Doctoral School of Information and Biomedical Technologies
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SUBJECT: Analysis of host-pathogen interactions of *L. monocytogenes* at the single-cell level

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DESCRIPTION: The dynamic and stochastic nature of host cell and pathogen interactions ultimately decide the fate of the whole organism; however, the underlying mechanisms are masked in typical population-level analyses. In this project, we will combine cutting-edge single cell biology approaches using live-cell imaging and gene expression studies to mechanistically understand invasion strategies of *Listeria monocytogenes*, an important food-borne pathogen of humans. We will employ as a model system infection of macrophages, which is a critical step controlling the overall infection outcome. We will monitor activation of a critical PrfA virulence system in single pathogen cells in vitro to quantitatively understand its regulation upon infection of macrophages, phagosome escape and replication. To understand how the host regulates the antibacterial effector responses to kill bacteria we will visualize the activation of the NF-kappaB and STAT signalling, the main antibacterial defence systems against infection. Finally, we will integrate gene expression patterns in the pathogen and the host in single cells to fully understand molecular mechanisms of the outcome of infection by single cell sequencing. Together, these cutting-edge single cell approaches will, for the first time, provide real insights into mechanisms that control infection outcomes of *L. monocytogenes*.

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