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Microbial applications of Single Use bioreactor systems

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MICROBIAL APPLICATIONS OF SINGLE USE BIOREACTOR SYSTEMS

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This work describes the ongoing assessment of single use bioreactors (SUBs) and their suitability for culturing microbial expression systems. Microbial expression systems are responsible for significant revenues as part of the biotechnology industry, in fact, their projected value for 2016 is in excess of $250 billion [1]. This promotes further interest in the area, with novel expression systems and pathways constantly under construction for the generation of bulk and high value chemicals.

The advantages offered by single use bioreactor technology has lead to increased adoption in many areas of bioprocessing [2], and microbial fermentation is no different. Applications include simple fermentation, but additionally areas such as whole cell bioconversions, which can further increase the challenges already presented to single use systems. Arguably the greatest of these challenges is providing sufficient oxygen mass transfer [3], not only to support the culturing of microbial expression systems, but also for use as a substrate during processing with whole cell oxidative bioconversions.

In order to facilitate the processing of microbial whole cell oxidative bioconversions in single use bioreactor technology, a whole cell P450 bioconversion was optimized at small scale using multifactorial statistical methods and characterized in a traditional bench top stirred tank bioreactor (STR). Characterisation of this elevated oxygen requirement, as a result of growth and the bioconversion forms the basis for understanding the demands that will be placed on SUBs.

The process of characterizing the oxygen mass transfer capabilities of a range of SUB systems is also underway. This is being done using static and dynamic methods, but also by modeling the influence of a range of key process factors. This characterisation is being carried out in bag type systems, as well as in more rigid technologies, which more closely resemble traditional STRs such as the Ambr250.

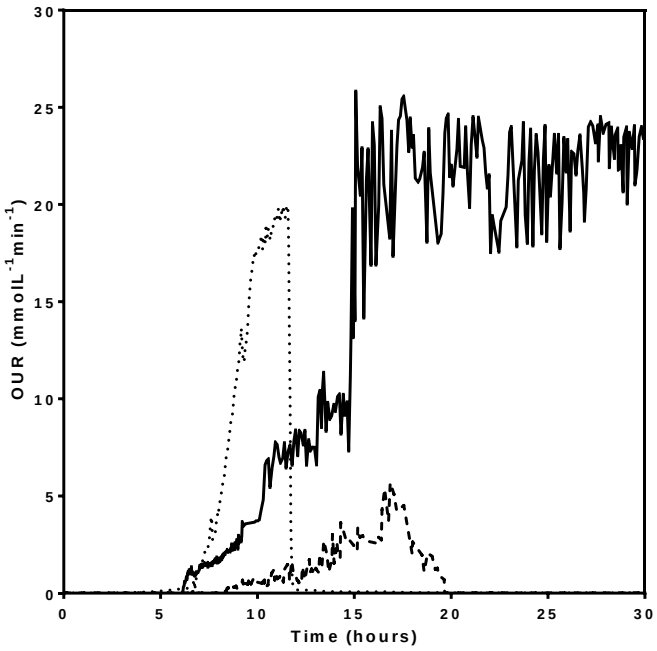

Figure 1 – Oxygen uptake rate during each of the pilot scale cultures. Solid line represents induced fed batch culture, dashed line shows induced batch culture and dotted line the non-induced batch culture.

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