



Tecnologie emergenti nello sviluppo di sistemi di drug delivery avanzati

Annalisa Aluigi

Dipartimento di Scienze Biomolecolari

Università degli Studi di Urbino Carlo Bo



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PIANO NAZIONALE
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TECNOLOGIE EMERGENTI

- 3D Printing

- **Nanoparticelle** mediante miscelazione microfluidica
- Patches nanofibrosi tramite tecniche di **blow spinning and electrospinning**



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3D Printing

Realizzazione di prototipi e
oggetti complessi con alta
precisione e rapidità

Sviluppo del
m a t e r i a l e
stampabile

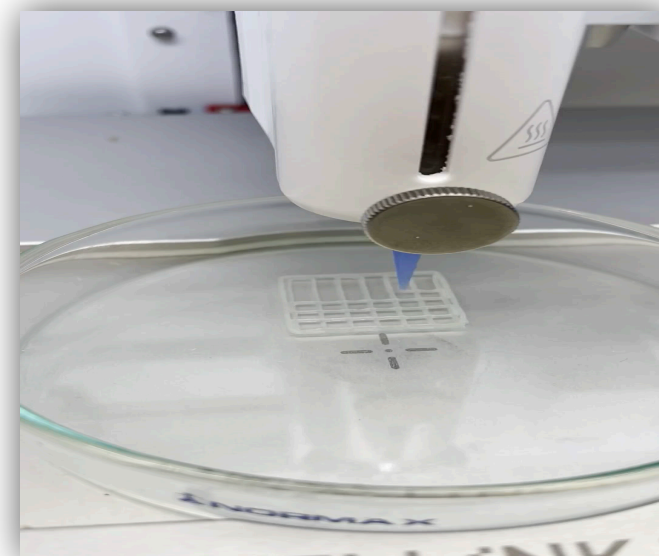
Modello Digitale
(CAD)

Printing via layer-by-
layer deposition.

Reologia



Analisi
termica





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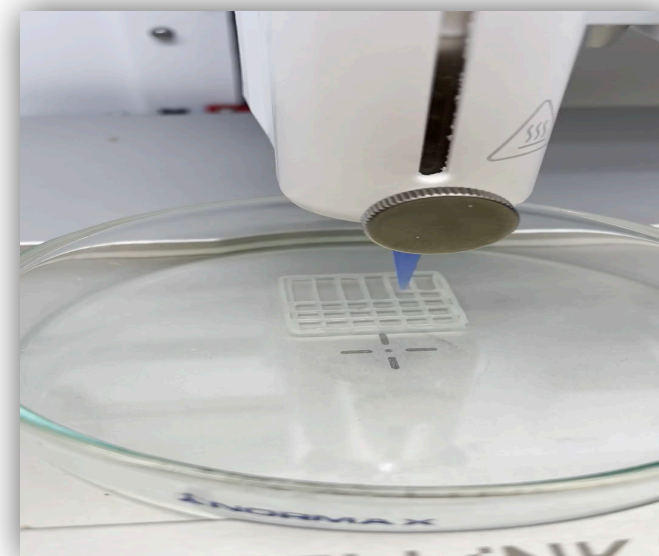
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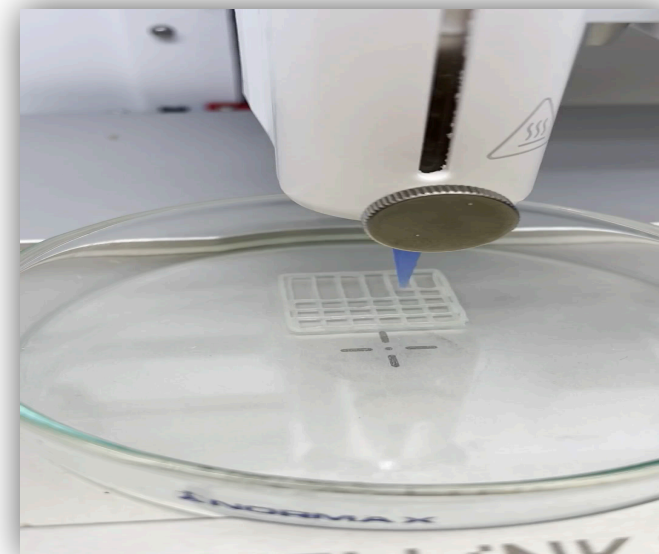
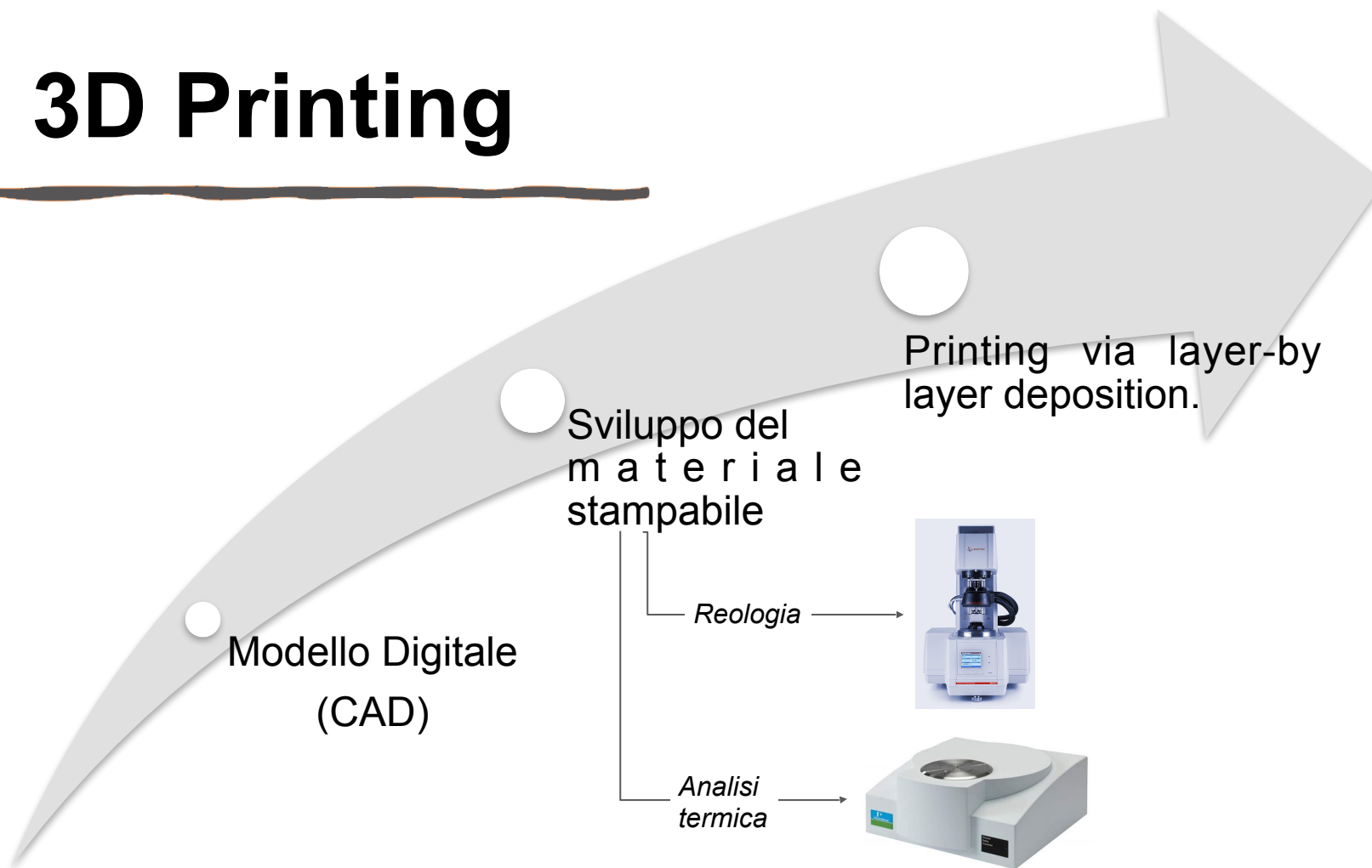
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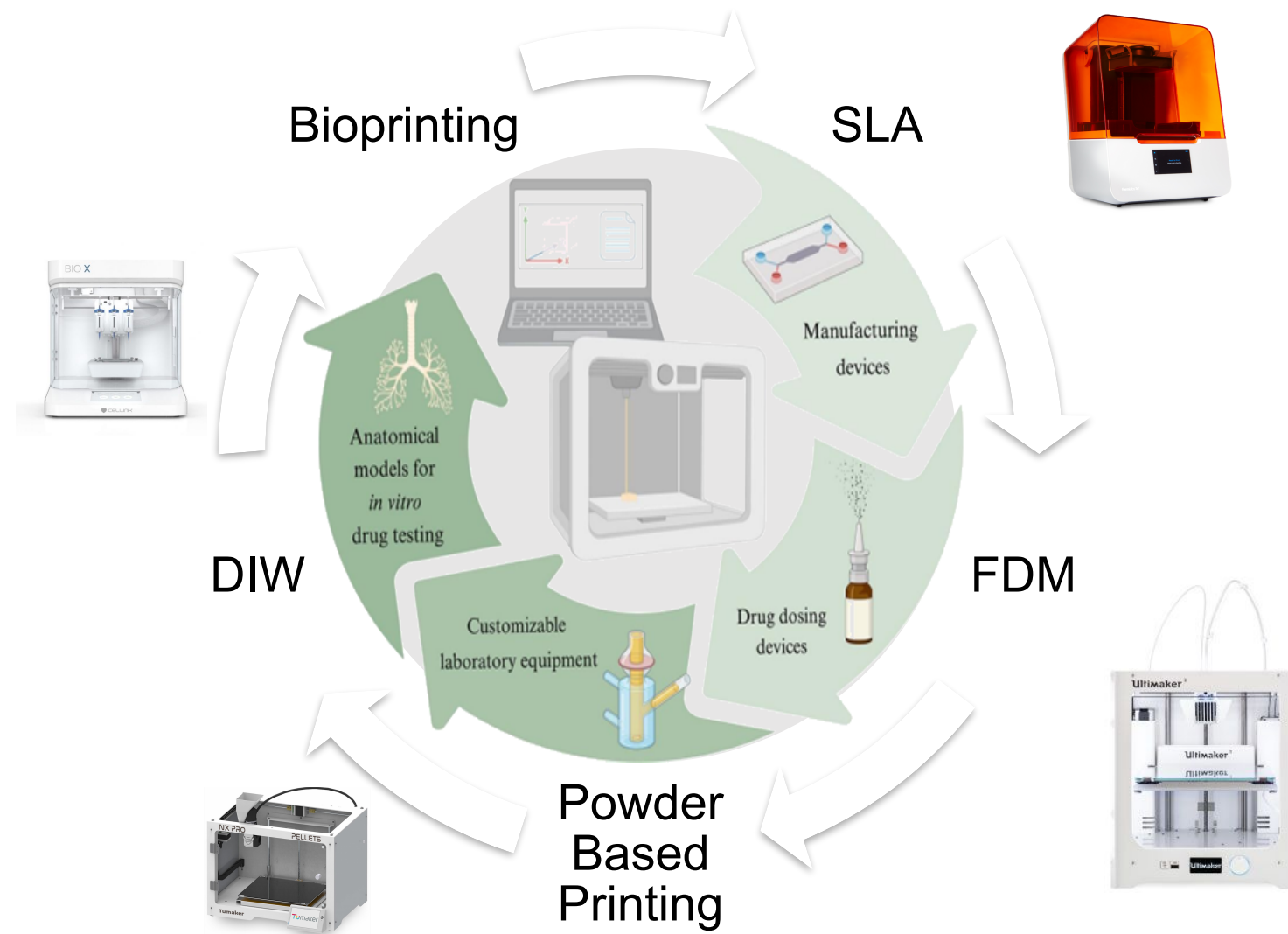
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3D Printing

Fratini C.#, Zhang Y.#, Moroni S., Tiboni M., Ong
H.X., Young P.M., Casettari L.* and Traini D.*
International Journal of Pharmaceutics – Volume
679, 30 June 2025, 125751





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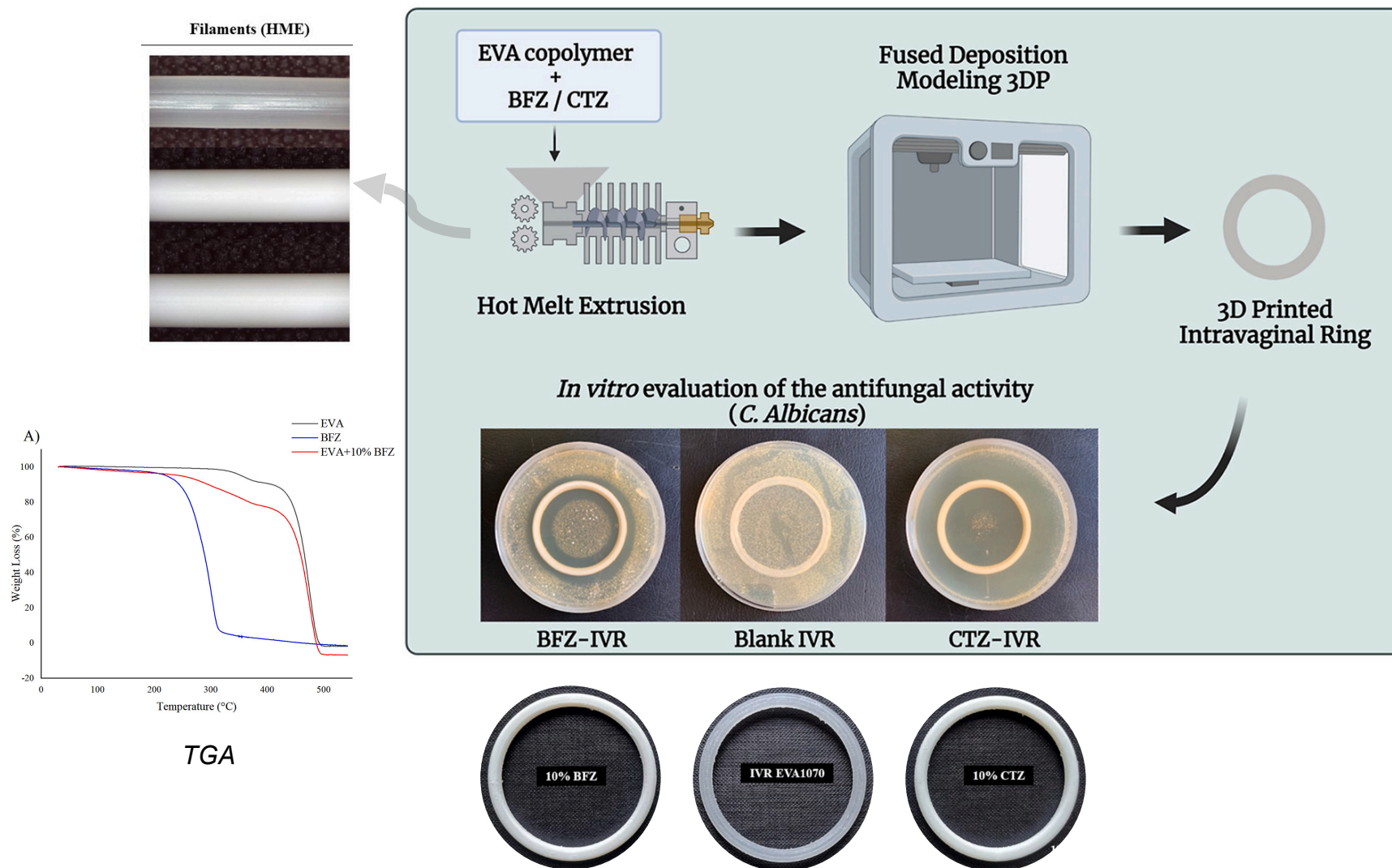


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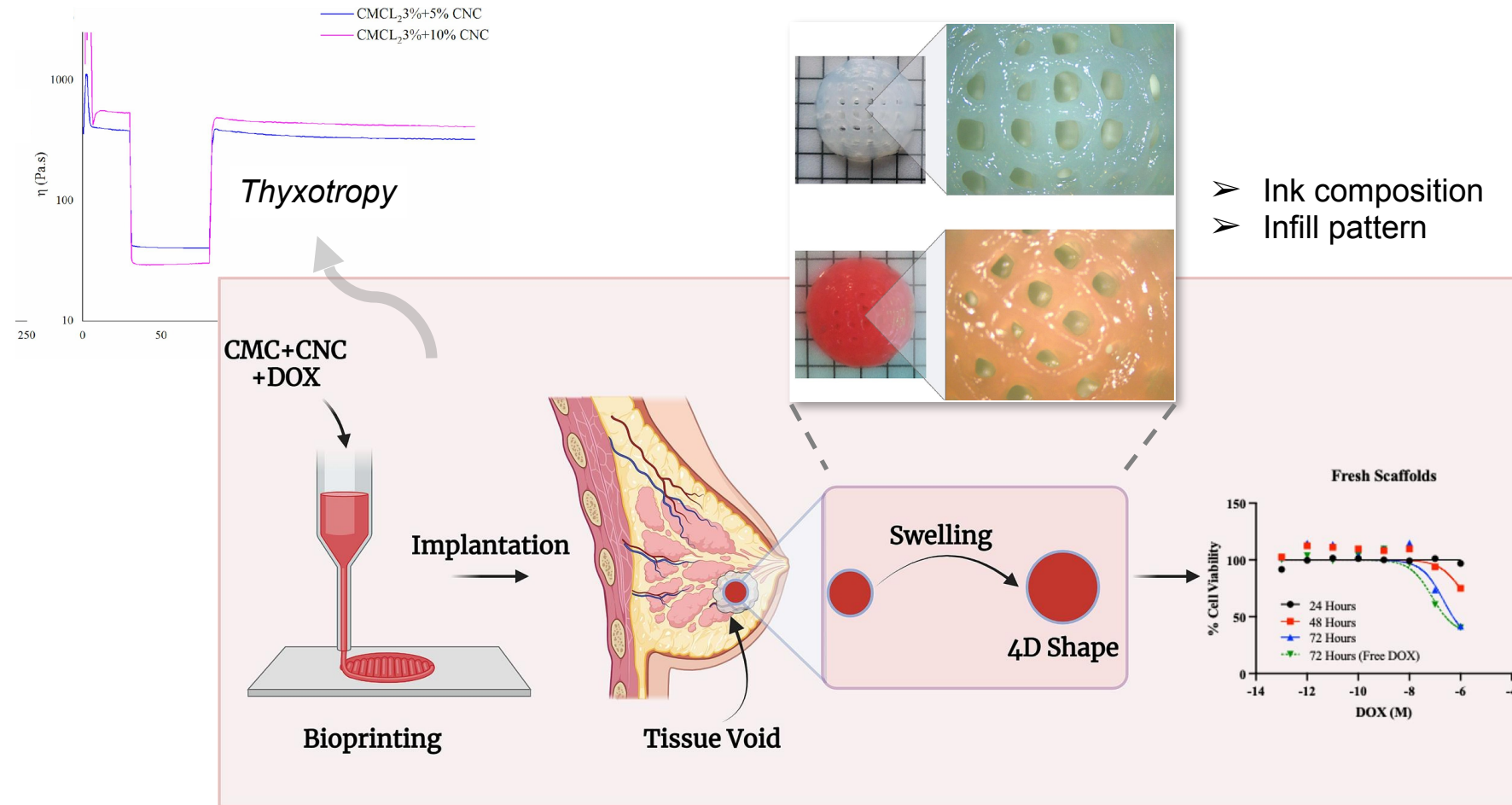
3D printing fabrication of Ethylene-Vinyl Acetate (EVA) based intravaginal rings for antifungal therapy



Sofia Moroni, Francesca Bischì, Annalisa Aluigi, Raffaella Campana, Mattia Tiboni, Luca Casettari, 3D printing fabrication of Ethylene-Vinyl Acetate (EVA) based intravaginal rings for antifungal therapy, *Journal of Drug Delivery Science and Technology*, Volume 84, 2023, 104469,



4D printed multipurpose smart implants for breast cancer management





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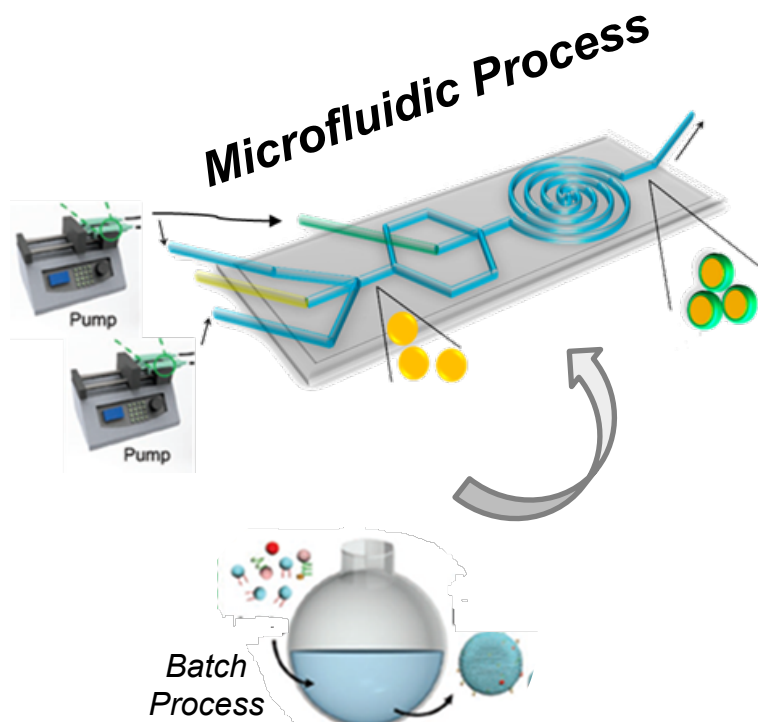


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Nanoparticelle mediante miscelazione microfluidica

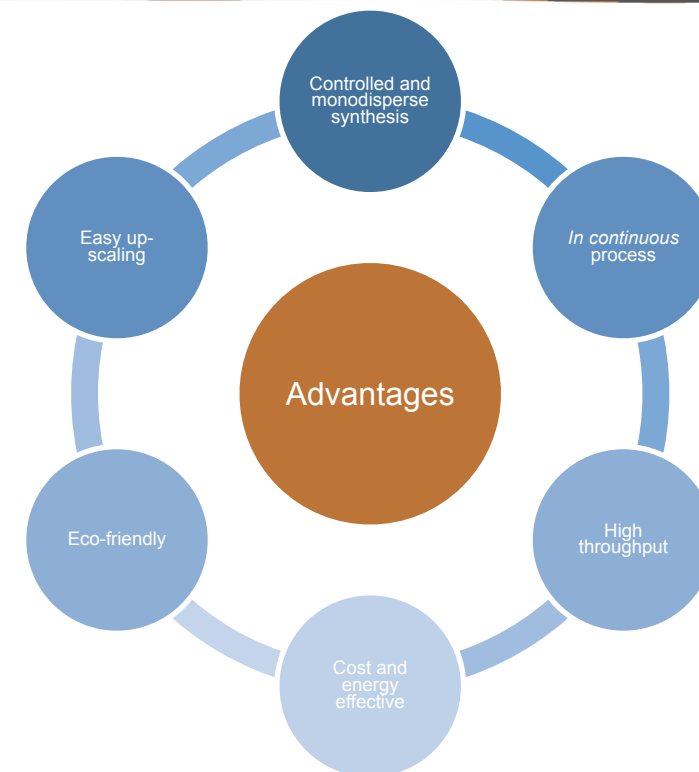


Proprietà delle nanoparticelle



Parametri di processo

- *Caratteristiche e concentrazione degli eccipienti e del farmaco;*
- *Geometria del chip;*
- *Flow Rate Ratio (FRR);*
- *Total Flow Rate (TFR)*





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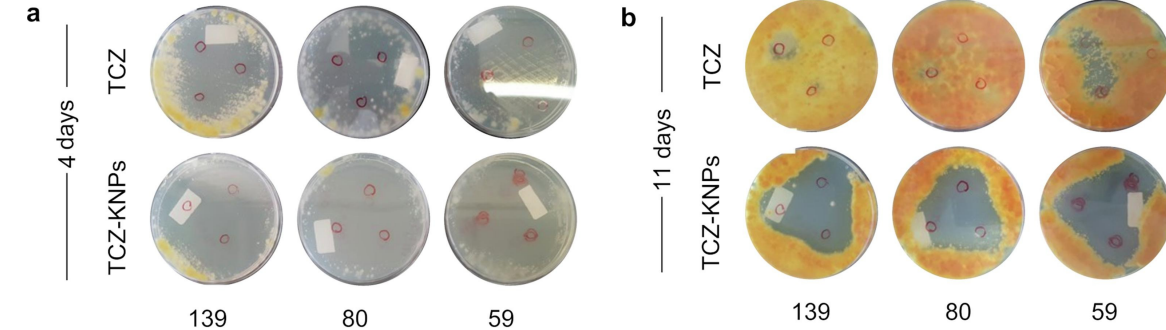
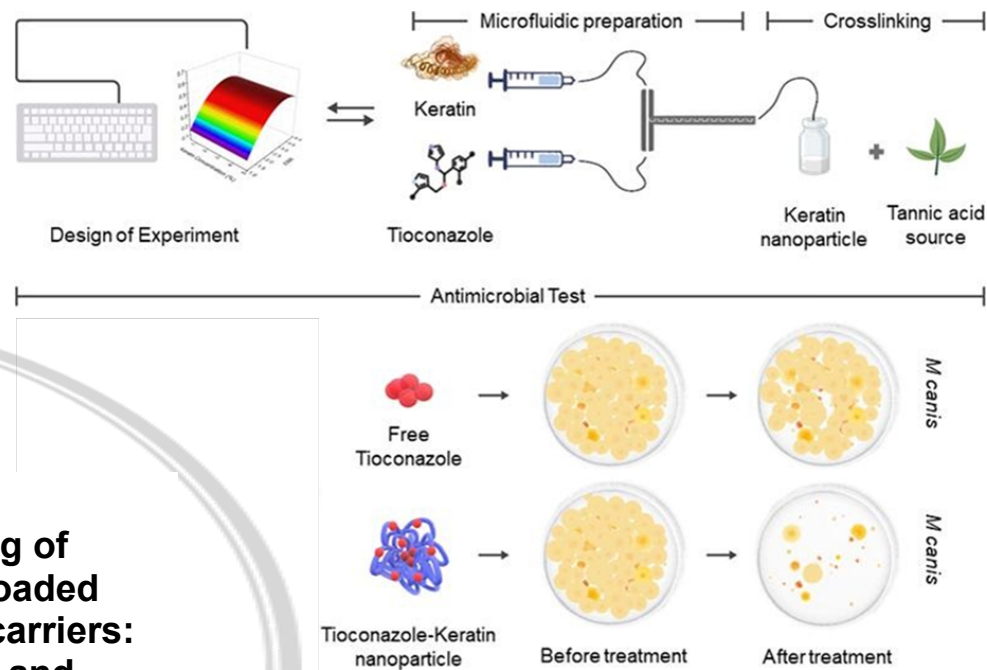


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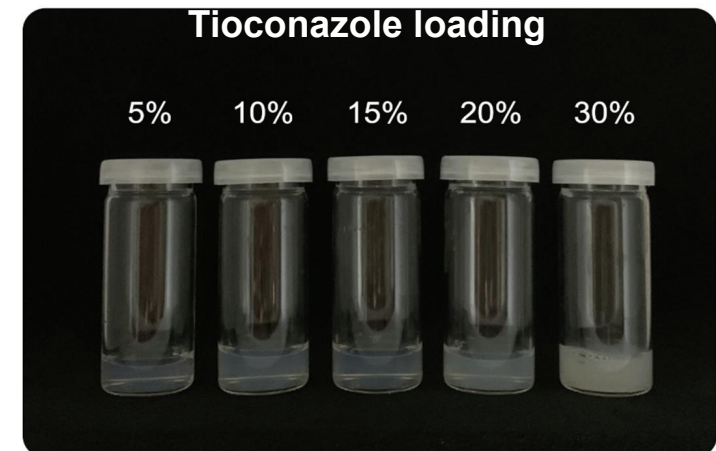


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Micosys and onychomycosis



Three strains of *M. canis*



Khorshid S., Goffi R., Maurizii G., Benedetti S., Sotgiu G.*, Zamboni R., Buoso S., Galuppi R., Bordoni T., Tiboni M., Aluigi A.*, Casettari L.
International Journal of Pharmaceutics – Volume 647, 25 November 2023, 123489

Microfluidic
manufacturing of
tioconazole loaded
keratin nanocarriers:
Development and
optimization by design
of experiments



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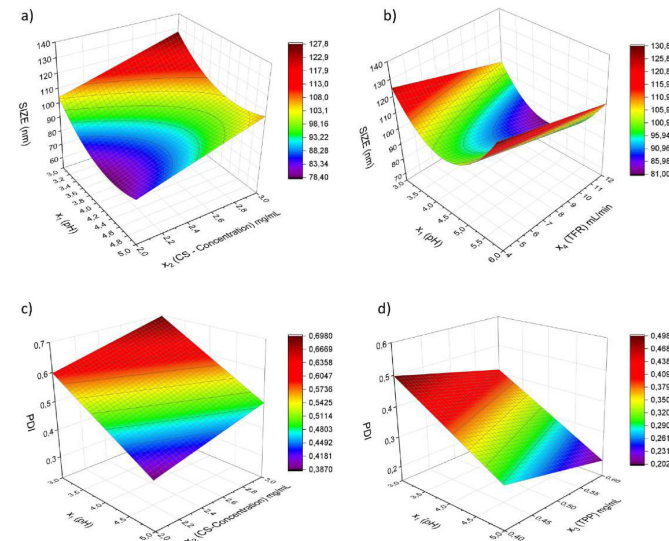
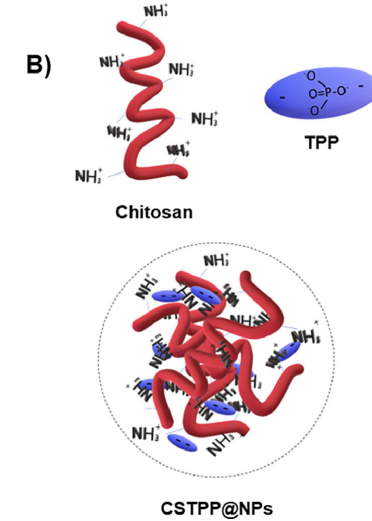
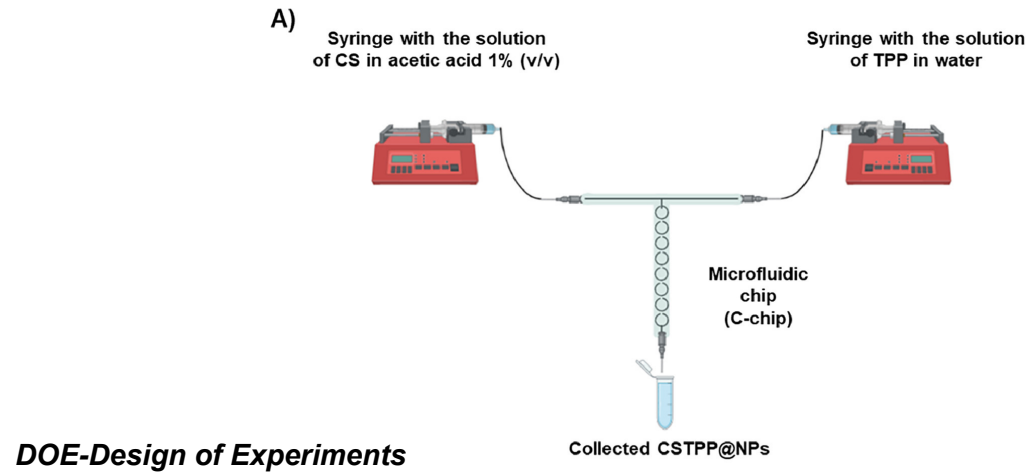


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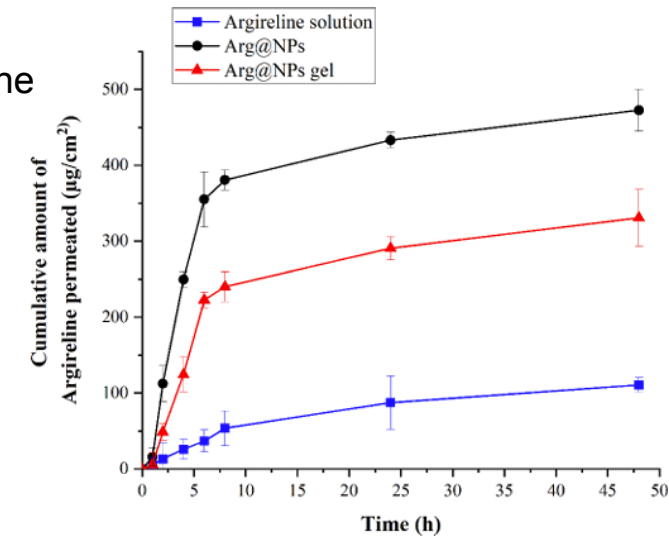
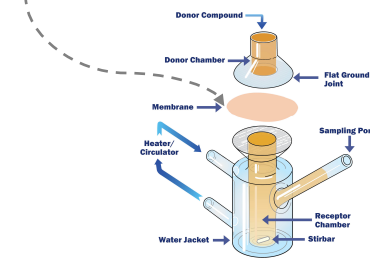


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Non-invasive peptides delivery using chitosan nanoparticles assembled via scalable microfluidic technology



Transdermal diffusion membrane



Maurizii G., Moroni S., Jiménez Núñez J.V., Curzi G., Tiboni M., Aluigi A. and Casettari L.*
Carbohydrate Polymer Technologies and Applications – Volume 7, June 2024, 100424



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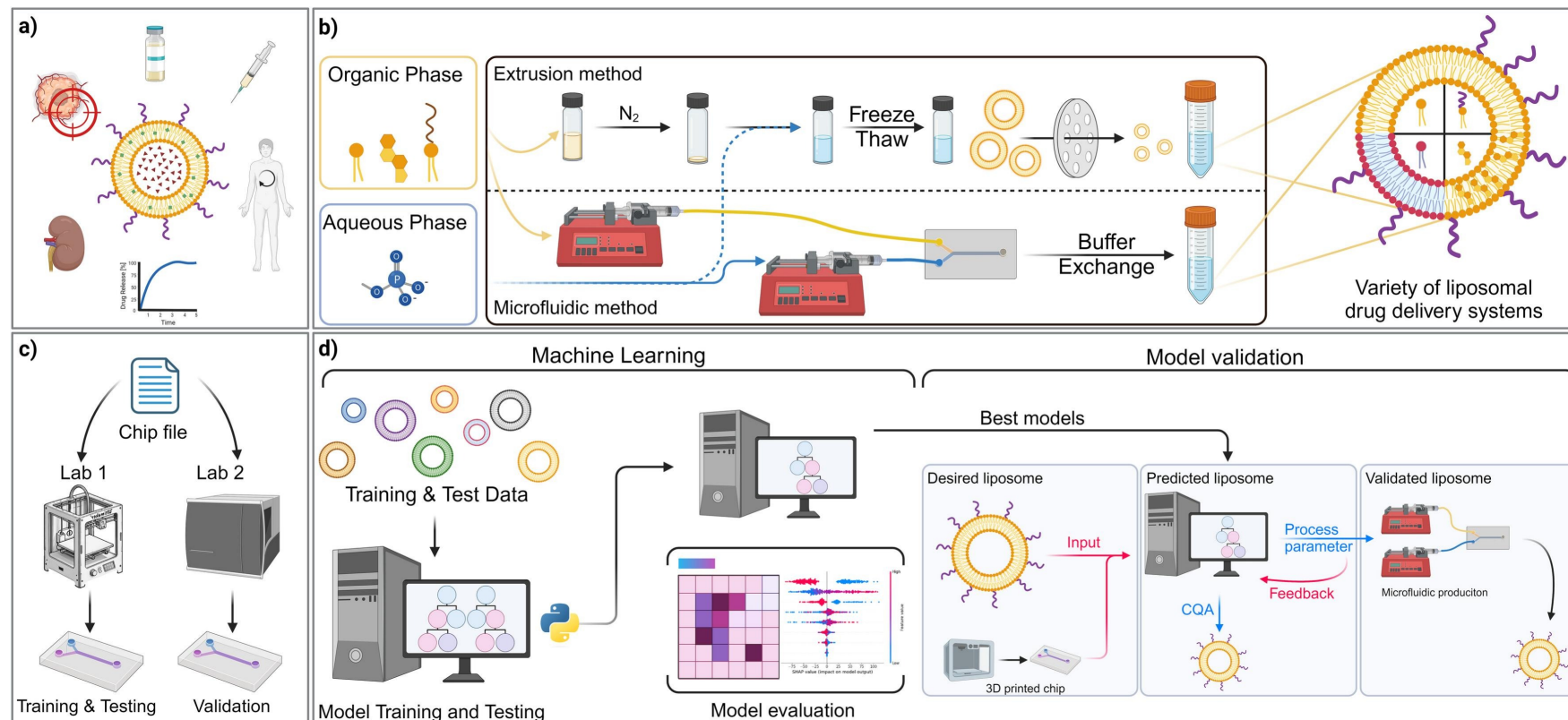


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Leveraging machine learning to streamline the development of liposomal drug delivery systems

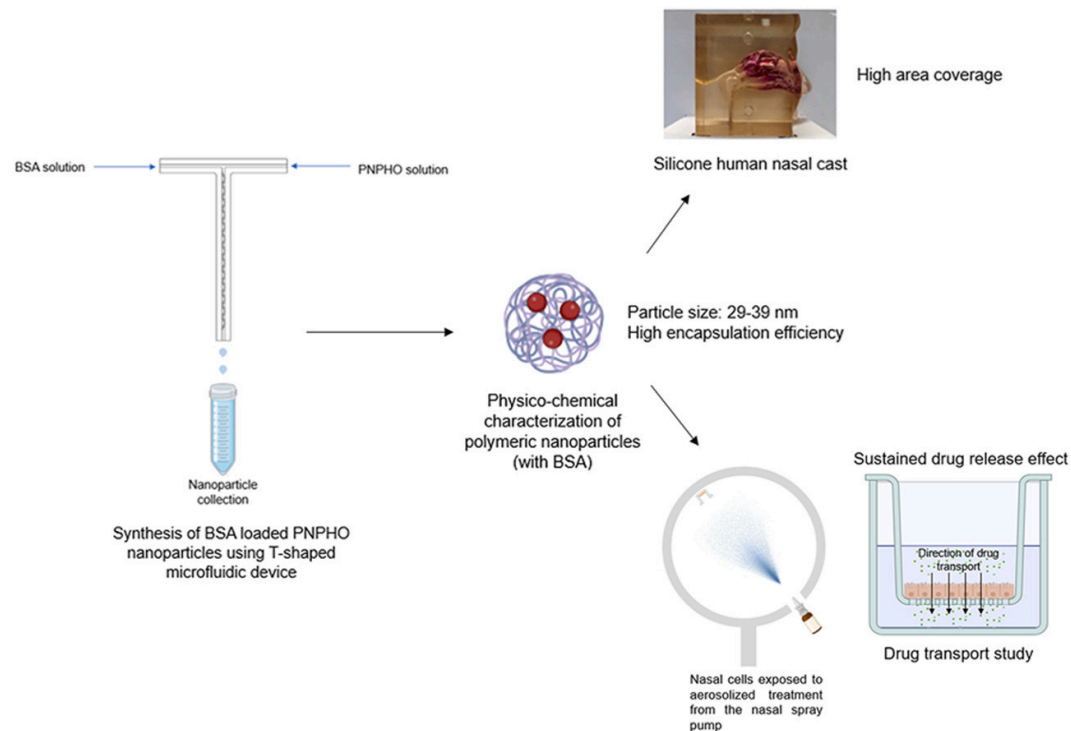
Ongoren B., Kara A., Casettari L., Tiboni M.,
Lalatsa A., Sanz-Perez A., Gonzalez-Burgos E.,
Romero A., Juberias A., Torrado J. J., Serrano
D.R.*

International Journal of Pharmaceutics –
Volume 663, 30 September 2024, 124536

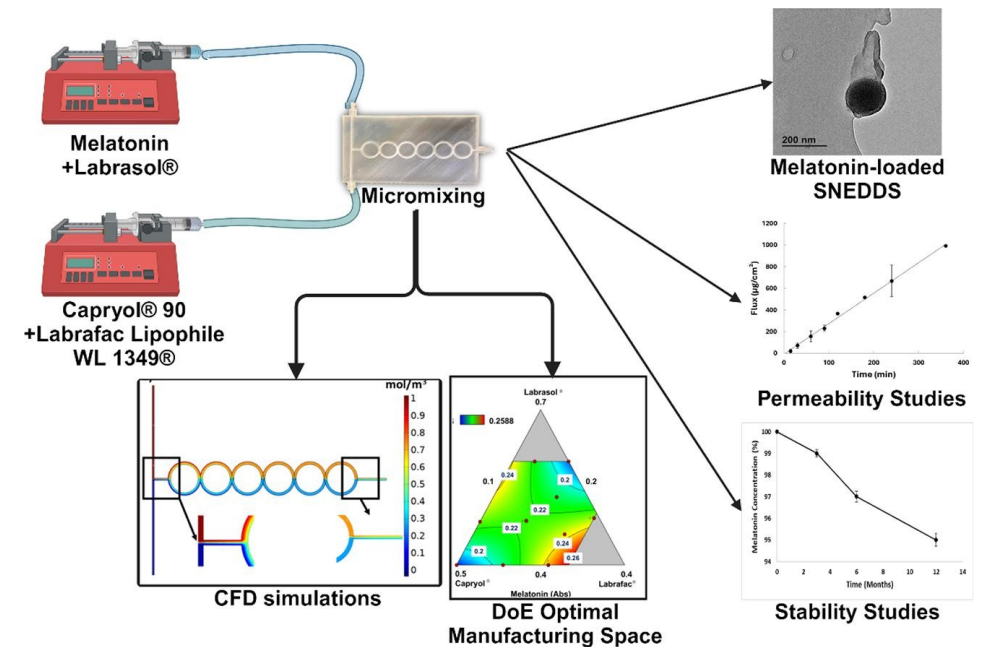




Exploring intranasal delivery of peptide and protein nanoparticles by a thermoresponsive hydrogel



Leveraging 3D-printed microfluidic micromixers for the continuous manufacture of melatonin loaded SNEDDS with enhanced antioxidant activity and skin permeability





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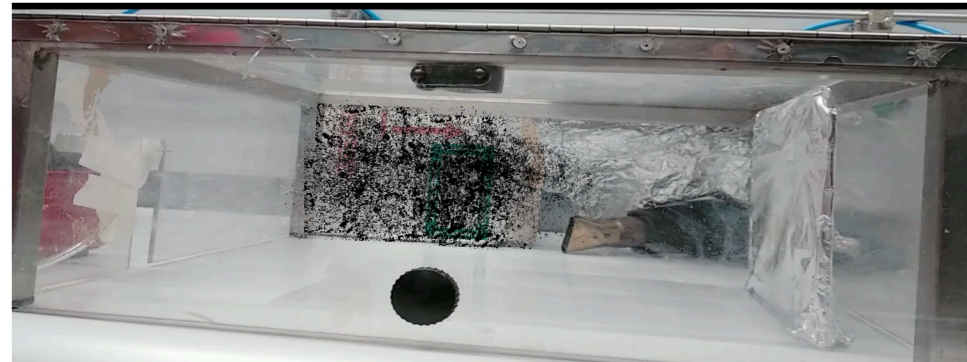
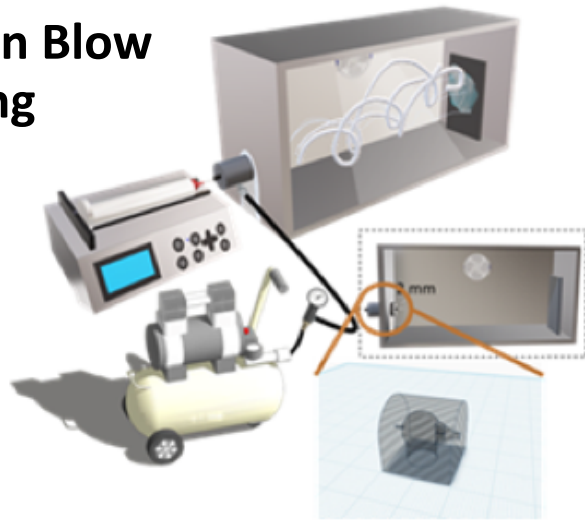
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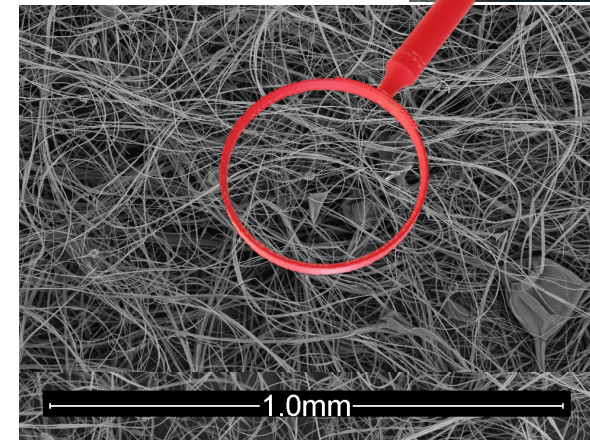
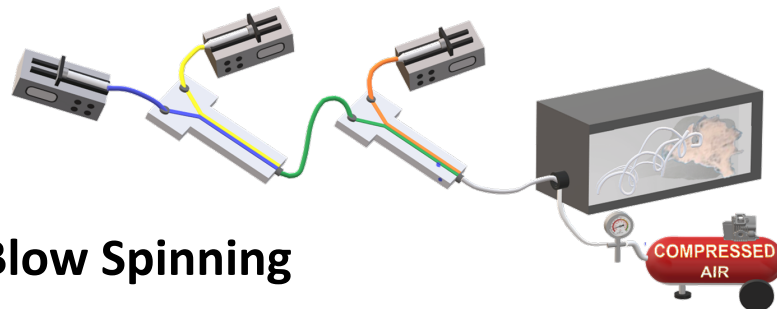
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Patch nanofibrosi mediante blow spinning

Solution Blow Spinning



Microfluidic Blow Spinning





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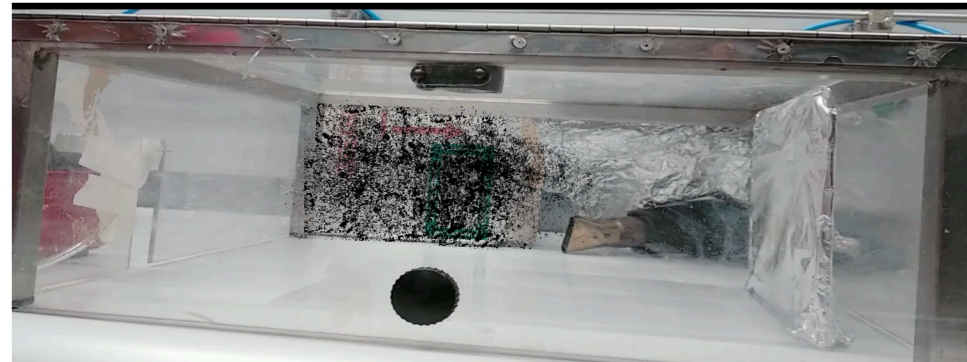
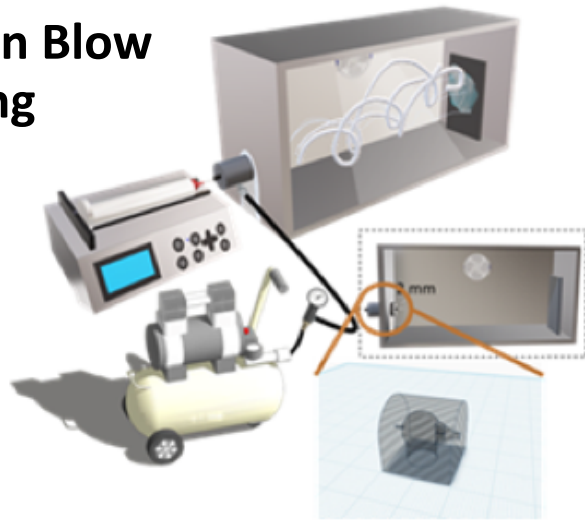
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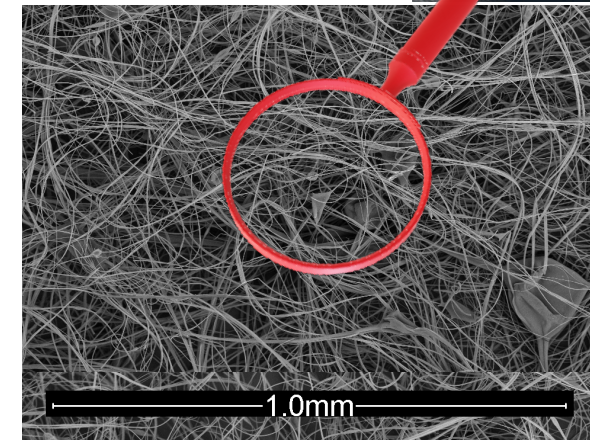
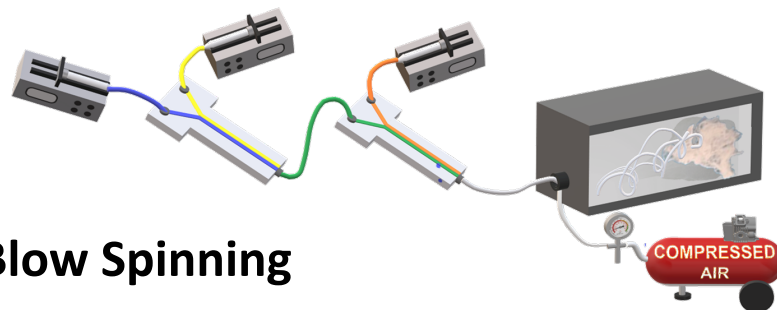
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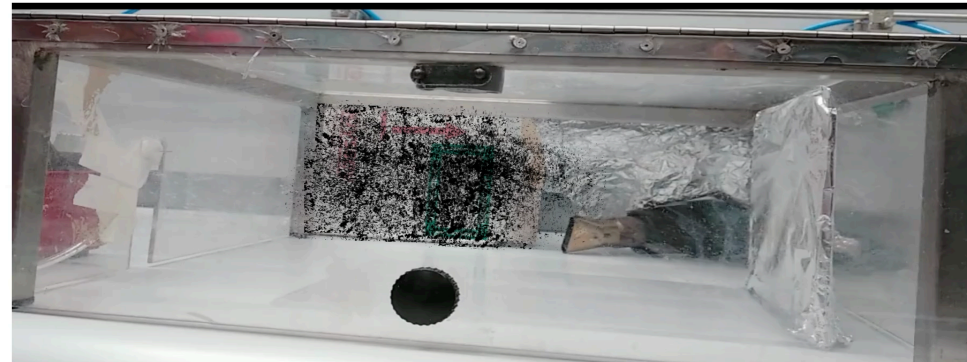
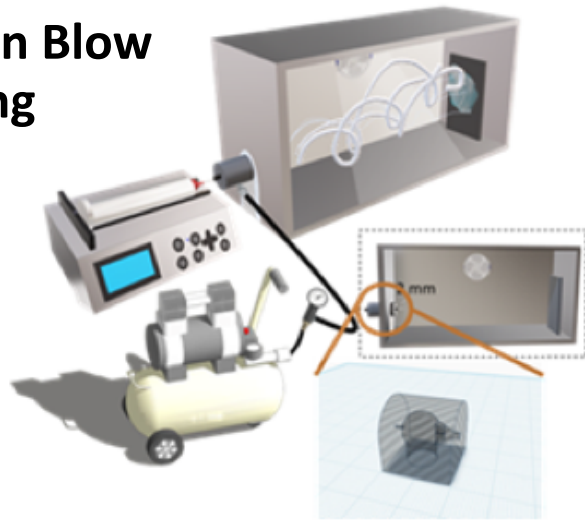
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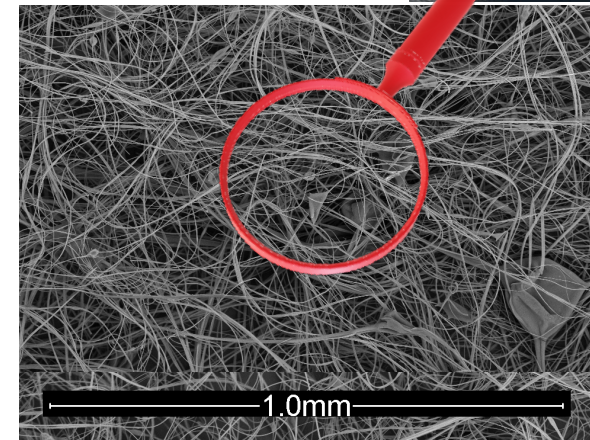
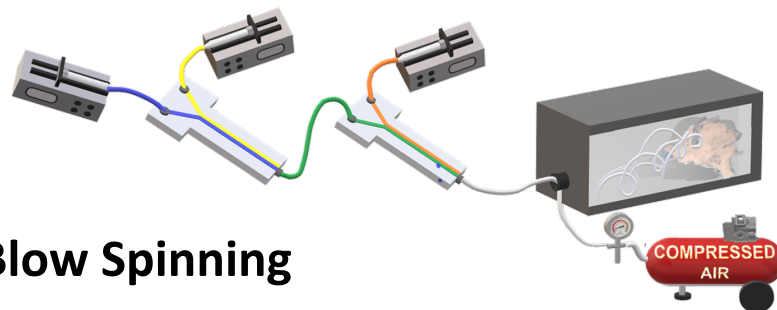
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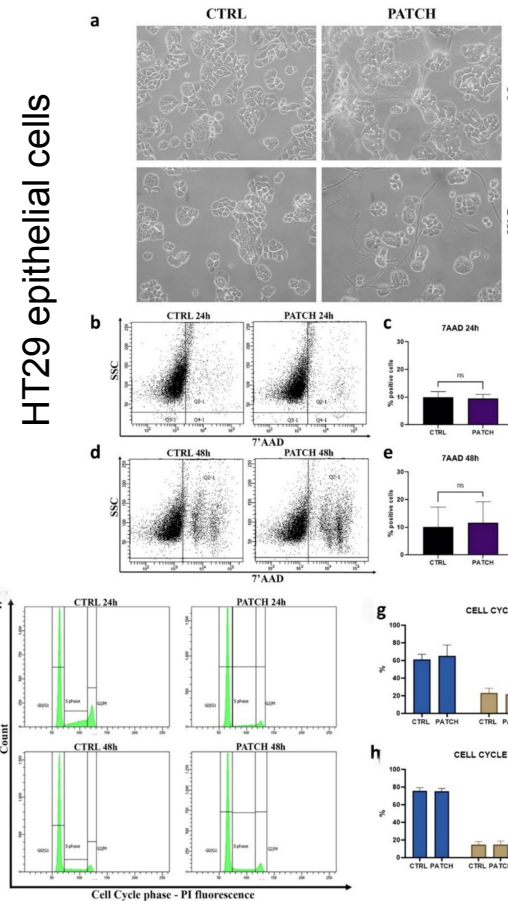
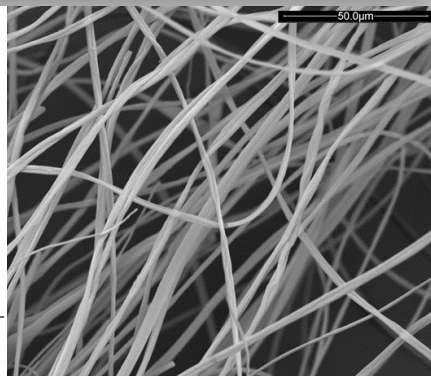
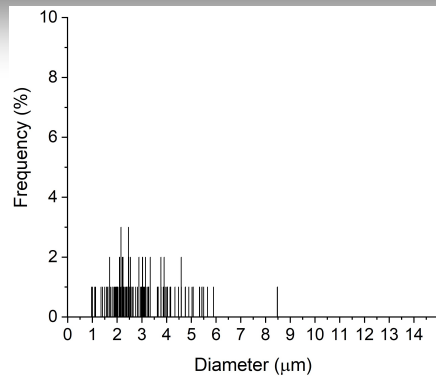
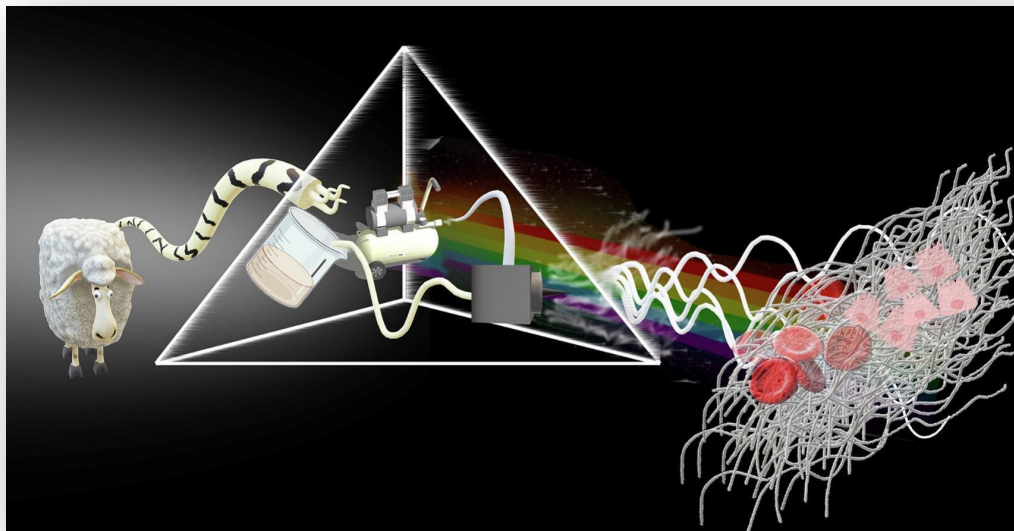
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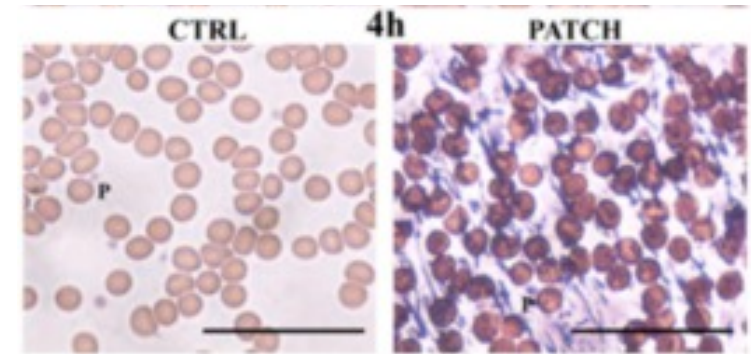
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The dark side of the wool?

From wool wastes to keratin microfilaments through the solution blow spinning process



BASIC HEMOCOMPATIBILITY



White blood cells, similar in both control and patch-treated samples, are visible. Echinocytes are indicated by black arrows while platelets are indicated by P.

Maurizii G., Valentini L., Sotgiu G., Zamboni R., Tonetti C., Vineis C., Canonico B., Montanari M., Tiboni M., Casettari L. and Aluigi A.*
International Journal of Biological Macromolecules – Volume 275, Part 2, August 2024, 133722



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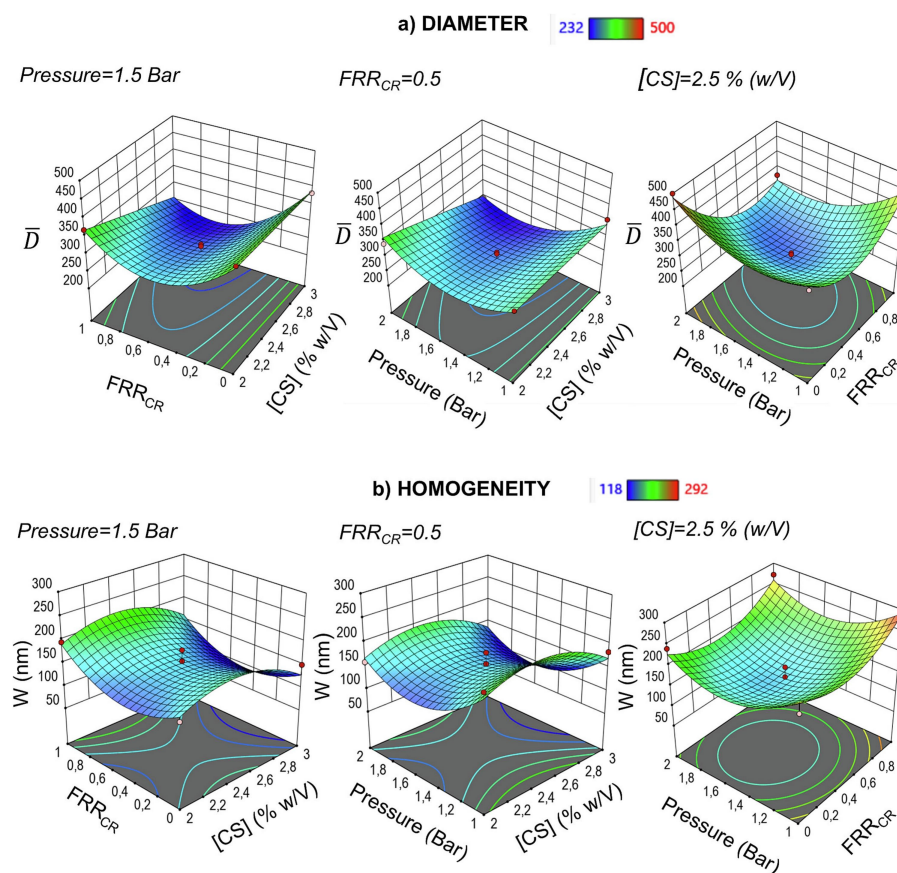
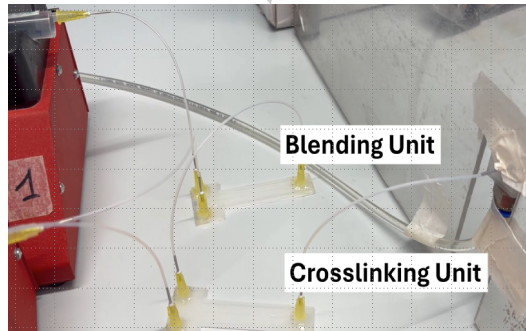
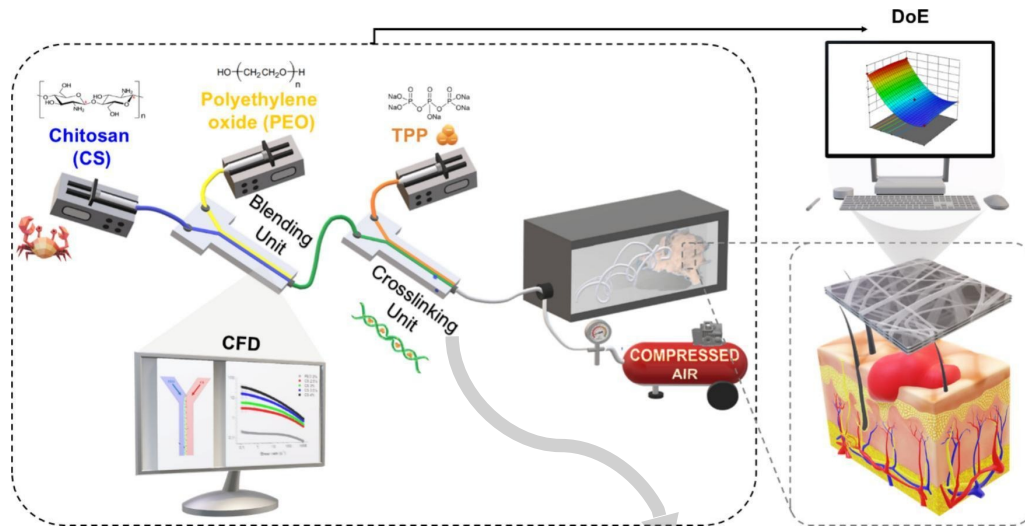


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Optimized microfluidic blow spinning process for single-step manufacturing of crosslinked chitosan nanofilaments using a quality-by-design approach



In-situ deposition



Matos A.F., Pricci A., Benedetti S., Tiboni M., Aluigi A.* and Casettari L.
International Journal of Biological Macromolecules – Volume 321, Part 2, September 2025, 146279



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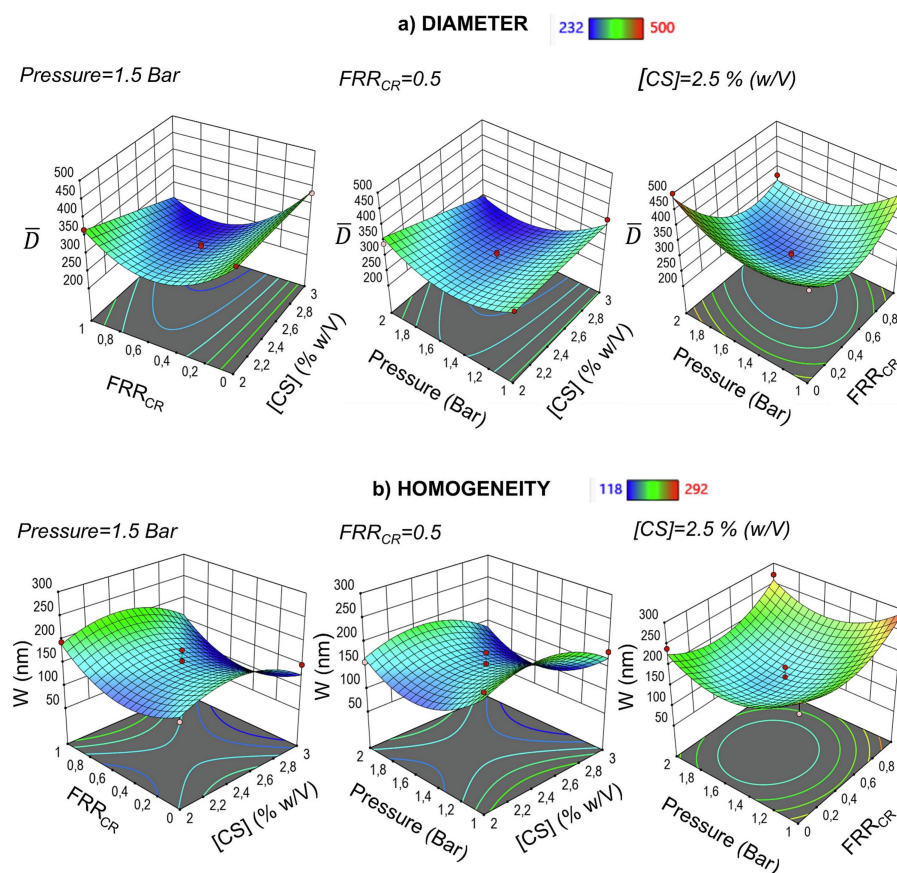
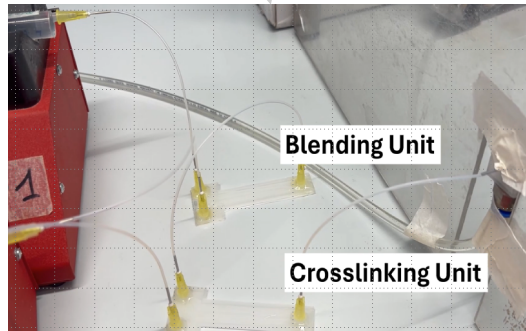
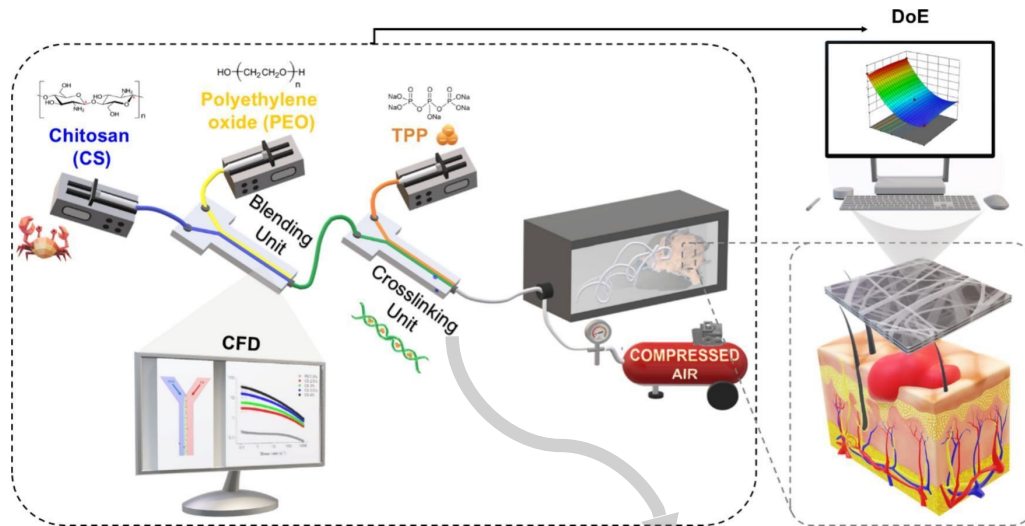


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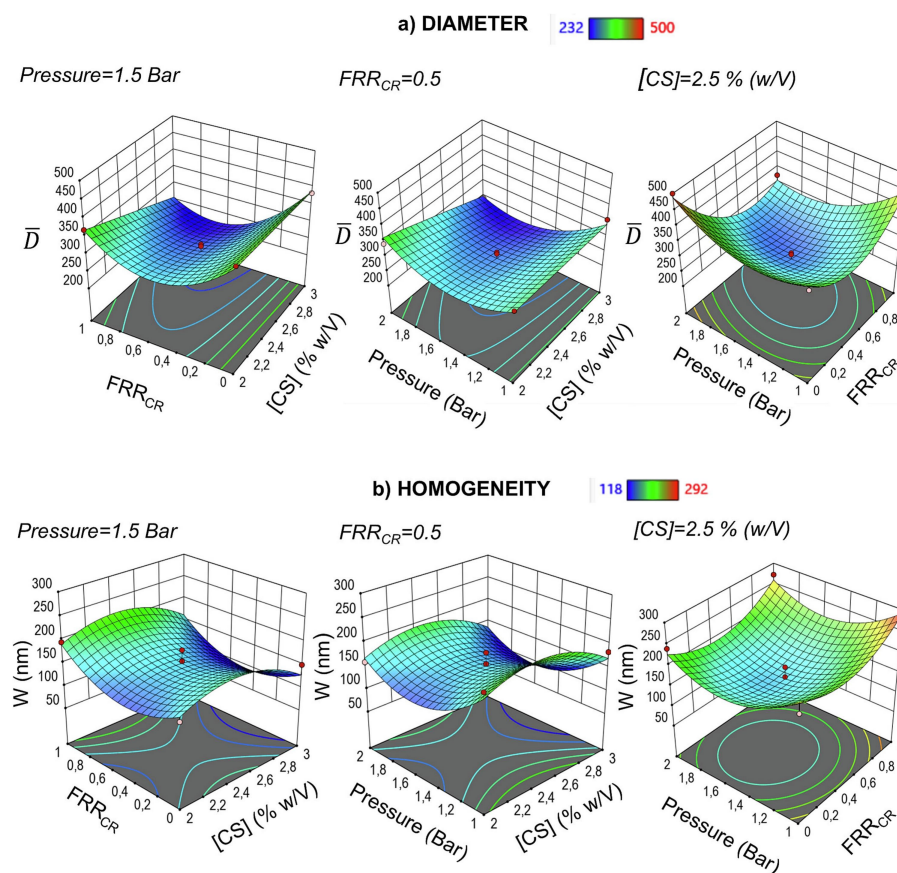
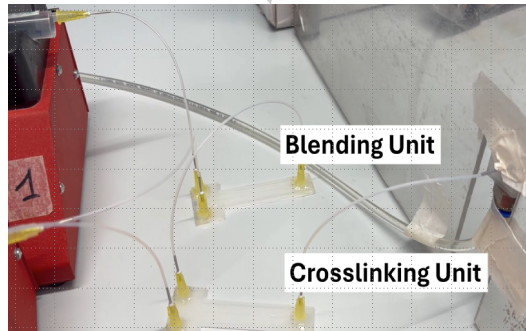
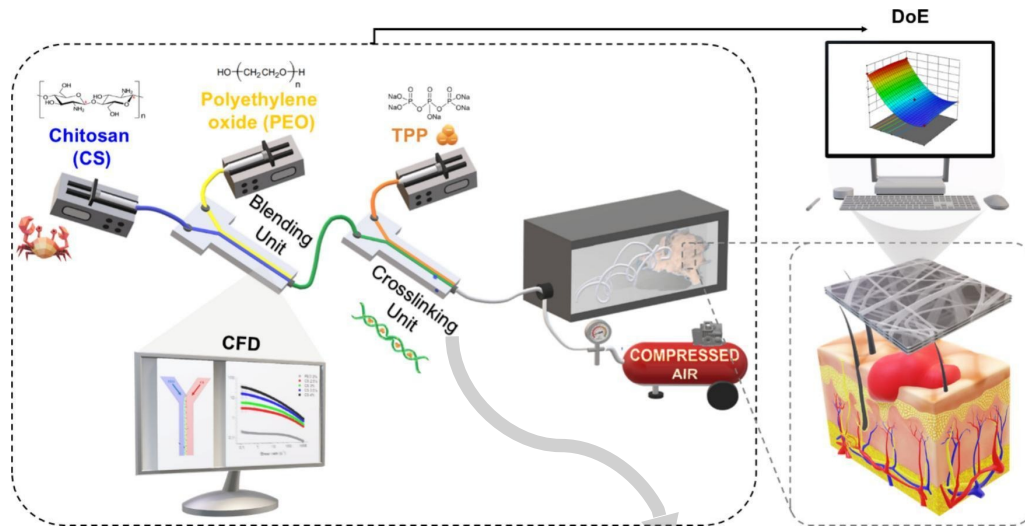


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Grazie per l'attenzione