

Summary Report for Tri Sri Noor Asih, Graduate Student Fellow, 2013

Tri Sri Noor Asih, together with Jonathan Forde, Suzanne Lenhart and Steven Wise, formulated a model for the development of cervical cells from normal cells, infected by Human Papillomavirus, into invasive cancer cells. In the system of ordinary differential equations, the cell populations were divided into five compartments: normal cervical cells, infected cells, pre-cancer cells, cancer cells, and a free virus compartment. The free virus infects normal cells, and this infection can start the pathway to cancer cells. The initial model was extended to include logistic growth for the normal cells and a threshold term for the transition from pre-cancer cells to cancer cells. After transforming the system into non-dimensional variables, the stability analysis of the equilibrium points of the model was completed. The calculation of the basic reproductive number showed which the rates and parameters play the important roles in the progression towards invasive cancer. By simulation we investigated geometrically the region for the initial conditions of infected cells and pre-cancer cells that go to the endemic stable equilibrium point. By varying a specific parameter, reflecting the effect of treatment on infected cells, the influence of that parameter on the progression was shown. A research paper on this work with an acknowledgement to NIMBioS will be submitted this winter.