

Vienna, 20 July 2021

## **Biophysics provides the basis for combating Covid-19: specialist European congress staged in Vienna as hybrid event**

**Biophysics helps researchers visualise and understand the functions and weaknesses of Covid-19. This, in turn, provides the foundation for the development of medications and vaccinations. The discipline is also using new methods to uncover new biophysical connections all the time – such as interactions between proteins and lipids. New insights from Austrian researchers into the complex mechanisms behind uncoupler molecules are giving hope that humans might be able to lose weight in their sleep at some point in the future. The European Biophysics Societies' Association (EBSA) congress will be sharing the latest basic research findings with the world from 24-28 July.**

“As biophysicists, we create the basis for understanding various things including viruses – such as the coronavirus and its variants – through our basic research. This is essential for vaccination development and preventing pandemics in the future. We are also developing a new set of tools to help combat a range of other medical conditions such as cancer, heart disease and obesity. New, groundbreaking insights could even have the capacity to trigger weight loss while sleeping,” confirmed Prof. Elena Pohl, President of the 2021 EBSA Congress, Vice President of the European Biophysical Societies' Association (EBSA), Vice President of Biophysics Austria and head of department at the Institute of Physiology, Pathophysiology and Biophysics at the University of Veterinary Medicine Vienna.

### **Three biophysics pillars playing a leading role in the fight against Covid-19**

Biophysics builds essential bridges between biology and physics by examining biological systems with the support of physics methodologies, while also attempting to decipher the underlying molecular mechanisms. In terms of research into Covid-19, it is helping scientists to build up an understanding of the structure of the virus. “Using ultra-modern biophysics methods such as high speed scanning force microscopy, cryo-electron microscopy and crystallography, researchers can map out the molecular structure and surface of a living virus and observe how it binds to the surface of cells and penetrates them,” Pohl confirmed. “In addition to these visualisations, mass spectrometry – a special process for measuring the mass of molecules – puts an additional tool at our disposal that helps to detect SARS-CoV-2 proteins in heavily diluted samples such as gargle solutions provided by Covid-19 patients. This helps scientists to monitor how the virus replicates,” the congress president said. Membrane topology, the third string in the biophysicians' bow, reveals which proteins and lipids the virus has and how they can be used as interfaces to the body's cells. This makes it possible to identify specific surface proteins, such as the spike protein. “If we understand the structure and function of the virus proteins through these and other new methods, we can go on to develop vaccines and medications,” Pohl noted. Which is why the high-calibre speakers at this year's EBSA Congress will focus on this highly topical subject.

### **Proteins and lipids – an unusual love story**

Biophysical membrane research plays a key role in medication and vaccine development, as drugs need a target to aim at in the body if they are to have an effect. “This target is a bio-molecule that the drug can bind to. Many of these are target proteins, and 60% of all target proteins for medications are membrane proteins,” Pohl explained. They sit in the cell membrane and facilitate communication between cells. As these membrane proteins are hydrophobic, i.e. repelled from water, they are not soluble in water and special techniques are needed to inspect the target proteins. “The interesting thing in this case is that there is an interaction between lipids and proteins, meaning that lipids have a regulatory effect on the proteins contained within them and that the proteins also have an effect on the lipids,” she added.

### **Hibernation in animals reveals potential weight loss method**

Researchers are also looking into ways that interactions between proteins and lipids could be used to help combat obesity. “We are taking a very close look at the mechanisms that hibernators have developed. During hibernation, they use a method of heat generation to stave off hypothermia that is not associated with the muscle activity of shivering. This involves the protein thermogenin, an inner-membrane decoupling protein found in brown fat mitochondria. If activated, this initiates a process called thermogenesis, which controls the generation of heat in hibernators and newborns,” Pohl confirmed. Until now, the complex molecular mechanisms of the proteins involved were not fully understood, but thanks to protein and lipid research, science is coming another step closer to deciphering them.

### **Interaction between numerous molecules during the decoupling process**

A brand new finding regarding proteins in the mitochondrial decoupler family is that this mechanism is not just activated through the membrane, but via other molecules, too. Substances that transport protons in particular are primarily involved in the process. “This insight is groundbreaking, especially when it comes to synthetic decoupler molecules such as dinitrophenol (DNP), because they show us why previous dosage experiments failed,” Pohl said. Many proteins in mitochondria appear to bolster the function of the decoupler molecule. “Due to this fundamental new finding, we need a complete rethink – in the direction of modified molecules,” she continued. This insight and new research approaches in this field are now being carried out from Austria into the wider world. “Together we are working on turning the dream of weight loss during sleep into reality,” Pohl concluded.

### **About EBSA/Biophysics Austria**

The European Biophysical Societies’ Association (EBSA) was founded with the goal of advancing and disseminating knowledge of the principles, recent developments and applications of biophysics, and fostering the exchange of scientific information in Europe. Every two years it hosts the EBSA Congress, the second largest of its kind in the world. At the congress, researchers present the latest basic research-oriented solutions, pioneering technologies and research findings. This year the EBSA Congress will take place at the Austria Center Vienna as a hybrid meeting. The local organiser is Biophysics Austria, which is celebrating its 60th jubilee this year, making it one of the oldest biophysics societies in Europe.

### **About IAKW-AG**

Internationales Amtssitz- und Konferenzzentrum Wien, Aktiengesellschaft (IAKW-AG) is responsible for maintaining the Vienna International Centre (VIC) and operating the Austria Center Vienna. The Austria Center Vienna is Austria's largest conference centre, with 24 halls, 180 meeting rooms, and some 26,000 m<sup>2</sup> of exhibition space, and is one of the top players on the international conference circuit.

### **Contact**

IAKW-AG – Austria Center Vienna  
Claudia Reis, Deputy Press Officer  
Tel: + 43-676-3199523, Mail: [claudia.reis@acv.at](mailto:claudia.reis@acv.at)