Press release

nova-Institut GmbH (www.nova-institute.eu)

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MeMBrane project ends after more than three years

The ERA CoBio funded MeMBrane project is drawing to a close at the end of this year and the team are reflecting on a successful project in difficult times.

At the kick off meeting in July 2018 the consortium from 9 institutions and 6 countries gathered in Birmingham, UK, with no one having met any more than one other partner on the project. This made it all the more remarkable to find the collaboration such a positive, supportive and cooperative working group. The group's diverse skillset proved to be synergistic as data was collected and combined into compelling narratives to inform biological membrane engineering.

The Spanish team set about developing yeast strains that were more tolerant to the increasingly high levels of alcohol encountered in wine production as a result of climate change, starting with characterising their vast collection, identifying strains with different tolerances, generating hybrids and analysing gene expression. This was complemented by lipidomic analysis and in vitro studies using liposomes by Aston University in the UK. In silico modelling of the membrane at Groningen, NL was used alongside these analyses to explain the effect of ethanol on different membrane compositions at a molecular level. An improved strain is being tested at scale by industrial partners Lallemand.

In Germany, researchers at Julich worked on a biological process for producing the antimicrobial propionate (PA) using Propionibacteria. This proved to be a very difficult bacterium to work with but after overcoming a number of hurdles the culture conditions were determined and a good yield of propionate was achieved. The process is now being scaled up at the Industrial Partner, Pakmaya. Metabolic fluxes in Propionibacteria are being studied using the MORFlux tool developed by the York team.

MORF is also used to hold, share and interrogate the 'omics data from the MeMBrane project and this will become openly available for the community after publication. The MORF platform is another output from the MeMBrane project and is now available for future projects with fermentation or 'omics data.

Also, at Julich, a parallel project focussed on production of the plant polyphenol resveratrol in Corynebacteria. Significant improvements in yield were achieved when a biphasic cultivation strategy was adopted to reduce the cytotoxic effects of resveratrol. During such biphasic cultivations, a second organic phase takes up the resveratrol and reduces the stress for the producing bacteria in the hydrophilic phase, which can now synthesize more resveratrol over a longer time. Furthermore, in close collaboration with project partner Remembrane, several small molecules could be identified, which reduce the interaction of resveratrol with the Corynbacterium membrane upon supplementation during cultivation. Modelling of the

Corynebacterium membrane by researchers in Groningen along with in vitro analysis at Aston provided further insights into the effects of these molecules on the membrane.

Finally, nova institute evaluated the effects of the MeMBrane technology by assessing feedstocks, performing Life Cycle Analysis (LCA) and using Association of German Engineers (VDI) assessment, which also takes into account the socioeconomic factors arising from a disruptive technology. Evaluation of the biobased PA, benchmarked against fossil-derived PA, identified a number of aspects where a biobased alternative could provide an advantage. The implementation of improved yeast species in wine and bioethanol fermentation was also explored. Results of LCA and VDI analysis showed that MeMBrane technology can improve the sustainability impact in both wine and bioethanol production.

The consortium is looking forward to future opportunities to work together and develop the research further, as well as seeing the results of the industrial scale tests!

https://www.membrane.org.uk

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