Advanced technologies for biomedical applications

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Recent technology advances have revolutionized the biomedical research and healthcare outcomes. The most promising areas of technological development in the biomedical field are within personalized medicine. In this contest, biomedical engineering with an interdisciplinary and problem-solving approach to biology and medicine, enables the development of technologies and systems that directly contribute to the diagnosis, treatment, and prevention of disease. Biomimetic and bioinspired smart materials, bioreactors and microfluidic and Organs-on-chip technologies are emerging as promising tools for both therapeutic and diagnostic applications, and for their possible use in tissue engineering and regenerative medicine. Research efforts are moving towards the exploration of new biomaterials that can foster the clinical translation of biotechnological approaches aimed at non-invasive imaging, biomarker development and drug targeting. By mimicking the biological features of the multicellular constructions, interactions among organs, vascular perfusion, physicochemical microenvironments, and so on, these devices are imparted with some key pathophysiological function levels of living organs that are difficult to be achieved in conventional 2D or 3D culture systems. In this technology, biomaterials are extremely important because they affect the microstructures and functionalities of the organ cells and the development of the organs-on-chip functions. Within NanoMicroFAB@STESI infrastructure, we aim, by a multidisciplinary approach, to develop biomimetic and bioinspired implantable devices, combining the use of bioreactors and innovative scaffolds for applications in regenerative medicine and tissue engineering. Our research activity is also directed toward the identification of new targets and biomarkers useful for the development of innovative therapeutic approaches and new medical tools/devices for diagnosis and prognosis of neurodegenerative, oncological, immunological and inflammatory diseases. The activities and results obtained, as well as the technological approaches used, the instruments and skills available, will be able to support both the research and development activities of researchers in the scientific network and BioPharma & Biotech Company interested to the development and validation of new medical devices for the prevention, diagnosis and treatment of degenerative, inflammatory, immunological and oncological pathologies, used alone or in association with pharmacological treatment.