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Entitled

ELECTRICAL CHARACTERIZATION OF INNATE IMMUNE CELLS

by

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Date & Venue

2:00 pm

Tuesday, 8 December 2020

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Abstract

This thesis is concerned with the electrical characterization of the key players of the innate immune cells. Innate immunity is basically the nonspecific immune response that is triggered by any foreign body that attacks the immune system. The key players of the innate immune system are mainly dendritic cells and macrophages. Accurately classifying these cell types helps us understand the mechanism of the immune system thereby enabling the development of models to improve new prospects for the therapeutics and diagnostics. The characterization described in this thesis is based on extracting the capacitance for each biological cell using I-V curves. The main aim of this thesis is to overcome the drawbacks of the conventional techniques used to characterize and differentiate between these immune cells. The main challenges with the conventional techniques are the problem of cross-referencing and lack of biological identity for each cell. A matlab mathematical model was developed to extract the capacitance from the I-V curves obtained from the DropSens machine. The results obtained display the concept of immunophenotyping, meaning the ability to accurately define and characterize the different types of cells.

Our results for the capacitance are in concordance with the area for each cell type and the published literature.

Keywords: Innate immunity, adaptive immunity, THP-1, dendritic cells, macrophages, electrical characterization, I-V curves, capacitance, image processing, flow cytometry