

Federal Ministry of Education, Science, Research and Technology (BMBF)

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Research success: Details on the origin of autoimmune diseases for the first time

An estimated 5% of all adults in Europe and the United States suffer from autoimmune diseases. The clinical picture: A disorder of the immune system causes inflammation in various organs of the body. Once such a condition has appeared, its existence is usually, with varying intensity, granted for a lifetime. Such chronic inflammation may lead to the destruction of the affected organs. Diseases triggered by autoimmune mechanisms include such diverse types as diabetes, multiple sclerosis and rheumatic diseases.

The origin of the mechanism of an autoimmune disease has so far been widely unknown. A research joint venture of 20 projects, promoted since 1990 with 13 million German Marks by the Federal Ministry of Education, Science, Research and Technology (BMBF) brought new insights.

Disease mechanism explored

The mechanisms of disturbances of the immune system have so far been largely unknown. A project of the BMBF-promoted research network "Autoimmunity Research" discovered that heavy metals as gold and mercury may trigger a disorder of the immune system: A certain group of white blood cells, the so called T lymphocytes, plays a key role in today's scientific awareness. Usually they function in combination with other immune cells to protect the organism from invading bacteria and viruses. There are, however, T lymphocytes that go "astray" and attack the body's own cellular structures. The healthy body eliminates many of these defective cells by a self-destruction mechanism, or immobilizes them through other various control mechanisms. Once an autoimmune disease has occurred, this is different: Misguided T cells become active and attack the body's own tissues.

Large research success

Whether it were external factors or internal body processes that had triggered those attacks on the 'self' - in most cases of autoimmune diseases this was only a matter of assumption. It was also unclear which endogenous molecules were misguided by the immune system. The observation that certain heavy metals are capable of inducing an autoimmune disease is therefore godsend. Ernst Gleichmann and his colleagues from the University in Düsseldorf, Germany, discovered in mice that the treatment of an antigen with either gold salts or mercury salts alters the immune response against this antigen. Antigens are foreign to the body. Without administration of heavy metal salts the proper part of the antigen is attacked by T cells - whereas after treatment with gold or mercury, the immune system re-acts distorted. The immune system then, also attacks portions of the antigen that are not supposed to be fought.

The reason: Heavy metals induce a chemical alteration of the antigen. T cells are no longer able to recognize the original antigen. It is assumed that this mechanism is also responsible for the emergence of autoimmune diseases.

The possibility of new treatment strategy

Many drugs that are used to treat rheumatism include gold salts as those exert a curative effect on rheumatoid arthritis. Rheumatoid inflammation as an unwanted side effect occurs on 20 percent of the patients that are treated this way. This is presumably a result of the described autoimmune mechanisms. However, other available drugs for treatment of rheumatism are also associated with significant side effects; alternative options for treatment are therefore limited. But, due to these new insights, researchers are now able to develop new strategies for more effective treatment of autoimmune diseases.

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