Title:	Design of bio-molecular interfaces using liquid crystals demonstrating endotoxin interactions with bacterial cell wall components
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Keywords:	bio-molecular liquid crystals bacterial cell wall components
Issue Date:	2015
Publisher:	Royal Society of Chemistry.
Citation:	RSC Advances, 5(81)
Abstract:	Interaction of different bacterial cell membrane components such as, peptidoglycan (PG) and lipoteichoic acid (LTA) with bacterial endotoxin (LPS) shows diverse consequences on the toxicity of Gram negative bacteria in mammalian hosts, implying the huge importance of studying this interaction for clinical understanding associated with Gram negative bacterial infections. In this advance, herein, we report a liquid crystal (LC) based simple, robust experimental design for rapid and precise recognition of the interaction of LPS with PG and LTA. The optical appearance of nematic 4-cyano-4′-pentylbiphenyl (5CB) LCs changed from dark to bright (consistent with an ordering transition of the LCs) in contact with an aqueous solution of PG and LTA on LPS–laden aqueous–LC interfaces. The ordering transition demonstrates the strong interaction between PG and LTA with LPS at these interfaces. Our experiment also revealed that the interaction of PG and LTA towards LPS is highly specific. In addition, PG and LTA shows different binding affinity towards LPS and response of the LC is found to vary significantly from one to another which is conveniently quantified by measurement of the light intensity transmitted through the LC under crossed polars. Langmuir Blodgett (LB) and polarization modulation infrared reflection absorption spectroscopy (PM-IRRAS) measurements provide further insight on LPS laden aqueous–LC interfaces. Finally, we have also quantified the different binding affinity of PG and LTA towards LPS by measuring the optical retardance of the LC at aqueous–LC interfaces. Overall, the results presented in this paper offer a promising approach to study and quantify the interactions between different bacterial cell membrane components with LPS at aqueous–LC interfaces.
URI:	https://pubs.rsc.org/en/content/articlelanding/2015/ra/c5ra09640e#!divAbstract (https://pubs.rsc.org/en/content/articlelanding/2015/ra/c5ra09640e#!divAbstract) http://hdl.handle.net/123456789/2842 (http://hdl.handle.net/123456789/2842)
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