# Mask effect: an actor in graphene oxide size dependent modulation of cellular activity and internalization

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**Abstract**

Graphene oxide (GO) is one of the most studied graphene-based nanomaterial, due to its extraordinary chemical and physical properties [1,2] and especially because of its good dispersibility in aqueous media [3]. Indeed, GO gathered an ever-growing interest in fields such as electronics, optics, energy, catalysis and biomedicine in the last few years [4-6]. As for other nanomaterials, this intense research activity on its potential applications imperatively needs to be associated to the assessment of its safety profile.

In particular, not much is known about the possible impact of the lateral dimensions of the GO sheets on their effects towards biological substrates *in vitro*, especially on human primary cells. In an attempt to address this issue, we evaluated whether GO samples constituted of large, small and very small flakes would differently affect primary human or murine macrophages. Our data revealed that GO sheet size had a significant impact on different cellular parameters (i.e. cellular viability, ROS generation, and cellular activation). Indeed, the more lateral dimensions of GO were reduced, the higher were the cellular internalization and the effects on cells. Interestingly, it was also possible to observe that these effects were more or less pronounced based on the cellular type as human cells resulted less sensitive and less responsive to the GO samples in comparison to murine macrophages in our conditions. Our study also suggested a possible correlation between the particular interaction of GO with the cellular membrane, surrounding and somehow masking it, with the subsequent internalization of graphene sheets and the following impact on cellular parameters. This intrinsic characteristic of GO, and in particular the mask effect, could be further developed and tuned to modulate or deplete cells. Together with the possibility of targeting specific cells via functionalization, this approach could open the way for new graphene-based therapeutic applications.

**References**

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