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Neutrons and Light as tools for the identification of specific biorecognition molecules for LPS detection.

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Gram(-) bacteria are pathogenic microorganisms whose outer membrane of the external envelope is composed of lipopolysaccharides (LPS), consisting of three structural domains: lipid A, the core oligosaccharide, and the O antigen. They are endotoxins responsible for many infections induced by bacterial pathogens, so represent a suitable target for selective detection. This can be achieved through specifically designed biosensors, where the biorecognition event is exploited for detection. Among biorecognition molecules, aptamers are very appealing. They are single-stranded DNA or RNA with high affinity and specificity towards specific analytes. Recently, an aptamer named LA27 has been identified to selectively recognise LPS. The LPS portion interacting with LA27 is not well understood yet. However, preliminary studies suggest a direct affinity with lipid A as well as a capability of this aptamer to interact with LPS deriving from different strains of Gram(-) bacteria. In this study, we investigated the interaction of LA27 with two LOS and one LPS extracted respectively from three Gram(-) strains: Akkermansia, Flavobacterium and Paenalcaligenes hominis. Exploiting Neutron Reflectometry and Dynamic Light Scattering on biomimicking bacterial membranes we were able to see that LA27 can interact with both LOS and LPS, although with Los a higher affinity was detected. The analysis of the experimental result suggests that the interaction is ruled by the O-antigen region of the LPS.

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