UNIVERSITI TEKNOLOGI MARA

MODELLING OF HYBRIDOMA CELL GROWTH PROFILE

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Thesis submitted in fulfillment
of the requirements for the degree of
Bachelor of Engineering (Hons.) Chemical and Bioprocess

Faculty of Chemical Engineering

July 2018

ABSTRACT

This research project is basically a study to develop a model equation for the hybridoma cell growth by mathematical modeling. The mathematical modeling is a tool that specially used for simulates, optimize and control any process. Thus, this method is really suitable to produce an overall model of hybridoma cell growth profile that can predict the characteristics of batch system. Thus, revolution has been made in order to develop the model equations that take into account the factors such as unwanted decline in cell viability, growth rate, culture condition and others that lead to the decreasing of MAB production. In order to develop the model equation, the kinetic of hybridoma cell is being studied. Based on the kinetic study, the growth of hybridoma cell is disturbing by several factors that inhibit the growth. The major factors that affecting the growth cell is substrate limitation and inhibitor production. In this simulation, the hybridoma cell is supplied with glucose and glutamine as the substrate. These substrate act as a carbon source for the growing of the cell. Substrate consumption by the cell during its growth is leading to the formation of inhibitor. However, only glutamine exhaustion being the main factor of growth cessation. The constructed of hybridoma cell growth profile is including all the growth phase except death phase. Based on this simulation, the concentration of ammonia increase proportionally to the decreasing of glutamine concentration. The growth profile of hybridoma cell culture were simulated using an unstructured model in batch mode. All the model equation that involved in the growth of hybridoma has been used and solve by ode45 in Matlab software.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank my supervisor, Mrs. Syazana binti Mohamad Pauzi for her constant guidance, unwavering support and an objective criticism of my work that helped in shaping up my subsequent research efforts. Not to forget, my deepest thanks to Universiti Teknologi Mara for allowing me to conduct this research.

I would like to also take this opportunity to express my gratitude to my fellow friends for their support, guidance and valuable information that helped me in completing this research project.

Last but not least, I would like to express thanks to my parents, Uda bin Abd. Hamid and for their continuous support and encouragement without which this research would not be possible

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Currently, the biopharmaceuticals product which produced from mammalian cell culture processes has been an extraordinary increase mainly because of their application in diagnostics and curative treatments. These mammalian cells are widely used in pharmaceutical field due to its capability in producing recombinant proteins such as hormones, cytokines, enzymes as well as antibodies for therapeutic purposes. The most popular biopharmaceutical product from mammalian cell is monoclonal antibody (MAB). This product has been produce by hybridoma cell as a product formation during its growth. Despite increasing demand, the productions are faced with the challenges of meeting lower cost expectations of the health system as well as small quantity of production of MAB. In industrial scale, the production of MAB is only done in small quantity in order to control the quality of production.

The growth of hybridoma cell has been widely studied in order to optimize the production of monoclonal antibody. The culture of this cell should be done in the optimum condition as allowing the cell growth rapidly hence producing a large amount of desired product. During the cultivation of hybridoma cell, the surrounding and its medium play the important role to enhance the growth. All this factor should be cooperate well with the kinetic characteristics of the cell. In order achieve the optimum condition, the factors that affecting the growth and the kinetic model of the hybridoma cell should be studied.

Hybridoma cell is a hybrid cell made in the laboratory by fusing two different cells in order to combine desired features of each. This hybridoma cell is combining a normal cell with a cancer cell such as myeloma or lymphoma, as the ability of the cancer cell to multiply rapidly with the ability of the normal cell to dictate the production of a specific antibody. In this experiment, the production of hybridoma cell is by fusing mammalian cell