Giuseppe Mucci, J Biotechnol Biomater 2016, 6:6(Suppl)
http://dx.doi.org/10.4172/2155-952X.C1.060

2nd World Congress on
Bio Summit & Molecular Biology Expo
October 10-12, 2016 Dubai, UAE

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Mesenchymal Stem Cells from potential risk of tumor to specific anti-tumor therapy

The use of expanded mesenchymal stem cells followed a path of its own, peculiar but not unique in medical history. Over less than ten years, it went from being negatively labelled as potentially tumorigenic, to being positively hailed as a candidate for new antitumor therapies in the near future. Mesenchymal stem cells (MSC) are indeed among the main candidates for the treatment of specific malignant tumors thanks to their intrinsic immunomodulation and antitumor capabilities. One of their most interesting features is the tropism directed against the tumor itself, supporting the transport of antitumor agents and genes directly into the tumor site. Before the scientific community officially acknowledged such capabilities and their potential in anticancer therapies, over the last decade several researchers have doubted the biological safety of expanded MSC. New studies later confirmed the antitumor effectiveness of MSC, which is particularly significant against specific tumors. Such feature, which obviously requires further investigation, depends on the source of origin of MSC, on the dose used, on the stage and on the nature of the tumor itself Obviously, identifying and selecting the tumors more responsive to MSC treatments is the key for a successful cellular therapy. Genetic studies have recently shown the existence of tumor-specific markers which can be used to identify the types of tumors that can be treated with MSC. Some genetic markers can be used to effectively monitor the response to some treatments (EGFR, BRAF, KRAS, NRAS, BRCA2, melanoma, lung, breast and colon-rectal cancer) and the potential onset of post-therapy resistance, thus allowing the development of specific antitumor therapies through stem cells.Besides, MSC can be modified to express or release multiple antitumor agents, thus overcoming the limitations linked to the half-life and the biological transformation typical of many chemotherapy drugs. This is why MSC have been tested as vectors for a more selective delivery of therapeutic agents such as p53 gene, oncolytic viruses, chemotherapy drugs or specific cellular factors, such as pigment epithelium-derived factors, *interleukin* 12 and interferon beta. Many of these therapies release substances and induce the death of the vector cell, thus reducing complications linked to stem cells mutation. If the death of the cell can not be induced, it is possible to introduce suicide genes which will cause the cell to kill itself. Even if details still need to be fully defined, the tropism of MSC against tumors clearly involves multiple chemokine-receptor pairs. So, MSC can suppress metastasis and inhibit tumor progression by regulating the expression of cancer suppressor genes, inducing cell cycle arrest, inhibiting angiogenesis, and stimulating the action of Natural Killer cells and of the molecules controlling cellular renewal and differentiation.

Biography

Giuseppe Mucci has graduated in Movement Science at Faculty of Medicine in Urbino, Italy. He is a Professor of Bio-Economy at the University of Lugano, Switzerland and Advisory Board Member of the University Roma Tor Vergata. He has established Bioscience Institute in San Marin, Italy in 2006 and Bioscience Clinic in Dubai UAE in 2013, those facilities are Regenerative Medicine compound (Cell Factory and Clinic) specialized in autologous Stem Cells Therapies. In 2014 he created the University spin-off Bioscience Genomics in Milan and Rome.

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