

## Sugar superbinders for precision disease diagnosis

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Antibodies, particularly monoclonal antibodies, have been the essential ligands for the recognition of biomolecules. However, due to the poor immunogeneity of sugars and the poor availability of the pure form of some sugars such as glycans, the preparation of anti-sugar antibodies still remains challenging. On the other hand, lectins, as the working horses for the recognition of sugars, have been widely used in life science researches and disease diagnosis. However, lectins suffer from several apparent disadvantages, such as difficulty in preparation, inadequate affinity and specificity. Therefore, artificial antibodies that are capable of recognizing sugars with excellent binding properties hold great potential for important applications such as disease diagnosis. Molecular imprinting is an important methodology for creating antibody mimics to recognize specific compounds. Recently, our team has established an approach termed boronate affinity controllable-oriented surface imprinting, which allows for easy and efficient preparation of MIPs specific to glycoproteins, glycans and monosaccharides [1-3]. Using glycan-imprinted nanoparticles as a labeling reagent, we have already developed a method called orthogonal dual molecularly imprinted polymer-based plasmonic immunosandwich assay (odMIP-PISA) for specific detection of glycoproteins and demonstrated its great potential in disease diagnosis [4]. Using the imprinting approach, a large variety of anti-sugar artificial antibodies with specificity superior to that of lectins have been prepared. In this talk, we introduce the preparation of monosaccharide and glycan-imprinted nanoparticles as labeling tags and corresponding Raman and mass spectrometry (MS) detection approaches for precision disease diagnosis. The use of fucose-specific and N-glycan A2G2S2-specific artificial antibodies have enabled precision diagnosis of hepatocellular carcinoma via recognizing the glycosylation status of alpha-fetoprotein. We foresee these anti-sugar artificial antibodies hold great perspectives in precision disease diagnosis.

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