

2012 Special Program in Applied Mathematics and Applied Mechanics

Modeling and simulating in acupuncture

2012 - 12 - 05 (Wed.)

15:00 - 17:00

308, Mathematics Research Center Building (ori. New Math. Bldg.)

Acupuncture is one of the oldest practices in the history of Traditional Chinese Medicine. Growing interest from the public for acupuncture treatments has led the scientific community to investigate the physiologic basis underlying acupuncture. This talk focuses on the mathematical modeling and simulation of the cellular response to acupuncture needling. This talk consists of two parts. In the first part, we present the physiologic basis of acupuncture and introduce a new biomathematical model of the cell response to acupuncture needling. The physiological effects of acupuncture needling lead to therapeutic effects and could be explained by a series of interactions among the nervous system, endocrine system and immune system. There is evidence that needle manipulation induces a mechanical stress that could lead to a cellular recruitment of mast cells through a chemotactic process in the subcutaneous connective tissues. Our model relies on the macroscopic description of Keller-Segel model for chemotaxis. In the second part, we discuss recent results on the mathematical analysis of a simplified model and present some numerical simulations of the full biomathematical model. We are particularly interested to show that blow-up occurs in finite time for large initial data concentrated around one point. In this particular situation, blow-up corresponds to the sustained response of the mast cells to acupuncture needling. We also compare our simulations to some properties of acupuncture points to validate our results.



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