Chemical and biological sensors to measure protein secretion in yeast

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The *in vivo* characterization of protein activities, key metabolites and other important parameters has become one of the central quests in molecular cell biology. The development and applications of tools that allow visualizing these parameters in living cells is therefore a highly active and interdisciplinary area of biological and chemical research. One of the goals of these activities is to obtain quantitative data on cellular processes in living cells and thereby to complement the more traditional analyses with a new *in vivo* biochemistry.

Protein secretion in yeast is a spatially and temporally regulated process. I will introduce two approaches that allowed us to measure aspects of early and late stages of this pathway in the living yeast.

The first approach is based on a split protein sensor and allowed us to measure the protein interactions that occur during the translocation of a protein across the membrane of the endoplasmic reticulum (ER). By employing fusions to different signal sequence bearing test proteins and to components of independent channel systems we could monitor the flux of secretory proteins through the different translocation channels in the membrane of the ER.

In an alternative approach we developed a new labeling strategy to modify fusion protein with fluorescent dyes and other chemical compounds. I will discuss how this technique helped us to visualize the spatially and temporally restricted delivery of proteins to the surface of the yeast cell. Examples of further applications of this labeling technique to investigate the properties of surface proteins will be discussed.