tight junctions between endothelial cells that prevents paracellular flow of materials. Because Wnt/β-catenin signaling is a major pathway regulating other aspects of brain development, the authors examined its potential involvement in constructing the BBB.

In brain endothelial cells, Wnt signaling was active during the time of maximum vascular development, but not after the BBB matured. Activation of the Wnt signaling pathway in vivo and in vitro promoted BBB development, and inactivation prevented it. In vitro, increasing Wnt signaling also strengthened junctions between non-brain endothelial cells.

This suggests that Wnt signaling might be tweaked to mend the BBBs in patients where it has failed—such as in stroke—or to temporarily open the BBB to deliver drugs that would normally be shut out.

Liebner, S., et al. 2008. J. Cell Biol. doi:10.1083/jcb.200806024.

If you build it, leukocytes will come (in)

As leukocytes rush by in the blood, the cells of the vessel wall are ready with a convenient handhold in the form of tetraspanin-enriched membrane microdomains, say Barreiro et al.

To fight infection, circulating leukocytes must exit the bloodstream, a process known to involve tetraspanins, membrane proteins that bring together other membrane proteins such as adhesion receptors.

To discover how tetraspanins assist leukocytes out of the blood, the team visualized them in live vascular endothelial cells by FRET-FLIM. Even in the absence of leukocytes, tetraspanins interacted with each other and with adhesion receptors such as VCAM-1 and ICAM-1 to form sticky nanoplatforms. The nanoplatforms then coalesced into larger structures, which presented the leukocytes with a plethora of adhesion receptors to grab onto. The platforms likely increase efficiency of leukocyte adhesion and bloodstream exit in the face of the high shear stress within the bloodstream, says author Francisco Sánchez-Madrid.

Barreiro, O., et al. 2008. J. Cell Biol. doi:10.1083/jcb.200805076.

Microtubule failure assists cleavage success

When it comes to positioning the cleavage furrow for cytokinesis, microtubules that fall apart are as important as stable ones, according to two papers by Foe and von Dassow and Odell and Foe.

The cleavage furrow forms at the equatorial region of the cell, when the underlying cortex transiently accumulates active myosin II that pulls on cortical actin filaments, constricting the membrane. It’s clear that positioning the furrow is one job of the mitotic apparatus, and probably its microtubules, but exactly how has been a mystery. To investigate this, von Dassow and Foe looked at microtubule dynamics and active myosin II distribution at various points during cytokinesis. They found that just prior to cleavage, the entire cortex was transiently depleted of activated myosin, setting the stage for its focused repositioning later on. Then, during anaphase, a set of stable microtubules formed, stretching from the centrosome to the equator, while short-lived dynamic microtubules spread to contact other regions of the cortex. Active myosin accumulated only where the stable microtubules contacted the cortex. The factors responsible for stability of the equatorial microtubules are not yet known.

These results were accounted for in a computer model by Odell and Foe when both types of microtubules bound centralspindlin, a complex of kinesin motor and Rho modulators that assembles on microtubules and motors toward the cortex. The stable microtubules acted as long-lasting rails, allowing time for centralspindlin to reach the cortex and activate myosin II. Meanwhile, excess centralspindlin remained sequestered on dynamic microtubules, but couldn’t reach the cortex before those microtubules depolymerized, thus reducing contractility everywhere else.

Foe, V.E., and G. von Dassow. 2008. J. Cell Biol. doi:10.1083/jcb.200807128.
Odell, G.M., and V.E. Foe. 2008. J. Cell Biol. doi:10.1083/jcb.200807129.