*Proceedings of the 1st International Conference on Industrial & Mechanical Engineering and Operations Management*
*Dhaka, Bangladesh, December 23-24, 2017*

Paper ID 22

# A Mathematical Model of Leukemia Treatment by Immunotherapy

**Mst. Shanta Khatun, Md. Aminul Islam and Md. Haider Ali Biswas**
Mathematics Discipline
Khulna University
Khulna-9208, Bangladesh

**Abstract**

In this paper, we propose and analyze a mathematical model to study the spread of leukemia and its treatment by using the most effective immunotherapy presently known as Adoptive cell transfer. The model is governed by four state variables namely; susceptible blood cells, infected blood cells, cancer cells and immune cells. The model is analyzed by using the stability theory of non-linear differential equations and numerical simulation. We calculate the basic reproduction number and the disease free equilibrium by Jacobian Matrix (JM). A major goal of this work is to determine the spread of leukemia after applying immunotherapy. We have observed the system is stable in the local and global sense if antigenicity rate of immune cells is greater than a threshold value dependent on the density of immune cells. Besides this, external infusion of immune cells reduces the concentration of cancer cells and infected cells in the blood. This implies that immune cells kill cancer cells on being stimulated and as antigenicity rate increases rate of destruction of cancer cells also increase leading to decrease in the concentration of cancer cells and infected cells in the body.

**Keywords**
Immunotherapy, treatment, Blood cells, Leukemic cells, Mathematical Modeling