Ph.D. in Chemical Sciences
Cycle XXXVI

PI: Alba Silipo
Co-PIs: Antonio Molinaro, Francesco Berti

Research project title:

Development of new NMR approaches for vaccine antigens characterization and interaction in complex matrix

Keywords: Glycans; structural chemistry; NMR, immunology.

Research project abstract:

Carbohydrate antigen structural characterization is critical for the discovery and development of vaccine candidates. Extensive comprehension of glycan structure-activity relationship is important to improve the vaccine antigens design and to understand how they interact with other macromolecules.

Antigens interaction studies are critical for several reasons and in different contexts, such as epitope mapping, understanding of the interaction with different classes of adjuvants, interaction/inclusion with supramolecular delivery systems. Characterization of these non-covalent interactions represents a big challenge and is often approached by a combination of several techniques, such as mass spectrometry, antibody-based techniques, sucrose gradient technique, and chromatography.

The scope of this PhD thesis is to develop specific analytical methods based on Nuclear Magnetic Resonance Spectroscopy (NMR) with the aim to minimize the sample handling and to study the antigens behaviors in solution, instead of the classical analytical techniques, avoiding the potential creation of artifacts. A combination of different NMR techniques (mono-dimensional ^{1}H, ^{31}P, ^{13}C; bi-dimensional NOESY, DOSY, TOCSY, STD-NMR) will be developed and applied in combination with other orthogonal technologies with the aim to have in-depth understanding of the antigens structure and binding properties.