Zürcher Hochschule
für Angewandte Wissenschaften

FED-BATCH CULTURE MONITORED WITH IN SITU GLUCOSE SENSORS

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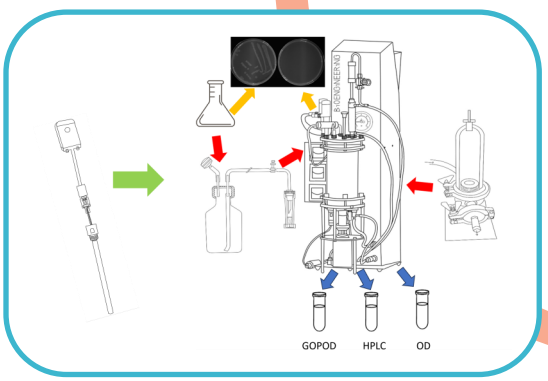
INTRODUCTION

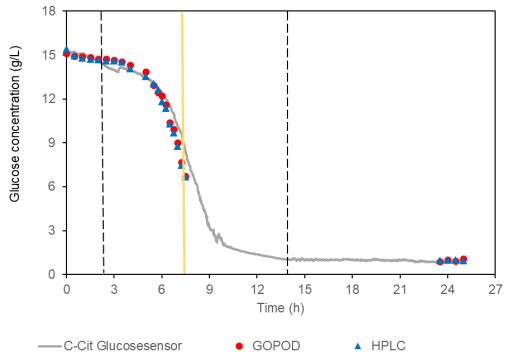
Glucose is an important process parameter in bioprocessing. Glucose is often fed as a bolus addition based on its daily offline measurements, but this can lead to high glucose fluctuations and to excessive glucose feeding, which can increase toxic byproducts such as lactate and acetate.
However, insufficient feeding can lead to nutrient depletion and a risk of carbon source limitation. By increasing the frequency of offline sampling and subsequent bolus additions, glucose can be maintained at low concentrations. That approach, however, increases workload and contamination risks.
This bachelor thesis focuses on the use of a glucose sensor in a fed-batch process.

MATHERIALS AND METHODS

- KLF Benchtop bioreactor (Bioengineering)
- *E. coli* BL21 (DE3)
- 24 to 26 hours cultivation time
- 3 feeding strategies: 1g/L, 0.1 g/L, manual feeding
- Glucose process probe (C-CIT Sensors AG)
- D-Glukose Assay Kit (GOPOD-Format) Megazyme, K-Gluc
- HPLC analysis



RESULTS AND DISCUSSION



	OD		
	1g/L	**0.1g/L**	**manual**
Time 24 hours	40.8	44.2	40

The yellow solid vertical line marks the point in time when 500 mL of the medium was drained to prevent the filling volume from getting too close to the maximum filling volume overnight without supervision.Exponential growth phase (log phase) and fed batch phase have been marked with black dashed vertical lines.

With regards to the analysis of the glucose concentration, the C-CIT glucose sensor gave comparable results to the GOPOD assay and the HPLC analysis, so this suggests that the C-CIT glucose sensor can generate accurate in situ data.
Moreover C-CIT automatically fed cultivations showed comparable OD values to the manual controlled fed-batch.
This shows that having a metabolic glucose feedback control helps maintain physiological glucose levels throughout a process without increased workload due to sampling and analyzing and more importantly without increasing contamination risk due to sampling.
It allows undisturbed culture conditions (incubator-based bioreactor systems), low batch-to-batch variability, and opportunities for automation.