

Comparison of oxygen enriched air vs. pressure cultivations to increase oxygen transfer and to scale-up plasmid DNA production fermentations

Lara AR, Knabben I, Regestein L, Sassi J, Caspeta L, Ramírez OT (2011) Comparison of oxygen enriched air vs. pressure cultivations to increase oxygen transfer and to scale-up plasmid DNA production fermentations *Engineering in Life Sciences* 11(4), 382-386.

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Abstract

Escherichia coli producing a plasmid DNA (pDNA) vaccine was cultivated in fed-batch mode at small scale (1 L) using oxygen-enriched air, and at pilot scale (50 L) using a pressurized bioreactor, to maintain aerobic conditions. In the small scale, the attained oxygen transfer rate (OTR_{MAX}) using an oxygen concentration in the inlet gas of 68.2%, reached $0.42 \text{ mol L}^{-1} \text{ h}^{-1}$. The OTR_{MAX} in the pressurized reactor with an overpressure of 8 bar was $0.5 \text{ mol L}^{-1} \text{ h}^{-1}$. In the small- and pilot-scale cultivations, the final biomass concentrations (74 and 79 g/L, respectively), pDNA concentrations (236 and 215 mg/L), overall productivity and pDNA topology were very similar. Therefore, the pressurized cultivation is a viable option to scale up pDNA production processes.

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Identifier

doi: 10.1002/elsc.201000104

