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**NATIONAL
HORIZONS
CENTRE**

 Teesside
University

INTRODUCTION TO UPSTREAM BIOPROCESSING



DELIVERED IN PARTNERSHIP WITH CYTIVA

 **cytiva**



A UK CENTRE OF EXCELLENCE
FOR THE BIOSCIENCE INDUSTRY

TRAINING



TEES VALLEY MAYOR



HM Government



European Union
European Regional
Development Fund

WELCOME

Dr Jen Vanderhoven

DIRECTOR

Welcome to the National Horizons Centre (NHC). We are Teesside University's centre of excellence for the biosciences and healthcare sector. With research, partnerships and training at our core, we bring together industry, academia, talent and world-class facilities to create real-world impact.

As a National Training Centre for Advanced Therapies, funded from the Department for Business, Energy & Industrial Strategy (BEIS) and Innovate UK (IUK) delivered through the Cell and Gene Therapy Catapult, our courses are industry approved and we have worked closely with key bioindustry leaders across the sector to ensure our courses have been designed to deliver vital skills needed for advanced therapies, vaccines manufacturing and bioprocessing.

Delivered in partnership with Cytiva, the *Introduction to Upstream Processing* training course is aimed at early career biotechnology professionals. It introduces delegates to common concepts and terminology used in bioprocessing – from cell culture to bioreactor and single-use upstream technologies, process control and evaluation. Adherent versus suspension cell culture and scale-up techniques are also covered. Our unique training facility houses state-of-the-art equipment that provides delegates with the opportunity to gain hands-on practical training in complex bioprocessing procedures.

I look forward to welcoming you to the NHC.

The NHC is one of the National Training Centres part of the ATSTN programme funded from the Department for Business, Energy & Industrial Strategy (BEIS) and Innovate UK (IUK) delivered through the Cell and Gene Therapy Catapult.



COURSE OVERVIEW

DAY 1: Introductory lectures and practical sessions

Lecture one

Upstream Processing in Biotechnology

The lecture introduces types of cells used and selection criteria in the bioindustry. It will introduce platform processes for production in microbial and mammalian cell cultures. It will give basic molecular biology background to students alongside case studies on mAb manufacturing and Viral vectors.

Lecture two

From cell culture to bioreactor

Overview of bioreactor requirements and architecture, with an introduction to the common concepts and terminology used in bioprocessing.

Lecture three

Introduction to Single-Use Upstream technologies (WAVE and Xcellerex bioreactors)

An introduction to aspects of single-use technology and its advantages, with an overview of the WAVE25™ and Xcellerex bioreactors that will be used in the practical sessions.

Lab one

Bioreactor – WAVE25

- >WAVE25 bioreactor setup
- >Aseptic transfer culture medium
- >Calibrate DO/pH sensors.

Lab two

Tubing and vessel materials for bioprocessing

- >Tubing requirements for bioprocessing
- >Extractables/leachables
- >Considerations for tubing and vessel material choices.

Lab three

Bioreactor – XDR-10

- >XDR 10 bioreactor setup
- >Calibrate DO/pH probes
- >Inflate XDR10 bag
- >Aseptic transfer culture medium, equilibration of bioreactor.

DAY 2: Process start-up and evaluation lectures and practical sessions

Lecture one

Cell metabolism

An introduction to the main cellular metabolic pathways and a look at the optimisation of cell metabolism.

Lecture two

Introduction to process control in bioreactors

A discussion of the principles and requirements of process control looking at sampling, sensors and signal processing.

Lecture three

Process Evaluation

Discussion around the importance of proper evaluation through sampling, data recording and handling.

Lab one

Aseptic techniques to avoid contamination

Lab two

Bioreactor – WAVE25

- >Sampling, cell counting, metabolite analysis
- >Set up of culture parameters
- >Inoculate and start culture run.

Lab three

Bioreactor – XDR-10

- >Sampling, cell counting, metabolite analysis
- >Set up of culture parameters
- >Inoculate and start culture run.

CASE STUDY: FUJIFILM Diosynth Biotechnologies

DAY 3: Adherent versus Suspension and introduction to scale-up

Lecture one

Adherent cell cultivation

A look at the culture of adherent cells and some of the commercially available technologies available to grow at scale.

Lecture two

Culture scale up and tech transfer

An introduction to scalability and scale-up, the parameters used and process characterisation and robustness.

Lecture three

Process optimisation

Defining the concept of process optimisation and the optimisation targets for upstream bioprocessing.

Lab one

Bioreactor – WAVE25

- >Sample culture
- >Metabolite analysis
- >Adjustment of culture parameters
- >Harvest.

Lab two

Bioreactor – XDR-10

- >Sample culture
- >Metabolite analysis
- >Adjustment of culture parameters
- >Harvest.

Lab three

Virtual reality bioreactor simulator

