Understanding the nanomaterial interaction with biomolecules, a journey from safety to applications in medicine

Monopoli P Monopoli, Department of Chemistry, RCSI University of Medicine and Health Sciences, Dublin, Ireland

For nanomedicine and nanosafety, there is a growing desire for a rational basis within which to understand nanoparticle-cell and organ level interactions. Nanoparticles in biological fluids (blood, or otherwise) generically associate with a range of biopolymers, especially proteins, organised into the 'protein corona' which is continuously exchanging with the proteins in the environment. In some cases, the residence times of proteins in the corona are sufficiently long that they confer an effective biological identity onto the nanoparticle. The transport and fate of nanoparticles (from intracellular trafficking to clearance pathways) likely reflect the corona, rather than the nanomaterial itself.

It is now clear that these interactions lead to dramatic surface changes and a new identity of the NP in biological fluid and the corona can induce unpredictable immunological responses and can hamper their therapeutic efficacy.

The protein corona is derived from proteins in biological fluids, many of which are glycosylated. We have now shown that the biomolecular corona has a strong glycosylation component that is biologically active and this class of biomolecules plays a dramatic role in the NP colloidal stability and firmly controls the NP biological fate and, if controlled, can offer new opportunities in nanomedicine.

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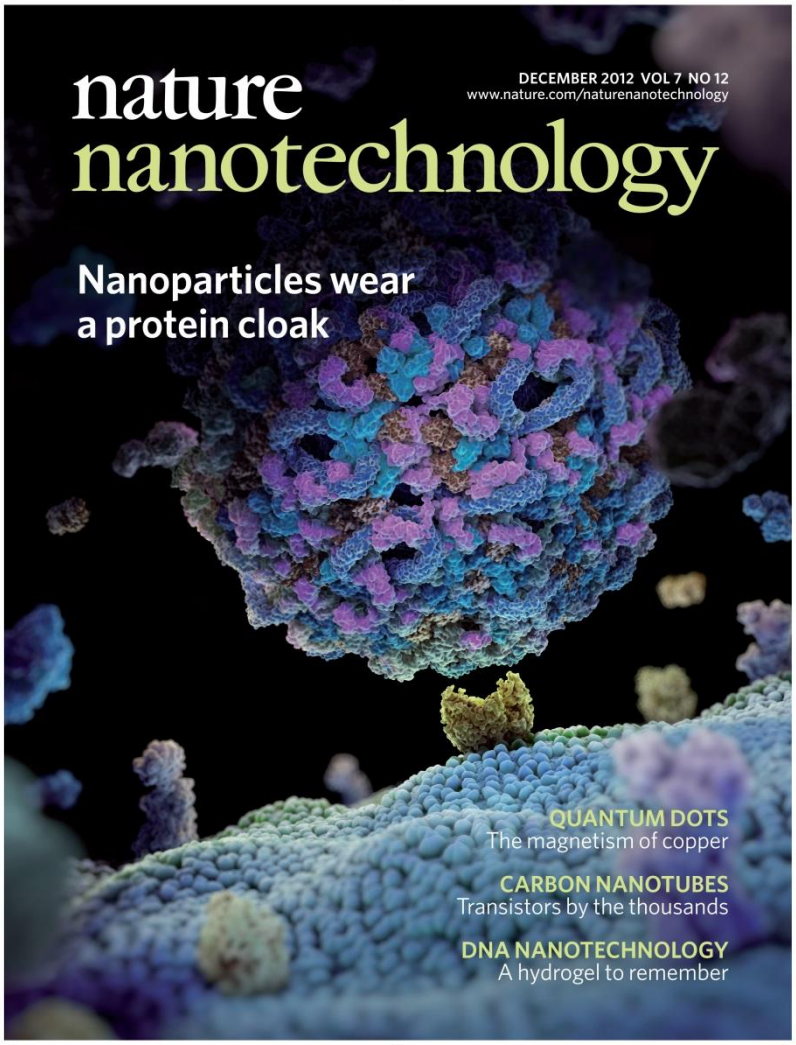
Nanoparticles wear a protein cloak



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