GLYCONANOMATERIALS AND APPLICATIONS

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To study and intervene in carbohydrate interactions our laboratory has developed an integrated strategy (Glyconanotechnology) to produce 2D- and 3D-gold surfaces functionalized with self-assembled monolayers (SAMs) of sugars. By combining these glyconanomaterials with novel analytic surface techniques (AFM, TEM, SPR) we have demonstrated and evaluated Ca^{2+}-mediated carbohydrate-carbohydrate interactions involved in a diversity of biological processes.

The 2D-surfaces have been used in the study of chemical forces between carbohydrate-carbohydrate interactions by AFM. The 3D-gold surfaces (glyconanoparticles,GNPs) coated with biological significant carbohydrates (antigens) and with differing density have been prepared to study biological mechanisms and to intervene in cell adhesion processes. The methodology includes the preparation of *multifunctional* GNPs incorporating carbohydrates and other molecules such as fluorescent molecules, biotin, peptides, proteins, antibodies or DNA.

The manipulation of the metallic cluster to obtain luminescent *glyco*-quantum dots (semiconductors) and magnetic nanoparticles for application in cellular labelling and imaging is comprised within the potential of this novel technology. Furthermore, the introduction of additional ligands can be used to guide the assembly of the nanoclusters creating a wealth of different nanostructured materials.

The glyconanomaterials presented here are excellent probes for understanding biomolecular interactions and potential instruments to solve biomedical problems. In this lecture, the Glyconanotechnology strategy will be presented and some of their applications will be highlighted.