BT5441 – Elements of Biopharmaceutical Manufacturing

Assignment 1

Low productivity of recombinant proteins including monoclonal antibodies remains a central bottleneck in biomanufacturing. Your task is to review strategies adapted to engineer the secretory pathway in mammalian cells to improve the protein yield and propose an experimental strategy to address the research gap in mammalian secretory engineering. Use the following steps sequentially to design your experiment:

1. Do an extensive literature survey and describe the different engineering strategies of secretory pathways to improve the protein yield in mammalian cells, mainly focussing on CHO cells. Literature review cannot be obtained from one or two review articles alone. The strategy shall be reported on previously published papers or patents. Upon collecting multiple strategies employed previously, organize your result and present them based on pathway categories. (40 marks)
2. Based on the literature survey, identify potential cellular engineering target(s) and the engineering strategy you wish to pursue. Provide the rationale of your choice. The strategy may be one reported in the literature or a novel approach. If you are following a literature based approach, you should justify how it is different from previously reported. Some examples of this can be, evaluating the strategies in multiple products beyond the one reported and the reasoning of why it may be important to evaluate by explaining the PTMs of multiple products considered. An alternate approach could be to multiplex several of the reported strategies. But remember you cannot do “N” number of gene modifications, therefore, you may have to thoroughly evaluate previous strategies, use a rank based approach and choose the targets for modification. (30 marks)
3. Outline a detailed experimental plan to perform the secretory pathway engineering. Assume you will evaluate the effect of engineering your target gene in two different recombinant clones producing two different products. Remember to include a control condition against which you will compare the engineered cells effects in your experiments. (20 marks)
4. Adhering to instructions of assignment (10 marks)

Submit your completed assignment report and supplementary files (if any) in Turnitin (Link for submission will be shared separately) by 14/09/2025 11:59:59 pm. Any late submissions beyond this time line 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. Work as a team of two which have been identified earlier. You will be later asked to evaluate your peers' contribution in the assignment. So, please make sure to note down your contributions during the assignment.
2. Report formatting instructions: Report cannot exceed a total of 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. The 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 table, figure, writeup, etc.

3. References for all your literature survey obtained results are must. Please follow the numbered format for references. While the body of the text should have the numbered references which substantiate the claim you make, at the annexe, provide full details of the references, i.e., Bibliography.
4. Please make sure all the included materials in the annexe such as figures, tables and writeup are to be numbered sequentially as well as cited in the main text appropriately. You may reuse the figures from previously published work but please provide the credits in the form of references as well as clearly mentioning that the "figure is reproduced as it is from _____ source".
5. Please state all the assumptions very clearly at the start of the assignment.