

Synthetic carbohydrates against autoimmune diseases

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Researchers are developing an innovative approach for the treatment of a rare autoimmune disease of the peripheral nervous system, using a type of molecular sponge consisting of carbohydrates to remove pathogenic antibodies from the bloodstream. Developed to treat anti-MAG neuropathy, the approach also has potential applications for the treatment of other autoimmune diseases. Scientists from the University of Basel and University Hospital Basel have reported their findings in the scientific journal *PNAS*.

Patients with anti-MAG neuropathy predominantly suffer from sensory loss in their arms and legs, neuropathic pain, and a loss of coordination that can substantially impair mobility. Through progressive damage to the peripheral nerves, the patients become increasingly disabled in their day-to-day lives until they require full-time care.

The disease is diagnosed based on the presence of blood serum autoantibodies that bind to the myelin-associated glycoprotein (MAG) in the peripheral nervous system. These anti-MAG [antibodies](#) have long been recognized as the cause of the disease. Furthermore, a reduction of the antibody concentration in the blood leads to an improvement in the symptoms.

To date, no approved treatment is available that specifically targets these autoantibodies. Current therapies are directed to suppress the immune response; they are inefficient and in some cases cause serious side effects.

Artificial molecule as a sponge

Basel-based researchers are thus working on a new treatment approach with customized synthetic glycopolymers that act like a sponge on the harmful autoantibodies. The glycopolymer mimicks the section of the MAG protein the anti-MAG antibodies are binding to.

The scientists could show in vitro that the glycopolymer neutralizes the [disease](#)-causing antibodies in patient sera and more importantly, that the anti-MAG antibodies could be effectively removed in immunized mice.

Potential for other autoimmune diseases

This new treatment method offers significant potential not only for an antigen-specific treatment of anti-MAG neuropathy but also for other antibody-mediated autoimmune diseases.

Currently, only fragmentary knowledge of the antigens in many [autoimmune diseases](#) is available. Antigen-specific therapies are therefore very difficult to develop. "The use of our glycopolymers opens up new possibilities for the treatment of diseases where anti-glycan antibodies play a role," says study director Professor Beat Ernst from the Department of Pharmaceutical Sciences at the University of Basel. Examples of such diseases include multifocal motor neuropathy or Guillain-Barré syndrome.

Collaboration with spin-off

These findings are the result of a joint project between the University of Basel's Department of Pharmaceutical Sciences and Polyneuron Pharmaceuticals AG, a University of Basel spin-off founded by Dr. Ruben Herrendorff, Professor Andreas Steck and Professor Beat Ernst

in 2014. The project was funded by the Commission for Technology and Innovation (CTI), the Gebert R f Foundation, and the Neuromuscular Research Association Basel.

Polyneuron Pharmaceuticals AG is currently preparing for a clinical trial with the glycopolymer drug for the [treatment](#) of anti-MAG neuropathy.

More information: Ruben Herrendorff et al., "Selective in vivo removal of pathogenic anti-MAG autoantibodies, an antigen-specific treatment option for anti-MAG neuropathy," *PNAS* (2017).

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