ADDING NEW DIMENSIONS TO THE DYNAMIC EXPLORATION OF THE BIOMOLECULAR CORONA

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Abstract:

The biological fate of nanomaterials (NMs) is driven by the specific interactions that biomolecules, naturally adhering onto their surface, engage with cell membrane receptors and intracellular organelles. The molecular composition of this layer, called biomolecular corona (BMC), depends on both the physical-chemical features of the NM and the biological media in which the NM is dispersed and cells grow. Over the last years, we have extensively investigated this exciting chemical space, also by introducing new experimental approaches. By exploring the *dynamics* of the BMC, we recently demonstrated[1] that the widespread use of 10% fetal bovine serum (FBS) for *in vitro* assay is unable to recapitulate the complexity of an *in vivo* systemic administration, with NMs being transported by the blood. To this purpose, by using gold nanoparticles (GNP) and graphene oxide (GO) as test NM, we undertook a comparative journey involving proteomics, lipidomics, high throughput multiparametric *in vitro* screening, as well as single molecular feature analysis to investigate the molecular details behind this *in vivo/in vitro* bias. Our work indirectly highlights the need to introduce novel, more physiological-like media closer in composition to human plasma to produce realistic *in vitro* screening data for NMs. With this work, we aim to set the basis to reduce this *in vitro-in vivo* mismatch, which currently limits the formulation of NMs for clinical settings. By exploring new technological solutions, we also bring another dimension to the investigation of the BMC, by enabling the possibility to map the epitopes that are exposed to the BMC outer surface[2].

REFERENCES:

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Short bio:

After his degree in chemistry and Ph.D. in biochemistry, Andrea Armirotti spent several years working at the Biochemistry Department of University of Genova. In 2010, he joined IIT, where he now coordinates the Analytical Chemistry Facility. Andrea Armirotti is an expert in bioanalysis and omics sciences (proteomics, lipidomics, metabolomics) and he applies these approaches to investigate the biological chemical space. Dr. Armirotti is deeply involved in cystic fibrosis research, working on many different aspects related to the molecular alterations linked with this pathology and to its pharmacological treatment. Dr. Armirotti is also active in the nanomaterials field of research, with extensive works aiming at exploring the composition and dynamics of the biomolecular corona. Based on SCOPUS, Dr. Armirotti has authored 164 papers in international, peer-reviewed journals, 24 as Corresponding Author and 9 as First Author. His work has received 5291 citations and his current H-index is 44. From the fundraising standpoint, Dr. Armirotti secured 6 grants as PI: ARMIRO24G0 from the Cystic Fibrosis Foundation USA, grants FFC#1_2018, FFC#1_2019, FFC#1_2021, FFC#1_2023 (Fondazione Italiana per la Ricerca sulla Fibrosi cistica) and Graphene Flagship Core3, WP4 (funded by the EU) and he participates several other projects as Partner.