Quantification of T-cell Migration in Confined and 3D Conditions

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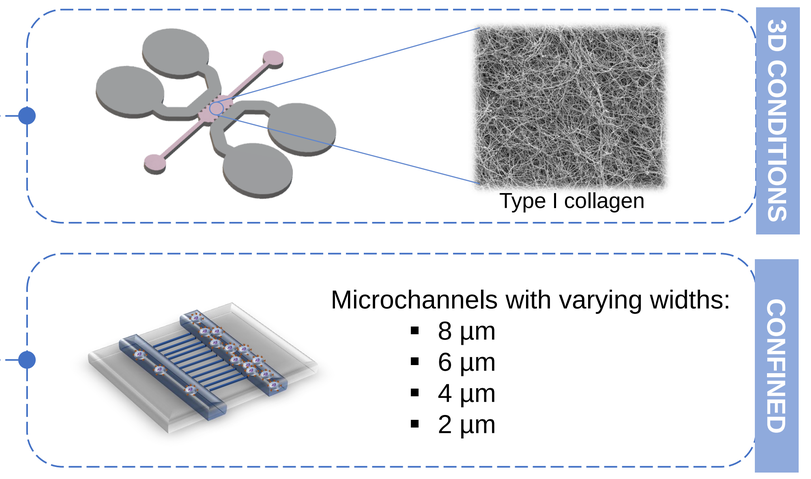
INTRODUCTION

- The **immune system** plays a crucial role in the defense against pathogens and aberrant cells, such as tumoral cells
- In order to carry out its function of immune surveillance, **migration** is one of the fundamental processes required
- It is essential to characterize this mechanism in physiologically and pathologically relevant scenarios to comprehend the **immune response**
- We have adopted a novel microfluidic-based approach that recreates the **biomechanical** aspects of solid tumors
- Two different microfluidic geometries were employed:
  1. One of them based on a central chamber which allowed hydrogel polymerization
  2. The other one based on confined microchannels of different widths

AIM

Characterize T-cell migration in:

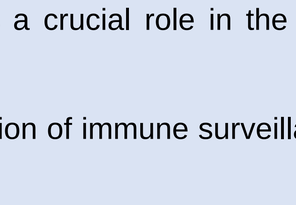
- 3D conditions
- Confined conditions



MATERIALS AND METHODS

The microfluidic devices were fabricated with **polydimethylsiloxane** (PDMS) owing to its many advantages, such as:

- ✓ Biocompatibility
- ✓ Transparency
- ✓ Flexibility
- ✓ Gas permeability



Modified from N. Movilla (2021)

T-cells were seeded on the microchips, where their migration was quantified via time-lapse **microscopy** under controlled conditions of:

- Temperature
- Humidity
- CO_2 concentration

Extracted from zeiss.com

The resulting images were **processed** with ImageJ and Matlab to quantify cell migration

RESULTS AND DISCUSSION

- T lymphocytes display **higher** velocity under confinement compared to 3D migration

CONSISTENT

In 3D hydrogel matrices cells must squeeze through different pores in three possible dimensions

This leads to an irregular track and slower migratory speed

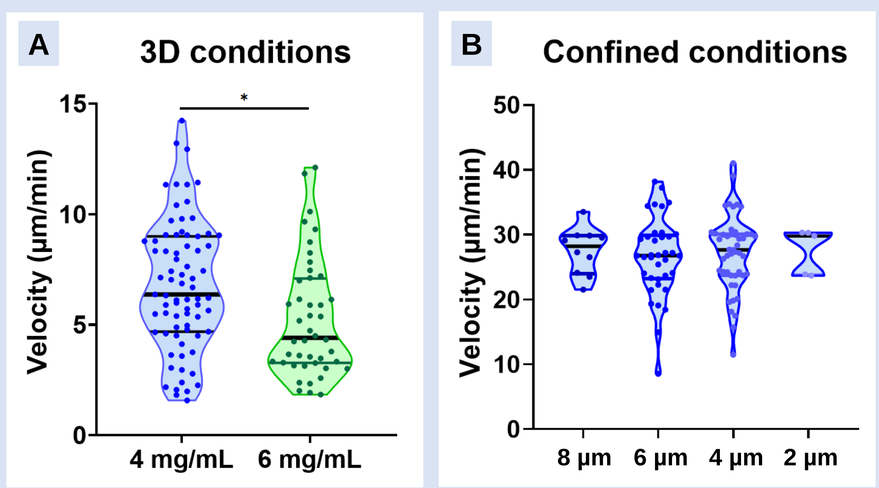


Figure 1. T-cell velocities in (A) 3D and (B) confined conditions. No significant differences are found in confined conditions. However, a significant difference is found regarding 3D conditions (APA style).

CONCLUSIONS

- The results demonstrate that **confinement** is a key factor in immune migration
- Its characterization can provide a better understanding of the **infiltrating capacity** of immune cells in solid tumors, as well as in wounds or other pathological conditions

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