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Assessing transport route of gliadin through the small intestinal epithelium

Wheat gliadins have high proline content which makes them resistant to hydrolysis of digestive enzymes. These resulted long peptides can trigger celiac disease or gluten sensitivity. In small intestine peptides are generally ingested by small intestinal epithelial cells by tri-or dipeptide transporters. However, gliadin fragments are too long for peptide transporters. Until now it has been unclear how gliadin peptides are transported to lamina propria.

The aim was to study the gluten peptide uptake by epithelial cells and transfer to the lamina propria by following photostable labelled gluten peptides under the confocal microscope.

The research was done with peptic tryptic digested wheat gliadin and maize zein that were covalently linked to photostable fluorescent labels. The immortalized Caco-2 intestinal epithelial cells were exposed to the labelled gluten or zein peptides. The cells were fixed at different time points, or the transfer was followed in time-lapse imaging. In both experiments the samples were imaged with Evident FV4000 confocal microscope.

The conjugated molecules were photostable and were visible under the microscope for few hours. In pilot experiments, after 60 min follow-up, only few labelled molecules could be detected inside the epithelial cells, whereas majority of the label was still residing outside the cellular membrane.

This method helps to understand how enterocytes react with gluten peptide, and how they are transferred to the lamina propria. This in the long run can help us to understand the first pathological reactions leading to celiac disease.