May 16th, 3:30 PM

Understanding the role of macrophages in lung inflammation through mathematical modeling

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BAMM 2019

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February 2019

Title: Understanding the role of macrophages in lung inflammation through mathematical modeling

Abstract: Mechanical ventilation provides support to the lungs for patients with severe breathing issues, but as the air is pushed into the alveolar space it can trigger an immune response, leading to ventilator-induced lung injury (VILI). Macrophages are immune cells essential in the response of this injury. Previous experimental work has uncovered a spectrum of macrophage types, so to better understand the role of macrophages in VILI, we model two types of macrophages: M1, associated with a pro-inflammatory response, and M2c, associated with an anti-inflammatory response. Using modeling methods with ordinary differential equations and parameter estimation techniques, we explore the dynamics of macrophages during VILI and possible ways to modulate this response to a more healthy resolution.