

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**NUMERICAL ESTIMATION OF THREE BASIC
COMPONENTS OF HIV MODEL USING
4TH ORDER RUNGE KUTTA METHOD**

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ABSTRACT

HIV (Human Immunodeficiency Virus) is a retrovirus that unable to reproduce by it self but it's rely on a host of CD4 T cells to aid reproduction. The HIV infection model of CD4+ T cells used to describe the rate of susceptible, infected and free virus particles in the blood . In this study, the mathematical model consists of three non linear ordinary differential equations. The aim of this study is to obtain approximate solutions of HIV model of CD4+T cells buy using the explicit 4th order of Runge Kutta. Next, HIV free particles in the blood was calculated to determine the existent of HIV particles in the blood with the change of each parameter based on the given data. The idea can be identify by calculating the reproduction number (R) and the result shows the maximum value of the data has higher virus population in the blood.

1 INTRODUCTION

1.1 Research Background

HIV or stand for “Human Immunodeficiency Virus” is a virus from the genus lentivirus that is a subgroup from family of retrovirus. This virus causes a condition that make a human immune system failure progressively and allowing a human body to be infected from life threatening infections or cancers. If a person is infected with HIV, it makes the body to have difficulty in fight off infections and diseases because HIV will infect a type of vital white blood cell called T-helper cell in the bloodstreams. The virus reproduces of itself inside the infected body using DNA in the nucleus of the T-helper cell and control it. T-helper cells are also accurately referred to as CD4+ T cells. In the critical stages of HIV infection, the loss of a large number of CD4+ T cells can lead to the symptomatic stage of infection known as the acquired immunodeficiency syndrome (AIDS).

Scientist believe that the infection came from a type of chimpanzee in the central Africa that mutated into HIV. When human hunted the infected chimpanzee for meat, it's blood are in contact to human blood. The virus had spread across Africa and around the world. CD4+ T cells act as soldiers to protect body's immune system from infection but if left untreated, virus such as HIV can easily destroy CD4+ T cells and body's immune system can't oppose against the diseases.

There are three stages of HIV infection i.e acute HIV infection stage, clinical latency stage, and AIDS. At the early stage, HIV will multiply and spread throughout the body. Then, the virus will attack and destroy CD4+ T cells. At latency stage, the number of CD4+ T cells drop due to the immune system become weaker. Besides that, there may have swollen glands and the peripheral blood drops to very low. At chronic HIV infection, HIV getting aggressive and destroy CD4+ T cells dramatically. The body fails to keep up and replacing new T cell. HIV disease progression can show a complex pattern of infection progression, mostly victim of the