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Infectious disease and allergy: Imbalance among helper cells

Tim R. Mosmann receives the Paul Ehrlich and Ludwig Darmstaedter Prize 2008

FRANKFURT am MAIN. **Professor Tim R. Mosmann**, (58), a chemist and physiologist who is the Director of the David H. Smith Center for Vaccine Biology and Immunology at the University of Rochester Medical Center, USA, is to receive the 2008 Paul Ehrlich and Ludwig Darmstaedter Prize with a total prize money of 100,000 euros for his outstanding contribution to the field of immunology. The award was conferred by the Council of the Paul Ehrlich Foundation, which has explained its decision as follows: "Tim Mosmann's research work has led to the discovery of two subsets of T helper lymphocytes, the Th1 and Th2 cells, thereby furthering our understanding of the mechanism underlying infectious diseases and allergies." The Paul Ehrlich and Ludwig Darmstaedter Prize is among the most prestigious international awards granted in the Federal Republic of Germany in the field of medicine. The award ceremony will take place in the Paulskirche in Frankfurt am Main on March 14, 2008, the birthday of Paul Ehrlich (1854-1915).

The Th1/Th2 paradigm

The body's immune defenses are furnished by the white blood cells or lymphocytes. While the so-called B lymphocytes synthesize antibodies, the T lymphocytes are subdivided into CD8⁺ T cells, which play an important role in defense responses to viral infections, and CD4⁺ T helper lymphocytes. The T helper lymphocytes in turn can be broken down into two groups, the Th1 and the Th2 cells. These two subsets can be distinguished by the different messengers they secrete. Th1 cells play a key role in the pathogenesis of autoimmune diseases, while Th2 cells are involved, for instance, in the development of allergies.

Th1 cells synthesize the messengers interleukin-2 (IL-2), interferon- γ (IFN- γ) and tumor necrosis factor- α (TNF- α). Th2 cells produce IL-4, IL-5, IL-6, IL-10 und IL-13. In addition to the Th1 and Th2 subsets, which were identified in 1986, a Th17 cell has now been described, which appears to be of crucial importance in autoimmune diseases.

It is through their release of IL-4 that Th2 cells are involved in the development of allergies, because IL-4 stimulates the synthesis of the IgE antibodies that are characteristic of allergies. The antagonist of IL-4 formed by Th2 cells is interferon- γ , which is synthesized by Th1 cells; this is because interferon- γ suppresses the release of IgE antibodies. Interferon γ is released when a virus infects a cell and prevents the virus both from replicating in the infected cells and from infecting other cells. This explains why IFN- γ is also used to treat certain viral

diseases, including hepatitis B viral infections. Moreover, IFN- γ has another important function: It stimulates the production of Th1 cells and so shifts the balance between Th1 and Th2 cells in favor of the Th1 cells.

According to this concept, which is called the Th1/Th2 Paradigm and which Tim Mosmann developed in 1986 on the basis of his work on mice, allergies develop as a consequence of a shift in the balance of Th1 and Th2 cells in favor of Th2 cells. Just which factors are involved in this shift is currently the focus of intensive research work, although the main "players" are known to be IFN- γ and IL-4, along with IL-10. "Through his work, Tim Mosmann has been instrumental in furthering our understanding of how immune defenses function in infectious diseases, autoimmune diseases such as allergies, and chronic inflammatory diseases such as rheumatoid arthritis," said Professor Joachim Kalden, Director Emeritus of Medical Clinic 3, Erlangen University Hospital, and member of the Council of the Paul Ehrlich Foundation, in his tribute to Tim Mosmann's achievements. "The knowledge gained in this way has provided a basis for the development of new treatment options."

Short biography of Tim Mosmann

Professor Tim Mosmann was born in Birkenhead, UK, on March 7, 1949, and studied chemistry and physiology at the University of Natal, and microbiology at Rhodes University, both in South Africa. He completed his Ph.D. at the University of British Columbia in Canada in 1973 and then spent two years at the Sick Children's Hospital in Toronto, Canada, before moving to the University of Glasgow, UK. In 1977, he was appointed Assistant Professor at the University of Alberta in Edmonton, Canada, and five years later moved to the DNAX Research Institute in Palo Alto, California, USA, where he remained until 1990. He was then appointed Professor of Immunology and later of Immunology and Microbiology at the University of Alberta. Since 1998 he has been Professor of Microbiology & Immunology at the University of Rochester and Director of the David H. Smith Center for Vaccine Biology and Immunology. Tim Mosmann is a British citizen.

Tim Mosmann holds numerous patents, is a member of various scientific societies and a Fellow of the Royal Society of Canada, and has won prestigious scientific awards such as the William B. Coley Award of the United States' Cancer Research Institute (1997) and the Avery-Landsteiner Prize of the German Society of Immunology (1994). According to data supplied by the Institute for Scientific Information, he has been among the most widely cited scientists since 2002. He has been scientific adviser to companies such as Genzyme Diagnostics and MedCell Biologics, Inc..

The Paul Ehrlich and Ludwig Darmstaedter Prize

The Paul Ehrlich and Ludwig Darmstaedter Prize is traditionally presented on Paul Ehrlich's birthday, March 14, in the Frankfurt Paulskirche. It is awarded to scientists in recognition of their special achievements in Paul Ehrlich's field of research, especially immunology, cancer research, hæmatology, microbiology and chemotherapy. This year, the laudatio will be held by Professor Joachim Kalden, Director Emeritus of Medical Clinic 3, Erlangen University Hospital, and Member of the Council of the Paul Ehrlich Foundation. Hilmar Kopper, Chairman of the Council, will present the award jointly with a representative of the Federal Ministry of Health. The prize, which has been awarded since 1952, is financed by tied donations from the Federal Ministry of Health, companies and the German Association of Research-Based Pharmaceutical Companies.

The Paul Ehrlich Foundation

The Paul Ehrlich Foundation is a legally dependent foundation of the Association of Friends and Patrons of the Johann Wolfgang Goethe University Frankfurt am Main e.V. The Honorary President of the Foundation, which was set up in 1929 by Hedwig Ehrlich, is the President of the Federal Republic of Germany, who also appoints the elected members of the Council and the Board of Trustees. The Chairman of the Association of Friends and Patrons is at the same time the Chairman of the Council of the Paul Ehrlich Foundation. This committee, comprised of 12 nationally and internationally reputed scientists from four countries, selects the prizewinners. The President of the Johann Wolfgang Goethe University is ex officio member of the Board of Trustees of the Paul Ehrlich Foundation.

Further information

The personal biography, selected publications, list of publications and photos of the prize winner can be obtained from the Press Office of the Paul Ehrlich Foundation (c/o Dr. Monika Mölders, phone: 0049-6238-982783, fax: 0049-6238-982784, e-mail: Paul-Ehrlich-Stiftung@pvw.uni-frankfurt.de).

Additional Information

http://www.urmc.rochester.edu/GEBS/faculty/Tim_Mosmann.htm