1058-92-247 **Mark B Campanelli***, Dept. of Mathematics and Computer Science, Southwest Minnesota State University, 1501 State Street, Marshall, MN 56258-1136. *A multicellular mathematical model for the initiation of gene-expression waves during somitogenesis.*

Somitogenesis is a process common to all vertebrate embryos in which repeated blocks of cells arise from the presomitic mesoderm (PSM) to lay a foundational pattern for trunk and tail development. Somites form in the wake of passing waves of periodic gene expression that originate in the tailbud and sweep posteriorly across the PSM. Previous work has suggested that the waves result from a spatiotemporally graded control protein that affects the oscillation rate of clock-gene expression. With a minimally constructed mathematical model, the contribution of two control mechanisms to the initial formation of the gene-expression wave has been examined.

A system of delay differential-algebraic equations tracks the level of mRNA and protein for both a clock and signaling gene in each cell, with a non-diffusive coupling mechanism between nearest neighbors and a non-autonomously prescribed control protein level. Four biologically motivated model scenarios have been tested, with either one or two clock protein transcription binding sites and with or without differential decay rates for clock protein monomers and dimers.

Results indicate that only the model scenario with both multiple binding sites and differential decay rates is able to reproduce experimentally observed waveforms. (Received February 16, 2010)