Disposable orbitally shaken TubeSpin® bioreactor 600 for mammalian cell cultivation

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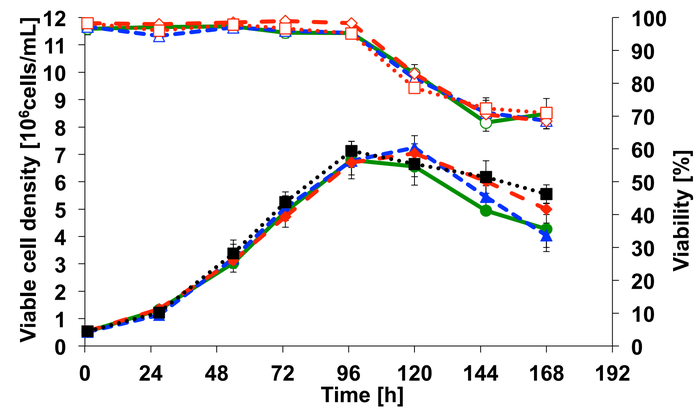
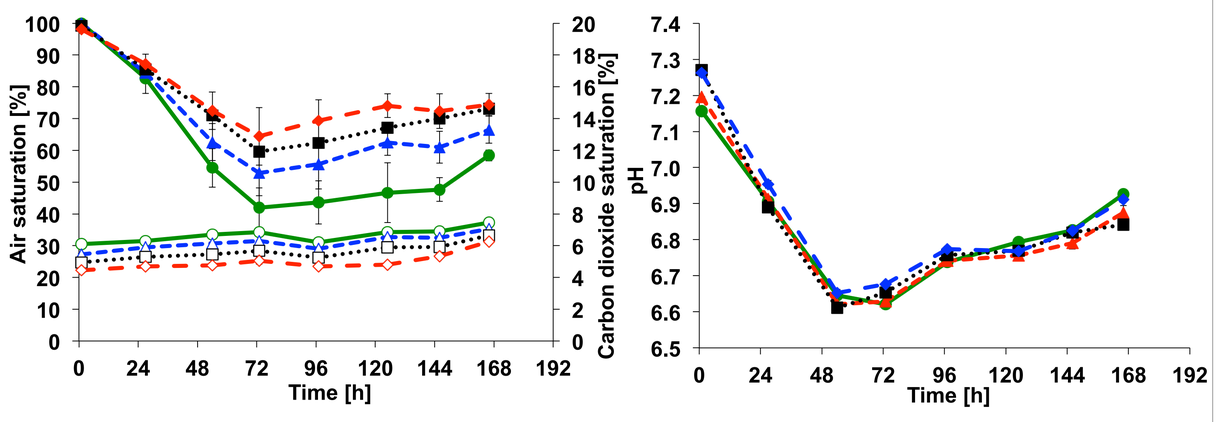
OrbShake Technology

Orbitally shaken (OrbShake) bioreactors have proven to be able to support the efficient cultivation of mammalian cells in suspension. For small-scale cultures, disposable tubes with ventilated caps and nominal volumes of 50 mL (TubeSpin® bioreactor 50 or TubeSpin) and 600 mL (TubeSpin® bioreactor 600 or MaxiTubeSpin) are commercially available. A study to assess mammalian cell cultivation in the TubeSpin® bioreactor 600 in comparison to a 1-L glass cylinderial bottle and a 1-L shake flask is described here.

Comparison of Different Shaking Frequencies

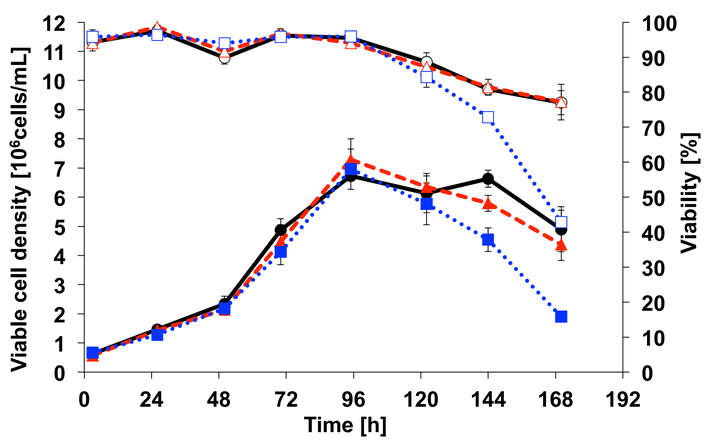


Shaking Frequencies
120 rpm
150 rpm
180 rpm
220 rpm

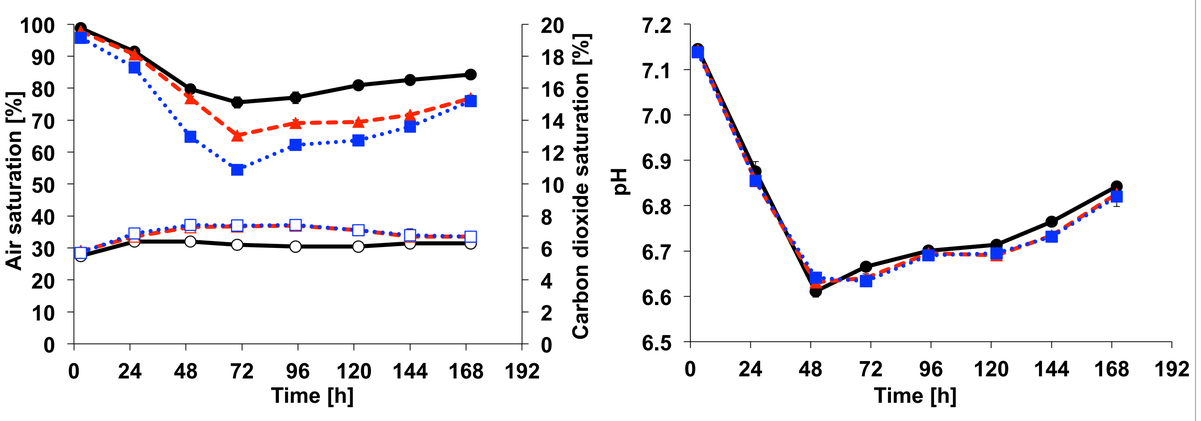


A cell growth comparison was performed by cultivating a CHO-derived cell line expressing a recombinant IgG in a TubeSpin® bioreactor 600 at different shaking frequencies as indicated. The cells were cultured at a working volume of 300 mL on a shaker platform with a shaking diameter of 50 mm. The air and CO_2 saturation and the pH were measured off-line. The cell density and viability were measured by the Trypan Blue exclusion method with a hemocytometer.

Comparison in Different Vessels



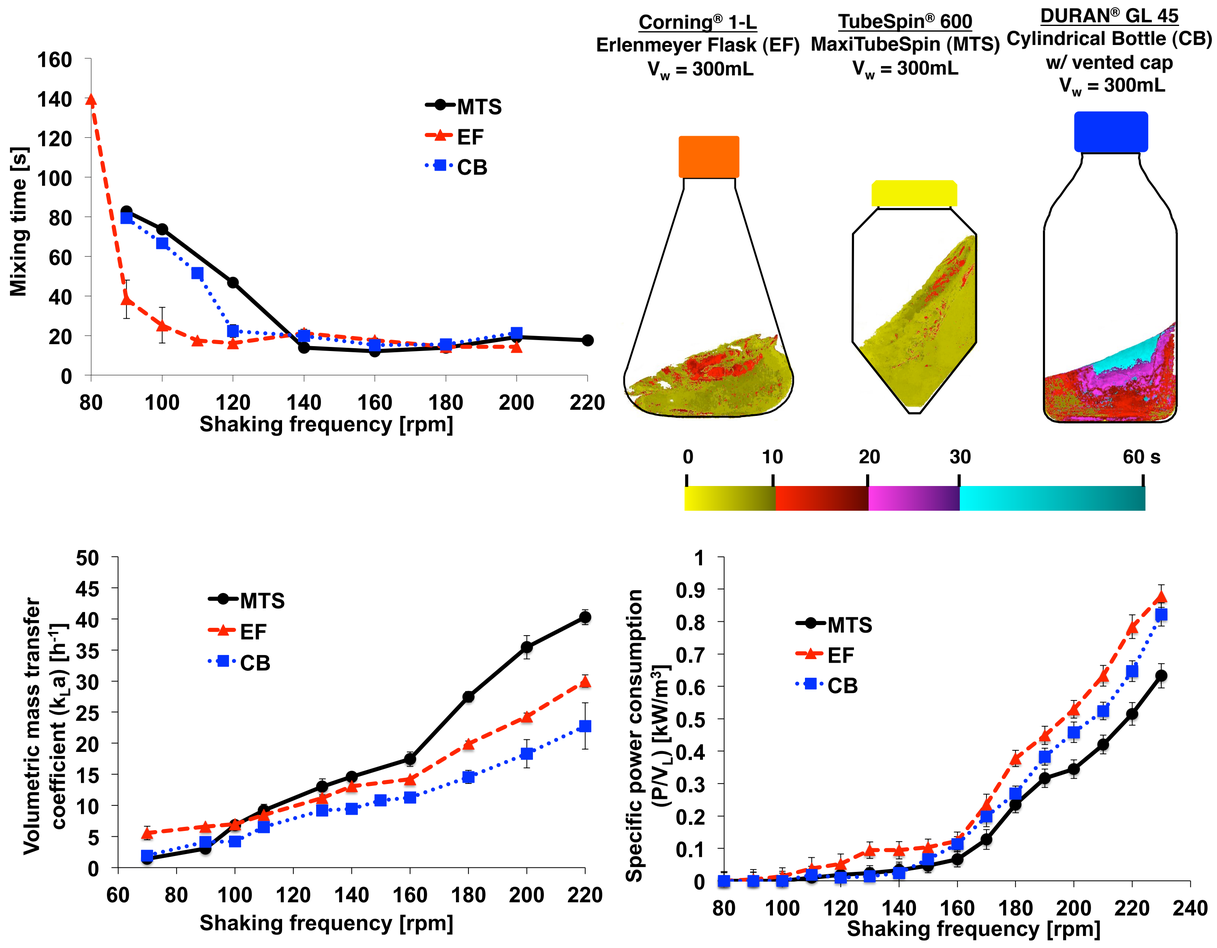
Shaking Frequencies
MTS 180 rpm
EF 120 rpm
CB 110 rpm



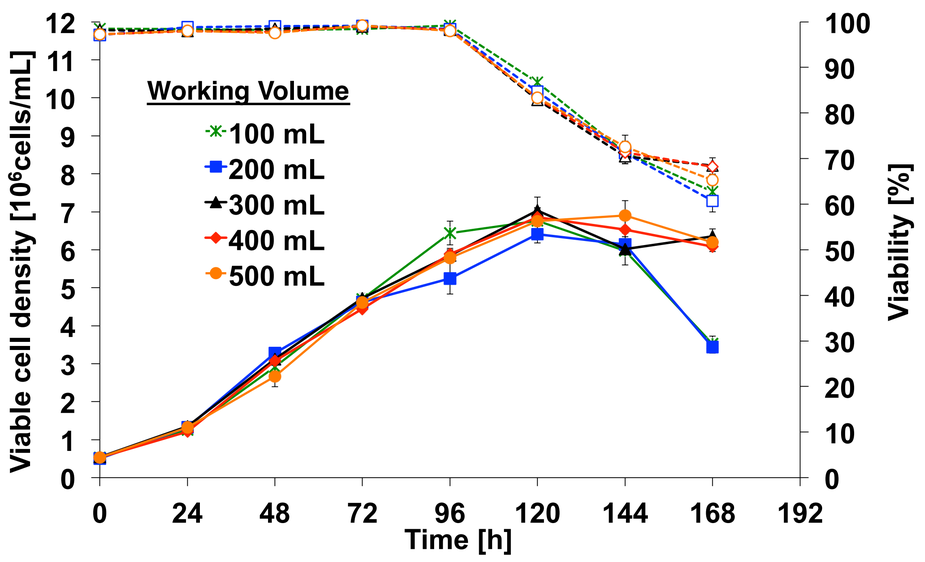
The CHO-derived cell line was conditioned in a Erlenmeyer flask (EF) and then its growth in three different OrbShake vessels including a TubeSpin® bioreactor 600 (MTS), a 1-L cylindrical glass bottle (CB), and an EF was determined. The pH and air and CO_2 saturation were measured off-line. The cell density and viability were measured with the Trypan Blue exclusion method.

Characterization of Engineering Principles

The mixing time was determined using the dual indictor system for mixing time (DISMT). The oxygen mass transfer coefficient or k_La was determined using static gassing-out with non-invasive optical oxygen probes. The specific power consumption was determined by measuring differences in electric power. All engineering studies were completed with a working volume of 300 mL for each vessel.



Comparison of Different Working Volumes



A cell growth comparison was performed with a CHO-derived cell line at different working volumes in TubeSpin® bioreactor 600 vessels. The cultures were agitated at 180 rpm with a shaking diameter of 50 mm.

Conclusions

- High gas transfer, rapid mixing, and low specific power consumption were observed for the TubeSpin® bioreactor 600.
- Animal cell cultivation at medium scale (100 – 500 mL) was demonstrated.
- Overall, the TubeSpin® bioreactor 600 shows comparable cell growth and physical mixing characteristics to 1-L Erlenmeyer flasks and 1-L round bottles.

Acknowledgments
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References
Monteil, D.T. et al., Disposable 600-mL orbitally shaken bioreactor for mammalian cell cultivation in suspension. *Biochem Eng J* 76, 6-12 (2013).

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