

## Human protein produced in a moss bioreactor

**The research group led by Prof. Ralf Reski is a moss specialist and has now, for the first time, succeeded in producing a human protein in a moss bioreactor – the complement factor H. The lack of this protein leads to age-related macular degeneration in about 50 million people worldwide. The complement factor H has been assigned ‘orphan drug’ status by the respective EU authorities.**

Diabetics use human insulin produced in bacteria in order to treat their metabolic disorder. Many other genetically engineered proteins are also on the advance in the field of medicine. They are used for diagnosis as well as therapy. Whereas insulin used to be extracted from slaughterhouse waste, it is nowadays produced genetically in bacteria. However, more complex proteins need to be synthesised in more complex organisms. This mostly takes place in bioreactors using animal cell lines. Biotechnologist Prof. Dr. Ralf Reski from Freiburg has developed the moss *Physcomitrella patens* into a safe and inexpensive supplier of medicine.

Reski’s group has now, under the leadership of Dr. Eva Decker, for the first time succeeded in producing a human protein in a moss bioreactor, the lack of which is the main cause of age-related blindness in 50 million people worldwide. The drug was assigned ‘orphan drug’ status by the respective EU authorities, which means that the development and approval of such medicines receive particular support from the authorities. The amount of this protein decreases in many people as they get older – with severe consequences. “With the complement factor H, we have produced a protein in moss that otherwise only occurs in blood and is important for the immune system,” said Eva Decker going on to add that “too low amounts of this protein in older people is the main cause of age-related macular degeneration (AMD), which is a major problem, particularly in industrialised countries.”

Biochemists from the Freiburg Center for Biological Systems Analysis, led by Dr. Andreas Schlosser, were able to show with the help of high-performance mass spectrometers that the human factor H produced by moss was a complete protein. Infection biologists, led by Prof. Dr. Peter F. Zipfel from the Hans Knöll Institute in Jena, Germany, were able in biological assays to show that factor H from moss is fully functional. “Currently, factor H is not available in pharmacies. Therefore, treatment of AMD with this protein is not possible,” said Peter Zipfel. “To date, the recombinant production of factor H was difficult. I am convinced that the moss bioreactor is a promising option for doing so.”

“It will still take a while before drugs produced in moss are available in pharmacies,” said Ralf

Reski, member of the Baden-Württemberg Innovation Council. "We are further optimising the moss bioreactor using systems biology and synthetic biology methods. However, the implementation of clinical trials and the establishment of industrial production take a long time and are expensive. Therefore, this is the task of industry and not of university research."

The work was supported by the German Federal Ministry of Education and Research, the Freiburg Initiative for Systems Biology and the BIOSSE excellence cluster.

**Original publication:**

Annette Büttner-Mainik, Juliana Parsons, Hanna Jérôme, Andrea Hartmann, Stephanie Lamer, Andreas Schaaf, Andreas Schlosser, Peter F. Zipfel, Ralf Reski, Eva L. Decker (2010): Production of biologically active recombinant human Factor H in *Physcomitrella*. *Plant Biotechnology Journal*, doi: 10.1111/j.1467-7652.2010.00552.x.

**Contact:**

PD Dr. Eva Decker  
Plant Biotechnology  
Faculty of Biology, University of Freiburg  
Tel.: +49 (0)761-203-6968  
E-mail: pbt(at)biologie.uni-freiburg.de

---

**Press release**

08-Aug-2010

Source: Albert-Ludwigs-Universität Freiburg (21.07.10) (P)