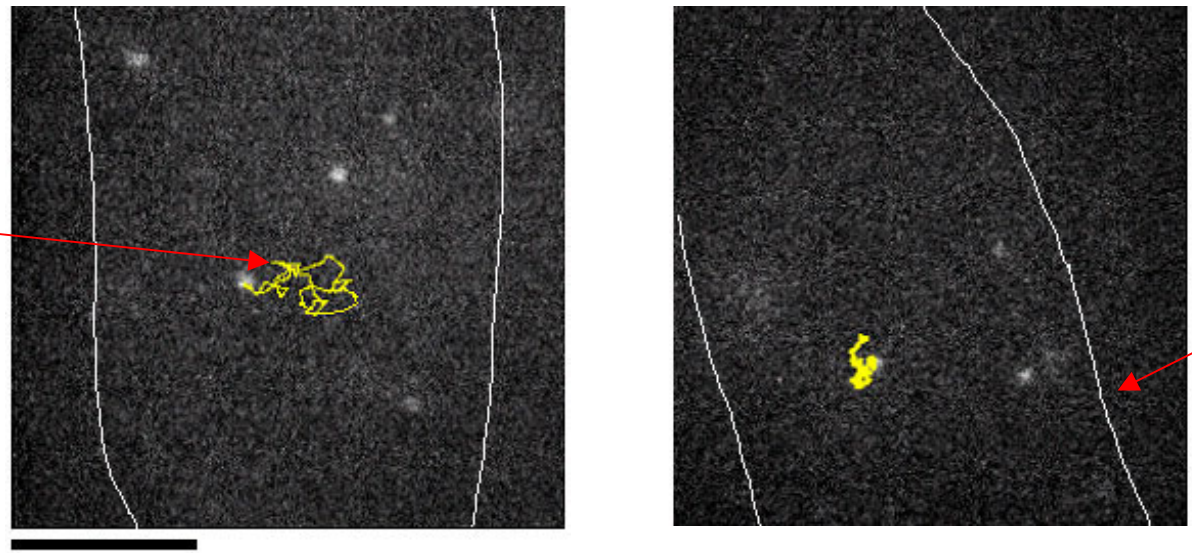
Motion of Single Transmembrane Proteins Depends on Membrane Cholesterol

Diffusion of Individual MHC II Proteins in Living Chinese Hamster Ovary Cells, By Single-Molecule Fluorescence Tracking

Normal Cholesterol

Reduced Cholesterol



NSF Grant No. MCB-0212503

Many transmembrane proteins on the surface of the cell move naturally, a motion which enables immune function and signaling, for example. Cholesterol is a key component of the plasma membrane of our cells. By labeling a particular transmembrane protein with a fluorescent molecule, we can follow the motion of *single* proteins in real time at video rates, with minimal perturbation on the living cell. Surprisingly, we see a dramatic reduction in the diffusion coefficient (see above) when the membrane cholesterol concentration is artificially reduced. Exploring this effect is leading to a deeper understanding of how cholesterol interacts with the lipids in the membrane to control the diffusion of embedded proteins.

M. Vrljic, S. Nishimura, H. McConnell, S. Nishimura, W. E. Moerner Biophys. J. 83, 2681 (2002) and Biophys. J. 84, 325A (2003)