Welcome back students.

In this lecture will do the16th module continuous

fermentation.

The outline for this lectureis continuous fermentation

modes of continuousfermentation, its advantages

and disadvantages and itsapplications.

The learning outcomes of thislecture are you will be able

to explain all the aspects ofcontinuous fermentation and

compare the differentfermentation processes.

Now we'll see the thirdfermentation process that is

continuous fermentation.Nutrients are continuously added

and the products are alsocontinuously removed at a fixed

rate. The term itself continuestells you that nutrients are

added in the product also isremoved and this takes place at

a fixed rate. Organisms aremaintained at log stage. Since

the products and the cells arebeing removed, only the log

states cells will remain in the

momentum. For mentors are calledflowthrough fermenters, because

medium is not kept in thefermenter, it is flowing

throughout. It's an opensystem again because it is

a flowthrough fermenter.

Continuous culture design. Thecells continuously propagate on the fresh medium, entering thebioreactor and at the same time, products metabolite, wasteproducts and cells are removed in the effluent.

If the reactor is stirred with amechanical agitator, it is called a continuous stirred tankfermenter that is CS TF.

Now let's see the booking of acontinuous fermenter. In the beginning you have an inoculumwhich is taken which is grown in batch cultures using abatch fermenter.

When the inoculum is anexponential growth phase, it is transferred into the continuousfermentation operation by adding continuous fresh media.

And this is continuously storedand a constant volume is maintained. Fresh medium iscontinuously added and displaces an equal volume of spentfermentation broth and sells at the same rate as fresh medium is introduced. Growth rate isproportional to dilution rate of the medium as the medium ischanged. You can see in the picture how continuousfermentation takes place.

The substrate iscontinuously added.

Now there are different modes ofcontinuous fermentation, where

para meters are kept constantwill see such 2 examples. One is a chemostat wherein the volumeis maintained so it maintains constant fermenter volume andfresh medium is continuously added at the same rate as theproduct is removed and dilution rate remains constant, so

camostat. Is based on the

constant volume. Where is W statmaintains constant self concentration. Fresh medium isautomatically added here to maintain the turbidity. Thedilution rate will depend on the concentration, whereas inchemist and the dilution rate remains constant because thevolume is constant throughout.

Nothing to see the advantages ofcontent, continuous fermentation. The reactorcan be operated for long

periods of time withouthaving to be shut down.

More productive then batchreactors, it is more productive because the process continues.You don't have to stop it clean and sterilize the fermenterafter every batch.

The growth rate of the footbacteria in the reactor can be

more easily controlled and

optimized. Since can also beimmobilized and continuous reactors to prevent theirremoval and thus further

increase the productivity ofthese reactors, the cells can

be immobilized in thefermenter so that fresh medium

is added and these same cellscan use up that medium.

It also results in highproductivity per unit volume.

As time consuming tasks suchas cleaning and sterilization

are unnecessary.

Now we will see thedisadvantages.

Complete sterilization is notpossible since it's a continuous

process. Sterilization takesplace only after a long time.

Prone to contamination again,because sterilization is not

possible, contamination occurs.

The original product straincould be lost overtime if a

faster growing one overtakes it.This fermentation is not stopped

and continues. That's why if a

strain mutates. It can all.

Grow Andy Origonal strain candie the viscosity and

heterogeneous nature of themixture can also make it

difficult to maintainfilamentous organisms when

using filamentous organismsitself. It is little difficult

with this fermentationprocess.

The applications of continuous

fermentation. Bio reactorsoperated as Camel stats can be used to enhance the selectivityof thermophiles or small tolerant strains. An mutantorganisms with high growth rates also the medium composition canbe optimized for biomass and product formation using a pulseand shift method.

That injects nutrients directlyinto the chemostat. So this is an automated technique whereinthe nutrients are directly added at a constant rate into thefermenter as changes are observed, the nutrient is addedto the medium supplied reserve oil and and you steady state is established. A question for you.

Which of the following wasused in the production of bakers yeast?

Batch culture, continuousculture, fed batch culture or solid state culture, and theanswer is fed batch culture. We have already seen this in the last lecture. All theconsequences of medium are excess in.

Chemostat, Darby dosed at batchculture or fed batch culture.

It is. The chemo stacked all theconstants of medium I access in a chemostat because thesubstrate is added at the

beginning to the full volume.

Now I will summarize everything.

We have learned about batchfermentation wherein the substrate is added only at thebeginning and product is recovered after the process.

In Fed batch fermentation,feeders continues to added until the maximum liquidfermenter volume is reached, but effluents are notremoved, and in continuous fermentation nutrients arecontinuously added and products are alsocontinuously removed at a fixed rate.

Thank you.