Nonlinear Dynamics and Systems Theory, **11** (2) (2011) 125–136

Analysis of an In-host Model for HIV Dynamics with Saturation Effect and Discrete Time Delay

P. Das [1*], D. Mukherjee [2], A. Sen [3], Z. Mukandavire [4] and C. Chiyaka [4]

[1] *The Kidderpore Academy, 35 Ramkamal Street, Kolkata – 700 023, India*
[2] *Department of Mathematics,Vivekananda College, Thakurpukur, Kolkata – 700 063, India*
[3] *Sarat Chandra Sur Institution (H.S.), 12 Pottery Road, Kolkata – 700 015, India*
[4] *Emerging Pathogens Institute, University of Florida, Gainesville, 32610 FL, USA*

Received: October 24, 2010; Revised: March 30, 2011

Abstract: We present an in-host HIV/AIDS model with saturation effect and a discrete time delay. It is shown that infection is endemic when $\mathcal{R}_0 > 1$ but dies out when $\mathcal{R}_0 < 1$. The switching phenomenon for the stable equilibria is observed when a discrete time delay is incorporated. The parameters that can control the disease transmission are also discussed. Numerical simulations are carried out to verify and support the analytical results and illustrate possible behavior scenarios of the model.

Keywords: *HIV/AIDS; stability; delay; switching.*

Mathematics Subject Classification (2000): 92B05, 92C60, 92D30.

1 Introduction

Throughout the ages and despite all medical and sanitary progress humankind has severely been afflicted by infectious diseases. The spread of human immune virus (HIV) is alarming today and becomes a global crisis of the modern era. No other disease engenders as much fear, revulsion, despair and utter helplessness as acquired immunodeficiency syndrome (AIDS). In a survey carried out in 2009, it was noted that about 33.3 million people are living with HIV/AIDS and 2.6 million people have newly been infected during this year only. Further, in this 2009 the number of AIDS-related deaths is estimated as 1.8 million [1]. The sexually active and risk groups such as truck drivers, commercial sex workers, bathhouse customers, and drinkers are known to play a central role in HIV population dynamics.

* Corresponding author: mailto:jit_das2000@yahoo.com

