BT5441 – Elements of Biopharmaceutical Manufacturing

Assignment 2

You are provided with a CHO cell batch culture dataset. Spent media analysis data from two CHO cell clones, CHO-TZ and CHO-S7, which were grown in 2 different media, A and B, is provided. Analyze the data and draw your insights regarding the performance of clones and media, and provide a report (not exceeding 3 pages, excluding annexe/supplement tables or figures) with the insights obtained. You may follow the following steps sequentially to obtain insights about the clone and media:

1. Plot the data and understand the performance of clone and media in terms of nutrient consumption, by-product secretion and titer increase over culture – discuss the key points about it. (20 marks)
2. Using the exponential growth phase of the culture (day 0 to 4), calculate the specific rates of all the substrates (glucose, amino acids, etc.), product (IgG), by-products (Lactate and NH3) and cell growth. (20 marks)
3. Using the specific rates calculated during the exponential phase, determine the overall carbon balance to evaluate carbon utilization and its distribution toward biomass, antibody, and other metabolites. Present your results with appropriate plots (e.g., carbon uptake rates and carbon flux distributions) and overlay the final antibody titer in the plots for interpretation. (**Note-** For the biomass composition, please refer to the carbon balancing Excel sheet already uploaded in Moodle). (20 marks)
4. Use the specific rates calculated from the exponential phase and perform PCA to identify patterns across 2 clones and 2 media. Use score plot, loading plot and biplot to interpret your results. (30 marks)
5. Formatting adherence (10 marks)

Submit your completed assignment report and supplementary files (if any) in Turnitin (Link for submission will be shared separately) by 05/10/2025 23:59:59 pm. Any late submissions beyond this timeline will have marks penalized, 10 marks per hour of being late. Obviously, if you submit it later than 10 hours, the entire assignment is considered forfeited.

Things to note:

1. It's good practice to calculate specific growth rate in units of (1/day), specific product rate in units of (pg/cell/day) and other specific rates in units of (pmol/cell/day).
2. Report formatting instructions: The total report cannot exceed three pages. Use Arial as font in your assignment. Font size has to be a minimum of 10. Margins on all four sides of the page cannot be less than 1 inch. Three page limit is not applicable for references and annexes. The three page limit does not include your references and any annexe/supplementary items such as tables, figures, figure legends, etc. 10 marks is allocated for adherence of mentioned formatting.
3. Please clearly state all the assumptions of the assignment, if any.