start-up companies in the public interest. It is the main point of contact for company founders and entrepreneurs in the Stuttgart and Neckar-Alb regions, including the cities of Tübingen and Reutlingen.
The STERN BioRegion is one of the largest and most successful bioregions in Germany. Its unique selling points include a mix of biotech and medtech companies that is outstanding in Germany and regional clusters in the fields of automation technology and mechanical and plant engineering.

Press contact:
BioRegio STERN Management GmbH
Dr. Klaus Eichenberg
Friedrichstrasse 10
70174 Stuttgart
Germany
+49 711-870354-0
eichenberg@bioregio-stern.de

https://www.linkedin.com/

Editorial department:
Zeeb Kommunikation GmbH
Anja Pätzold
Lindenstraße 12
12527 Berlin
+49 711-6070719
info@zeeb.info