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MATHEMATICAL MODELING: IMMUNE SYSTEM DYNAMICS IN THE PRESENCE OF CANCER AND IMMUNODEFICIENCY IN VIVO

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ABSTRACT

The Human Immunodeficiency Virus (HIV) targets CD4 T-cells which are crucial in regulating the immune systems response to foreign pathogens, including cancerous cell development [1]. Furthermore, several studies link HIV infection with the proliferation of specific forms of cancer such as Kaposi Sarcoma and Non-Hodgkin's Lymphoma; HIV infected individuals can be several thousand timesmorelikely to be diagnosed with cancer [1]. However, much remains unknown about the dynamic interaction between cancer development and immunodeficiency. During HIV-1 primary infection, we know that the virus concentration increases, achieves a peak, and then decreases until it reaches a set point [2]. In this project, we studied longitudinal data from 18 subjects identified as HIV positive during plasma donation screening to examine the dynamics of primary HIV infection. In doing so, we applied several nonlinear ordinary differential equation HIV infection models and analyzed the behavior of the system. We used these models as a basis for integrating cancer-immune dynamics to examine the interaction of both cancer and immunodeficiency within the immune system.

References

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