World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:12, No:01, 2018

Design of Liquid Crystal Based Interface to Study the Interaction of Gram Negative Bacterial Endotoxin with Milk Protein Lactoferrin

Authors : Dibyendu Das, Santanu Kumar Pal

Abstract : Milk protein lactoferrin (Lf) exhibits potent antibacterial activity due to its interaction with Gram-negative bacterial cell membrane component, lipopolysaccharide (LPS). This paper represents fabrication of new Liquid crystals (LCs) based biosensors to explore the interaction between Lf and LPS. LPS self-assembled at aqueous/LCs interface and orients interfacial nematic 4-cyano-4'- pentylbiphenyl (5CB) LCs in a homeotropic fashion (exhibiting dark optical image under polarized optical microscope). Interestingly, on the exposure of Lf on LPS decorated aqueous/LCs interface, an optical image of LCs changed from dark to bright indicating an ordering alteration of interfacial LCs from homeotropic to tilted/planar state. The ordering transition reflects strong binding between Lf and interfacial LPS that, in turn, perturbs the orientation of LCs. With the help of epifluorescence microscopy, we further affirmed the interfacial LPS-Lf binding event by imaging the presence of FITC tagged Lf at the LPS laden aqueous/LCs interface. Finally, we have investigated the conformational behavior of Lf in solution as well as in the presence of LPS using Circular Dichroism (CD) spectroscopy and further reconfirmed with Vibrational Circular Dichroism (VCD) spectroscopy where we found that Lf undergoes alpha-helix to random coil-like structure in the presence of LPS. As a whole the entire results described in this paper establish a robust approach to envisage the interaction between LPS and Lf through the ordering transitions of LCs at aqueous/LCs interface.

Keywords : endotoxin, interface, lactoferrin, lipopolysaccharide
Conference Title : ICBST 2018 : International Conference on BioSensing Technology
Conference Location : Zurich, Switzerland
Conference Dates : January 15-16, 2018