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A DROPLET-BASED MICROFLUIDIC PLATFORM FOR THE PRODUCTION, ANALYSIS AND USE OF DESIGNER PROTEINOSOMES

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Project Summary: In recent years, several synthetic cell-like entities have been proposed, generally formed through self-assembly of inorganic, polymer or protein based membranes (termed colloidosomes, polymerosomes, and proteinosomes respectively), as well as membrane free formed coacervates. So far most of these synthetic cell-like structures have been formed in bulk, thus resulting in very little control over the distribution of components inside these protocells and the overall size distribution of the structures formed. We developed a novel microfluidic platform for the high-throughput generation of monodisperse proteinosomes, encapsulating a variety of molecules at high efficiency. Furthermore, the proteinosome membrane was functionalized with the enzyme glucose oxidase and the enzyme horseradish peroxidase encapsulated within, to perform a two-step reaction cascade. Finally, inspired by how cells process information, enzymatic DNA reaction networks were encapsulated within proteinosomes in which chemical communication occurs through diffusion of DNA products with the ultimate goal of building artificial cell populations capable of processing information and pattern formation.

CV. Martina received his BSc Environmental sciences and MSc in Experimental biology (Immunology) from Faculty of science at University of Zagreb in 2012 and 2014. She started her PhD studies in the deMello group in 2015.