# Plants recycle too

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A research team from VIB and Ghent University (Belgium), and Staffan Persson from the Max Planck Institute of Molecular Plant Physiology in Potsdam (Germany) has now identified a new protein complex which is crucial for endocytosis in plants.

Cells communicate through proteins embedded in their cell membranes. These proteins have diverse functions and can be compared with antennas, switches and gates. For the well-being of the cell, it has to adjust the composition of its membrane proteins and lipids constantly. New proteins are incorporated, while old proteins get recycled or eliminated. The process by which membrane material gets internalized is called endocytosis. A research team headed by Daniël van Damme and Geert De Jaeger from VIB and Ghent University (Belgium), and Staffan Persson from the Max Planck Institute of Molecular Plant Physiology in Golm near Potsdam (Germany) has now identified a new protein complex which is crucial for endocytosis in plants. This finding has now been published in the scientific journal *Cell*.

## Take up and recycle

Plants and animals are made up of billions of cells. For the optimal functioning of organisms, cells must receive information from their neighboring cells and from their surroundings. Cells communicate through proteins anchored in their membranes. These can be receptors, which function as antennas or switches to detect the presence of certain molecules, or transport proteins, which act as gates to control the uptake of nutrients. To optimize the communication, the cell needs to adjust the

composition of its membrane at any time. The process by which new membrane proteins are sent to the membrane is called exocytosis. The opposite process, which is needed to take up membrane material, is called endocytosis. To initiate endocytosis, adaptor proteins need to recognize specific areas of the membrane to be internalized. Proteins that encage this membrane area are subsequently recruited. As a result, a small portion of the membrane will then invaginate and ultimately pinch off to produce a vesicle inside the cell. Membrane proteins incorporated in such vesicles can then be degraded, recycled or transported to other parts of the cell.

## The TPLATE complex shows the way

For several decades, endocytosis has been heavily investigated in plants, animals and yeast. This has resulted in a wealth of information about the many proteins involved, but also about the complex interactions between them. Nevertheless, only a few adaptor-related components have been found in plants. Using state-of-the-art techniques, researchers of VIB, Ghent University and the Max-Planck-Institute in Potsdam-Golm have now identified an adaptor protein complex which is essential for endocytosis and which only exists in plants. The complex is built of the protein TPLATE and seven previously unknown proteins. The TPLATE complex turned out to be key for plant endocytosis as it arrives first at the position where endocytosis should get initiated. In terms of evolution, the plant specificity of the TPLATE complex was a surprising discovery. While proteins involved in endocytosis, such as clathrin, are conserved across the animal and plant kingdoms, the members of the TPLATE complex appears specially designed for plants. To which plant cell properties the TPLATE complex is an adaptation, remains subject for further investigation. These research results are now published in the prestigious scientific journal *Cell* thanks to intense collaboration between VIB and the Max-Planck-Institute.

Provided by VIB (the Flanders Institute for Biotechnology)