

## Campus Vienna Biocenter – Thriving Plant Research

Date: 02-10-2006 01:15 PM CET

Category: [Health & Medicine](#)

Press release from: [Campus Vienna Biocenter](#)

Agency: **PR&D - Public Relations for Research & Development**

At the Campus Vienna Biocenter research has begun into environmental stress-induced changes to the plant genome supported by the Austrian genome program (GEN-AU). A EUR 1.3 million budget has been allocated to the three-year project. Two task groups at the University of Natural Resources and Applied Life Sciences and five at the Campus will investigate how extreme environmental conditions impact on the plant genome. It is also hoped that evidence will be found to support the hypothesis that inheritable environmental adaptations of living organisms do not occur randomly. Confirmation of this would revolutionise current thinking about heredity.

But surely everyone knows mutations happen by chance, don't they? Researchers at the Campus Vienna Biocenter are not so certain, and this is precisely the question a three-year project there will now address. A total of 17 scientists will be looking into the effects of environmental stress on the genome of the model plant *Arabidopsis* with financial support from the Austrian genome program (GEN-AU), a program funded by the Ministry of Education, Science and Culture. They will also investigate whether stress reactions may contribute to further changes in the genome. If that were the case it would show that mutations do not simply arise randomly, but are also influenced by the plant metabolism – and it would be time to re-write the textbooks.

Prof. Heribert Hirt of the Dept. of Microbiology and Genetics at the University of Vienna commented: "In the early 19th century it was widely believed that the adaptation of living organisms to their environment was a systematic process, and could be passed on to offspring. Darwin and modern genetics overturned these assumptions. According to them, inheritable adaptations are random. A few of them are beneficial, and are naturally selected. It is now known that random adaptations are caused by mutations. However for some time now there has been evidence that mutations are by no means as random as was thought. In lower organisms such as bacteria, in particular, it has been shown that mechanisms leading to an increased incidence of mutations are activated by certain types of stress."

The settled life style of higher organisms, and plants in particular, means that they have to resort to a wide range of reactions to adapt to environmental stress. The consortium of scientists in Vienna will now attempt to clarify whether changes in the plant genome can also arise from environmental stress. Such alterations include methylations of parts of the DNA or of associated proteins. These occasional chemical structure modifications regulate gene expression and precipitate environmental adaptations. But permanent genome changes such as base pair changes, or the multiplication of a single gene or whole chromosomes are also stress reactions. If it were demonstrated that these permanent, and hence inheritable changes are a specific reaction to environmental stress, this would mean that the plant influenced the environmental adaptations of future generations — a state of affairs at odds with current scientific teaching.

Prof. Hirt is well aware of the project's wider implications. As he put it: "Plants are increasingly coming under threat from global climate change. In our project we will therefore subject plants to precisely the kinds of stressful conditions that are caused by climate change, including extreme temperatures, drought and increased UV radiation. We suspect that this abiotic stress affects the genome, but we know little about what these effects mean for species development. The aim of our project is to understand the impacts and to be able to use them in the future."

### Project Consortium:

University of Natural Resources and Applied Life Sciences, Department of Applied Genetics and Cell Biology: Dr. Marie-Theres Hauser, Dr. Christian Luschnig, co-ordinator

Gregor Mendel-Institute of Molecular Plant Biology (GMI): Dr. Werner Aufsatz, Dr. Claudia Jonak, Dr. Ortrun Mittelsten-Scheid, Dr. Karel Riha

Max F. Perutz Laboratories, University of Vienna, Department of Plant Molecular Biology: Dr. Heribert Hirt

About the Campus Vienna Biocenter (February 2006):

The Campus Vienna Biocenter is one of the largest R&D clusters in Austria with approx. 1,000 scientists from 40 nations at 16 organisations. Academic departments (University of Vienna, Medical University of Vienna, subsumed in the Max F. Perutz Laboratories), private research institutes (IMP - Institute of Molecular Pathology) and institutes of the Austrian Academy of Sciences (IMBA - Institute of Molecular Biotechnology and GMI - Gregor Mendel-Institute) are also located here along with commercial R&D companies, service companies and training course centres ([www.viennabiocenter.com](http://www.viennabiocenter.com)).

Supported by Innovatives-oesterreich.at, Campus Vienna Biocenter Association, dialoggentchnik and the agency PR&D

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Vienna, 10th February 2006

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