The new age in bioprocessing:
Single-use bioreactors for microbial applications

Nico M.G. Oosterhuis[1], Anton Tromper[1], Nick A. van Biezen[2]

Compared to traditional bioreactors, single-use bioreactors show to be more flexible, diminish contamination risk, simplify validation and do require less infrastructure. However, the currently available single-use bioreactors are less suitable for application in microbial fermentation. The innovative CELL-tainer® bioreactor is multi-purpose and suited for both high-density mammalian cell cultures as well as microbial and fungal processes.

Results

In the CELL-tainer® a significant improvement of the k_la value compared to the more traditional Wave Bioreactor™ is found. When *E. coli* cells are cultivated at different scales and in different reactor types, it is shown that the CELL-tainer® bioreactor is well suited for *E.coli* cultivation. Optical densities measured in a 10L CELL-tainer® batch culture are comparable with a 1L and 100L stirred tank bioreactor. For all reactor types, air was enriched with oxygen. When no oxygen is added, growth is more slowly, but an OD = 70 is reached within 48 hrs in a fed-batch culture.
The growth can be controlled by applying a gamma-irradiated in-line glucose measurement which is available as well.

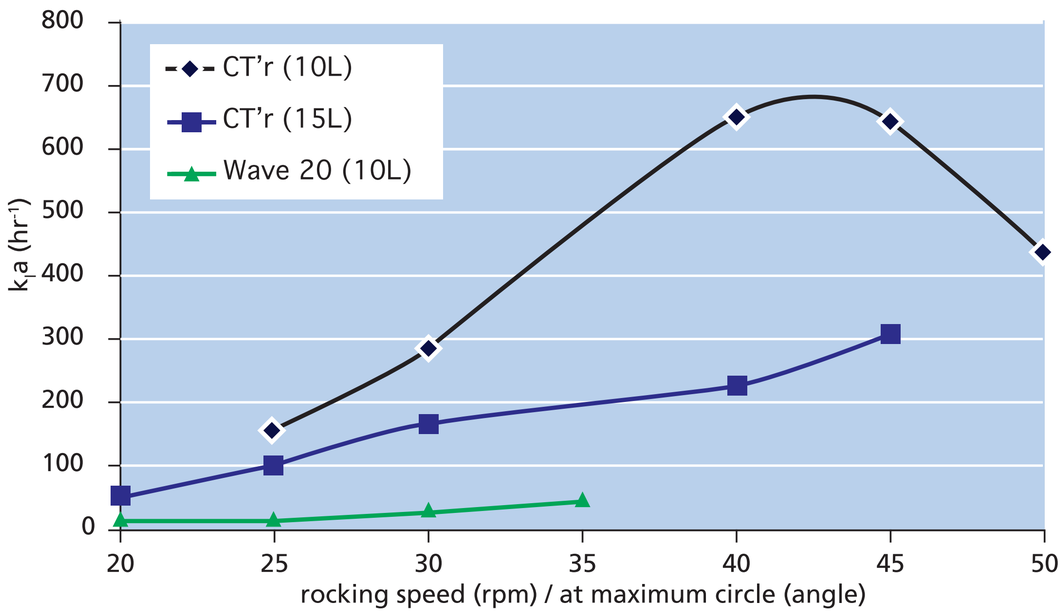
Costs

Due to the fast turn-around time and the restricted infrastructure needed, with the CELL-tainer® single-use bioreactor cost of operation can be reduced with at least 40% compared to an autoclavable or in-situ sterilizable fermenter.
As the system is very flexible in volume (0,2 – 15L in one-and-the-same bag) also for mammalian cultures cost of operation can be reduced even compared to the Wave type of single-use systems. Square shaped bags (3D) offer a volume range of 2,5L-25L in one-and-the-same bag for mammalian cell culture application and up to 20L for microbial fermentation.

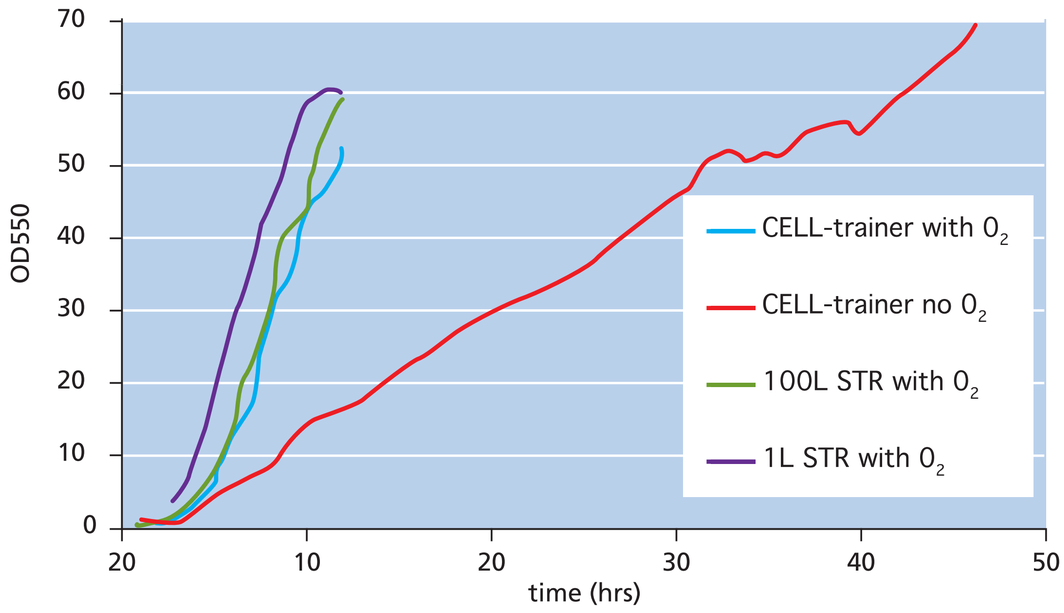
Conclusion

The CELL-tainer® single-use bioreactor is suitable for application with mammalian cell cultures as well as for microbial cultures. Applying in-line glucose measurement makes the system well suitable for process development. Also for screening purposes, pre-culture application and production of small batches the CELL-tainer® is very suitable, more flexible and reduces the risk of contamination. As the system also leads to significant cost reduction we expect a wide-spread of application in bio-processing and therefore a new age is started.

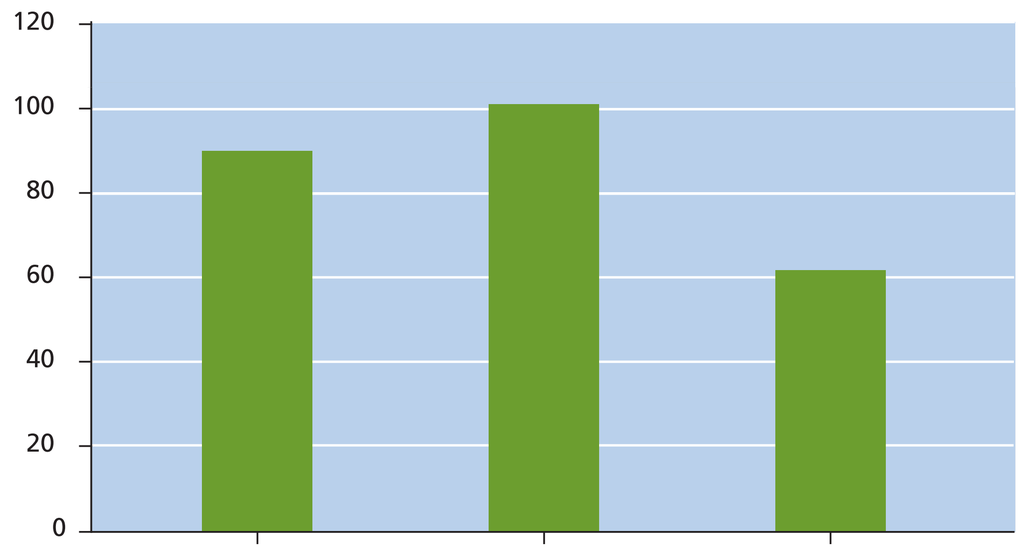
k_la in single use bioreactors



E.coli culture in various type of bioreactors



comparison of relative costs for various bioreactors (10L)



The CELL-tainer® single use bioreactor is exhibited at STAND no. 4 (CELLON)

Data *E.coli* also courtesy to Lonza Hopkinton (as published at the IBC-Boston, 2009, WengLong Lin)

[1] CELLUtion Biotech BV, Dr. A.F. Philipsweg 15a, 9403AC Assen, The Netherlands,
[2] HAN BioCentre, P.O.box 6990, 6503GL Nijmegen, The Netherlands

CELLution Biotech BV
Dr. A.F. Philipsweg 15A
9403AC Assen • The Netherlands
T : +31 592 301929
F : +31 592 308077
info@cellutionbiotech.com • www.cellutionbiotech.com