Glyco-tools for precision biomedical applications: from small molecules to glyconanomaterials

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Glycoscience is a field with the most significant technological advances of the last decade, which enabled to unveil the role of glycans (complex carbohydrates) in human health and diseases. All cells are coated by glycans which can be found on cell surface mainly linked to protein, lipids and as recently discovered RNA. These glycans are molecular antennas and they are involved in key molecular recognition processes (*e.g.* cell-cell signaling, modulation of the immune system, host-pathogen interactions). Accordingly, alterations on the composition and expression of glycans are active drives of a plethora of human diseases (*e.g.* cancer, infections, autoimmune diseases, lysosomal disorders) and control several biological processes that underlie either the onset or the progression of these conditions. Glycosylation changes are non-random, and these changes are fingerprints of specific diseases.

With this in mind, the GlycoFluoNano lab in Florence is focused on studying and developing enabling technologies to investigate the role of glycans in health from different perspectives and devise new therapeutic approaches. In this communication, the recent results of the GlycoFluoNano Lab on the development of glycomimetics, glyconanomaterials and glycol-fluorescent probes will be discussed. Details on the use of these glyco-tools for cancer treatments and bacterial infections, and for the study of glycan-lectin interactions will be provided.