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3D-tissue engineered bone marrow as predictive tool for personalized therapy in multiple myeloma

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Multiple myeloma (MM) is the second most common hematological malignancy and represents approximately 20% of deaths from hematological malignancies. Despite the success of numerous contemporary therapies to eradicate MM *in vitro* and in animal models, more than 90% of MM patients develop resistance to therapy and relapse. The discrepancy between drug efficacy in laboratory settings and the dissatisfactory clinical outcomes can be attributed to limitations of the classic drug development models, including the neglect of the interaction of tumor cells with other components of the bone marrow (BM) microenvironment; lack of tri-dimensional (3D) aspects of the BM niche (hypoxia and drug-gradient); and relying on a limited number of cell lines and do not reflect the enormous heterogeneity between individual patients. In our study, we produced a 3D-tissue engineered *in vitro* model of BM (3DTEBM) in MM, including MM cells, stromal cells, endothelial cells and extracellular matrix. All cells used for one 3DTEBM are isolated from a BM aspirate from individual MM patient. The 3D scaffold to accommodate the cells was produced by biological cross-linking of the BM supernatant of the same individual MM patient. We found that, in the 3DTEBM, MM cells proliferated more and showed significantly more drug resistance compared to classic tissue cultures. This 3DTEBM is currently investigated to predict the drug-response in MM patients, in which, we develop 3DTEBM for individual patients to test their response to therapy in vitro and correlate our findings with clinical response; to develop personalized therapeutic strategies for each individual MM patients.

Biography

Abdel Kareem Azab completed his Pharmacy studies, MSc in Medicinal Chemistry, and PhD in Drug-delivery Systems and Biomedical-implants at The Hebrew University of Jerusalem. He joined Dana-Farber Cancer Institute/Harvard Medical School for his Post doctoral training focusing on the biological role of tumor microenvironment in progression, metastasis, and drug resistance in hematologic malignancies. He leads his laboratory for "Multi-Disciplinary, Translational Research to Beat Cancer" at Washington University of Saint Louis. He published more than 55 publications and 6 patents; he is on the editorial board of several scientific journals, and collaborates with leading academic laboratories and pharmaceutical industry.

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