Functionalized carbon nanodots interaction with human immune cells

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Carbon nanodots (CNDs) are emerging as promising theranostic nanotools thanks to their superior physicochemical properties, such as luminescence emission and easy functionalization [1]. However, the application of CNDs in biomedicine requires the assessment of their impact on the complexity of the immune system. Therefore, the aim of this study was to exploit our experience gained on the impact of nanomaterials on immune cells [2] to evaluate the interactions of human peripheral blood mononuclear cells (PBMCs) with six different functionalized CNDs: nitrogen-doped carbon nanodots (NCNDs), BODIPY-doped carbon nanodots (BCNDs), as well as their methylated (mNCNDs and mBCNDs, respectively) and carboxylated forms (NCNDs-COOH and BCNDs-COOH, respectively).
Exploiting their intrinsic optical properties, CNDs were detected by multiple flow cytometry and confocal microscopy, allowing a comprehensive study of their interactions with the immune cells.
CNDs were successfully internalized by PBMCs in a dose-dependent manner without affecting cell viability. Monocytes were the main immune cells able to internalize the materials and in particular the BODIPY-doped CNDs (BCNDs, mBCNDs, and BCND-COOH)as reported in figure 1.
The interaction between CNDs and the immune cells, and in particular monocytes, together with their excellent biocompatibility, opens a new scenario for the development of CND-based theranostic tools.

References

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