Institute of Experimental Medicine AS CR, v.v.i.
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An interview with Prof. Eva Syková, MD, DSc, Director of the Institute of Experimental Medicine (IEM) at the Academy of Sciences of the Czech Republic

Regenerative Medicine Is Our Future

Prof. Eva Syková, MD, DSc, graduated from the 1st Medical Faculty, Charles University in Prague. During her studies she was already involved in research and started working at the Physiological Institute of the Academy of Sciences right after her graduation. She has worked in a number of research institutions in the Czech Republic and abroad. In 1991 she joined the IEM and became its director in 2002. Since 1996 she has been head of the Neuroscience Institute at Charles University's 2nd Medical Faculty , which she founded, and since 2002 she has been head of the Centre for Cell Therapy and Tissue Repair at Charles University. In 2002 she was named professor of physiology and pathophysiology. She has lectured about her neuroscience and stem cell research at more than 100 foreign universities and conferences. She is an elected member of Academia Europaea, an assembly of the world's best scientists, and a member of the steering committee of IBRO (International Brain Research Organization). She is a member of the editorial boards of prominent scientific journals (The Neuroscientist, Journal of Neuroscience Research, Neuron-Glia Biology, International Journal of Developmental Neuroscience, etc.). Since 2005 she has been president of the Czech Neuroscience Society. Prof Eva Syková is an author of five patents and the recipient of several Czech and international scientific prizes. She has published extensively and her publications have been cited more than 5,500 times (her H-Index is 41). She is one of the most distinguished personalities within the Czech scientific community. She is married and has two sons.

You are a very successful woman who has achieved a lot in her career. What is your perception of our all-male government?

I am asked quite often about that. It has been a recurring question in my life, and I have been following this issue at the international level as well. As a successful woman I am often asked to talk about gender issues at various forums. Ten years ago, a summit of the world's most prominent female politicians, scientists, and entrepreneurs was held in Stockholm, which focused on the problems women face in their professional life. It is quite symptomatic that I was not nominated by anyone from my country, but I represented Yale University there. I feel bad about the fact that our country has one of the worst records of female representation in high positions, and this issue is not seen as a challenge here. There are a lot of highly qualified women in all areas of life here, but one can see that women rarely achieve more important posts. It is less striking in science than in politics, where there are no tools to help women succeed. When there is a need for a woman in a higher political function, a "harmless" woman is usually chosen – one who will not be active in pushing through her own ideas. The only way forward is to make fair representation of women a binding principle and a precondition for the creation of any new functions. In our country, people are reluctant to support measures for better female representation, and any discussion of possible enablers automatically elicits a negative response. Progress will be very slow without pressure. It is a major failure that there is not a single woman in the current government.

Have you ever encountered a situation when being a woman was an obstacle to your career progress?

Women usually have problems when they are young. This was also quite apparent when the new Czech cabinet was being set-up. They face the prejudice that when young, pretty and intelligent women long for marriage, family or so-called "womanly things", then they do not take other issues as seriously as men do. Once a woman gets older, her situation and chances improve. Another problem is the media – they are mostly interested in actresses or singers, and neglect many talented women


Photo: Vladimír Weiss

in other societal sectors. The result is that celebrities are taken as a model. On the other hand, many families of young educated people function today in a more equal manner.

What impact can the upcoming cuts in science financing have on the Academy of Sciences' institutes?

The proposed cuts seem quite bizarre, as much will be lost and not much saved. We have just received the 2010 budget cut of 2.5%. We will have to save a lot of money during the last four months of the year, so we decided to lower some salaries. I think we can handle it, but if there are more cuts next year, as suggested, we will face much trouble. Our institute is one of the best within the Academy of Sciences, and more significant overall budget cuts would be very complicated for us, but almost fatal for other institutes. On the basis of an assessment we are currently making, many institutes of the Academy of Sciences are likely to appear among the best institutions within Czech science. Certainly, there are some tools that would allow for offsetting the direct budget cuts, but they can't be mobilized so quickly. One of them is to increase grant resources, in other words replacing institutional funding by ad hoc project funding. Another option is to allocate funding according to scientific results, but that can be done only to a limited extent. Science and research need continuity, and it is not wise to take something away and then return it, because competent people will leave in the meantime, and the overall quality of research will drop. Czech research has been improving and slowly reaching the level of Western countries, and rushing into ill-considered measures could dampen the positive trend.

Basic research may seem uneconomic and non-profitable...

It seems so from a purely economic point of view, but it is not true. Basic research is the necessary basis for all future innovations. We represent one of those institutes that have embraced innovative principles together with so-called translational research. We know our research cannot be limited to basic research only. Of course there are scientists who focus purely on basic research, but my task as director is to support the transfer of research outcomes into practice. This is much desired, especially in medicine. We have created a number of tools for this transfer, funded from EU money – for example the Innovation Centre and Business Incubator. Scientists won't leave research in order to devote themselves to business applications; nevertheless, you can motivate them to do both. Unfortunately, there are no conditions being created by the state for that purpose. Although the new government is supposed to adopt this very approach, concrete tools and resources still remain unknown. Establishing the Technological Agency that aims at financing joint projects of scientists and business is, however, a major step forward.

Is the co-financing of EU projects threatened?

Co-financing is not a major problem. EU funded projects are very welcome, but they finance only a minor part of our research; they are more important with regards to international cooperation, prestige and contacts with scientists in Europe than the actual financing. Most of our financial resources come from the Czech budget and Czech grants.

What is the current state of Czech neurosciences?

Czech neuroscience has a long tradition since the era of J. E. Purkyně, and it enjoys a good reputation at the international level. It includes all fields that somehow relate to the brain. As in other European countries, there is a Society for Neuroscience in the Czech Republic and a number of prestigious neuroscience sites. Today, we encounter more and more diseases affecting the brain and nervous system that we cannot cure – we are only able to deal with their symptoms. These include degenerative diseases, which can also occur at a young age, inborn defects and genetically inherited diseases. During one's midlife, diseases such as Disseminated Sclerosis, Parkinson's and Alzheimer's disease can start to appear. They are demanding and costly both for the health system and the patients' relatives. There are also more and more frequent brain and spinal cord injuries that patients are able to survive, but their quality of life is lowered considerably. We have been witnessing an increase in psychiatric disorders, e.g. depression, which represent a complicated factor for both personal and professional life. Therefore, research is extremely important in this area as it is intimately connected with new therapeutic methods that require deeper scientific knowledge. Regenerative medicine, as a new field of research, does not include solely brain diseases, but also other diseases of organs affected by ageing – the heart, liver, kidneys and the musculoskeletal system. The process is not just about regeneration. Modern methods such as stem cell therapy, tissue replacement, or genetic interference are utilized in order to treat the origin of diseases. Here lies the hope for the future treatment of diseases that can't be cured pharmacologically or through transplantation.

How long will it take to make all those modern technologies part of usual medical care?

Some of them are already being applied in practice, and more and more have been introduced. Research needs time, but this is not a major problem. The introduction of new methods into clinical practice is highly regulated and contingent on thorough clinical testing. It takes five years or more before one gets results. It is a slow process, as everything has to be tested separately, and the new methods do not really help the patients at the beginning, because first of all they must not harm them. Testing is extremely difficult in the case of the brain. It is much easier with joints, where we cooperate on clinical testing with positive results. We have had very good results in the treatment of diabetic foot-through transplantation, where a patient's own cells save their foot and no amputation has to be carried out.

How does the cell therapy application look?

Stem cells are like small factories, they can rescue demaged cells or replace them and replace the function of another cell; they can even regenerate and build an organ – this is the so-called rescue and replacement effect. As long as the patient's own cells are used, there is no risk. Only those cells made of embryonic or fetal cells or quasi-embryonic cells created by genetic modification of the patient's adult cells are capable of replacing an organ or even neurons. Another complication is that the cells often cannot be applied just by themselves, as they are not able to remain and survive in the tissue; it is necessary to employ a combination of carriers and cells. We have had good outcomes in animal testing as far as spinal cord injuries are concerned. The lesion in the spinal cord is bridged by a biomaterial containing cells. For humans, those processes would have to be supplemented by at least five other agents in order to achieve a successful cure. It is a long-term project, and the way forward leads through a combination of artificial materials and one's own tissues – matrix and proper cells. This is how it partly is and will be; in any case here lies the future of medicine, it is just a matter of further tests and work.

What are you currently working on?

I am deeply interested in the fundamental functions of the brain, and the so-called non-synaptic transmission has been my life's project. There is synaptic transmission in the brain, which means everything is connected by fibers and synapses. It turns out that there is also wireless transmission, as in telecommunications, based on the physical diffusion principle. We participated in elaborating this theory and its verification, and we have been continuing with this research because a number of diseases affect the quality of this non-synaptic transmission. Besides that, I have been working on stem cell research, nanomaterials and other biomaterials for various uses, for example spinal cord injuries, post-stroke symptoms, and brain tumors – but also for cartilage, bones, tendons and diabetic foot. Furthermore, our institute is the only one in the Czech Republic authorized to carry out experiments on animals with human embryonic stem cells.

What is the most fascinating thing about the brain to you?

Since my second grand-daughter was born three months ago, I have been watching how fast the evolution of the brain is. A human being is born relatively immature. I am familiar with the course of events happening in the brain, and I can imagine how the neurons are migrating in my grand-daughter's brain, how connections are being set-up, how dendrites are growing and the hemispheres are being linked together. It is really exciting to observe the progress she has made in three months. Human evolution over time is very interesting, too. It is impossible to catch it during a single lifetime, but if you do a time projection of the progress that the human race has made, one can ask about its remaining capacity, and whether human brain characteristics will be absolutely different in a thousand or million years. As a scientist, I care about our possible influence on the ageing of the brain. All cells get older, each of them has its own ageing model but none live forever. At present we think a human being can live up to 130–135 years at maximum, unless we are able to change every cell's cycle. Brain cells get older, too, and regardless of diseases that we could cure, it is also important that 130-year-old people maintain good brain functions. Thanks to memory tests carried out on old animals and people, we see huge differences between individuals; some are able to maintain their learning capacity and their memory almost as well as in their youth. We have been focusing a little bit on those differences in the speed of ageing as well.

By Věra Řiháčková

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