Major assumptions and simplifications of the integrated model

(1)   A 2D AP-by-ML slice along the DV midline can serve as a proxy for 3D somitogenesis;

(2)   PSM growth in the AP direction is primarily due to the posterior addition of cells from the tail bud, rather than proliferation of cells within and throughout the PSM;

(3)   Cell growth and proliferation can be neglected in the simulated PSM region;

(4)   Cells enter the middle of the PSM with uniform intracellular concentrations of FGF8, Wnt3a and *fgf8* mRNA;

(5)   Cells enter the middle of the PSM with their segmentation clocks synchronized to their immediate medio-lateral neighbors;

(6)   Differences in random motility among PSM cells can be neglected in the simulated region;

(7)   Gradual changes in adhesion properties can be approximated by two abrupt changes occurring at determination and differentiation, respectively;

(8)   Segmentation and somite formation dynamics can be separated from epithelialization and non-adhesion-related Eph-ephrin signaling;

(9)   Details of ECM-PSM interaction can be neglected at the level of detail of the model;

(10)   The effect on the morphogen gradients of endocytosis-assisted passage of Wnt3a and FGF8 through cells can be neglected at the level of detail of the model;

(11)   At the level of detail of the model, the most important role of the external environment is to physically constrain the PSM in medial, lateral and dorsal and ventral directions;

(12)   Each cell has an identical internal three-oscillator segmentation-clock network, the behavior of which can be approximated by a deterministic ODE reaction-kinetics submodel in the simulated region;

(13)   The phases of Paraxis and cMeso1 expression closely resemble those of Axin2 and Lfng at the time of determination;

(14)   A sub-threshold concentration of FGF8 induces cell determination;

(15)   The adhesion of determined and differentiated cells depends only on four transmembrane proteins (N-CAM, N-cadherin, EphA4 and ephrinB2) according to **Table 3**.

Experimental features included and reproduced by the model

Included:
(1)   Cells occupy volume and have deformable shapes;
(2)   Cells have intrinsic random motilities distinct from directed cell motion due to, *e.g.*, sorting at the forming somite borders;
(3)   Realistic extracellular FGF8 concentration gradient;
Reproduced:
(4)   An extended stripe of PSM tissue of constant length;
(5)   Realistic Wnt3a governed variation in segmentation-clock period;
(6)   Medio-lateral stripes of high Lfng concentration that travel from the posterior to the anterior of the PSM;
(7)   Lfng stripes narrow in the anterior-posterior direction as they move anteriorly;
(8)   Segmentation clocks between neighbor cells phase lock;
(9)   An unlimited number of regular somites of controlled size;
(10)   Misplaced cell types in the forming somite occur at a rate consistent with experiments;
(11)   Spontaneous intrasomitic border correction of misplaced cell types after differentiation;
(12)   Somite-to-somite shape variation is consistent with experiments;
(13)   Parameter variation leads to interspecies-like variability in somites:
     a. Somite size depends on the segmentation-clock period;
     b. Somite size depends on the rate of the PSM growth;
     c. The number of Lfng stripes depends on the segmentation-clock period;
     d. The number of Lfng stripes depends on the ratio of the PSM length to the PSM growth rate;
     e. Lfng stripe width depends on the rate of Wnt3a decay (*i.e.,* on the slope of the Wnt3a gradient);