Mathematical Modelling of Tumor-Immune Interactions and Oncolytic Virotherapy

Rachid Ouifki
University of Pretoria, South Africa

In this talk I will present and discuss some mathematical models that investigate the interaction dynamics between tumor cells, oncolytic viruses and the immune system.

I will start by presenting and analyzing a mathematical model that addresses some mechanisms by which tumors escape detection and control by the immune system. This will be followed by a mathematical model that is aimed at exploring how oncolytic virotherapy can be enhanced by using nonspecific oncolytic viruses (i.e. viruses that are able of infecting, in addition to tumor cells, some normal cells in the vicinity of the tumor). Then, I will present a mathematical model dedicated to (oncolytic) virus delivery, whereby some cells are used for the delivery of oncolytic viruses to the tumor site. The aim of this model is to investigate how this method of virus delivery enhances outcomes of oncolytic virotherapy. Finally, I will present a model of oncolytic virotherapy with two delays; an intercellular delay in the viral replication and a second delay for the immune's response to viral infection. The aim here is to investigate possible trade-offs between these delays that will eventually help resolve some challenges faced with virus delivery in oncolytic virotherapy.