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# MULTI-PHYSICS AND MULTI-SCALE MODELLING OF MUSCULAR SYSTEMS

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## ABSTRACT

Modelling of muscular system is relevant for assessing underlying process, linked to muscle contraction or contractility, and verify the pertinence of physiological hypothesis that cannot be assessed solely by experimentation. It helps also practitioners for the early detection of muscular pathologies (preterm labor, motor impairments) and for the definition of patient specific strategies of functional rehabilitation. Under this scope, this mini-symposium aims to promote valuable effort in modeling muscular systems other than the cardiac system. Therefore, the following fields are encouraged:

*Striated muscles*, responsible of motion genesis are driven by the central nervous system, through the peripheral system, and composed by thousands of aligned fibers of several type. Their modeling allows a better understanding of the complex mechanisms involved in muscle contraction. We are concerned with realistic modelling of electrical (sEMG signal) and/or mechanical (force, torque) phenomenon, at a multiscale level (sarcomere, fiber, motor unit, muscle), with or without sensor network paradigm, in healthy and pathological situations, by assessing neural drive, EMG/force relationship, muscle activation and synergies…

*Uterine muscle*, made of billions of cells, contracts due to ionic exchanges (generating electrical and mechanical activities). The contraction is efficient when the cells contract synchronously. Recent works stated that this synchronization arises not only due to electrical diffusion, but also through a hydro-dynamic-stretch activation mechanism, liking cell electrical activity to uterine stretching. Simulating the electrical activity, the mechanical activity and/or this mechano-electrical coupling will permit to develop tools for the monitoring of uterine contractility and help in formalizing and analyzing the actual patho-physiological knowledge on delivery regulation…

*Any other smooth muscle* modelling, concerning the electrical and/or the mechanical activity, at any scale level, for physiological and/or pathological purpose will be of concern for this mini-symposium topic.