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## Oxygen supply in disposable shake-flasks: prediction of oxygen transfer rate, oxygen saturation and maximum cell concentration during aerobic growth

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### Abstract:

Dissolved oxygen plays an essential role in aerobic cultivation especially due to its low solubility. Under unfavorable conditions of mixing and vessel geometry it can become limiting. This, however, is difficult to predict and thus the right choice for an optimal experimental set-up is challenging. To overcome this, we developed a method which allows a robust prediction of the dissolved oxygen concentration during aerobic growth. This integrates newly established mathematical correlations for the determination of the volumetric gas-liquid mass transfer coefficient ( $k_La$ ) in disposable shake-flasks from the filling volume, the vessel size and the agitation speed. Tested for the industrial production organism *Corynebacterium glutamicum*, this enabled a reliable design of culture conditions and allowed to predict the maximum possible cell concentration without oxygen limitation.

Keywords: *Corynebacterium glutamicum*, disposable shake-flask, non-invasive optical sensor technology, oxygen transfer rate, volumetric gas-liquid mass transfer coefficient  $k_La$