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[Zürich][Biotech] Engineered Moss Can Produce Human Proteins

ScienceDaily (May 11, 2009) — ETH Zürich researchers have shown that mosses and humans share unexpected common characteristics. These evolutionary relics could be useful in the production of therapeutic proteins.

Mosses and human beings appear to have little in common. The moss Physcomitrella patens is small, pale green, immobile, and uses sunlight as its energy source. Humans are large, mobile, and need to obtain energy by eating vegetable or animal foods. This made the result of the experiments carried out by researchers in the group led by Martin Fussenegger, Professor of Chemical and Bioengineering at ETH Zürich, all the more astonishing. In collaboration with researchers at the University of Freiburg im Breisgau, the PhD student Marc Gitzinger carried out tests to see what happens when unmodified human or mammalian genes are inserted into the moss genome. They transferred the foreign, unmodified genes into the moss and discovered that the moss was easily able to manufacture the proteins encoded therein.

The same process, however, does not work when a mammalian gene is implanted into what are known as “higher” flowering plants. The reason is that sections of the start and finish sequences of the genes of animals, plants, fungi and bacteria are considerably different. They are responsible for ensuring that a gene in the organism is recognized as such, and the proteins encoded by it are produced in the correct amount and are released from the cell. This is why biotechnologists must normally adapt them to a foreign organism before transplanting a gene into it. The researchers were astonished to find that this was not necessary in the case of the moss.

The explanation given for this by Ralf Reski, Professor of Plant Biotechnology at the University of Freiburg im Breisgau, is that the moss has remained a generalist. Today, the moss Physcomitrella patens and its ability to manufacture mammalian proteins could help to satisfy the large worldwide demand for therapeutic proteins. One well-known example is insulin, which enables diabetics to control their blood sugar level. However, further research will be needed before the moss can be used to produce therapeutic proteins on an industrial scale.

Journal reference:

1. Gitzinger et al. Functional cross-kingdom conservation of mammalian and moss (Physcomitrella patens) transcription, translation and secretion machineries. Plant Biotechnology Journal, 2009; 7 (1): 73 DOI: 10.1111/j.1467-7652.2008.00376.x

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