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Hungary has the knowledge and capacity to produce global innovations.

20.11.2019

Tags:

Hungary, Academia, Research, University, Semmelweiss University

Dr. GyÃ¶rgy Bagdy, professor and former vice rector at Semmelweis University, shares his insights on the longstanding history of pharmacology in Hungary, the key strengths of the country in the field of neuroscience, and the future outlook of a more collaborative and innovation-focused research landscape.

Please begin by introducing yourself and your specific areas of research interest.

I am a professor of pharmacology at Semmelweis University in the department of pharmacodynamics in addition to being a Doctor of Sciences at the Hungarian Academy of Sciences. At the beginning of my career, I worked at the National Institute of Psychiatry and Neurology and spent nearly five years at the NIH in the US a few years later. Upon returning to Hungary, I organized my research group and became the scientific director of the institute in 2002. In 2007 I moved with my research group to Semmelweis University to the Faculty of Medicine and a year later I became the head of the Department of Pharmacodynamics at the Faculty of Pharmacy. From 2015 I served as a vice rector for scientific affairs at the university. I also work in European research consortia since 2001 and am a member of the Academia Europaea. My research field of

interest is neuropsychopharmacology which spans neuropharmacology, psychopharmacology, and related fields such as behavioral pharmacology, neuroendocrinology and genomics.

What is the significance of pharmacology in the research history of Hungary?

Pharmacology has a longstanding history in Hungary because after the second World War the eastern bloc countries were given special commitments and Hungary was given drug research and discovery responsibility. There were no raw materials but the necessary skills in chemistry and biology were here. Therefore, during this time original pharmacological and pharmaceutical research boomed in Hungary including for example diuretics, blood pressure-lowering, and anti-inflammatory drugs. The most important was selegiline, also known as L-deprenyl, which was an anti-Parkinson drug that can also be used in depression, designed by Dr. Joseph Knoll. There was also Dr. Kalman Magyar, the founder of this department, who first described the two different type enzymes that metabolize monoamine neurotransmitters, which was a critical discovery for the development of selegiline. This drug molecule was marketed in at least 120 countries.

Hungary has also a very strong tradition in neurosciences in particular. Dr. Janos Szentagothai was a world-famous Hungarian anatomist and based on his inspiration, the universities of Budapest and Pecs developed this field very extensively. Hungary has very accomplished key opinion leaders in the field such as Dr. Miklos Palkovits from Semmelweis University, inventor of brain punching, a key method for the chemical neuroanatomy, who has the highest research citations in all life sciences fields in Hungary, or Dr. Tamas Freund, recipient of the Brain Prize in 2011, the vice president of the Hungarian Academy of Sciences, who is leading the Institute of Experimental Medicine.

The Hungarian Brain Research Program was first initiated in 2014 and renewed in 2017. How is the program increasing Hungaryâ??s competitiveness in the field?

Looking at the funding of pharmacological research in Hungary over the last century, until the 70â??s almost all the think tanks in the country were located at the universities. During this time, the Hungarian drug companies had a special role in assisting the research being conducted at universities, including also related topics of the drug development such as licensing and clinical trials. However, after the privatization of Hungaryâ??s life sciences sector, drug research slowly moved to the pharmaceutical industry. Gedeon Richter is the best example of a company that remains primarily Hungarian owned and is engaging in innovative research.

As the research moved outside, the institutes and universities had less funding on a research basis. However, with the Hungarian Brain Research Program, the tradition of drug research within the public sector is again booming and advancing parallel and in conjunction with neurosciences.

To what extent is Semmelweis University partnering with other institutions in the field of neurosciences?

When I was the previous vice rector for scientific affairs at the university, it was my duty to care about the ranking of the university. Semmelweis always ranked first among Hungarian universities and globally between 400 and 500 overall. However, in the field of pharmacology, we typically ranked much higher within the top 150 institutions. Looking at neuroscience and the Institute of Experimental Medicine (IEM), it is among the best research institutions of its kind in the world and

together with Semmelweis has a common Doctoral School. Our research is often complementary and collaborative with the IEM as well.

How are collaborative research programs playing a role in enhancing the innovation capacity of Hungary?

Hungary has the knowledge and capacity to produce global innovations. For example, cariprazine is an antipsychotic drug developed by Gedeon Richter in Hungary and now marketed worldwide. The drug was originally used in schizophrenia, but it was discovered that it can treat also bipolar disorder in both manic and depressive stages.

Gedeon Richter recognized Hungaryâ??s ability in drug research connected to the neuroscience field. This is opposite to the general trends worldwide as there have been very few CNS drugs to reach the market recently and none this year. However, since the decision to take on this high-risk area, the company has succeeded. As long as Hungary has a strong infrastructure of research institutions and skilled scientists, the private industry can leverage this as a basis for innovation.

Hungary faces a critical issue of the brain drain of its talented scientists. What is your current assessment of the situation?

Brain drain has always been in issue â?? even in the middle ages, the emperor collected the best scientists. I worked several years in the US and it was unsure whether I would return to Hungary. In the end, I came back and organized my research group with many talented students from Hungary and abroad. I believe that brain drain is a general issue that cannot be avoided completely.

I always suggest that my students should apply for foreign jobs or research groups once they receive their PhDs. I strongly believe in the importance of spending a few years abroad for the scientistâ??s career. Despite having very prestigious and competitive positions abroad, I often have students who in the end return to Hungary to continue their research careers.

What is your vision for the future outlook of scientific research in Hungary?

The capital is a key issue in Hungary which involves many factors outside the university. However, there are many steps that Semmelweis can take on its own to advance research capabilities such as partnering with the pharma industry. Looking forward, we want to have a more successful approach for not only science and discovery but also for development. Therefore, there should be a shift in the curriculum and job application requirements to have a little higher weight for licenses and patented research that is beneficial to the R&D of pharmacology and drug products.

What final message would you like to deliver on behalf of the Hungarian life sciences community?

Life sciences including neuroscience and pharmacology are fields that have very strong basis in Hungary, and they will continue to have an even more successful output in the future.

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