



Project title: Sustainable Microbial Valorisation of Waste Lipids into Biosurfactants (Waste2Surf)

Project No. 1.1.1.1/19/A/047

Project leading partner: University of Latvia

Project partners: JSC "Biotehniskais Centrs"

Project report on the tasks completed in the period from 01.04.2023. till 30.06.2023.

As the project enters its final phase, more focus is placed on summarizing and analysing results thus concluding some of the project activities. During this reporting period, modelling efforts continued in both the Genome Modelling Group and the Sustainability Modelling Group.

The Metabolic modelling group has developed cell designs that could be considered candidates for laboratory implementation. These designs offer numerous alternative pathways for gene expression, with a significant number of implementation options to be analysed. Some designs focus on producing bioactive compounds using alternative gene-protein-reaction associations. The completion of cell design development marks a significant milestone in this activity.

The Sustainability modelling group has concluded work on the system dynamics model and is now proceeding with multi-criteria analysis to assess the sustainability of sophorolipid production. The model's individual structures have been enhanced to reduce uncertainties. Simulations have captured the system's state for the years 2020, 2030, and 2050. The system dynamics model, its modules, and various scenarios are detailed in a project report. As the system dynamics activity concludes, the project's final phase will focus on comprehensive multi-criteria analysis to evaluate the sustainability of sophorolipid production. Ongoing work includes the selection of indicators and value determination.

In the Yeast physiology laboratory, heterologous gene cloning has demonstrated the activity of expressed genes. Four out of six genes have been prepared for expression in *Y. lipolytica* using the GoldenGate protocol. The construction of recombinant cells will continue until the project's end. A method has been adapted for assessing the production of bioactive compounds using *Y. lipolytica*.

At the partner institution, fermentation experiments using the Model Predictive Control system have been conducted. Data from these experiments have been consolidated for reporting purposes. Testing and refinement of the optimization algorithm are ongoing, focusing on identifying states where the algorithm may not perform effectively. Additional parameters will be incorporated into the system to enhance the recognition of sophorolipid synthesis and biomass growth states.

Throughout the reporting period, several dissemination and communication activities have been implemented, including poster presentations in two international scientific conferences. In addition, a three-day seminar-training course "Biomodelling Spring 2023" was organized to promote and share knowledge on the metabolic modelling methods used in the project.

Information about the project at the partner's website: <https://www.bioreactors.net/wastetosurf>

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