

Effects of graphene oxide and graphene nanoplatelets on the *in vitro* model of intestinal barrier (Caco2/HT29)

J. Domenech^{*}, C. Cortés, A. Hernández and R. Marcos

*Grup de Mutagènesi, Departament de Genètica i de Microbiologia, Universitat Autònoma de Barcelona, Edifici C, Campus de Bellaterra, 08193 Cerdanyola del Vallès (Barcelona), Spain
E-mail: Josefa.Domenech@uab.cat*

Nanotechnology has become a booming discipline due to the wide range of applications of new nanomaterials (NMs). Among these, Graphene stands out as an attractive carbon-based NM due to its physicochemical properties. Its optical and electric properties make it a perfect candidate for applications in a variety of fields such as physics, healthcare, material science, and, recently, biomedicine. Moreover, the possibility to customize these properties through chemical modifications has generated a wide range of graphene materials, among which are graphene oxide (GO) and graphene nanoplatelets (GNPs).

Given the usefulness of graphene NMs in innovative approaches such as drug delivery systems and biosensors for health monitoring, it is important to define their interaction with potentially-exposed human tissues. Considering oral intake as an exposure route for graphene NMs, we aim to evaluate the interaction, distribution, and toxic effects of GO and GNPs in the intestinal barrier. For this purpose, we used a co-culture *in vitro* model composed of differentiated Caco2 and HT29 cells, which respectively mimic the phenotype of the enterocytes and goblet cells.

After the characterization of GO and GNPs by DLS and TEM, cell viability assays showed that concentrations ranging 5-100 µg/mL GO and GNPs were non-cytotoxic in our model. To detect the potential adverse effects of these NMs, Caco2/HT29 barriers will be treated with 5-50 µg/mL of GO and GNPs. TEER and LY experiments will elucidate the effects of GO and GNPs on the barrier's integrity and permeability, while Laser Scanning Confocal Microscopy assays will show their distribution in our intestinal barrier model. In addition, genotoxic and oxidative damage assessment by comet assay and changes in the expression of *HO1* and *SOD2*, two ROS-scavenging involved genes will give us information on the oxidation state of the cells and DNA damage. Finally, as it has been suggested that the relationship between autophagy and nanoparticles could be related with their mechanism of toxicity, we will also study the expression of autophagy markers by Western Blot in response to GO and GNPs treatments.