Beat: Health

The Princess of Asturias award research to find vaccines against COVID-19

Awards 2021

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USPA NEWS - The scientists Katalin Karikó (biochemist), Drew Weissman (immunologist), Philip Felgner (immunologist), U?ur ?ahin (doctor), Özlem Türeci (doctor), Derrick Rossi (biologist) and Sarah Gilbert (vaccinologist) have been granted the 2021 Princess of Asturias Award for Technical and Scientific Research, as announced by the Jury responsible for conferring aforementioned Award. This candidature was put forward by Peter Lawrence, 2007 Prince of Asturias Laureate for Technical and Scientific Research.

The year 2020 began with the onset of a pandemic that changed daily life and the world economy and ended with an extraordinary demonstration of the ability of science to deal with the problem, thanks to the first vaccines against the SARS-CoV-2 coronavirus, the cause of the COVID-19 pandemic. Katalin Karikó, Drew Weissman, Philip Felgner, U?ur ?ahin, Özlem Türeci, Derrick Rossi and Sarah Gilbert have independently contributed to the development of some of the vaccines approved to date, all based on different strategies, but which have protein S as a common target. This protein is present on the surface of the virus and facilitates its attachment to and entry into cells.

Philip Felgner is a pioneer in the use of protein microarrays to understand in detail how the immune system responds to different infectious microorganisms and to identify the best antigens for use in vaccines and diagnostic tests. Moreover, in 1985 he discovered and developed lipofection technology, a strategy that consists in introducing genetic material into a liposome so that it can be delivered to and introduced into cells. This technology is present in lipid nanoparticles that serve as delivery vehicles for messenger RNA (mRNA) vaccines against COVID-19.

On the other hand, Katalin Karikó (Szolnok, Hungary, 1955), a pioneer in the study of the therapeutic possibilities of this molecule, is considered the 'mother' of this type of vaccine. Together with immunologist Drew Weissman, she began working on mRNA-based vaccines and saw that this molecule caused strong inflammatory reactions because the immune system detected it as an intruder. Both managed to introduce small changes in the structure of the RNA so that these reactions did not take place. This breakthrough laid the foundation for the use of RNA therapies and its results allowed U?ur ?ahin (Alexandretta, Turkey, 1965) and Özlem Türeci (Lastrup, Germany, 1967), by BioNTech, and Derrick Rossi (Moderna) to develop the mRNA-based vaccines that have currently been approved against COVID-19 and whose use can be extended to different areas of medicine such as cancer, autoimmune diseases and tissue regeneration.

Finally, vaccinologist Sarah Gilbert (Kettering, Northamptonshire, UK, 1962) is another of the researchers who have worked to obtain a vaccine against SARS-CoV-2. The vaccine she developed, Oxford/AstraZeneca, is another of those approved by European authorities to date and is based on an adenovirus that is used as a vector to introduce the DNA encoding protein S into cells, thus stimulating the immune response.

American scientists

Drew Weissman was born in Lexington (Massachusetts, USA). He obtained his Bachelor and Master's degrees from Brandeis University (USA) in 1981, where he majored in biochemistry and enzymology. He received his PhD from Boston University in 1987 and completed his residency at Beth Israel Hospital, Boston. He continued his studies at the National Institutes of Health (NIH) and, in 1997, moved to the University of Pennsylvania, where he focused his work on the study of RNA and the innate immune system. He is currently a Professor of Medicine at the Perelman School of Medicine at UPenn, where he carries out research on RNA and its application in the development of vaccines and gene therapy. Weissman is a member of the American Federation for Clinical Research, the Association of American Physicians, and the American Association of Immunologists. His work has resulted in several patents and he was joint recipient of the 2020 Rosenstiel Prize (USA), together with Katalin Karikó.

Philip Felgner was born in Frankenmuth (Michigan, USA) on 7th February 1950. He graduated in Biochemistry from Michigan State University in 1972, received his Master's degree three years later, and completed his PhD in 1978 at the same university. After postdoctoral work at the University of Virginia, he joined Syntex Research as a staff scientist. It was there that he developed lipofection

technology. In 1988, he became Director of Product Development and founder of Vical Incorporated. In addition to the aforementioned contributions, Felgner's findings led to the development of DNA vaccines, based on introducing the genetic material for encoding viral antigens into the body. He is currently Director of the University of California at Irvine (UCI) Center for Vaccine Research and Development and the Protein Microarray Laboratory and Training Facility, where he has studied the proteome of numerous infectious microorganisms and has begun to manufacture the first microarray of the human proteome. He is the author of more than 200 articles, which have been cited over 38,000 times, and holds 45 patents and an h-index of 74, according to Google Scholar.

Derrick Rossi was born in Toronto (Canada) on 5th February 1966. He graduated from the University of Toronto with Bachelor and Master's degrees in Medical and Molecular Genetics and earned his PhD from the University of Helsinki (Finland) in 2003. He continued his studies as a postdoctoral fellow at Stanford University from 2003 to 2007 and held different positions at Harvard Medical School and the Stem Cell Institute of the same university until 2018. He has also carried out research at the Institute for Immune Diseases (IDI) and in the Program in Cellular and Molecular Medicine at Boston Children's Hospital. In 2010, Rossi founded the biotechnology company Moderna to exploit his discovery of the ability to transform and reprogram pluripotent stem cells thanks to mRNA-based technologies. In 2015, he co-founded Intellia Therapeutics, which uses CRISPR gene editing to develop new drugs for treating genetic diseases. In 2016, he co-founded Magenta Therapeutics, focussing on haematopoietic stem cell transplantation for the treatment of autoimmune diseases, blood cancers and genetic diseases.

He is the author of around 200 articles, which have been cited over 20 000 times, holds 21 patents and has an h index of 59, according to Scopus. Among other distinctions, he has received the Pathways to Independence Award (PI) from the NIH, and was named a Robertson Investigator by the New York Stem Cell Foundation.

As stated in their Regulations, the Princess of Asturias Awards are aimed at rewarding "the scientific, technical, cultural, social and humanitarian work carried out at an international level by individuals, institutions or groups of individuals or institutions." In keeping with these principles, the Princess of Asturias Award for Technical and Scientific Research is to be granted to the "work of fostering and advancing research in the field of mathematics, astronomy and astrophysics, physics, chemistry, life sciences, medical sciences, earth and space sciences or technological sciences, including those disciplines corresponding to each of these fields as well as their related technologies."

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