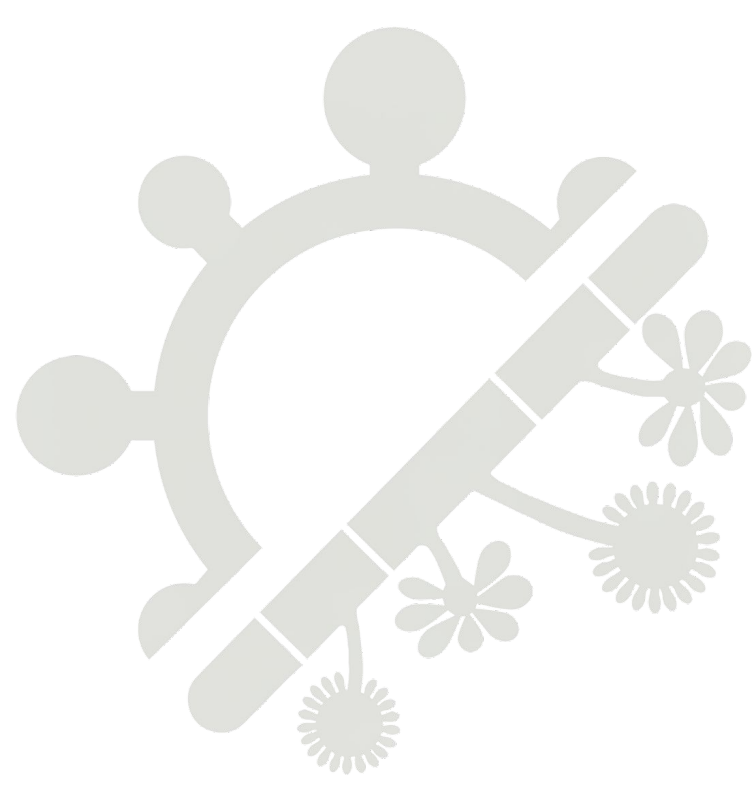




Development and Characterization of a Nanoemulsion for Antibody-Based Therapy Against *Candidozyma auris*

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INTRODUCTION

Candidozyma auris is an emerging multidrug-resistant fungal pathogen associated with high mortality rates and healthcare-associated outbreaks.

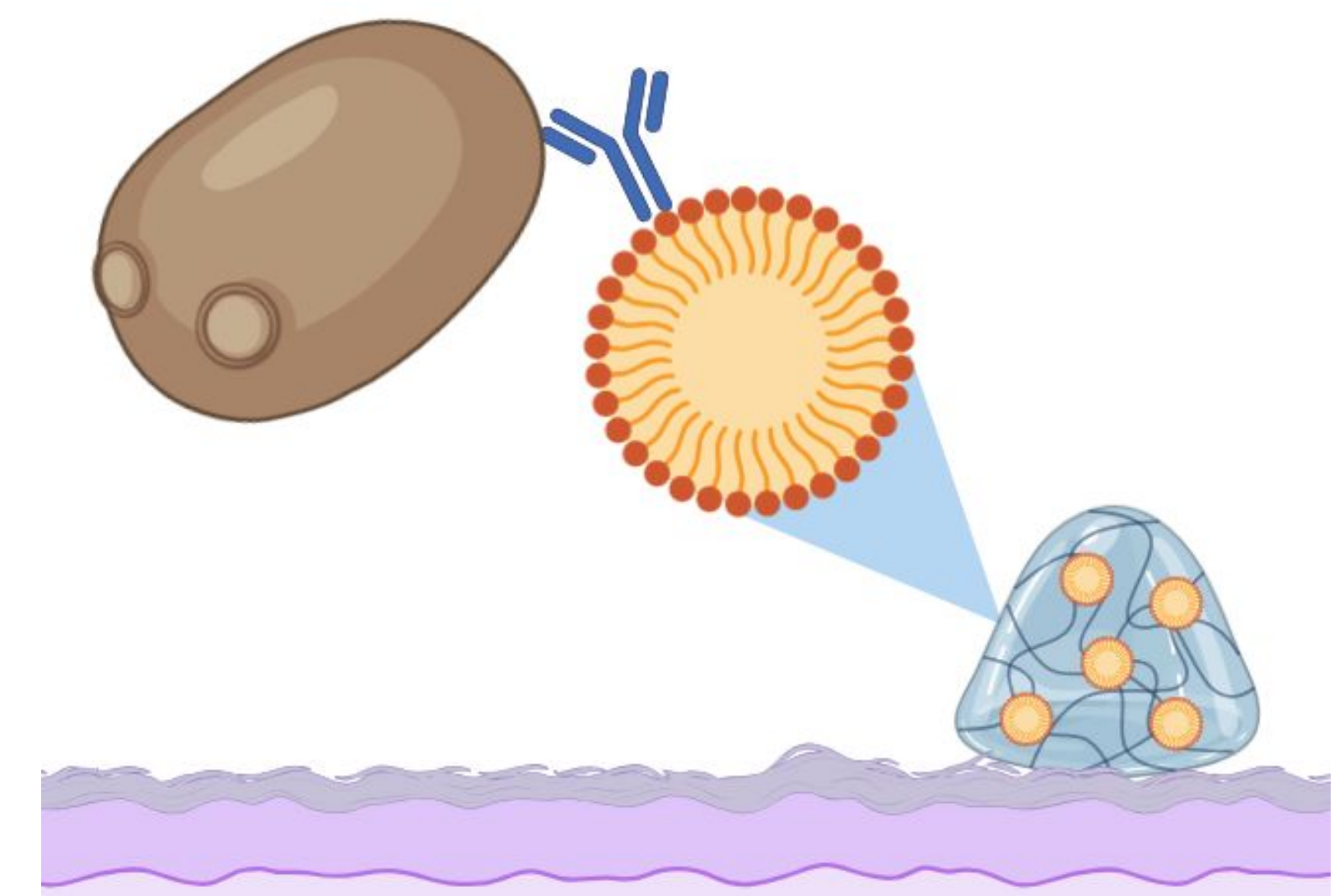
Fungal adhesion is a critical first step for colonization and infection, making adhesins attractive therapeutic targets.

Nanoemulsions (NEs) are promising drug delivery systems due to their stability, biocompatibility, and ability to be functionalized with bioactive molecules.

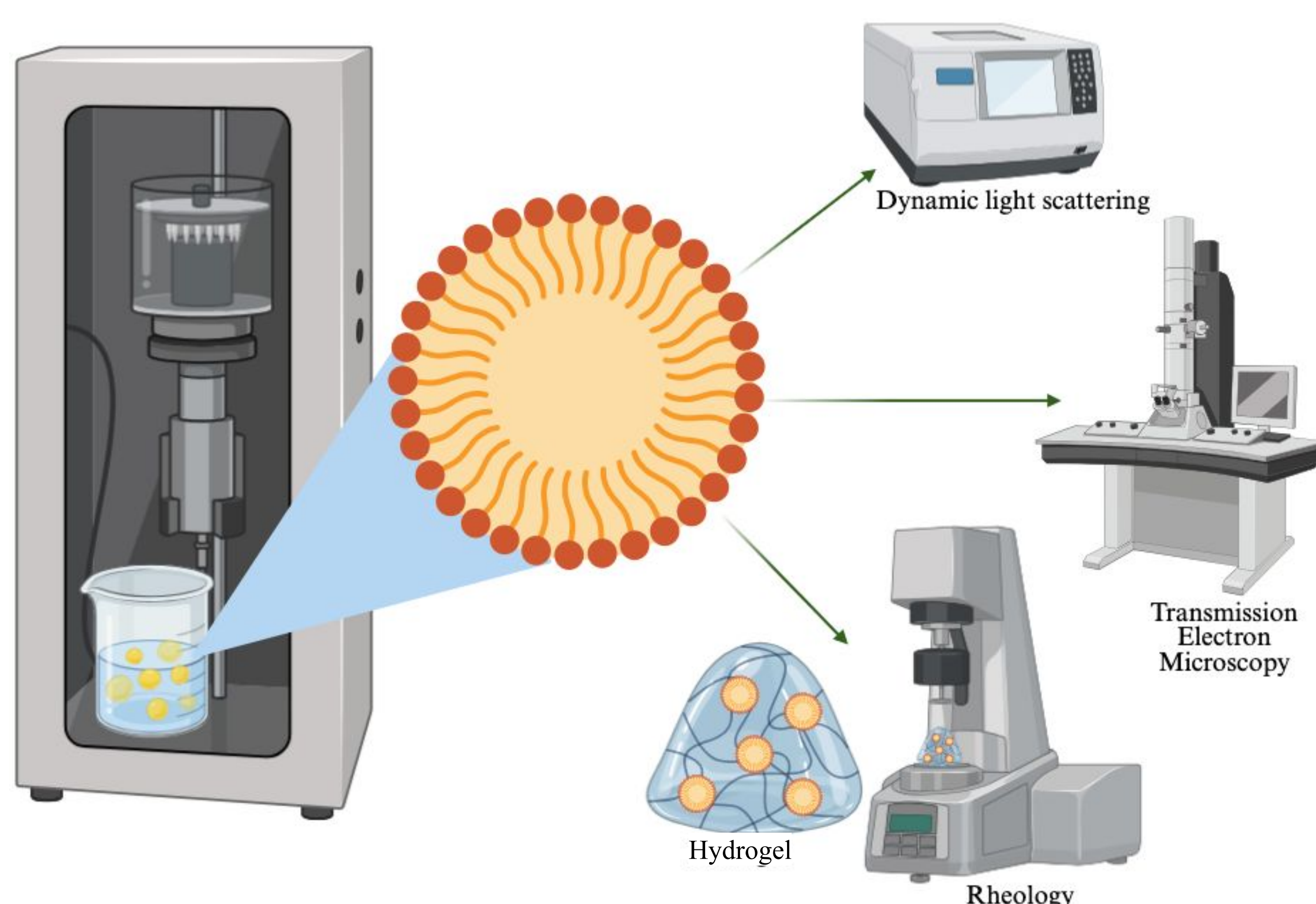
Incorporation of antibody-functionalized NEs into topical hydrogels may provide a novel strategy to prevent fungal adhesion on the skin.

OBJECTIVE

Development and characterization of an oil/water (O/W) nanoemulsion for future functionalization with antibodies against a key adhesin of *Candidozyma auris*, intended for incorporation into a topical hydrogel to impair fungal adhesion.



METHODS



O/W NE formulation:

- Phosphate-Buffered Saline (PBS)
- PEG 8000
- Oleylamine
- (2:1) Brij® + Soy phosphatidylcholine (SPA)
- (5:1) Sunflower oil + Cholesterol

O/W NE sonication:

- 40 minutes; 25% amplitude; 30 sec on/off pulse; cold-water bath

O/W NE characterization and stability monitoring:

- Particle size, PDI, and ζ -potential by dynamic light scattering (DLS; Zetasizer®)

Hydrogel formulation:

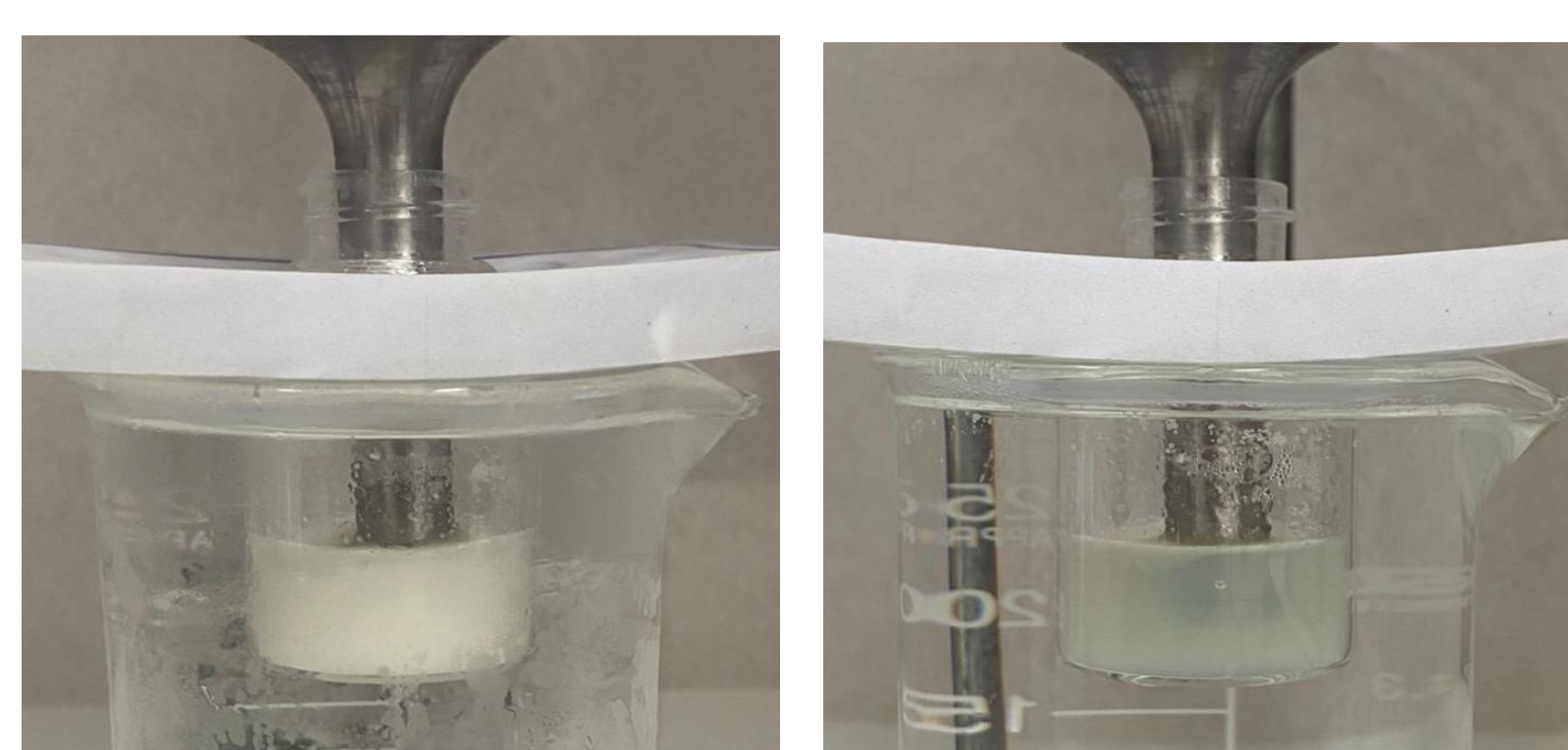
- Water (H₂O)
- PEG 8000
- Carbopol 940
- EDTA
- Imidazolidinyl urea (50% solution)
- 1M NaOH for pH adjustment

Steady shear (flow) rheology

- AR2000ex rheometer in flow mode
- Cone-and-plate geometry at 37 °C, with the shear rate for the ascending curve ranging from 0 to 100 s⁻¹.

RESULTS

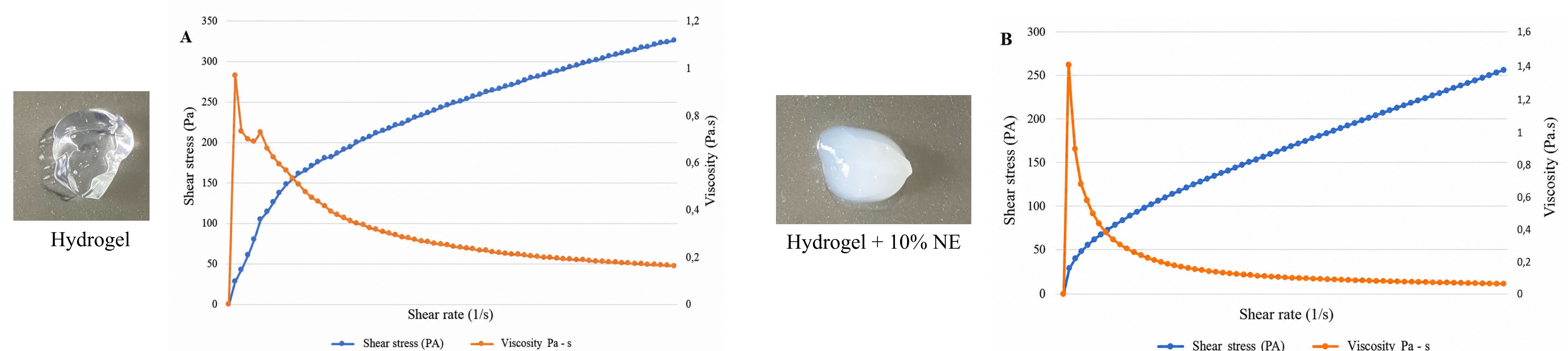
O/W NE formulation



NE before sonication

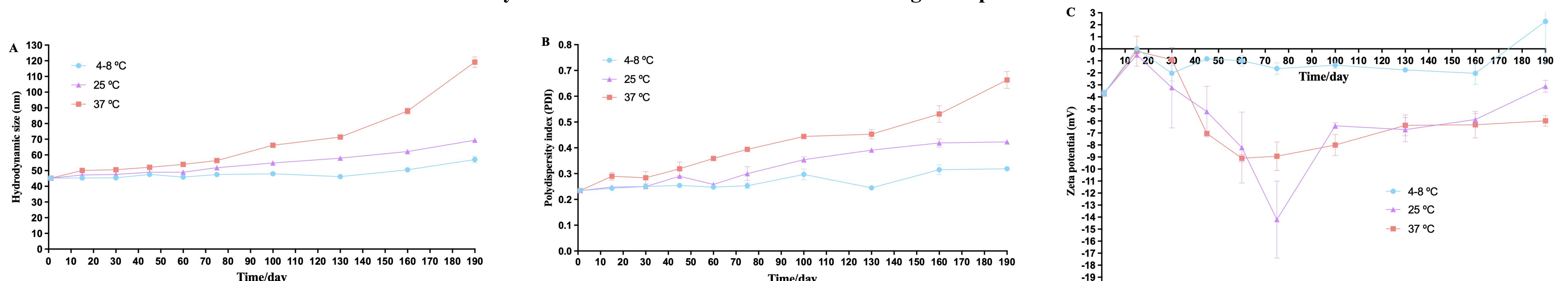
NE after sonication

Rheological Behavior of Hydrogel and Hydrogel + NE



(A–B) Steady shear flow curves of the hydrogel alone (A) and hydrogel containing 10% nanoemulsion (B), obtained using an AR2000ex rheometer in flow mode. Shear stress (blue, left axis) and viscosity (orange, right axis) were measured as a function of shear rate (s⁻¹). Both formulations exhibit non-Newtonian shear-thinning behavior, characterized by a decrease in viscosity with increasing shear rate. The incorporation of 10% NE slightly modifies the rheological profile while maintaining the overall pseudoplastic behavior of the system.

Stability Evaluation of NE Under Different Storage Temperatures Over Time



(A–C) Stability profile of the nanoemulsion (NE) stored at 4–8 °C (blue), 25 °C (purple), and 37 °C (orange) over 190 days. (A) Hydrodynamic diameter (nm), (B) polydispersity index (PDI), and (C) zeta potential (mV) were monitored at defined time points.

CONCLUSION

The NE developed presents suitable characteristics for further functionalization with anti-*C. auris* antibodies and will be part of a promising new nanotherapy against the fungus, contributing to stability of the active compound and the applicability of the therapy.

FINANCIAL SUPPORT