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The effects of supramolecular network topology on hapten-receptor avidity JASON BENKOSKI, ANDREW MASON, JILL LA FAVORS, JOSHUA WOLFE, The Johns Hopkins University Applied Physics Laboratory — Antibodies produced in the early stages of the immune response have much lower affinities for a given antigen than those produced later on. Nature compensates for the initial weakness of these associative bonds by synthesizing multivalent antibodies. The total binding strength, represented by the avidity constant, is equal to the product of the affinity constants for the individual hapten/receptor sites. However, under realistic conditions the individual binding sites do not act independently. Factors such as steric hindrance, intramolecular stresses, and competitive binding can significantly alter the relationship between affinity and avidity. We investigate the influence of these factors on a model system consisting of synthetic multifunctional nanoparticles and polymers. Each polymer or nanoparticle is decorated with either multiple antigens (thromboxane B2) or multiple antibodies. We then measure the association and dissociation in real time using Surface Plasmon Resonance Spectrometry (SPR). By using synthetic polymers and nanoparticles, we are able to systematically control the degree of functionality, flexibility, and distance between receptor and hapten sites.

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