

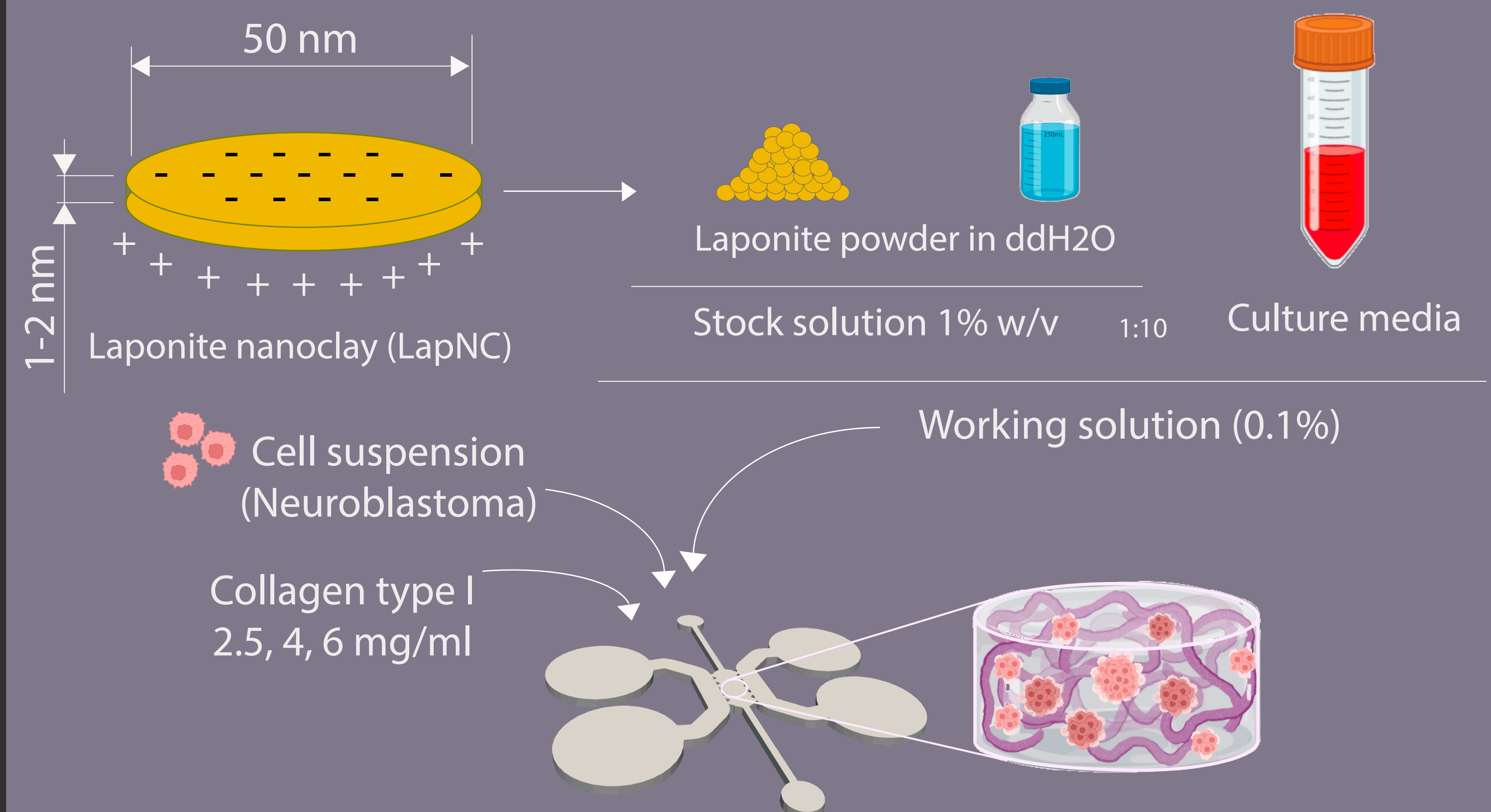
# Collagen-nanoclay hydrogels for stiffness enhancement of the extracellular matrix: the effect on spheroid growth

## INTRODUCTION

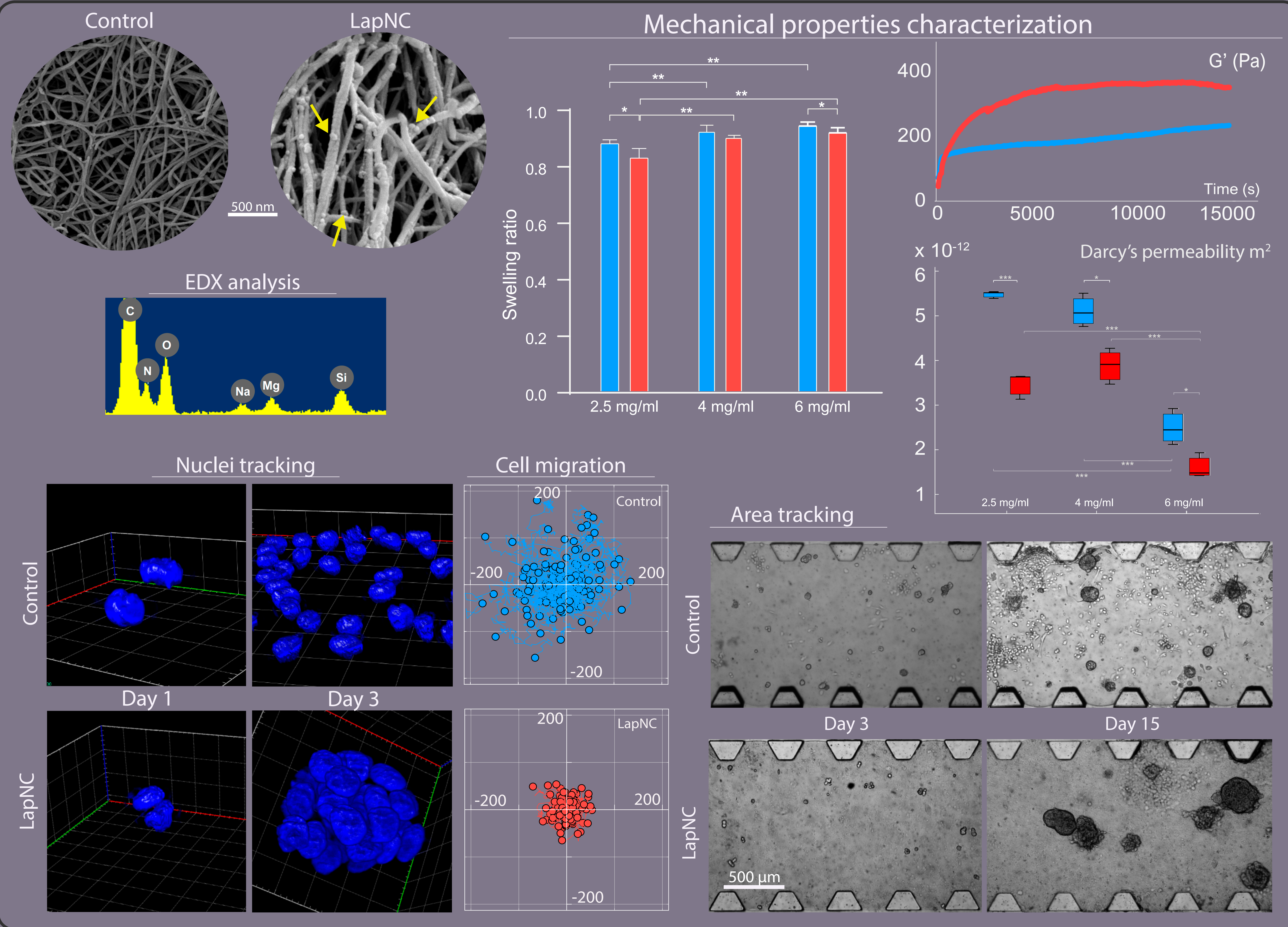
The extracellular matrix (ECM), composed mainly of collagen, plays a pivotal role in maintaining tissue integrity and regulating diverse cellular functions. Hence, the customization of ECM stiffness holds great potential for personalized research and therapies in tissue engineering. In this regard, clay nanomaterials have emerged as promising biomaterials.

We hypothesized that nanoclays could enhance stiffness without the need for increased collagen concentration. To test this hypothesis, we incorporated laponite nanoclay (LapNC) into collagen hydrogels of varying concentrations and characterized their properties. Furthermore, we propose the utilization of these LapNC-supplemented collagen hydrogels as 3D cancer culture systems for the growth of tumor spheroids.

## METHODS



## RESULTS



## OUTCOMES

- LapNC addition implied several changes in the collagen-based matrices:
  - Larger storage moduli
  - A reduction in swelling ratio
  - Decreased permeability
- Regarding cancer cell cultures:
  - Cell migration was reduced for stiffer matrices
  - Larger spheroids were observed in stiffer matrices

## CONCLUSIONS

- LapNC can tailor the mechanical properties of collagen-based matrices.
- Permeability, swelling ratio and micro-architecture were also modified.
- Spheroid growth tracking in microfluidics showed a valuable application.
- Tailoring of collagen and LapNC concentrations may control tumour spheroid growth.
- LapNC supplementation offers promising possibilities for personalized cancer research, among other biomedical areas.