MOLECULAR BIOTECHNOLOGY

Eukaryotic microorganisms such as filamentous fungi and algae have many talents sought after by the biotechnology industry. For example, filamentous fungi are world-champions in protein secretion and algae are of interest for their nutrient content and importance in biofuel production. Research projects available within the group contribute to the development of new technologies for high-level expression of genes in filamentous fungi, understanding protein secretion in fungal cell factories and mapping the capacity of microalgae for biotechnological applications. We are also looking into some medical fungi with a view of understanding the nature of fungal virulence factors.

Our research uses a variety of contemporary molecular technologies applied to eukaryotic microorganisms. We carry out gene amplification and knock-outs and conduct genomic and proteomic analyses to understand metabolism, protein secretion and regulation in the eukaryotic hosts under study. As part of the synthetic biology initiative at MQ, we are also designing and introducing new parts and abilities into organisms.

If you are interested in working with eukaryotic microorganisms, come and talk to us so we can tailor a project according to your specific interests. Please consult the examples below.

MAKING HUMAN ENZYMES IN A FUNGAL CELL FACTORY

We have a number of exciting new fungal recombinant strains that produce human glycosyltransferases. These enzymes will have to be produced in fermentor cultivations at high levels for detailed structural and functional characterisation. Our bench-top fermentor is user friendly, yet equipped with the latest technology and software.

A considerable task after molecular construction of a production strain is to optimise the cultivation so that the production potential of the organism will be utilised to its maximum. This involves testing different growth media, pH conditions, aeration rates etc. in a computer-controlled laboratory fermenter where such parameters can be adjusted. The work also features ‘molecular mapping’ of the production where the messenger RNA levels will be assessed and e.g. ‘production proteomes’ created to assess the progress of fermentation. This research area suits for a biotechnology-oriented person who would like to develop practical skills in microbial strain development and analysis including product fermentation. Detailed characterisation of the product made can be included as part of the project.

SYNTHETIC BIOLOGY TOOLS FOR FUNGI AND MICROALGAE ARE ALSO DEVELOPED IN THE GROUP

This involves expanding the recombinatory space in eukaryotic microbes, designing synthetic gene promoters and gene editing. Projects will be designed around tools available at any given time. Work in progress involves yeast and the industrially-exploited filamentous fungus *Trichoderma, reesei.*
Selected Publications


