Electronic Supplementary Material (ESI) for Soft Matter.

Anomalous diffusion of *E. coli* under microfluidic confinement and chemical gradient

Supplementary Information

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FIGURES

1. Figure $S1$: Intensity profiles across the full device. (A-B) Fluorescent intensity is very high at both the right hand (saturated, ~ 255) and left hand (saturated for 10 µm, and ~ 80 for 50 µm) feeding channels even at the start of our readings (t=0). Inset shows a characterized length scale profile after excluding an initial distance of 125 µm and 50 µm in the 50 µm wide and 10 µm wide motility observation channel, respectively.

2. Figure $S2$: (A) The percentage of cell centroid positions lying within a 3 μm crawling region from the walls in 50 μm and 10 μm wide channels. We plot the percentage of cell positions obtained in absence and presence of glucose along with the random distribution of positions in each channel. (B-E) Normalised bacterial cell positions after ignoring 100 µm distance from the point of entry. Note that bacteria enter the channel at random positions along the width (x-axis) and with randomised velocity directions. Due to surface-induced attraction, the bacteria then require a finite time to reach the wall. Ignoring an initial transient of 100 μm allows us to characterise the cell positions corresponding to the steady swimming behaviour. Vertical red dashed lines indicate the mean (μ). The error in the mean is the standard deviation. M indicates the median cell position.

3. Figure $S3$: Distribution of run length times (A - D) and residence times (E - H) in 50 μm and 10 μm wide channels in *absence* and *presence* of the chemoattractant glucose. Red dashed lines in the plots indicate mean values ($\mu\pm$ SD). N indicates the number of trajectories analyzed..

4. Figure $S4$: (A - C) Different threshold angles are explored to define the threshold for "tumbling". (D - F) Distribution of tumbling frequencies depends on the choice of the threshold angle. (G - I) Rose plots showing the distribution of tumbling angles also depend on the choice of the threshold angle

MOVIES

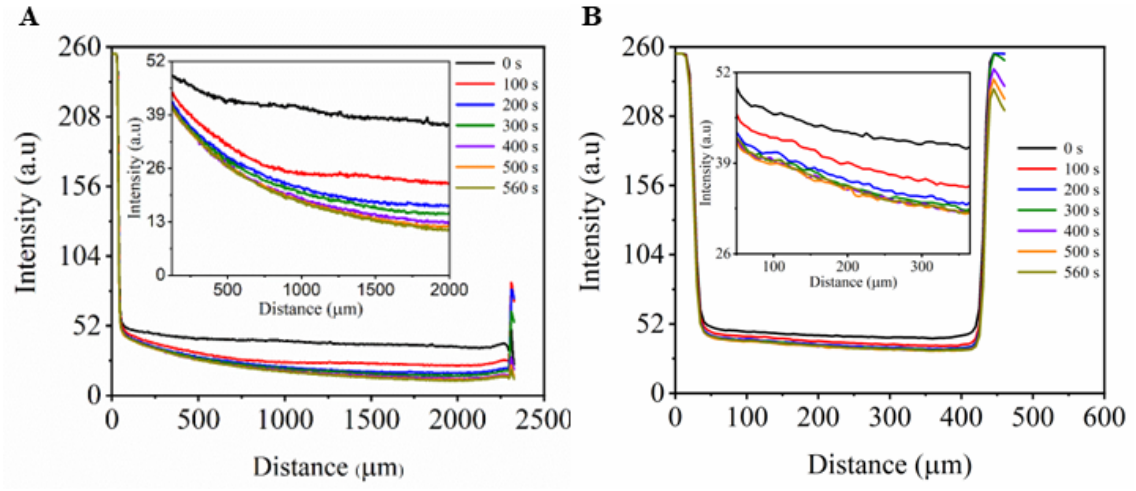
1. Movie $M1$: Motion of *E.coli* in the feeding channel.

2. Movie $M2$: Motion of *E. coli* in 50 μm wide channel in *absence* of chemoattractant.

3. Movie $M3$: Motion of *E. coli* in 50 μm wide channel in *presence* of chemoattractant.

4. Movie $M4$: Motion of *E.coli* in 10 μm wide channel in *absence* of chemoattractant.

5. Movie $M5$: Motion of *E.coli* in 10 μm wide channel in *presence* of chemoattractant.



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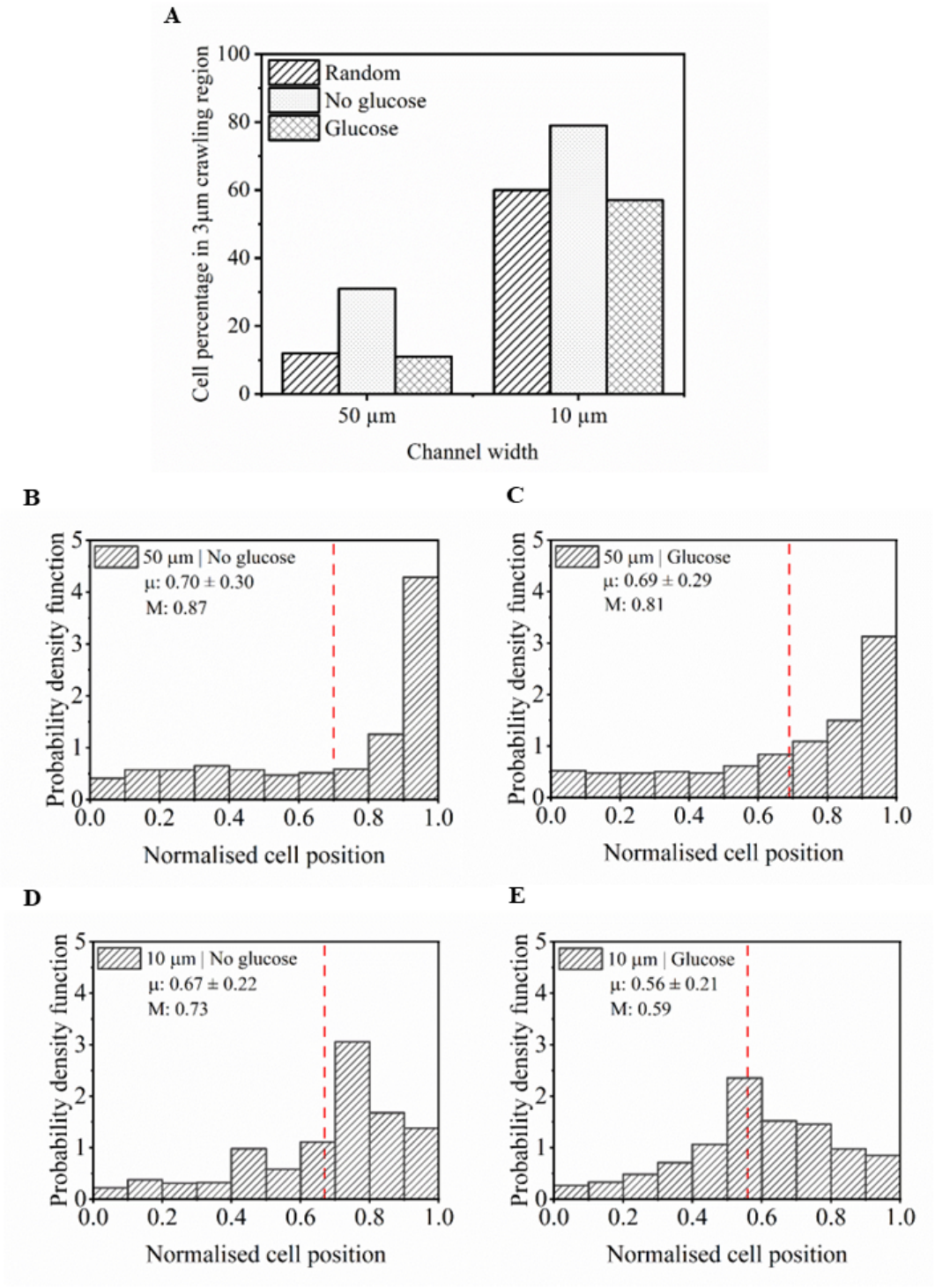

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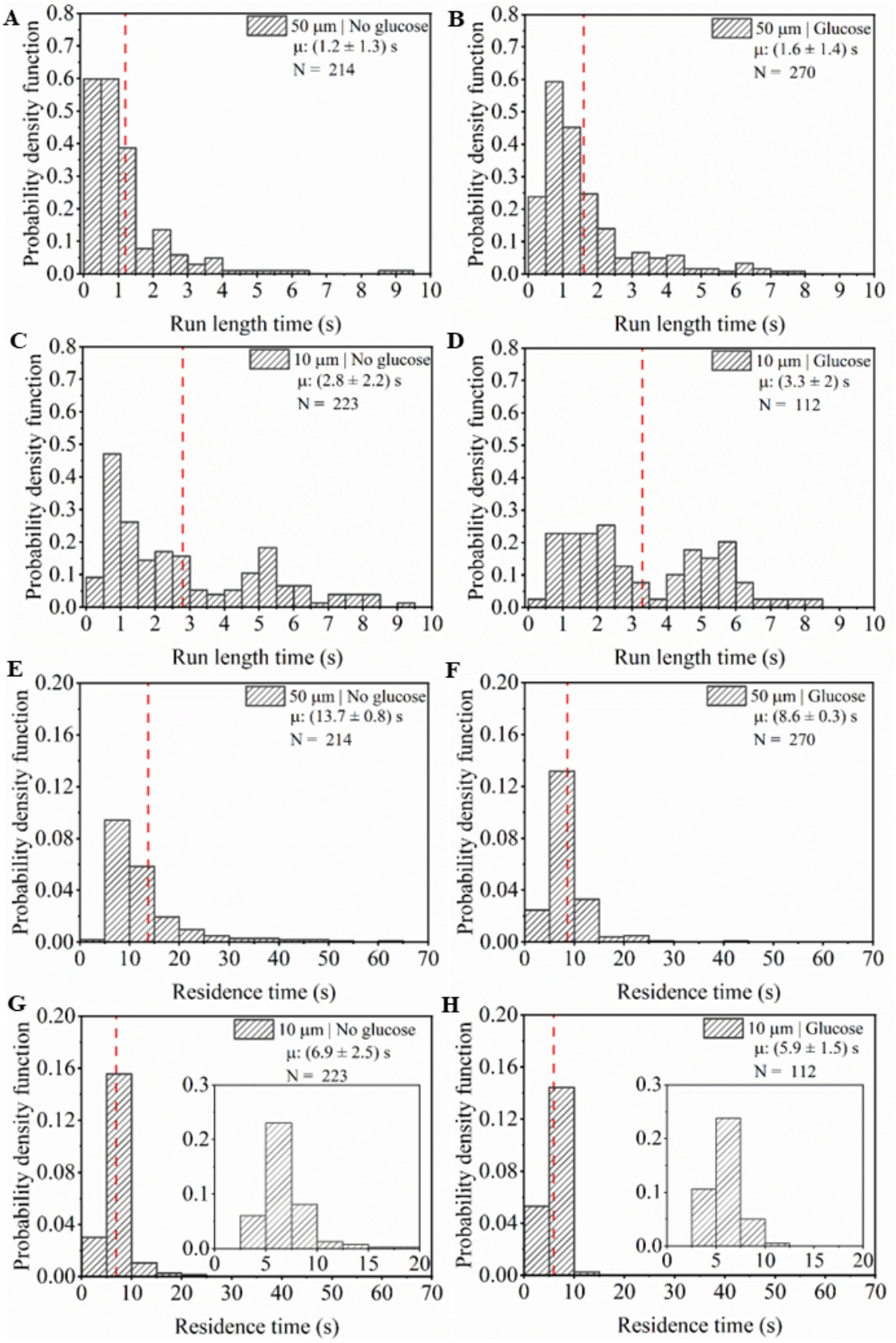

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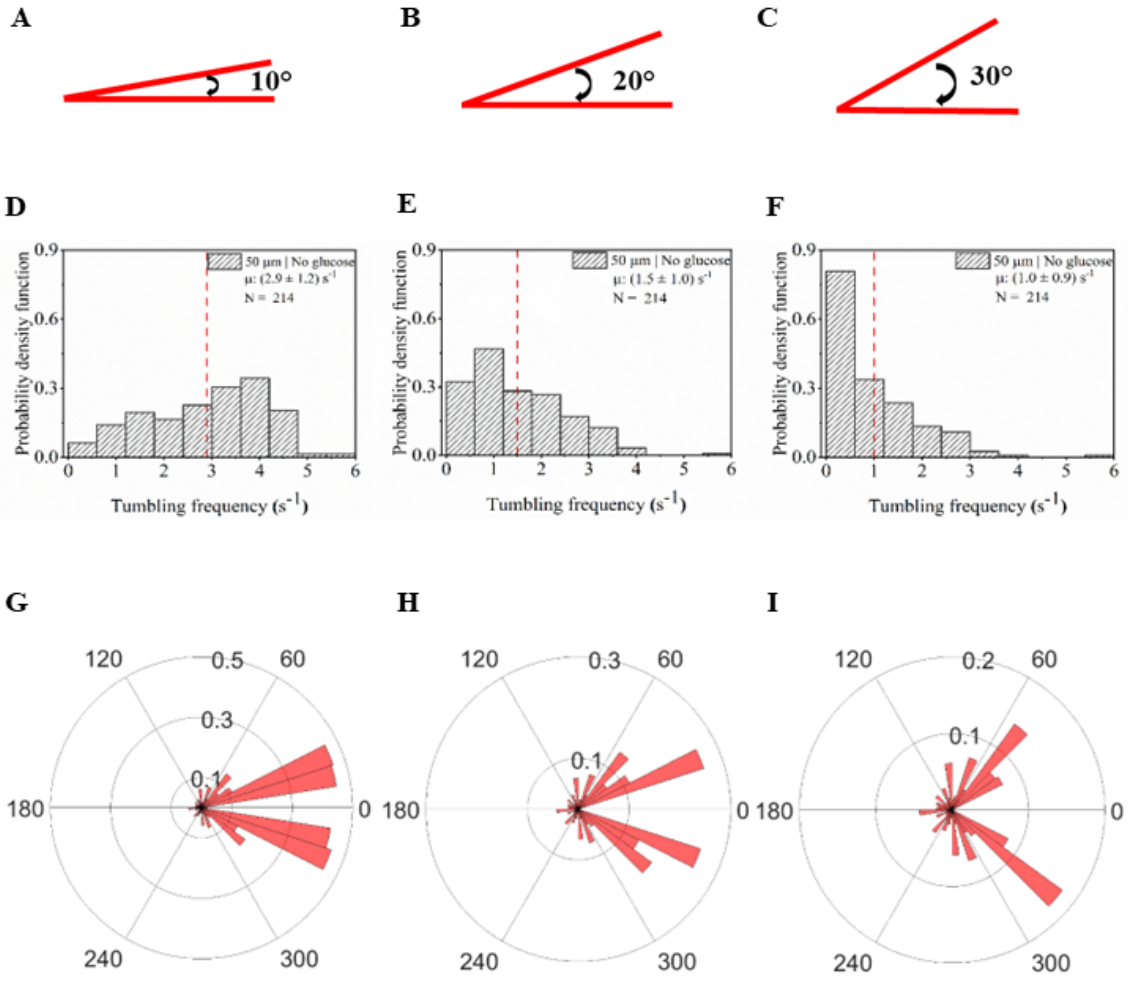

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