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[1] Ojo, E.O., Auta, H., Baganz, F. and Lye, G.J. (2015). Design and parallelisation of a miniature photobioreactor platform for microalgal culture evaluation and optimisation. Biochem. Engng. J., in press. [2] Ojo, E.O., Auta, H., Baganz, F. and Lye, G.J. (2014). Engineering characterisation of a shaken, single-use photobioreactor for early stage microalgae cultivation of Chlorella sorokiniana. Bioresource Technol., 173: 367-375.

SINGLE-USE BIOREACTOR TECHNOLOGIES FOR EARLY STAGE DEVELOPMENT OF MICROALGAE CULTIVATION PROCESSES

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This work describes the engineering characterization and evaluation of two novel, single-use photobioreactor technologies for microalgal cultivation. There is currently considerable interest in microalgae as alternative expression systems for the production of value-added chemicals as well as therapeutic proteins and vaccines. In contrast to mammalian expression systems, however, bioreactor platforms to address early stage development challenges are not well established particularly for phototrophic and mixotrophic cultivation strategies.

To support early stage cell line selection and process characterization a single-use, 24-well micro photo-bioreactor (mPBr) was established together with an illuminated and environmentally controlled shaker platform [1]. The same orbital shaker platform was also used for microalgae cultivation up to 10L scale, in single-use bags usually used for mammalian cell cultivation on rocked platforms [2]. Particularly for small and micro-companies this single-use photobioreactor (SUPBr) provides a route for rapid process optimization and materialization of novel products from microalgae.

Both bioreactor technologies were characterized in terms of their fluid hydrodynamics, mixing and gas-liquid mass transfer. The influence of these factors as well as light path length and light intensity on growth and pigment formation in *Chlorella sorokiniana* was also studied. Successful scale translation between the mPBr and the SUPBr was demonstrated illustrating the complementarity of the two approaches to help reduce microalgal bioprocess development timelines.

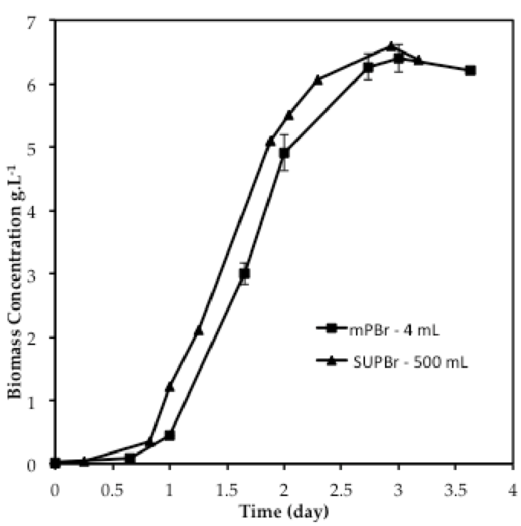

Figure 1 – Comparison of Chlorella sorokiniana *growth kinetics in orbitally shaken miniature (mPBr) and single-use (SUPBr) bioreactors under matched growth conditions. Results show a quantitative growth comparison over 125-fold scale translation.*

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