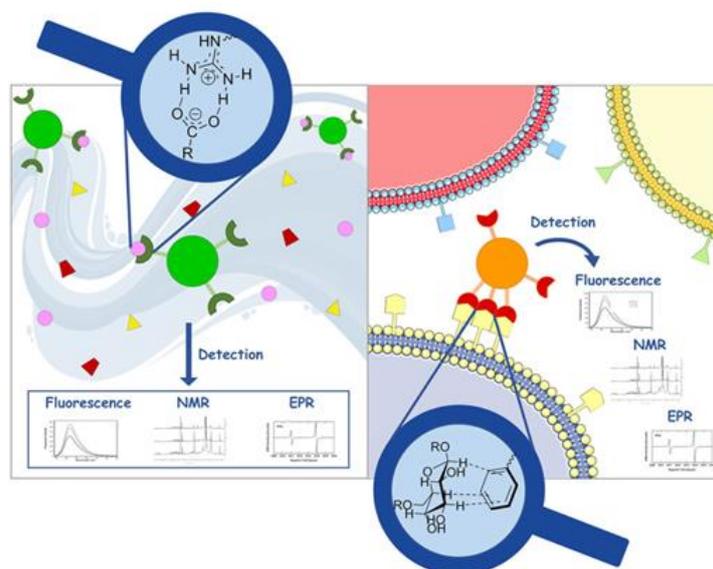


## Supramolecular nanostructures for sensing of biomolecules

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The doctorate project is within the frame of BacHounds “Supramolecular nanostructures for bacteria detection” project funded by MIUR in the PRIN program. Aim of the project is to develop smart nanosensors able to identify bacterial strains through the recognition of molecular patterns exposed on bacterial outer membranes and of bacteria metabolites under physiological and pathological conditions with particular regard to the characterization of gut microbiota.<sup>1</sup>

By capitalizing on advanced instruments of Supramolecular Chemistry, such as self-assembly and multivalency, BacHounds proposes an innovative approach to bacteria detection that combines recognition of the bacterial cell wall and of their metabolites. This will be achieved by exploiting different chemical systems ranging from molecular receptors (calixarenes) to large and complex nanostructures such as AuNPs and liposomes. Selectivity toward bacterial strains will be achieved targeting the different architecture of bacterial external cell walls with complementary recognition units (positively charged guanidinium and ammonium moieties, lipophilic groups, hydrogen bonding donor/acceptor, etc.) which will be inserted in the self-assembled nanosystem. The coupling of these nanoobjects with proper reporters (fluorescent, UV-vis, paramagnetic) will cause the modulation of the emerging signal upon interaction with the target, enabling its sensitive detection (see Figure).



Schematic representation of the recognition/sensing process of small analyte (left) and bacteria cell walls (right)

The doctorate project will be focused on AuNPs and liposomes which will be decorated on the surface with proper recognition units leading to multivalent sensors. Selectivity and sensitivity will be further enhanced by exploiting new concepts such as clustered multivalency and control of surface morphology on AuNPs<sup>2</sup> in order to expose ordered clusters of different recognition motifs. The project will be developed in strict collaborations of the research units of BacHounds.

### References:

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2. Şologan M., Marson M., Polizzi S., Pengo P., Boccardo S., Priel S., Posocco P., Pasquato L. *ACS Nano*, **2016**, *10*, 9316–9325.