IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS)
ISSN(E): 2321-8851; ISSN(P): 2347-4580
Vol. 2, Issue 6, Jun 2014, 201-210

MATHEMATICAL MODELS OF CORECEPTOR USAGE AND A DENDRITIC CELL-BASED VACCINE DURING HIV-1 SUBTYPE C INFECTION

MANGA, U. S

Department of Mathematics, Shobhit University, Meerut, Uttar Pradesh, India

ABSTRACT

Due to costs, most vaccine development is carried out Europe(subtype B) rather than Africa and Asian (subtype C) countries. However since the mechanisms of disease progression in HIV-1 subtype B may be different from those in HIV-1 subtype C, it is interesting to investigate if and how a dendritic cells based vaccine can be used on individuals in Africa and Asia. To investigate this, mathematical models and sensitivity analysis techniques are used to understand the mechanisms of disease progression in two HIV-1 subtypes. These models are then extended to explore the ways in which the vaccine could be used to treat these different HIV-1 subtypes. It is found that the level of immune activation plays a large role in determining the mechanism of disease progression and can itself be a means to the development of AIDS. It is also shown that the dendritic cells based vaccine could reduce the viral load but not eliminate the virus resulting in a viral rebound. To maintain a low viral load, vaccination would have to be repeated. Unfortunately, repeated vaccination may lead to the overproduction of proinflamatory cytokines resulting in severe side effects however this could be avoided by using a carefully planned treatment schedule. We conclude that the dendrite cells based vaccine can be used in individuals in either subtype B or subtype C region as long as the correct treatment schedule is followed.

KEYWORDS: HIV/AIDS, Coreceptor Usage, Dendritic Cells and Vaccine