Role of chemical-physical properties in the behaviour of nanomaterials in the gastrointestinal tract.

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Nanomaterials (NM) are extensively used in industry in wide range of applications. As result, the unintentional exposure of humans to these materials could be very common.
Among the various routes of exposure, ingestion is the less studied. Nevertheless, ingestion of NM is very common, since they are used as food additives, and excipient in drugs and cosmetics. There are some evidences that the exposure to NMs can lead to cytotoxic effects to intestinal epithelial cells and can cause alteration of the microbiota [1-2]. Furthermore, the GI tract is a known portal entry of nanomaterials [3].
The biological response to NMs and their fate in the human body largely depends upon the transformation occurring following contact with the biofluids [4]. Due to the complexity of the gastrointestinal tract (GI) the description and prediction of the NM transformation during the journey along the gastrointestinal tract is challenging [5-7].
The aim of this study was to investigate the physico - chemical parameters that influence the fate of nanomaterials after the ingestion, by using a set of NM of different chemical nature and an in vitro system simulating the gastrointestinal tract.
By using a multi-techniques approach we investigate the modification in term of size distribution (DLS, FFF and FPIA) and surface charge (ζ potential). The occurrence of protein corona was also investigated. (DLS, FPIA, ζ potential and the SDS-PAGE). Modification of the surface reactivity leading the production of reactive oxidative species (ROS) was studied after the simulated digestion (EPR – spin trapping).
The results indicate that NM undergo reversible and irreversible changes during digestion, and that such changes are strongly dependents upon the intrinsic properties of the NMs.
The data presented herein contribute to the hazard assessment of NM by defining the biological identity of ingested NMs as well as the driving forces leading transformation along the GI tract.

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