**A 3D-printed multi-chamber device allows culturing cells on buckypapers coated with PAMAM dendrimer and obtain innovative materials for biomedical applications.**

Paolini Alessandro1, Battafarano Giulia1, D’Oria Valentina1, Mura Francesco2, Sennato Simona3, Mussi Valentina4, Roberta Risoluti5, Materazzi Stefano5, Del Fattore Andrea1, Masotti Andrea1.

1) Bambino Gesù Children’s Hospital, IRCCS, Research Laboratories, Viale di San Paolo 15, 00146 Rome, Italy.

2) Center for Nanotechnology for Engineering (CNIS), Sapienza University of Rome, P.le A. Moro 5, 00185 Rome, Italy.

3) Department of Physic and CNR-IPCF UOS of Rome, P.le A. Moro 5, 00185 Rome, Italy.

4) National Research Council, Institute for Complex Systems ISC-CNR, Via del Fosso del Cavaliere 100, 00133 Roma, Italy.

5) Department of Chemistry, Sapienza University of Rome, P.le A. Moro 5, 00185 Rome, Italy.

**Abstract:**

The advent of 3D printing technology allows the realization of custom devices that can be used not only in the everyday life but also in the nanotechnology and biomedical fields. In nanotechnology, the use of bi-dimensional nanostructures based on carbon nanotubes, generally referred as buckypapers, have received considerable attention for their versatility and potential use as implantable devices. The fabrication of polymeric devices able to accommodate buckypapers and allow cell growth would allow obtaining scaffolds for applications in tissue repair and regeneration. Unfortunately, buckypapers are extremely hydrophobic and cannot be used in aqueous media to culture cells. So far, few studies have used these nanostructures in culture media and none of them evaluated their potential as scaffolds for cell growth. We found that by using novel techniques such as polymer coating we were able to increase buckypaper hydrophilicity, whereas the use of 3D printing technology allowed us to culture cells on these structures for many days. Therefore, we were able to characterize in details the morphology of these structures and study the kinetic of cell proliferation for the first time. We found that these scaffolds, if properly functionalized, are suitable materials to grow cells for long time and potentially used in the biomedical field. Although we and others found that these materials are cytotoxic under certain circumstances, we found that suitable coating polymers and specific experimental conditions may allow the use of buckypapers as novel scaffolds for cell growth.