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MAJOR RESEARCH INTERESTS

Research in my computational bioengineering laboratory focuses on the application of mathematical and computational models to biology in health and disease. We are also interested in the development of new tools to describe, validate and visualise such models. The research group collaborates with clinicians at the National University Hospital plus a number of local and overseas research institutes, including the Bioengineering Institute at the University of Auckland and the Mayo Clinic. Current projects include

1. Quantitative descriptions of gastrointestinal electrophysiology and motility disorders
2. Modelling the biomechanics and electro-mechanics of smooth muscle
3. Uncovering the mechanisms behind cardiac ischemia and reperfusion injuries
4. Motion capture for the functional assessment of the rheumatoid hand
5. Mathematically modelling the neurosphere niche to understand neurosphere formation and optimise culture conditions
6. Using CellML (XML) and related technologies to describe mathematical models of cellular electrophysiology

RECENT PUBLICATIONS

1. Nickerson DP, Buist ML (2008) Practical applications of Cell ML1.1 : the integration of new mechanisms into a human ventricular model. *Prog Biophys Mol Biol*. In press.
2. Nickerson DP, Corrias A, Buist ML (2008) Reference descriptions of cellular electrophysiology models. *Bioinformatics*. In press.
3. Corrias A, Buist ML (2008) A quantitative cellular description of gastric slow wave activity. *Am J Physiol Gastrointest Liver Physiol*. In press.
4. Corrias A, Buist ML (2007) A quantitative model of gastric smooth muscle cellular activation. *Ann Biomed Eng*. 35(9):1595-607.
5. Cheng LK, Komuro R, Austin TM, Buist ML, Pullan AJ (2007) Anatomically realistic multiscale models of normal and abnormal gastrointestinal electrical activity. *World J Gastroenterol*. 13(9):1378-83.
6. Lin AS, Buist ML, Cheng LK, Smith NP, Pullan AJ (2006) Computational simulations of the human magneto- and electroenterogram. *Ann Biomed Eng*. 34(8):1322-31.
7. Buist ML, Cheng LK, Sanders KM, Pullan AJ (2006) Multiscale modelling of human gastric electric activity: can the electrogastrogram detect functional electrical uncoupling? *Exp Physiol*. 91(2):383-90.
8. Fernandez JW, Buist ML, Nickerson DP, Hunter PJ (2005) Modelling the passive and nerve activated response of the rectus femoris muscle to a flexion loading: a finite element framework. *Med Eng Phys*. 27(10):862-70.
9. Pullan A, Cheng L, Yassi R, Buist M (2004) Modelling gastrointestinal bioelectric activity. *Prog Biophys Mol Biol*. 85(2-3):523-50.
10. Buist ML, Cheng LK, Yassi R, Bradshaw LA, Richards WO, Pullan AJ (2004) An anatomical model of the gastric system for producing bioelectric and biomagnetic fields. *Physiol Meas*. 25(4):849-61.
11. Smith NP, Buist ML, Pullan AJ (2003) Altered T wave dynamics in a contracting cardiac model. *J Cardiovasc Electrophysiol*. 14(10):S203-9.
12. Buist M, Sands G, Hunter P, Pullan A. (2003) A deformable finite element derived finite difference method for cardiac activation problems. *Ann Biomed Eng*. 31(5):577-88.