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Importance of Mechanotransduction in Immune Responses

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Importance of mechanotransduction in immune responses

The current major focus of immunology is how our immune systems are regulated. In particular, how different receptors at the surface of immune cells respond to the presence of either antigen or pathogen, and how these responses are regulated at a subcellular level. But we should keep in mind that biophysical cues generated by physiological events, either normal or abnormal, also influence our immune system.

The development of new technologies and interdisciplinary approaches has allowed us to investigate physical effects on biological interactions, shifting the view of cells as passive organisms to active entities.

Mechanotransduction is a process by which cells are able to sense mechanical stress, and transfer it into a biochemical signal [1]. In this process, mechanoreceptors present at the cell membrane sense the mechanical stress and transfer the signal to the other signalling molecules [2]. It is well known that mechanical stimuli such as blood flow in vessels, stretch in lung or cell division induced stresses regulate the conformational changes of different receptors, affect plasma membrane density of different molecules, change cytoskeleton dynamics, and control gene expression [2].

Circulating and tissue leukocytes are exposed to a variety of mechanical stresses [3]. In arteries, circulating leukocytes can be subjected to different flow dynamics (laminar, disturbed laminar or turbulent flows) [3]. In addition, white blood cells in different vascular beds (arterial, venous and microvasculature) are subjected to different magnitudes of shear stress [4]. The different degrees of mechanical stress and different types of flow dynamics control several aspects of immunity ranging from adaptive immune responses, to innate humoral immunity, cell adhesion and migration and release of pro and anti-inflammatory responses [4]. In fact, there is an emerging paradigm showing that normal physiological stress is immunosuppressant while pathophysiological mechanical stress is inflammatory.

Beside these basic aspects of mechanotransduction on immune responses, investigating the effect of physiological/pathophysiological levels and types of mechanical stress on immune responses will add depth to our current knowledge. Understanding the effect of physical surroundings on different aspects of cellular responses is essential for the development of new and more efficient anti-inflammatory therapies.

References

1. Hahn C and Schwartz MA (2009) Mechanotransduction in vascular physiology and atherogenesis. Nat Rev Mol Cell Biol 10: 53-62.
2. Orr AW, Helmke BP, Blackman BR, Schwartz MA (2006) Mechanisms of mechanotransduction. Dev Cell 10: 11-20.
3. Makino A, Shin HY, Komai Y, Fukuda S, Coughlin M, et al. (2007) Mechanotransduction in leukocyte activation: a review. Biorheology 44: 221-249.
4. Previtera ML (2014) Mechanotransduction in the Immune System Cell Mol Bioeng. Cell Mol Bioeng 7: 473-481.