Transport at multiple scales in medical processes: from modelling to simulation

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Short Description

While the past decades have witnessed continuous progress in the mathematical modelling and analysis of most processes that are known as serious challenges for human health and well-being, the basic principles which underlines their full mechanisms that trigger these processes or avenues to controlling them are in general far from being fully understood. However, within their complex dynamics, all critical health challenges (such as cancer, would healing, blood flow through arteries, blood perfusion) involve a cascade of transport processes that span over multiple spatial and temporal scales. Transport processes, ranging from molecular cell-scale to cell-populations scales, shape the behaviour of these key health challenges, and their understanding is critical for their potential future control and treatment.

This mini-symposium focuses on the modelling and numerical simulation of some key complex medical challenges, whose complex dynamics are typically based on interlinked transport processes occurring at many temporal or spatial scales. In this context, of special interest for us is the mathematical modelling and computational exploration of processes such as tumor growth (cancer research), wound healing, blood flow through arteries, or heart perfusion. The mathematical models of such problems are complex, multiscale, systems of nonlinear partial differential equations. Solving them numerically is a very challenging task. In this mini-symposium we will address both modelling aspects and advanced simulation techniques associated with these models.