Protein Targeted Corona Phase Molecular Recognition

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Corona Phase Molecular Recognition (CoPhMoRe) is a method whereby a heteropolymer is adsorbed onto a nanoparticle surface, templating it for the recognition of a specific target analyte. Recently demonstrated for small molecules [1,2], CoPhMoRe applicability has not been extended yet to macromolecules such as proteins. In this work a CoPhMoRe screen of single walled carbon nanotubes (SWCNT) wrapped in a library of phospholipid-poly ethylene glycol derivatives and oligonucleotides against a panel of human blood proteins reveals a phase highly selective to fibrinogen. This corona phase has one of the highest relative coverage of the nanotube surface, of more than 85%, and upon the interaction with fibrinogen, an 80% decrease in fluorescent emission intensity is observed. The three nodules of fibrinogen are shown to bind sequentially in a three step mechanism, starting with the outer D-regions followed by the central E-region, with dissociation constants that increase with the SWCNT diameter, ranging from 3.5 nM for the (6,5) chirality to 31.4 nM for the (11,3) chirality. Our results open a new direction in the fundamental search of novel synthetic non-biological antibodies for the recognition of bio-macromolecules, proteins, and peptides, for biological applications.

References

[1] Zhang J. *et. al.*, *Nature Nanotechnology*, 8, 959–968, 2013

[2] Kruss S. *et. al.*, *J. Am. Chem. Soc.*, 136 (2), 713–724, 2014