Recent discoveries on graphene, a two-dimensional, crystalline allotrope of carbon, stimulated research on related structures, such as Graphite NanoPlatelets (GNPs), a 1-15 nm thick flake, constituted of 3-48 layers of graphene, obtained starting from Intercalated Graphite Compounds (GIC) via thermochemical exfoliation. These novel nanomaterials are providing fascinating opportunities for biotechnological development because of their unique structures, properties and possible applications.

Graphene and its derivatives are promising candidates for important biomedical applications because of their versatility. Due to the expanding applications of nanotechnology, human and environmental exposures to graphene-based nanomaterials are likely to increase in the future. However, the prospective use of graphene-based materials in a biological context requires a detailed comprehension of their toxicity.

Herein, we report on the interaction of stable and evenly dispersed exfoliated GNPs obtained using an ultrasonic bath for different times (30 min, 50 min and 70 min) with human breast adenocarcinoma cells (SKBR3 and MDA-MB-231) for 24 h. Biocompatibility of nanoplatelets has been evaluated by MTT (Fig. 1) while cell viability has been detected using Trypan Blue assays (Fig. 2). GNPs particles were more cytotoxic in SKBR3 than MDA-MB-231 cells suggesting a cell phenotype-dependent effect.

Furthermore, light microscopy observations (Fig. 3 and 4) and scanning electron microscopy analysis (data not shown) were used to gain understand on the mechanism of cell-nanoplatelets interaction. The bright-field images showed GNPs particles on SKBR3 and MDA-MB-231 cellular surfaces (see arrows).

Our results lead us to expect that efforts with interdisciplinary approaches among chemistry, biology, and engineering will accelerate mechanistic understanding of graphene-based platforms for bio and nanomedicine applications.
Fig. 1: GNPs (30 min, 50 min and 70 min) biocompatibility on SKBR3 and MDA-MB-231 cell lines by MTT test after 24 hrs of incubation.

Fig. 2: SKBR3 and MDA-MB-231 cell viability evaluation by Trypan blue assay after incubation with GNPs (30 min, 50 min and 70 min) for 24 hours.

Fig. 3: Bright-field microscopy image of SKBR3-nanoplatelets interaction. Cells were incubated for 24 hours with GNPs (arrows).

Fig. 4: Bright-field microscopy image of MDA-MB-231-nanoplatelets interaction. Cells were incubated for 24 hours with GNPs (arrows).