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**Biochemistry on a leash: Confinement as a regulatory mechanism for bimolecular reaction rates** DANIEL REEVES, KEITH CHEVERALLS, JANE KONDEV, Brandeis University — We describe two mechanisms by which confinement regulates diffusion-limited bimolecular reaction rates. The first mechanism, illustrated by the actin capping protein formin, uses a flexible polymer to tether ligand binding sites, which serve as intermediaries, to the reactive site. The second mechanism uses a potential (e.g. hard wall potential), to constrain the motion of a ligand receptor within a confining volume. We analyze both mechanisms theoretically, using a combination of analytic and numerical techniques, to obtain the steady state binding kinetics. We explore how the reaction rates are regulated by parameters of the model such as the length of the polymer tether, and use our findings to explain the key features of the formin system. Finally, we suggest other systems, both synthetic and biological, in which these mechanisms for regulating bimolecular reactions might be at play.

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