Full Presentation Title

Subtitle of Your Presentation

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LOGO 1

LOGO 2

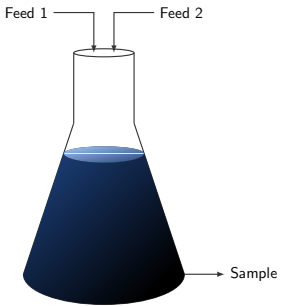
Acronyms

- Chinese hamster ovary (CHO)
- critical quality attribute (CQA)
- dissolved oxygen (DO)
- Food and Drug Administration (FDA)
- monoclonal antibody (mAb)
- model predictive control (MPC)
- ordinary differential equation (ODE)
- Open Platform Communications (OPC)
- partial differential equation (PDE)
- plug flow reactor (PFR)
- process systems engineering (PSE)
- quality by control (QbC)
- quality by design (QbD)
- quality by testing (QbT)
- singular value decomposition (SVD)
- total cell density (TCD)
- viable cell density (VCD)

Outline

Introduction

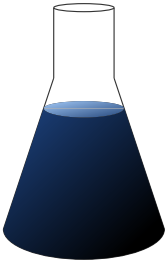
- Some motivation
- Some background



Outline

Methods

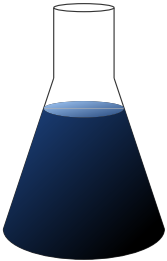
- Fed-batch cell culture illustration



Fed-batch bioreactor

Methods

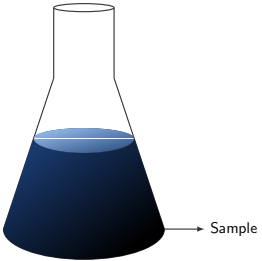
- Fed-batch cell culture illustration
  - Culture day k



Fed-batch bioreactor

Methods

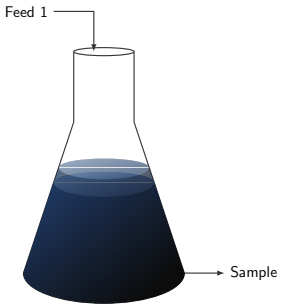
- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down



Fed-batch bioreactor

Methods

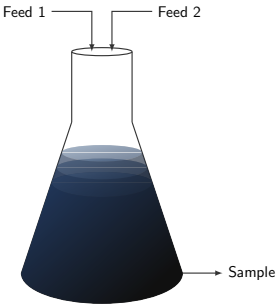
- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down
  - Add feed 1 **according to working volume**, volume up



Fed-batch bioreactor

Methods

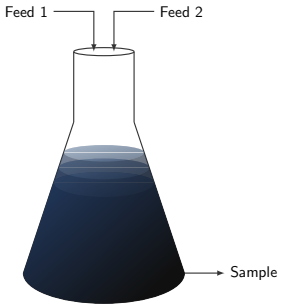
- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down
  - Add feed 1 **according to working volume**, volume up
  - Add feed 2 to meet glucose target, volume up



Fed-batch bioreactor

Methods

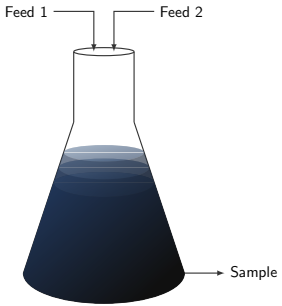
- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down
  - Add feed 1 **according to working volume**, volume up
  - Add feed 2 to meet glucose target, volume up
  - Reaction continues for 24 h



Fed-batch bioreactor

Methods

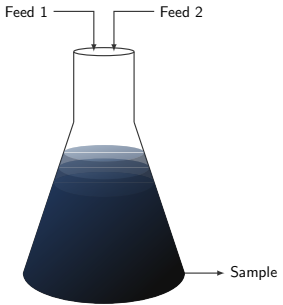
- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down
  - Add feed 1 **according to working volume**, volume up
  - Add feed 2 to meet glucose target, volume up
  - Reaction continues for 24 h
  - Repeat for culture day $k + 1$



Fed-batch bioreactor

Methods

- Fed-batch cell culture illustration
  - Culture day k
  - Sample, record concentration, volume down
  - Add feed 1 **according to working volume**, volume up
  - Add feed 2 to meet glucose target, volume up
  - Reaction continues for 24 h
  - Repeat for culture day $k + 1$
- From heuristics-based to model-based optimal feeding
  - Standard protocol: constant feed-to-volume ratio
  - Can we further optimize feeding?
  - Add feed precisely to meet production targets
  - Never **over**- or **under**-feed the culture



Fed-batch bioreactor

Outline

Results and Discussion

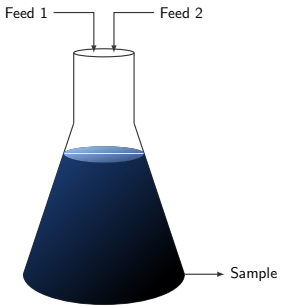
- Some results
- Some discussion

Item		
Animal	Description	Price ($)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

Outline

Conclusion

- Some conclusion
- Some future direction



LOGO 1

LOGO 2

References I