

Medicines from plants

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Dr. Jürgen Drossard, Dr. Thomas Rademacher and Dr. Stefan Schillberg (from left to right) produce active substances in transgenic plants and plant suspension cells. Credit: © Dirk Mahler

Some people think of herbal teas, others of tobacco when they hear the buzzword "medicines from plants". One research team succeeded in producing biopharmaceuticals -- such as an antibody against HIV, for example, -- in tobacco plants.

"Medicines from plants" – one thinks of herbal teas or valerian drops. However, that has nothing in common with what the researchers at the Fraunhofer Institute for Molecular Biology and Applied Ecology IME in Aachen, Germany, are doing. They use plants to produce

biopharmaceuticals. Those are proteins that, unlike many other medications, cannot be chemically produced.

Biologically produced medications, such as recombinant insulin or therapeutic [antibodies](#) to fight cancer, have become indispensable. Plants are particularly suitable for producing complex active substances. The reason is that these substances can be produced inexpensively and on a large scale in plants. Compared to producing them in animal cells, plants have the advantage that they grow quickly, are easy to look after and can be protected well against damaging influences.

Precisely controlled raising of plants

Tobacco was the plant of choice. Dr. Jürgen Drossard explains the reason: "Tobacco has long been a very interesting plant for molecular biologists. It is easy to modify, meaning a foreign gene coding for the pharmaceutical protein can be introduced. In addition, a lot of biomass grows quickly and therefore a greater quantity of the desired proteins is also produced." The active substances must be absolutely safe. It is for this reason that the requirements both for growing the plants and for the processes and equipment for the preparations are particularly high. The researchers from Aachen passed the stringent tests of the supervisory and approval authorities for both. "The [tobacco plants](#) are protected from all external influences and grown under precisely controlled conditions. We practically grow them on sterile substrates. And fertilization with manure is absolutely out of the question, of course," says Dr. Thomas Rademacher.

But growing the plants only solved a part of the problem. Because, how does one get as much protein as possible from the leaves that are harvested? The team developed the equipment that is suitable for that itself, because current processes, coming from food technology, for example, work on an entirely different scale. The complete pulping

process now takes place in a closed loop.

Biopharmaceuticals for clinical studies

Dr. Jürgen Drossard, Dr. Thomas Rademacher and Dr. Stefan Schillberg from the IME, in cooperation with Prof. Dr. Wiltrud Treffenfeldt from Dow AgroSciences and Dr. ctive substances in transgenic plants and plant suspension cells – economically and safely. They are being honored with the Prize for Human-Centered Technology for their achievements.

"We wanted to show that it can be done, that biopharmaceuticals can be produced that are suitable for clinical studies," says Dr. Stefan Schillberg of the IME. And this is exactly where the team is at with its development. The proteins that are produced in this manner are currently being tested with the objective that they be used in clinical studies. For example, the antibodies could be used to manufacture a vaginal gel with which women could protect themselves from an [HIV](#) infection. In a new project, the researchers are currently working on producing a malaria vaccine in [plants](#).

Provided by Fraunhofer-Gesellschaft

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