

Supplemental Figure Legends

Supplemental Figure 1: Binding takes place in two stages.

Immobile receptors and mobile ligands were randomly seeded onto the surfaces of separate spherical cells that had radii of 5 μm . A flat contact area that had a radius of 4 μm was used such that the contact area accounted for one sixth of each cell's surface area. The receptors interacted with their ligands using on-rates of $1.57 \times 10^3 \text{ M}^{-1}\text{s}^{-1}$ and off-rates of 0.063 s^{-1} for 360 s. Thereafter, the on-rate was set to $0 \text{ M}^{-1}\text{s}^{-1}$ to observe dissociation for 120 s. The simulation was carried out in 0.1 s increments. The percentages of bound immobile receptors inside the contact area at a given time are shown. **(A)** (*Black*) 10,167, (*dark gray*) 10,833 or (*light gray*) 11,500 ligands interacted with 10,000 receptors using confinement distances of 12.35 nm, 1.37 nm and 0.15 nm, respectively. The diffusion coefficient of unbound ligands was $1.0 \times 10^{-13} \text{ m}^2\text{s}^{-1}$. **(B)** A confinement distance of 0.15 nm was used to analyze the binding of (*black*) 11,500, (*dark gray*) 14,500 or (*light gray*) 19,000 ligands to 10,000, 30,000 and 60,000 receptors, respectively. **(C)** 19,000 ligands that had diffusion coefficients of (*black*) 10^{-13} , (*dark gray*) 10^{-14} or (*light gray*) $10^{-15} \text{ m}^2\text{s}^{-1}$ interacted with 60,000 receptors using a confinement distance of 0.15 nm. Each simulation was repeated five times.

Supplemental Figure 2: CD2 may be most important during the first few minutes of T cell activation.

The relative amounts of TCRs that are present in an activated state in the presence and absence of CD2 are shown. The simulation shown in [Fig. 5](#) was compared to a similar simulation that did not include any CD2 molecules.