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Paracrine vs Autocrine Regulation of Early Vascular Patterning

During embryonic vasculogenesis, the earliest mechanism of blood vessel morphogenesis, isolated vascular cell progenitors called angioblasts assemble into a characteristic network-like pattern. So far, however, the mechanisms underlying the coalescence and patterning of angioblasts remain unclear.

We consider a hybrid cell-based approach similar to that used for a similar *in vitro* process [1,2]. However, contrary to previous mathematical models that assume chemotaxis towards an autocrine signal [1,2,3,4], we favour an alternative mechanism based on matrix-binding of paracrine signals. Detailed morphometric analysis of simulated vascular networks and confocal microscopy images obtained from *in vivo* quail embryos reveals our model can reproduce the vascular patterns with high accuracy.

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References

[1] Merks RMH, Brodsky SV, Goligorksy MS, Newman SA and Glazier JA (2006) , *Cell elongation is key to in silico replication of in vitro vasculogenesis and subsequent remodeling*, Dev Biol **289**: 44-54.

[2] Merks RMH, Perryn ED, Shirinifard A and Glazier JA (2008), *Contact-Inhibited Chemotaxis in De Novo and Sprouting Blood-Vessel Growth*, PLoS Comput Biol **4(9)**: e1000163.

[3] Serini G, Ambrosi D, Giraudo E, Gamba A, Preziosi L and Bussollino F (2003), *Modelling the early stages of vascular network assembly*, EMBO J **22**: 1771-1779.

[4] Gamba A, Ambrosi D, Coniglio A, de Candia A, Di Talia et al (2003), *Percolation, Morphogenesis, and Burgers Dynamics in Blood Vessels Formation*, Phys Rev Lett **90**, 11810: 1-4.