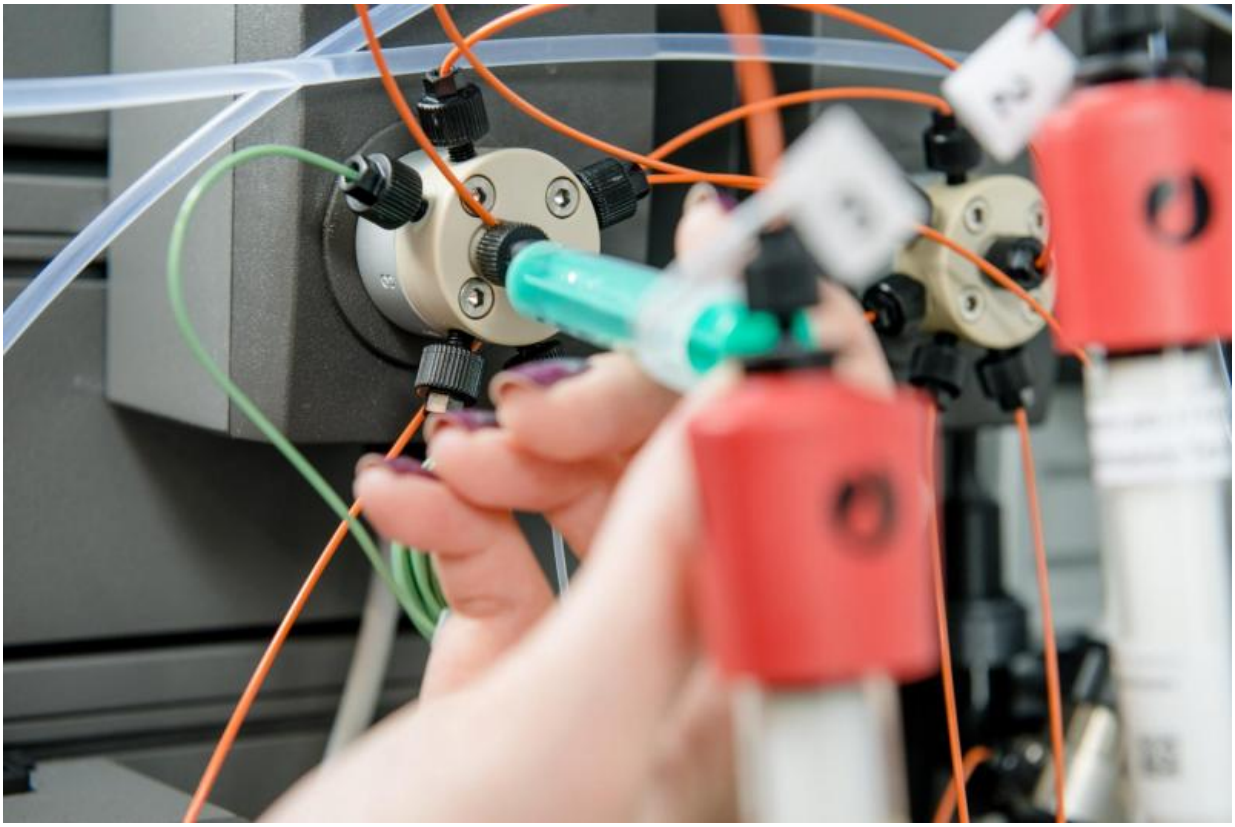
# Researchers discover giant pores in the membrane of the cell organelles

December 4 2015



The RUB researchers gained new insights into the mechanisms of protein import into the peroxisomes using chromatography. With this method, they can purify molecules and then characterise them in detail. Credit: Marquard

Researchers have discovered a second giant pore for the transport of

folded proteins in certain cell organelles, i.e. peroxisomes. Five years ago, the group already described the first giant pore. The team headed by Prof Dr Ralf Erdmann from the Institute of Biochemistry and Pathobiochemistry at the Ruhr-Universität Bochum published the findings in the journal *Cell Reports* together with colleagues from Osnabrück, Bremen and Göttingen.

## Import of folded proteins had baffled researchers for a long time

The functions of peroxisomes include, for example, the degradation of fatty acids and the elimination of toxic hydrogen peroxide in the cell. They contain numerous enzymes that they have to import from the cytoplasm. "For a long time, scientists had no understanding of how peroxisomes import large proteins," says Ralf Erdmann. "Especially since the proteins traverse the membrane in folded state." This means they are not transported in the form of a long chain of amino acids, but rather in their final three-dimensional configuration, the dimensions of which can be huge.

## Two signal sequences mark proteins for the peroxisome

Proteins that are assigned to the peroxisomes carry certain signal sequencies. There are two types, namely PTS1 and PTS2. They are recognised by import receptors, which transport the folded proteins via a giant pore inside the peroxisomes. The pore that was discovered five years ago grants access to proteins with PTS1 sequences. The new pore is permeable to proteins with PTS2 sequences. Prior to the current study, it was considered that proteins with different signal sequences are imported via the same pore. Now, the researchers want to conduct a further study to figure out why separate import channels exist.

# Pore is giant by cellular standards

"With a diameter of 4.5 nanometres, the PTS2 pore is giant by cellular standards," explains Prof Erdmann. The study, moreover, demonstrated that the channel has other properties than the PTS1 pore. For example, it is apparently unable to adjust its size to the protein that is to be transported. "However, in the model organism that we analysed the proteins transported via this channel did not exceed a certain size. Thus, size adjustment would have probably been an unnecessary luxury," assumes Erdmann. If the PTS2 transport channel malfunctions, the consequences for humans are fatal. Most patients die within the first year of life, often due to respiratory disorders.

**More information:** M. Montilla-Martinez, S. Beck, J. Klümper,M. Meinecke,W. Schliebs, R. Wagner, R. Erdmann (2015): Distinct pores for peroxisomal import of PTS1 and PTS2 proteins, *Cell Reports*, DOI: 10.1016/j.celrep.2015.11.016

Provided by Ruhr-Universitaet-Bochum