

Posted: Mon Sep 04, 2006 5:26 pm



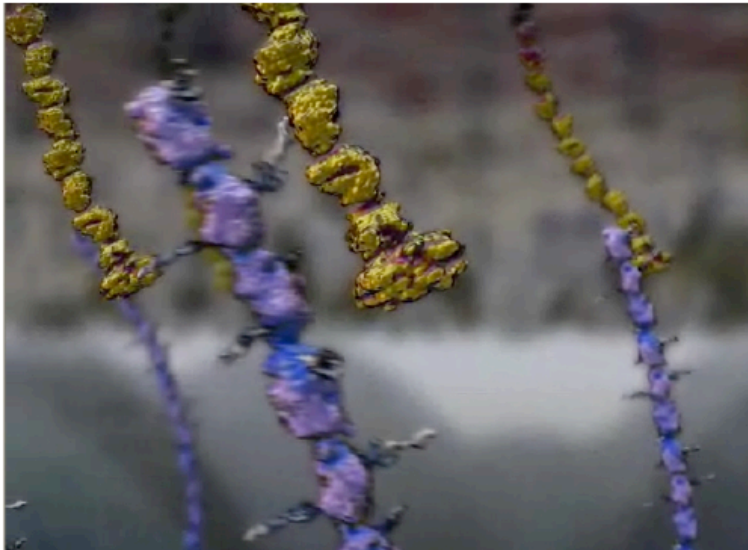
Ok, this took a while, but I wanted everyone to be able to enjoy the video, so I took captions for each scene and I explained briefly what it's about.

A white blood cell rolls across the inner wall of a blood capillary, as its receptors transiently interact with proteins on the surface of the capillary epithelial cells.



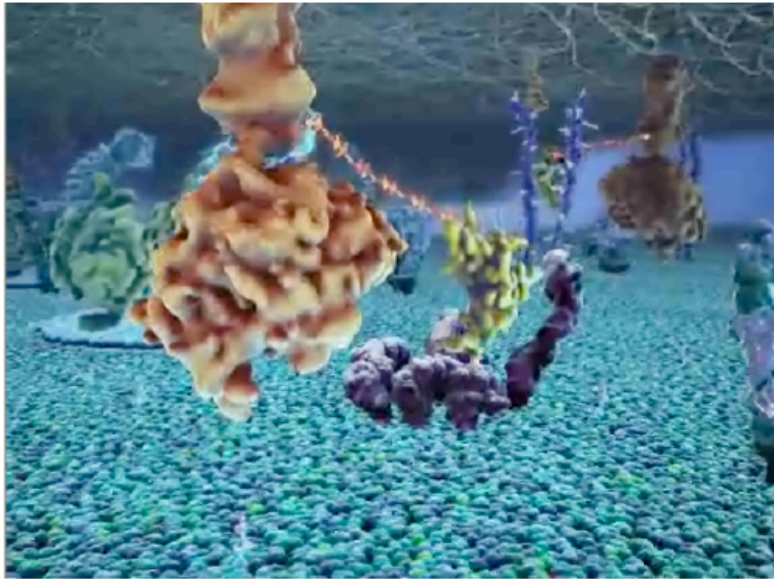
*Thumbnail, click to enlarge.*

At one point, the cell reaches a specific type of membrane protein which its receptors bind more tightly, causing it to dock at that location. It's probably an interaction between cadherin proteins on both cells. These proteins are expressed at that site to recruit the white blood cell to a nearby inflamed location, perhaps just behind the wall of the capillary. The inflammation causes the capillary cells to express these receptors to recruit the white blood cells from the blood and into the site.



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This transduces a signal through the membrane via the activated receptors



*Thumbnail, click to enlarge.*

This signal is carried in the form of second messengers that promote actin polymerization in the direction of the activated receptors.



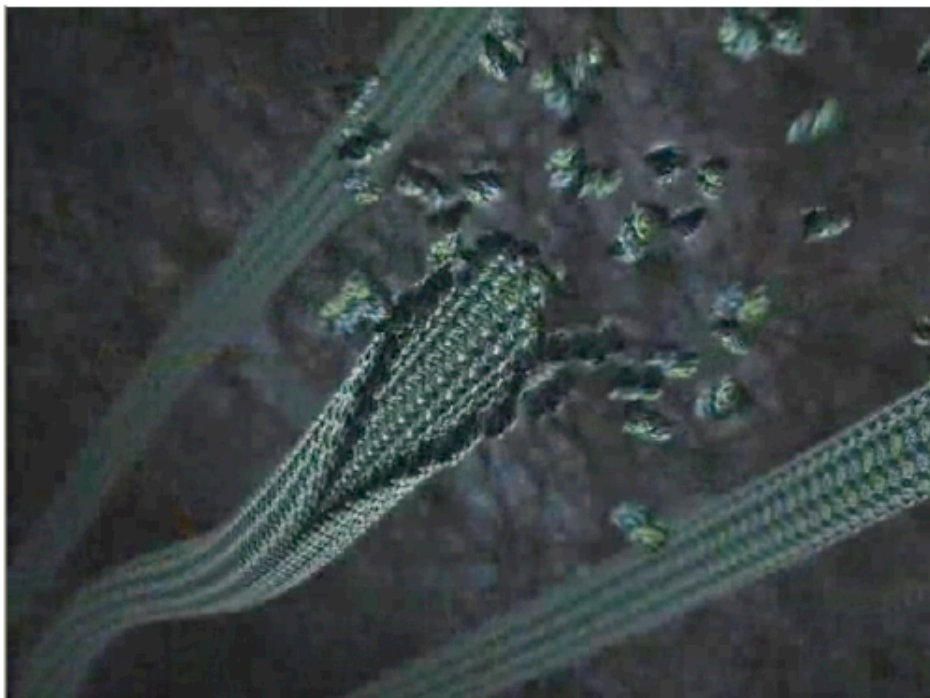
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This also causes the breakdown of actin filaments in the direction opposite the activated receptors. This causes a net push forward for the cell in the direction of the activated receptors



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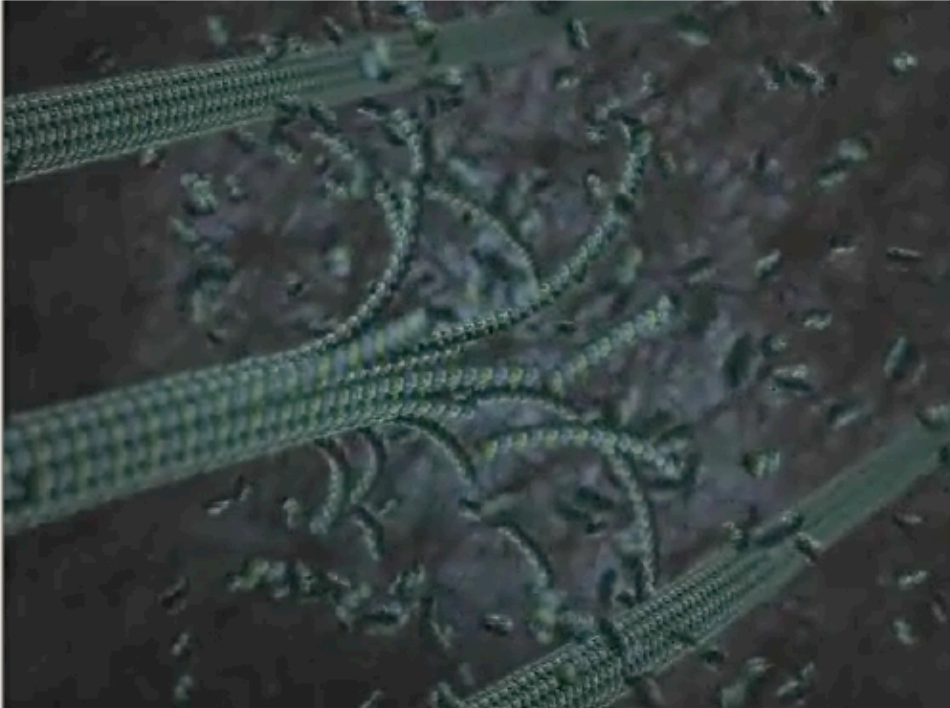
The signal also causes tubulin to polymerize forward



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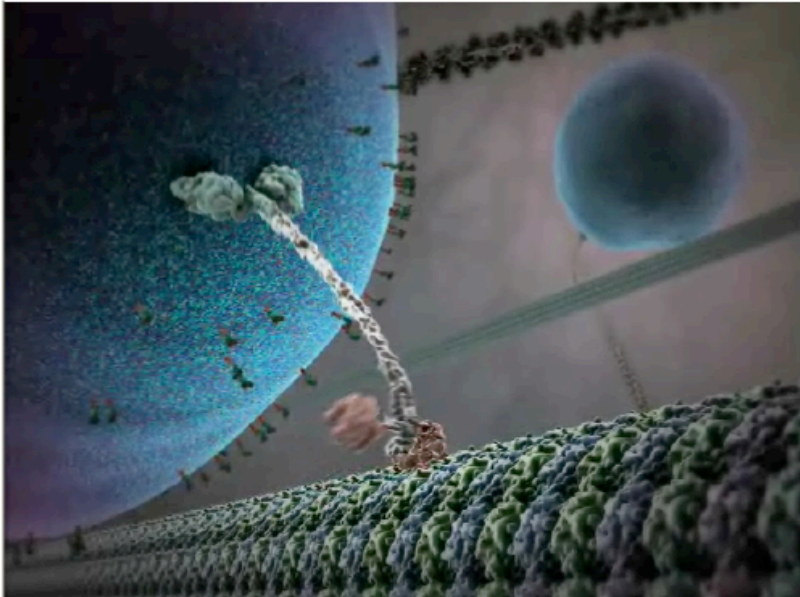


And here's tubulin breaking down in the back of the cell, again contributing to the forward push



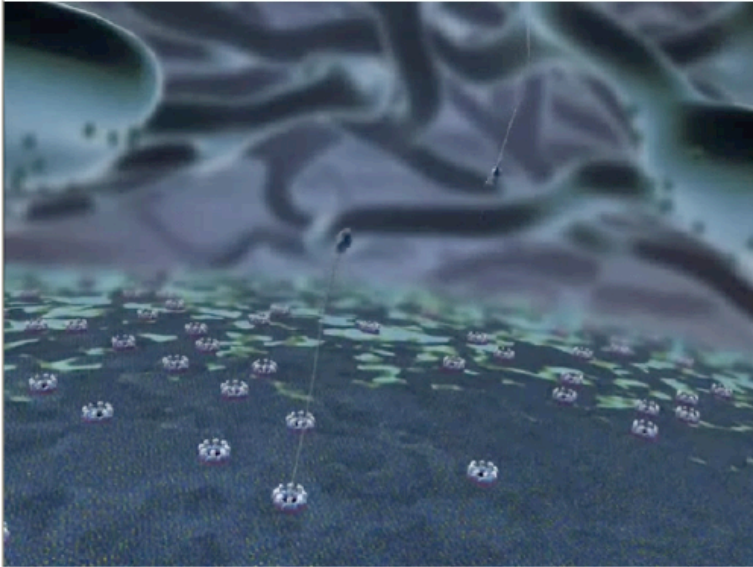
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Here is a small motor protein dragging a vacuole towards the contact scene on the newly polymerized tubulin tubule



*Thumbnail, click to enlarge.*

A signal is also transduced to the nucleus, in the form of transcription factors which induce mRNA expression. You see here mRNAs leaving the nucleus through pores in the nuclear membrane, aided by a shuttle protein



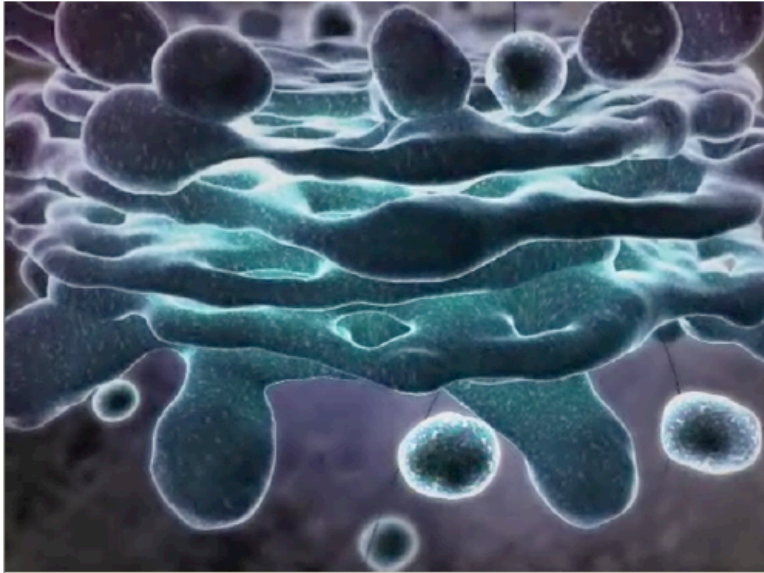
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The large and small subunits of the ribosome assemble on the mRNA and initiate translation. You can see a peptide chain emerging from the other side of the large subunit.



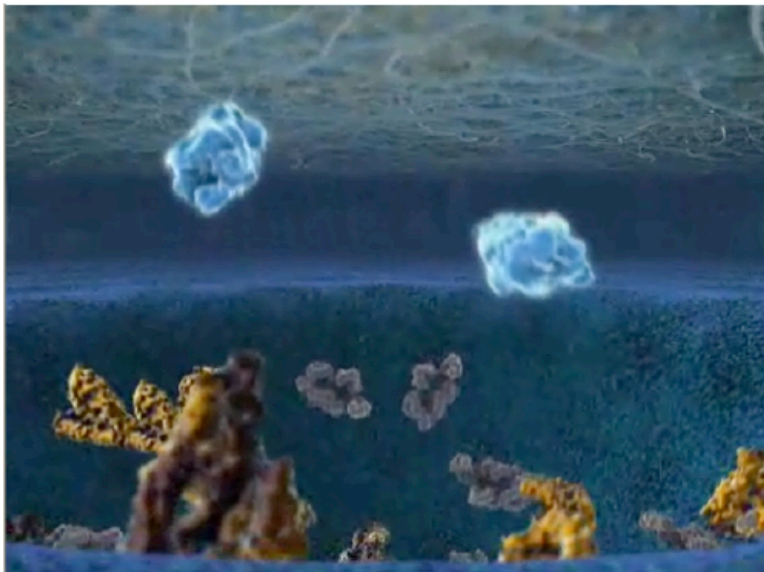
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Vacuoles containing soluble or membrane bound proteins bud from the endoplasmic reticulum and migrate towards Golgi apparatus.



*Thumbnail, click to enlarge.*

After processing, the blobs continue towards the membrane at the point of contact, and they merge with the plasma membrane releasing their soluble proteins into the intercellular space. The membrane bound ones remain attached to the surface and now act as receptors or docking points.



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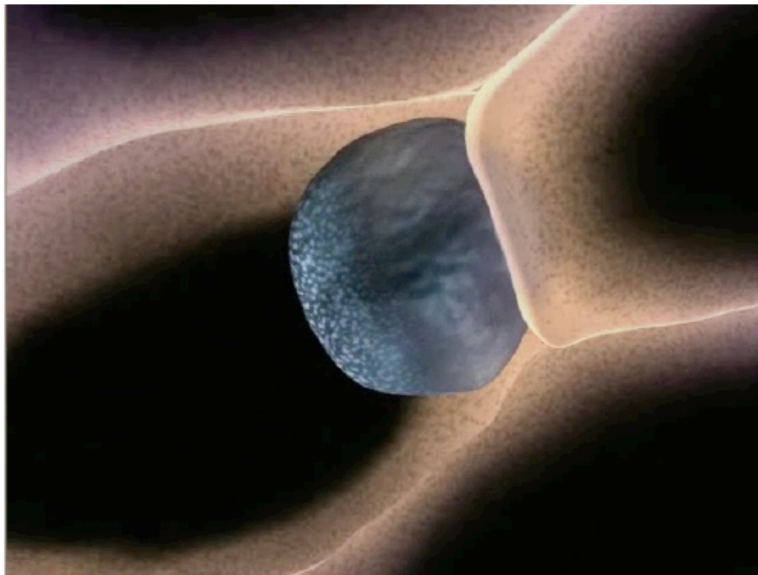


These receptors attach to other receptors on the epithelial cell, and the soluble proteins stimulate the epithelial cells to produce more receptors to strengthen the contacts.



*Thumbnail, click to enlarge.*

That along with the forward polymerizing actin and tubulin cause the white blood cell to flatten out, and then attach to the receptors being expressed in front of it, and guides it through the capillary membrane, as it squeezes itself out the other end, probably to a site of inflammation.



*Thumbnail, click to enlarge.*

Big thanks to BioVisions and Harvard University for creating this magnificent piece of work.