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Assessing the potential of micro-fermentations through screening and media optimisation of recombinant  $\beta$ -carotene production by the yeast *Yarrowia lipolytica*.

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The demand for  $\beta$ -carotene as a natural pigment and an antioxidant has increased in previous years. All projections show that the demand will increase even more in the coming years [1], [2]. Currently  $\beta$ -carotene is produced either chemically or synthetically, the latter has been linked to multiple negative effects including cancer [3]–[7]. These concerns, in addition to a more critical view on synthetic colorants from the public has offset the search for natural or recombinant production platforms. Low productivities and difficulties are some of the issues associated to the few existing naturally-derived production systems [4], [6], [8].

As a result, we chose to focus on the production of recombinant  $\beta$ -carotene from an engineered *Yarrowia lipolytica* strain [1], and how we could optimise the production capacity as much as possible through media optimisation. In *Yarrowia*, the terpenoid pathway and lipogenesis share a common precursor, therefore we hypothesised that optimising the lipogenesis would also optimise the synthesis of  $\beta$ -carotene. To maximise the number of parameters in our screening we used the BioLector I micro-fermentation system, which allowed us to run 48 micro-fermentations simultaneously.

Among our findings, we identified parameters to optimise in order to target specific points in the metabolism and determined their optimum values. Through scale-up of experiments from micro-scale to benchtop laboratory-scale bioreactors we determined the scalability of the BioLector system to be accurate. We thereby proved that the BioLector I can be used in studies like ours and in studies where a fast and accurate screening method is needed.

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