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Frankfurt am Main, March 14, 2014

EMBARGO: March 14, 2014, 2 pm MEZ

The immunologist Michael Reth receives the Paul Ehrlich and Ludwig Darmstaedter Prize for 2014

Before antibodies are produced, the immune cells responsible for this task must first be activated. Michael Reth has decoded important steps in this process.

FRANKFURT am MAIN. The €100,000 Paul Ehrlich and Ludwig Darmstaedter Prize goes this year to Michael Reth, Professor of Molecular Immunology at the Institute of Biology III of the Albert Ludwigs University Freiburg, Head of the Research Group at the Max Planck Institute of Immunobiology and Epigenetics and Director of the BIOS Centre for Biological Signalling Studies in Freiburg, an excellence cluster. Reth has been awarded the prize for his outstanding achievements in the field of antibody research. "Michael Reth has demonstrated how the immune system's B cells are activated and induced to produce antibodies," wrote the Scientific Council of the Paul Ehrlich Foundation in explaining its decision. Reth has thereby helped to decode the molecular bases of Paul Ehrlich's famous side-chain theory. The award will be presented today, Ehrlich's 160th birthday, by Professor Harald zur Hausen in the Paulskirche, Frankfurt. Awarded annually since 1952, the Prize is among the most distinguished international prizes awarded in the Federal Republic of Germany in the field of medicine.

The B cells entrusted with the production of antibodies are activated via the so-called antigen receptor. The receptor consists of a membrane-bound antibody and two further proteins, which Reth has discovered. These proteins act like heralds: they tell the B cell when a cognate antigen has docked on the antibody portion of the antigen receptor and help transmitting the

signal for B cell activation. Reth has elucidated numerous molecular details of this signaling pathway. Errors in the signaling mechanism can lead to leukemia.

Reth's work has also disproven the cross-linking model of B cell activation that still persists in many textbooks. Every B cell carries about 120,000 antigen receptors. As the Paul Ehrlich and Ludwig Darmstaedter prize laureate was able to demonstrate, they do not occur singly on the surface but rather in groups. "The binding of an antigen destabilizes the group," Reth explains. "It then disintegrates into individual antigen receptors. This process of dissociation is what kicks off the activation of the B cells." The cross-linking model holds the opposite to be true: according to this model, the antigen receptor is activated by individual receptors associating together to form a group.

Since you can only really understand something if you put it together from its individual components, Reth uses the tools of synthetic biology in order to express the antigen receptor of mammals in the fruit fly. His next goal is to learn more about the protein landscape on the B cell's surface. "We've discovered that the membrane proteins in the range of 10 to 200 nanometers are arranged in a more orderly fashion than we had previously assumed," says Reth. "They are not distributed haphazardly on the B cell's surface but are organized in protein islands. It might also be possible to control the activation of the antigen receptor via the organization of these protein islands." Reth is anticipating a host of new knowledge about immune cells from this foray into the nanoworld.

Short biography of Professor Michael Reth

Michael Reth was born in 1950 in Düsseldorf. He studied biology in Cologne and obtained his doctorate from the Institute of Genetics of the University of Cologne. After a postdoctoral period at Columbia University in New York, he returned to Cologne in 1985 where he received his "Habilitation". In 1989 he moved to the Max Planck Institute of Immunobiology in Freiburg. In 1995 he was appointed Professor of Molecular Immunology at the Albert-Ludwigs University in Freiburg and continues to do research at the Max Planck Institute of Immunobiology and Epigenetics in Freiburg. In 2007 Reth was appointed Director of the BIOS Centre for Biological Signalling Studies, an excellence cluster. Michael Reth has received numerous awards: the Heinz Maier-Leibnitz Prize for Immunogenetics, the Gottfried Wilhelm-Leibniz Prize of the DFG, the EFIS-Schering-Plough-European Immunology Prize and an Advanced Grant of the European Research Council. Reth is a member of the German Academy of Sciences Leopoldina and of the European Molecular Biology Organization EMBO. He is also an Honorary Member of the American Association of Immunologists and sits on the editorial board of various specialist journals.

The Paul Ehrlich and Ludwig Darmstaedter Prize

The Paul Ehrlich and Ludwig Darmstaedter Prize is traditionally awarded on Paul Ehrlich's birthday, March 14, in the Paulskirche, Frankfurt. It honors scientists who have made significant contributions in Paul Ehrlich's field of research, in particular immunology, cancer research, microbiology, and chemotherapy. The Prize, which has been awarded since 1952, is financed by the German Federal Ministry of Health, the Deutsche Bank Foundation in the Stifterverband für die Deutsche Wissenschaft e.V., the German association of research-based pharmaceutical company vfa e.V. and specially earmarked donations from companies. The prizewinner is selected by the Scientific Council of the Paul Ehrlich Foundation.

The Paul Ehrlich Foundation

The Paul Ehrlich Foundation is a legally dependent foundation which is managed in a fiduciary capacity by the Association of Friends and Sponsors of the Goethe University, Frankfurt. The Honorary Chairman of the Foundation, which was established by Hedwig Ehrlich in 1929, is the German Federal President, who also appoints the elected members of the Scientific Council and the Board of Trustees. The Chair of the Paul Ehrlich Foundation is Professor Harald zur Hausen, and the Chair of the Board of Trustees is Dr. Rolf E. Breuer. Professor Wilhelm Bender, in his function as Chair of the Association of Friends and Sponsors of the Goethe University, is at the same time the Chair of the Scientific Council of the Paul Ehrlich Foundation. The Chancellor of the Goethe University is at the same time a member of the Board of Trustees.

Further information

You can obtain selected publications, the list of publications and a photograph of the prizewinner from the Press Office of the Paul Ehrlich Foundation (c/o Dr. Hildegard Kaulen, phone: +49 06122/52718, email: Paul-Ehrlich-Stiftung@uni-frankfurt.de and at www.paul-ehrlich-stiftung.de.