Chromatin Condensation Variation during Confined Cell Migration

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Summary

Cells are subjected to a spectrum of mechanical cues to which they adapt. We use microfluidic devices to simulate their mechanical environment during confined migration. We found that chromatin condensation differs according to the degree of confinement.

Body text

Cells are constantly subjected to a spectrum of mechanical cues to which they adapt by mechanotransduction mechanisms (Wagh, 2021). In particular, signalling strategies have been shown to affect migration in response to certain mechanical stimuli (Friedl, 2011).

The deformation of the cell nucleus during confined migration is thought to be one of the mechanosensing mechanism used by the cell, which affect the gene expression (Jacobson, 2018). The possible relationship between them could help to understand the expression mechanism that allows cancer cells to pass through narrow channels during metastasis.

We use microfluidic devices with microchannels of different sizes (ranging from 2 to 14 micrometers width and 6 micrometers height) to simulate the mechanical environment of the neuroblastoma cells during confined migration. Chromatin condensation in these neuroblastoma cells is then estimated using fluorescence optical microscopy imaging. In this way, nuclear deformation and chromatin variation during confinement can be analysed. (Fig. 1)

When cells undergo confinement, we found a chromatin distribution variation related to a chromatin condensation parameter.

Conclusions

In conclusion, our findings clarify how the deformation of the cell nucleus impacts chromatin reorganization, which is relevant to understand the mechanotransduction mechanisms in metastasis and could help in the future to design new therapeutic targets.

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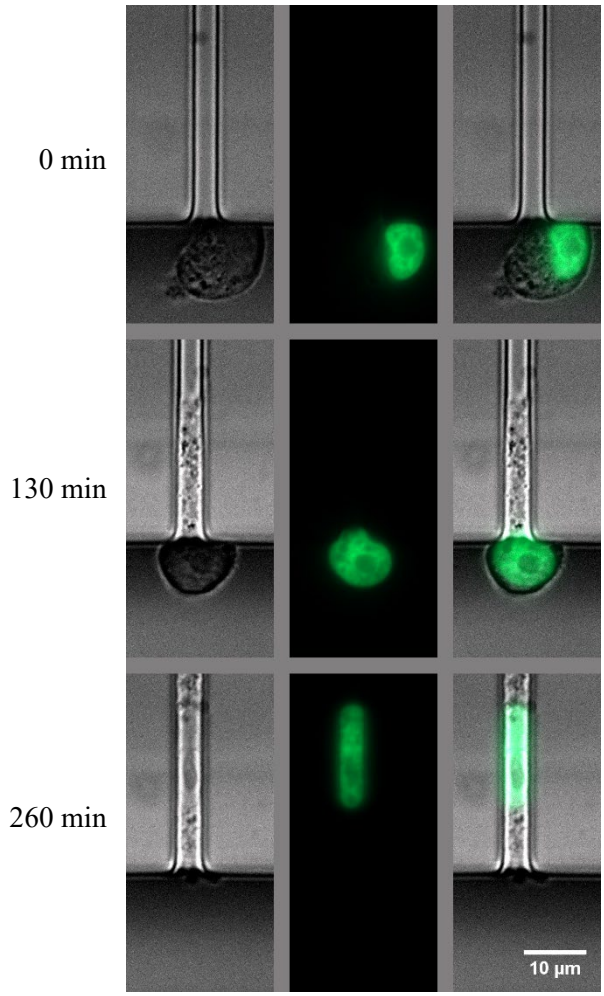

Fig 1. Optical microscopy image showing a cell undergoing confinement in a channel of 4 micrometers width and 6 micrometers height. From left to right: bright-field channel, nucleus fluorescence channel, and overlay of both channels. From top to bottom: temporal progression.