

Live Cell Optical Imaging technologies demonstrate Novel Routes for Functional Connectivity in the Immune System.

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ABSTRACT

The dendritic cell (DC) is a central player in generating a functional immune response and has a primary role in collecting and presenting antigens throughout the body. However to present collected antigen the cells must migrate from the distal compartment (under the skin for example) to the draining lymph node, which may be a considerable distance away. If cells act in isolation it is highly unlikely that a functional immune response would be generated. Using a variety of multidimensional live cell imaging methodologies we show that DC are interconnected at distances of several hundred microns forming an interconnected network of cells which may act synergistically to produce a profound and effective immune response. The connectivity allows a calcium flux to radiate from specific cells over considerable distances and between multiple cells. This flux then leads to activation and migration of cells. Furthermore, the potential for the cells to interchange surface membranes extensively using these tubular connections is demonstrated. We consider this to be a mechanism for antigen sharing between cells leading to an expansion of the antigenic signal between cells. Together these findings which were critically dependent of advanced live cell imaging techniques have expanded our understanding of how cells in the immune system function and how the immune response is generated.