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Nano-domains of high viscosity and stiffness mapped in the cell membrane by thermal noise imaging YUNHSIANG HSU, ARND PRALLE, University at Buffalo, SUNY — The cell membrane is thought to contain spatial domains, created by cholesterol-lipid clusters and by interactions with the membrane cytoskeleton. The influence of these domains on membrane protein mobility and cell signaling has clearly been demonstrate. Yet, due to their small size and transient nature, the cholesterol stabilized domains cannot be visualized directly. We show here that thermal noise imaging (TNI) which tracks the diffusion of a colloid labeled membrane protein with microsecond and nanometer precision, can visualize cholesterol stabilized domains, also know as lipid raft, in intact cells. Using TNI to confine a single membrane protein to diffuse for seconds in an area of 300nm x 300nm provides sufficient data for high resolutions maps of the local diffusion, local attraction potentials and membrane stiffness. Using a GPI-anchored GFP molecule to probe the membrane of PtK2 cells we detect domains of increased membrane stiffness, which also show increase viscosity and are the preferred location for the GPI-anchored protein. These domains are further stabilized by addition of ganglioside cross linking toxins and disappear after removal of the cholesterol.

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