

G-IMMUNOMICS: Characterization of Graphene immune-impacts through omics approaches and genotoxic analysis

Main area: Immunogenomics and proteomics

Keywords: graphene; carbon nanomaterials; nanotoxicology; immunotoxicology

Duration (months): 36

Total project funding: € 977 542

Abstract

Graphene is the most promising, versatile, and sustainable key enabling nanotechnology which may bring solutions in the near future to many areas spanning materials science and medicine. However, the potential interactions of graphene with biological systems deriving from its physico-chemical properties and reactivity are raising public concern on risks for human health and environment. Independently from any specific purpose, a critical step for future translational applications is represented by the assessment of graphene impact on the immune system. Following any type of exposures, nanomaterials immediately contact the organism immune cells. Hence the investigation of the immune cell reactions is a milestone for the safe exploitation of graphene for therapeutic and diagnostic applications.

The overall objective of G-IMMUNOMICS is to complement Flagship research on graphene safety with immunogenomic and proteomic data, not covered by the Core Project. G-IMMUNOMICS will provide new insights on the immune impact of several types of graphene to lay the basis for a safe use of graphene and the graphene technology future transfer in medicine. The specific objectives are:

1. Produce highly stable and dispersible pristine and functionalized graphene family materials (GFMs) with different lateral size and appropriate functionalizations
2. Characterize by high throughput functional immunogenomics and proteomics approaches and genotoxic assays the immune cell response induced by GFMs on different cell lines and primary cells

3. Evaluate the immune cell response induced by GFMs on four different species: human, mouse, pig and worm.

G-IMMUNOMICS integrates with the FLAGSHIP at 3 levels

- Scientific: Well established collaborations are ongoing with many partners of the Flagship; in particular the project will synergize with the WP2 Flagship objectives.

The project will: 1) extend the range of immune cell types investigated with a wide variety of populations and species; 2) implement the large scale OMICS research approaches assays (genomics and proteomics); 3) take part in the assessment of the environmental impact of the new materials by analysing the genotoxic effect on different organisms.

- Operational: The work plan builds on deep connections with the FLAGSHIP, due to: 1) the exploitation of synthesis protocol Flagship developed by WP1 and WP10; 2) the testing of GFMs provided by Flagship WP2 and WP10 partners; 3) the usage of human ex vivo and mouse in vivo samples for genomic, proteomic and genotoxic analysis provided by Flagship WP2.

- Dissemination: The results gained during the project will be shared with Flagship partners during WP meetings and general assemblies in order to boost the transfer of knowledge achieved on graphene.

Outcomes: G-IMMUNOMICS research may outline potential pathogenic biomarkers (genes, miRNAs and proteins) associated with GFMs exposure, assess their overall safety profile and identify highly biocompatible GFMs suitable for future medical exploitation.

Consortium

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