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Immune Receptor Clustering in a Plasma Membrane Model

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Effective regulation of immune responses is essential for the proper functioning of the immune system. Fcγ receptors are a family of IgG receptors expressed on the surface of various immune cells, comprising several activating receptors and one inhibitory receptor. The inhibitory receptor, FcγRIIB, plays a crucial role in modulating the activating signals of other Fcγ receptors. Upon activation, FcγRIIB undergoes phosphorylation at its ITIM cytoplasmic domain, a process believed to involve access to sphingolipid rafts.

This study aims to elucidate the mechanisms underlying the membrane-dependent clustering of Fcγ receptors, focusing particularly on the inhibitory FcγRIIB receptor. Using coarse-grained molecular dynamics (CG MD) simulations, we explore the dynamics of immune receptor clustering and its impact on physical membrane characteristics. Specifically, we investigate the effects of clustering on the local lipid nano-environment and membrane curvature. Our findings suggest a complex interaction between membrane composition and immune signaling.