Combining multiplexed SPRi and AFM approaches for the detection and qualification of circulating blood microparticles sub-populations.

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In the fields of nanotoxicology and diagnosis, it is of major interest to develop instrumentations or biochips which are able to detect and characterize nano-bio-objects (such as protein complexes, virus, particles...) that are present in various biological samples. Especially, microparticles (MPs) are produced from membrane of every cell types by a process called vesiculation. Circulating microparticles present in blood samples have emerged as a biological marker in several pathologies. Indeed, an increased concentration of circulating microparticles can be associated with autoimmune diseases or thrombosis. Despite a huge clinical interest, no standard procedures are available for the detection and characterization of blood microparticles, because these biological objects present sizes below the detection limit of conventional methods (< 300nm in diameter). Thus the quantification and qualification of microparticles, that are crucial in various medical fields, require combination of new analytical solutions[1,2]. Among them, Atomic Force Microscopy appears as a powerful technique for size detection and shape determination of particles[3].

Our project consists in developing versatile biochips in arrays allowing both **1)** qualifying MPs cellular origin, and then defining their associated functions through surface plasmon resonance analysis (SPRi) and **2)** reliable sizing and enumeration of MPs by on-chip AFM investigations. A complete multiplexed study of blood microparticles screening in plasma will be presented, based on arrayed chips, bio-functionalized by natural ligands and antibodies. Our results of nanosized blood particles exploration and characterization seem to be promising in comparison with usual techniques like flow cytometry or dynamic light scattering in terms of sensitivity and accuracy.

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