Rapid Colorimetric detection of antibody-epitope recognition at a bio-mimetic membrane interface

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Abstract

Biomolecular recognition of antigens and epitopes by antibodies is a fundamental event in the initiation of immune response, and plays a central role in a variety of biochemical processes. Peptide binding requires, in many cases, presentation of the peptides at interfaces, such as protein surfaces, cellular membranes, and synthetic polymer surfaces. We describe a novel molecular system, in which interactions between antibodies and peptide epitopes displayed at a bio-mimetic membrane interface can be detected through induction of visible, rapid color transitions. The colorimetric assembly consists of a phospholipid / polydiacetylene matrix anchoring a hydrophobic peptide displaying the epitope at its N-terminus. The colorimetric transitions observed in the assembly, corresponding to perturbation of the polydiacetylene framework, are induced only upon recognition of the displayed epitope by its specific antibody present in the aqueous solution. Significantly, the color changes occur after a single mixing step, without further chemical reactions or enzymatic processing. The new molecular system could be utilized for studying antigen-antibody interactions and peptide-protein recognition, epitope mapping, and for rapid screening of biological and chemical libraries.