



The Physics of Soft and Biological Matter

P.12 Single cell measurements of intracellular signaling, and motility, in activated macrophages

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Macrophages are cells of the vertebrate innate immune system. They are the only cells able to eat colloidal scale particles and bacteria. Macrophages move around the body to explore the environment and with their receptors they are able to detect the presence of pathogens. When this happens a complex network of signal pathways is triggered on. In this particular state the macrophage is "activated". The aim of our research is the characterization of the activation process in macrophages, via the investigation of both the NF- κ B intracellular signaling pathway and the observation of motility and morphological cell phenotypes.

Regarding the intracellular signaling we propose a single cell approach to a better understanding of the TLR4 receptor and its role in the activation of the NF- κ B pathway inside macrophage cells. We developed custom-build image segmentation software that enables the detection of NF- κ B translocation within the cell. This method allows us to have quantitative direct measurements and to discriminate common trends and differences between different individual cells. On a bigger scale, from the point of view of cell motility, we investigate if the migratory behavior of macrophages changes depending on the different activation agents in order to fulfil specific biological needs. With this aim we conducted experiments to observe cells behaviors after stimulation from LPS (a molecule present on the outer membrane of gram-negative bacteria) and IFN- γ (used by macrophages for intercellular communication).