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Epitope-imprinted polymers for diagnostics

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Epitope sequences are unique combination of amino acids sequence positioned on exposed domains of proteins. Molecular imprinting is a promising technique for creating molecular receptors with recognition and binding sites that are chemically and sterically complementary in shape, size and functionality to the predetermined target molecules in synthetic polymer. This approach creates template-shaped cavities in polymer matrices with memory of template molecules to be used in molecular recognition. Imprinting whole protein denatures the tertiary and quaternary structures of protein in the polymer matrix and complexity and flexibility of its structure cannot be sustained in the polymer matrix. Epitope approach offers a way out of such snags. The epitope-imprinted film revealed high selectivity over the target protein and allow tolerance for even a single amino acid mismatch between the epitope and target protein. Bioinformatics tools were adapted to search epitope sequences of *Neisseria meningitides*, a human-specific bacterial pathogen which causes bacterial meningitis by invading the meninges of central nervous system. High mortality rate associated with the disease therefore requires proper medical diagnosis and early treatment. Diagnosing bacterial meningitis is currently cumbersome and involves isolating the bacteria from sterile cerebrospinal fluid (CSF) through lumbar puncture followed by observing presence of meningococci under microscope by a neurologist. T-cell epitopes from outer membrane proteins Por B present on the exposed surface of immunogenic loops of Class 3 OMP allele of *N. Meningitides* as well as another epitope sequence identified from *N. meningitides* iron acquisition protein viz. an iron regulated outer membrane protein frpB. These epitopes are used for designing a diagnostic tool *via* molecularly imprinted piezoelectric sensor (MIP-QCM) for *N. meningitides* strain MC58. The epitope can be simultaneously bound to functional monomer and fitted into the shape-selective cavities. On extraction of epitope sequence from thus grafted polymeric film, shape-selective and sensitive sites were generated on EQCM crystal i.e known as epitope imprinted polymers (EIPs). Imprinting was characterized by atomic force microscopy images. The epitope-imprinted sensor was able to selectively bind *Neisseria meningitides* proteins present in blood serum of patients suffering from brain fever. Thus fabricated sensors can be used as a diagnostic tool for meningitis disease.

Biography

Meenakshi Singh received her PhD from Banaras Hindu University, Varanasi, India in 1995. She has joined as Assistant Professor in Department of Chemistry, MMV, Banaras Hindu University in 2005, later on as Associate Professor in 2012. Her research interests include polyelectrolytes, hydrogels and organogels, molecular imprinting (MIP) and MIP sensors. She is experienced in designing the novel polymeric formats for crafting molecular recognition elements to device sensors for biomolecules/drugs using molecular imprinting. She has published many papers in peer-reviewed reputed international journals and supervised few PhD and Master's students in the field of Analytical Chemistry.

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