Abstract

The heterogeneity of responses in effector T cell population have intrigued scientists for a very long time as they are responsible for controlling the fate of immunotherapies. Studying T cells at single cell level helps in delineating the underlying processes resulting in different T cell responses within a population which remain hidden during bulk level studies. In this work we have used two new microfluidic platforms to pair T cell and macrophages in a single cell array format which differ up to 5 times in size. We characterized the early and long-term responses of OT1-CD8 T cells after they come in contact with mature primary macrophage cells. Our main goal was to understand how macrophages activated through different type of maturation protocols impact the early-stage T cell calcium signalling dynamics and their secretory profiles in long term. We then tried to understand the migratory response of the activated T cells at single cell level and tested their ability to differentiate between bidirectional ques inside fork shaped microfluidic channels. These studies carried out using different dedicated microfluidic platforms helped us track and quantify the responses of T cells from an early stage to the migratory stages where the effect of maturation of macrophages were corelated with T cell responses. The study helped in elucidating the underlying signatures of T cell responses and quantify the finer parameters which regulate the success or failure of newly designed therapies.

Key words: Immunotherapy, Single cell, Microfluidic, heterogeneity, Effector T cell, Macrophage, Maturation, signaling dynamics, fork shaped microfluidic channels, bidirectional ques.