Mucin-like glycocalyx modules for creatingcomplex artificial glycocalyxes

Laia SALTOR NÚÑEZ [1], Ralf RICHTER [2,3], Bruce TURNBULL [1,2]

[1] School of Chemistry, University of Leeds, UK [2] Astbury Centre, University of Leeds, UK; [3] Bragg Centre for Materials Research, University of Leeds, UK

l.saltornunez@leeds.ac.uk

The glycocalyx on the outer surface of cells is made of glycoproteins, glycolipids, and proteoglycans, and accomplishes many crucial functions in the communication of the cell with its environment.[1] Cholera toxin (CT), a lectin secreted by *Vibrio cholerae* that causes life-threating diarrhea, targets Lewis^y and Lewis^x carbohydrate antigens in this layer in addition to ganglioside GM1 in the cell membrane.[2,3] Shiga toxin (ST), a lectin secreted by *Shigella dysenteriae* type 1 and some strains of *Escherichia coli*, binds to the Gb_3 glycosphingolipid on the cell membrane and causes haemorrhagic colitis and hemolytic uremic syndrome.[4–6]

Even though the general mechanisms of infection for both CT and ST are well known, how these proteins interact with the glycocalyx en route to infecting the host cell remains poorly understood. The complexity of the glycocalyx, and the scarcity of tools to control and analyse glycocalyx composition and organisation, make mechanistic studies *in vivo* and *in vitro* challenging.

We aim to generate well-defined glycocalyx models to understand how CT and ST interact with the cell surface. To this end, hyaluronan (HA) and Lewis^x or Gb_3 oligosaccharides were prepared with appropriate bio-orthogonal reactive groups to allow their conjugation, followed by the incorporation of a biotin group on the reducing end of the HA backbone, to build a well-defined mucin-like molecular structure suitable for anchorage to cell membrane models, and to perform quantitative binding studies using quartz crystal microbalance or spectroscopic ellipsometry.

Acknowledgements

synBIOcarb was funded by the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska Curie grant agreement no. 814029

Bibliographic references:

1.R. Bansil, BS. Turner (2006), Curr. Opin. Colloid. Interface Sci. (11) 164-170.
2.BJ. Stoll, KMB. Hossain (1985), Am. J. Epidemiol. (121) 791-796.
3.Cholera (2017). Wkly. Epidemiol. Rec. (92) 521-536.
4.M.A. Karmali, M. Petrie, H. Lior (1985), J. Infect. Dis. (151) 775-782.
5.M.A. Karmali (2004), Mol. Biotechnol. (26) 117-122.
6.A.R. Melton-Celsa (2014), Microbiol. Spectr. (2) EHEC-0024-201