ABSTRACT

Title: A Glimpse into Cell Death Mechanisms for Sustainable Yeast Biotechnology: The MSCA Doctoral Network "Understanding and Postponing Yeast Cell Death (UPsYDe)"

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Abstract content:
Yeasts are widely used as microbial cell factories to convert renewable feedstocks into valuable products, including biofuels, proteins, pharmaceuticals and lipid-derived compounds. While *Saccharomyces cerevisiae* remains the best-studied industrial yeast, non-conventional species such as *Komagataella phaffii*, *Yarrowia lipolytica* and *Debaryomyces hansenii* offer important traits for biotechnology, including methylotrophy, lipid production and tolerance to extreme conditions.
The productivity and sustainability of yeast-based bioprocesses depend strongly on how long cells remain viable and productive. However, yeast cells have a limited lifespan and can die through distinct, regulated cell death (RCD) pathways. Although RCD has been extensively studied from a fundamental cell biology perspective, its role under industrial process conditions remains poorly understood, especially in non-conventional yeasts.
UPsYDe (https://upsyde.eu/) aims to decipher how yeast cells die under industrially relevant conditions and to use this knowledge to improve yeast bioprocesses. By combining yeast cell biology, quantitative physiology, biotechnology, fermentation technology, systems biology and synthetic biology, UPsYDe will investigate cell death mechanisms, identify genetic and process-related triggers, and develop strategies to prolong productive lifespan.
The network will use *S. cerevisiae* as a benchmark and extend its approach to *K. phaffii*, *Y. lipolytica* and *D. hansenii* and other species. Key objectives include developing rapid methods to distinguish yeast cell death phenotypes, identifying genetic and environmental factors involved in cell death, studying cell heterogeneity, and integrating these insights into dynamic metabolic models.

UPsYDe will train a new generation of doctoral researchers able to connect fundamental yeast biology with industrial biotechnology. By presenting the network at this conference, we aim to increase the visibility of UPsYDe's scientific objectives, share its interdisciplinary approach with the yeast research community, and highlight the relevance of yeast cell death for both fundamental biology and applied bioprocess development. This dissemination will help create awareness of the network's activities and open opportunities for future scientific exchange, collaboration and translation of UPsYDe findings into more robust and sustainable yeast-based processes.