GLYCOMICS MICROARRAYS REVEAL HIGHER CD64 BINDING AND GREATER PHAGOCYTOSIS ASSOCIATED WITH SERUM IGG FUCOSYLATION IN SEVERE COVID-19 DISEASE

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) caused the global coronavirus disease 2019 (COVID-19) pandemic. SARS-CoV-2 infection typically stimulates production of serum antibodies against various viral antigens (Ag) over time. We previously demonstrated that there was a significant association between disease severity and serum antibody binding intensity for specific viral protein antigens including spike protein fragment S1 [1]. Serum antibody level is also associated with neutralisation and clearance as Fc receptors (FcR) and effector functions are engaged. However antibody-Ag immune complex receptor binding has not yet been associated with COVID-19 disease severity and phagocytosis.

Serum IgG core fucosylation was revealed in the severe COVID-19 disease cohort by lectin microarray profiling and HPLC analysis, which was absent in the mild and moderate disease and pre-pandemic healthy donor cohorts. The affinity (Kd) of IgG from severe patients was highest by 3 weeks post-infection. Serum IgG from the different disease severity and healthy cohorts were also complexed with various viral protein Ags of differing glycosylation and incubated with Fc receptors (FcR) in a custom microarray format. Serum IgG-Ag immune complexes modulated FcR interactions and Kd compared to Ag alone, and Ag glycosylation also impacted binding. Phagocytosis of bead bound S1 Ag was assessed in the presence and absence of serum IgG from the different cohorts. Overall, higher binding to CD64 and greater phagocytosis was associated with severe disease serum IgG and fucosylation. Further, custom glycomics microarray platforms provide a novel and rapid methodology to identify and measure immune interactions, which can contribute to disease severity prognostics and treatment modality decisions.

References:

1. M. Le Berre, T. Paulovčáková, C. De Marco Verissimo, S. Doyle, J.P. Dalton, C. Masterson, E. Ribes Martinez, L. Walsh, C. Gormley, J.G. Laffey, B. McNicholas, A.J. Simpkin, M. Kilcoyne, *PloS One*, **2023**, *18*, e0283537.