Title *

Protein coating determines the cellular responses in the abdominal cavity after graphene oxide administration

Abstract *

Graphene oxide (GO) has attracted commercial interest for a wide range of applications, from inks and spray coatings to drug delivery. Understanding the toxicological profile of GO especially *in vivo* is crucial for this implementation to occur.

In the present work, we investigated the impact of GO flakes of large, micrometre-sized lateral dimensions (l-GO, 1 to 20 µm) after i.p. injection, to test whether high aspect ratio nanomaterials such as l-GO have a more deleterious impact than their smaller counterparts. We also aimed to address whether a protein corona would alter the biological response by testing different dispersing modalities (0.5% BSA in saline solution vs 5% dextrose in water).

Using SPECT/CT imaging and Raman mapping, we confirmed that both GOs were able to reach the peritoneal mesothelium. Histological and SEM analyses showed that GO flakes did not induce significant recruitment of granulocytes to the mesothelium, irrespective of their size and dispersion.

Assessing the potential of these materials to induce inflammation, we observed that s-GO pre-dispersed in 5% dextrose elicited a greater recruitment of monocytic cells in the peritoneal cavity 24 h after injection. But when flakes were pre-coated with BSA proteins, the recruitment of immune cells by s-GO was reduced.

In conclusion, GO flakes did not induce mesothelial granuloma irrespective of their lateral dimensions and dispersion. However, s-GO triggered monocytic cell recruitment in the absence of protein pre-coating. These results highlight the importance of a bio-corona in the surface reactivity of GO flakes towards biological systems.

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Affiliations and Authors *

Author Information
artur filipe rodrigues (Presenting)

Affiliations
university of manchester, manchester, United Kingdom

Author Information
leon newman

Affiliations
university of manchester, manchester, United Kingdom

Author Information
dhifaf jasim

Affiliations
university of manchester, manchester, United Kingdom

Author Information
kostas kostarelos

Affiliations
university of manchester, manchester, United Kingdom

Author Information
cyrill bussy

Affiliations
university of manchester, manchester, United Kingdom