

DEVELOPMENT OF IMMUNE MICROPHYSIOLOGICAL SYSTEMS (IMMUNE SYSTEMS ON A CHIP) FOR MCM TESTING

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A goal for Organs-on-chips (OOC) is to recreate living tissues or organ microenvironments with an immune response. The absence of an immune component is a significant drawback to fully recapitulating the physiological human response following exposure to chemical and/or biological agents. Within the innate immune system mast cells are pivotal effector cells contributing to a wide range of downstream immune responses. Mast cells are a prime choice to serve as a vital first step in developing OOC technology with an immune component. The integration of an immune component into OOC technology offers a physiologically sound model of infection and/or chemical exposure that will more closely simulate vertebrate infection with high fidelity especially when compared to current alternatives. DEVCOM CBC has a variety of OOC systems however the Emulate system was chosen as an ideal candidate for the incorporation of an immune component. The Emulate Lung-on-a-chip allows seeding of different cell types allowing the system to be easily amenable to the incorporation of mast cells into the cellular framework. This project focused on incorporation of mast cells into the Emulate lung-on-a-chip followed by exposure to a vesicant chemical and comparison between lung-on-a-chips with and without mast cells. The development of an in vitro OOC system with an immune response helps drive human relevant characterization of chemical and biological threats faced by the warfighter.

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