

## **Biomanufacturing Module 2**

### **Lesson 4 – Inducing Production of the Recombinant Protein**

#### **Lesson objectives:**

Students will understand:

- How protein production is induced.
- The benefits of inducing production of recombinant proteins.

#### **Essential Question**

- What are the benefits of inducing recombinant protein production at a specific time?

#### **Materials:**

- Induction of Recombinant Protein Production slide deck
- Upstream Process: Production of RFP+ or GFP+ Bacteria Protocol
- Scaled up liquid bacterial culture created in the last class period
- 50X arabinose stock solution
- Shaker/incubator
- Upstream Process Batch Record Document

#### **What Students Will Do**

- Students will listen to/watch the Induction of Recombinant Protein Production slide deck
- Teams will add arabinose to their liquid bacterial culture to induce production of RFP or GFP
- Teams place the flask containing their induced culture in the shaker/incubator
- Each team fills out the appropriate parts of their Upstream Process Batch Record

#### **Teacher Preparation**

- Prior to class, provide the team file folders containing:
  - Upstream Process: Production of RFP+ or GFP+ Bacteria Protocol (one per team)
  - Upstream Process Batch Record Document (one per team)
- Prior to class, turn on the bacterial shaker/incubator to a temperature of 37 degrees Celsius.
- Provide each team
  - Upstream Process: Production of RFP+ or GFP+ Bacteria Protocol
  - One p200 micropipette
  - One aliquot of 1mL 50X Arabinose stock solution
  - One box of p200 micropipette tips
  - Sharpie marker and tape for labeling flasks
  - Spray bottle of 70% ethanol
  - Paper towels
  - Upstream Process Batch Record
  - Team file folders

#### **Organizer**

Time	Activity	Materials
10 minutes	Watch/Listen to Induction of Recombinant Protein Production slide deck	Slide deck
5 minutes	Members of all teams put on PPE	Lab coats, gloves, safety goggles
5 minutes	Teams sanitize and prepare their bench space	70% ethanol, paper towels, sterile LB/Amp media, sterile 125mL baffled flask, micropipette, tips, small liquid bacterial culture started in previous class period
15 minutes	Each team takes their scaled up liquid bacterial culture out of the shaker/incubator and adds the appropriate amount of the arabinose stock to induce protein production	Upstream Process Protocol – Day 3, sterile 50X arabinose stock solution, micropipette, tips, scaled up bacterial culture started in previous class period
10 minutes	Teams fill out the appropriate portions of their Upstream Process Batch Record Document and file it	Upstream Process Batch Record Document, Team File Folder

## Procedure

### Induction of Recombinant Protein Production

1. Present the Induction of Recombinant Protein Production slide deck

### Induce production of RFP or GFP in the bacterial culture

2. Members of each team put on PPE
3. Each team sanitizes and organizes their bench space
4. Each team retrieves its scaled up bacterial liquid culture from the incubator
5. Each team follows the Upstream Process Protocol – Day 3 to induce recombinant protein production in their culture.
6. Each team puts their flask containing the induced culture in the shaker/incubator to shake at 37 degrees C for 24 hours.
7. Each team fills out the appropriate sections of the Upstream Process Batch Record and files it in their team file.