LS24-058 - Designing a professional-secretory synthetic endoplasmic reticulum in yeasts and plant cells

Zusammenfassung

The endoplasmic reticulum (ER) is the key organelle for folding and processing of secretory proteins. Inefficient folding and secretion are a major challenge in production of recombinant proteins needed as biopharmaceuticals or for securing future food requirements. In most non-mammalian cells, the ER is spatially limiting these processes. SynthER aims to go beyond mere physical ER expansion by tailoring functionality through orthogonal and combinatorial expression of synthetic ER shaping proteins in yeast and plant cells. Inspired by professional secretory mammalian cells, SynthER envisages to biomimic their stacked ER sheet and luminal architecture in yeast and plants. The new morphologies will be monitored by a wide range of microscopic methods and quantitative image analyses, and their impact on the quality and quantity of secreted recombinant proteins will be determined.

Furthermore, synthetic ER exit vesicles (SERV) will be designed to deliver their protein cargo directly to the plasma membrane, bypassing the often adverse functions of the Golgi and vacuole. SERVs shall be programmable synthetic circuits, that can be expressed on demand.

Taken together, SynthER will develop novel cell factory concepts that represent a significant advance to the state of the art. Synthetic endomembrane engineering addresses a timely research topic through a pioneering synthetic biology approach with significant potential for advancing both the scientific understanding of secretory pathway plasticity and impacting technological applications, thus benefiting medicine and biotechnology.

Our ground-breaking interdisciplinary combination of cross-kingdom molecular and cell biology in microbes and whole plants together with advanced microscopy and engineering unlocks new scientific opportunities and expands the toolkit of synthetic cellular design.

Wissenschaftliche Disziplinen:
Cell biology (35%) | Industrial biotechnology (30%) | Molecular biology (35%)

Schlagworte:
endomembrane engineeringendoplasmic reticulumKomagataella phaffii / Pichia pastorisplant cell engineeringyeast biotechnologyrecombinant protein productionprotein folding and secretion

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Weiterführende Links zu den beteiligten Personen und zum Projekt finden Sie unter
https://wwtf.at/funding/programmes/ls/LS24-058/