

Healthcare industry BW

Engineered moss produces human hormone

Erythropoietin (EPO) is a human protein hormone that is predominantly produced in kidneys. Scientists from the Chair of Plant Biotechnology of the University of Freiburg, Germany, around Dr. Eva Decker and Professor Ralf Reski and from the Freiburg-based biotech company greenovation have genetically engineered the moss *Physcomitrella patens* in such a way that it now produces recombinant human asialo-EPO in the moss bioreactor. The researchers published their results in the current online-version of the Plant Biotechnology Journal.



Light only light" developed by the artist Jun Takita
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EPO plays a major role in the formation of red blood cells, a process known as erythropoiesis. It is commonly used to treat and prevent anaemia in nephrology and cancer patients. Today this pharmaceutical is produced as recombinant human EPO in animal cell cultures, especially in Chinese hamster ovary (CHO) cells. EPO is the leading biopharmaceutical with a world-wide market of about ten billion Euro per year. This hormone has a bad reputation in the public due to its abuse in unethical and illegal doping of athletes.

More recently it was shown that in the human body EPO is made in different tissues when oxygen supply is limited. In these cases the hormone protects these tissues by inhibiting apoptosis, a cell death program that occurs in stress conditions. In this context EPO is a potential treatment for stroke, diabetes-induced eye damage and peripheral nerve injury.

Asialo-EPO has no potential doping activity

In the human blood, the EPO protein has attached several complex sugar structures which make up to 40% of its molecular mass. These sugar moieties modify half-life and function of the hormone in the human body. A specific form of this complex glycoprotein, the asialo-EPO, can provide tissue protection but does not stimulate red blood cells. Thus, recombinant asialo-EPO is regarded as a safe drug as it has no potential doping activity.

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Eva Decker explains: "Asialo-EPO is hard to produce in animal cell cultures. In contrast, the genetic engineering performed in moss did not alter growth or performance of the plants. We, therefore, suggest the moss bioreactor as the system of choice for the production of this potentially neuroprotective protein." Ralf Reski, a co-founder of greenovation and currently Senior Fellow at the Freiburg Institute for Advanced Studies (FRIAS) says: "This exciting new protein is the result of a combination between plant biotechnology and synthetic biology we are dedicated to in our Freiburg-based research cluster of excellence, BIOS. We hope that its potential as biopharmaceutical will be assessed soon."

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