

Capturing Moving Cells Poses Challenges in Microfluidic Encapsulation

Trypanosoma brucei is an extracellular highly motile parasite capable of crossing host tissues. The motility of this parasite varies across its different life stages, resulting in a heterogeneous motility pattern within different niches. While single-cell RNA sequencing (scRNAseq) using microfluidic systems, such as 10XGenomics, is a prevailing trend in parasitology, the motility of these organisms could impact their encapsulation and posterior analysis.

We conducted experiments to investigate the effects of adding motile and non-motile parasites to the encapsulation process of 10XGenomics at both the transcriptional and microscopy levels. We observed that these parasites did not incur any damage during the encapsulation process and retained their high motility. This suggests that the parasites are capable of extensive movement within the Gel Bead-in-Emulsion (GEM) droplets, potentially causing their rupture and releasing the parasites into the interspaces of the bubbles. The posterior analysis revealed that a significant proportion of immotile parasites persisted in the final data, while the highly motile ones nearly disappeared by the end of the analysis.

This data highlights the importance of considering cell motility in such mechanisms, where valuable information from highly motile cells may be lost. One potential solution is to induce immobility, for example, by subjecting the parasites to cold conditions before introducing them into the machine.