Spring 5-12-2016

Effect of cell-surface interactions on monocyte-derived immunotherapy products

Corinne Hoesli
McGill University, corinne.hoesli@mcgill.ca

EFFECT OF CELL-SURFACE INTERACTIONS ON MONOCYTE-DERIVED IMMUNOTHERAPY PRODUCTS

Corinne Hoesli, McGill University
corinne.hoesli@mcgill.ca
Natalie Fekete, McGill University
Andreas Wargenau, McGill University
Ariane Virginie Béland, McGill University
Sheng Xu, McGill University
Nathalie Tufenkji, McGill University
Sarah Clark, Saint-Gobain Ceramics & Plastics, Inc.

Key Words: immunotherapy, cell culture bags, fluoropolymer, monocyte, protein adsorption

Monocyte-based cellular therapy products have been approved by the FDA for immunotherapy applications. The transition from a research and preclinical setting to the clinic is typically associated with a shift open culture systems such as polystyrene flasks to closed cell culture systems. Closed systems such as fluoropolymer-based bags offer benefits from a handling and safety perspective. However, the interactions between cells and fluoropolymer surfaces may differ from polystyrene surfaces. Differences between the physicochemical properties of the materials may profoundly impact the type and conformations of the proteins adsorbing to the surfaces. In turn, differences in the protein adlayer formed on the materials may affect cell adhesion, expansion, survival and differentiation. The objective of this work was to investigate protein-surface and cell-surface interactions in the context of monocyte-based cell therapies. Defined serum-free cell culture medium or control media were placed into contact with fluoropolymer surfaces or polystyrene surfaces. The rate and amount of protein adsorption was quantified using quartz crystal microbalance with dissipation monitoring (Figure 1). Interestingly, the hydrophobic fluoropolymer surfaces gave rise to a more compact (less hydrated) protein film structure as compared to a more hydrophilic surface. Human monocytes were isolated from the peripheral blood of healthy donors using CD14+ magnetic cell sorting. The cells were then cultured in polystyrene and fluoropolymer-based vessels and exposed to cytokine cocktails to induce their differentiation and maturation. Prior to inducing cell maturation, the cultured monocytes showed comparable levels of viability, adhesion and aggregation on both culture surfaces (Figure 1, B). The differentiation step led to a complete loss of CD14 surface expression and to the upregulation of the antigen-presenting cell-specific surface markers, irrespective of the culture surface tested. These results suggest that monocytes can differentiate into dendritic cells on both fluoropolymer and polystyrene culture surfaces. Understanding cell and protein interactions with culture surfaces at a molecular and mechanistic level can provide predictive tools to engineer materials and surfaces tailored to a variety of cell culture applications.

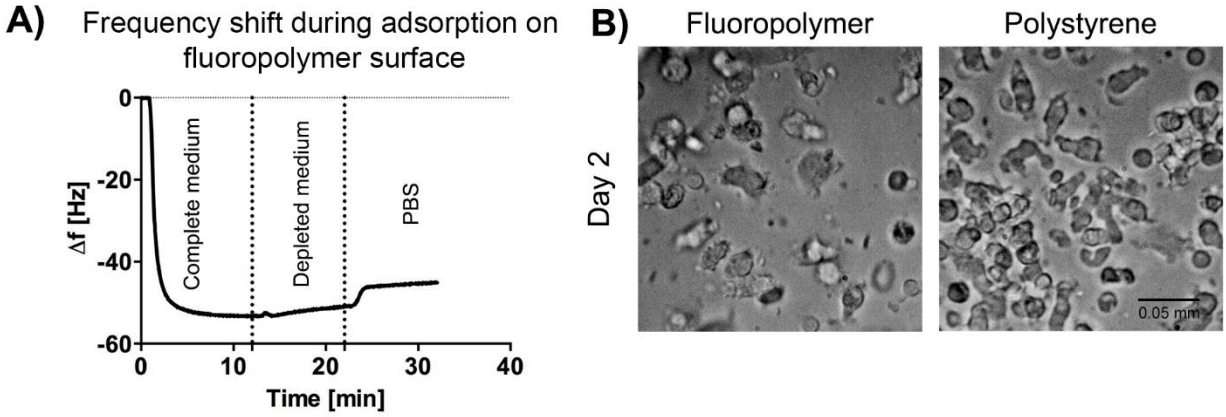

Figure 1. *Analysis of protein-surface and cell-surface interactions. (A) Rapid and irreversible protein adsorption to fluoropolymer surfaces. Depleted medium: proteins removed by filtration. PBS: phosphate-buffered saline solution. (B) Similar adhered cell phenotype on fluoropolymer and polystyrene surfaces.*