The Hong Kong Polytechnic University

Department of Applied Mathematics

Talk

Travelling wave solutions of the reaction-diffusion mathematical model of glioblastoma growth: An Abel equation based approach

By

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We present quasi-stationary (travelling wave type) solutions to a nonlinear reaction-diffusion equation with arbitrary, autonomous coefficients, describing the evolution of glioblastomas, aggressive primary brain tumors that are characterized by extensive infiltration into the brain and are highly resistant to treatment. The second order nonlinear equation describing the glioblastoma growth through travelling waves can be reduced to first order Abel type equation. By using the integrability conditions for the Abel equation several classes of exact travelling wave solutions of the general reaction-diffusion equation that describes glioblastoma growth are obtained, corresponding to different forms of the product of the diffusion and reaction functions. The solutions are obtained by using the Chiellini lemma and the Lemke transformation, respectively, and the corresponding equations represent generalizations of the classical Fisher--Kolmogorov equation. The biological implications of two classes of solutions are also investigated by using both numerical and semi-analytical methods for realistic values of the biological parameters.

Date: 8th January, 2015
Time: 15:00 to 16:00
Venue: Room HJ610, PolyU

****** All are welcome! ******