

Diabetes Research

T cells in babies give clues to who will develop type 1 diabetes

Together with colleagues from Helmholtz Zentrum München, researchers at the DFG Center for Regenerative Therapies Dresden (CRTD) in Dresden introduce a new understanding of cellular mechanisms occurring in babies having a high risk of developing type 1 diabetes. The study was published in 'Science Translational Medicine'.

Type 1 diabetes occurs when the body's own immune system destroys the cells in the pancreas that produce insulin. The process usually starts in childhood in genetically at risk children, and can be detected by the presence in the blood of antibodies to proteins in the pancreas. Each year, there are about 2300 new cases of type 1 diabetes in Germany and this number has doubled in the last twelve years. While a genetic predisposition helps to identify children at risk for the disease, researchers around the world still try to further identify why in some children at risk the disease breaks out while in others not.

Led by Prof. Ezio Bonifacio, group leader and Director at the DFG Center for Regenerative Therapies Dresden (CRTD), Cluster of Excellence at TU Dresden, and group leader at DZD-Paul Langerhans Institute Dresden, the researchers closely looked at six months old children at high risk of developing type 1 diabetes followed throughout childhood by Prof. Dr. Anette-G. Ziegler, Director of the Institute of Diabetes Research at Helmholtz Zentrum München. One group of these children later in life developed autoantibodies that are typical for type 1 diabetes, while the other did not. When the researchers stimulated the T cells from the children with the pancreas proteins, they could identify a specific type of aggressive T-cells (TFH-TH1-TH17) that developed only in the children who later became positive for the antibodies. These T cells developed further into fully activated TH1 cells after the children became positive for the antibodies.

"Our finding on cells from these very young children is fascinating. It is the first time we are able to pinpoint a molecular difference in the immune system of children who develop diabetes so early in life. These exciting findings indicate that the immune system is already wrongly programmed, genetically or environmentally, really early. Our job now is to learn how to reset it before it starts to react against the insulin producing cells. We hope that the Freder1k study and our prevention studies will teach us", explains Ezio Bonifacio.

"We were able to find these rare cells in the blood with new sophisticated methods established at the CRTD. We are trying to understand exactly what these special cells do and how they come about", says CRTD scientist Dr. Anne Eugster. "We are excited at the possibility of using this knowledge to help developing prevention therapies such as our vaccination strategy", comments Anette-G. Ziegler.

Further Information

Background:

Physicians are observing an increase in the number of new cases of the disease each year among children and adolescents. In Germany, approximately 4 in every 1000 people suffer from type 1 diabetes.

Original Publication:

Heninger, AK. et al. (2017): [A Divergent Population of Autoantigen-Responsive CD4⁺ T Cells in Infants Prior to \$\beta\$ Cell Autoimmunity](#). Science Translational Medicine, doi: 10.1126/scitranslmed.aaf8848

Founded in 2006, the [DFG Research Center for Regenerative Therapies Dresden](#) (CRTD), Cluster of Excellence at the TU Dresden has now passed the second phase of the Excellence Initiative which aims to promote top-level research and improve the quality of German universities and research institutions. The goal of the CRTD is to explore the human body's regenerative potential and to develop completely new, regenerative therapies for hitherto incurable diseases. The key areas of research include haematology and immunology, diabetes, neurodegenerative diseases, and bone regeneration. At present, eight professors and ten group leaders are working at the CRTD – integrated into an interdisciplinary network of 87 members at seven different institutions within Dresden. In addition, 21 partners from industry are supporting the network. The synergies in the network allow for a fast translation of results from basic research to clinical applications. www.crt-dresden.de

The [Helmholtz Zentrum München](#), the German Research Center for Environmental Health, pursues the goal of developing personalized medical approaches for the prevention and therapy of major common diseases such as

diabetes and lung diseases. To achieve this, it investigates the interaction of genetics, environmental factors and lifestyle. The Helmholtz Zentrum München is headquartered in Neuherberg in the north of Munich and has about 2,300 staff members. It is a member of the Helmholtz Association, a community of 18 scientific-technical and medical-biological research centers with a total of about 37,000 staff members. www.helmholtz-muenchen.de/en

The [Institute of Diabetes Research](http://www.helmholtz-muenchen.de/en/idf/index.html) (IDF) focuses on the pathogenesis and prevention of type 1 diabetes and type 2 diabetes and the long-term effects of gestational diabetes. A major project is the development of an insulin vaccination against type 1 diabetes. The IDF conducts long-term studies to examine the link between genes, environmental factors and the immune system for the pathogenesis of type 1 diabetes. Findings of the BABYDIAB study, which was established in 1989 as the world's first prospective birth cohort study, identified risk genes and antibody profiles. These permit predictions to be made about the pathogenesis and onset of type 1 diabetes and will lead to changes in the classification and the time of diagnosis. The IDF is part of the Helmholtz Diabetes Center (HDC). www.helmholtz-muenchen.de/en/idf/index.html

The [German Center for Diabetes Research](http://www.dzd-ev.de/en/index.html) (DZD) is a national association that brings together experts in the field of diabetes research and combines basic research, translational research, epidemiology and clinical applications. The aim is to develop novel strategies for personalized prevention and treatment of diabetes. Members are Helmholtz Zentrum München – German Research Center for Environmental Health, the German Diabetes Center in Düsseldorf, the German Institute of Human Nutrition in Potsdam-Rehbrücke, the Paul Langerhans Institute Dresden of the Helmholtz Zentrum München at the University Medical Center Carl Gustav Carus of the TU Dresden and the Institute for Diabetes Research and Metabolic Diseases of the Helmholtz Zentrum München at the Eberhard-Karls-University of Tuebingen together with associated partners at the Universities in Heidelberg, Cologne, Leipzig, Lübeck and Munich. www.dzd-ev.de/en/index.html