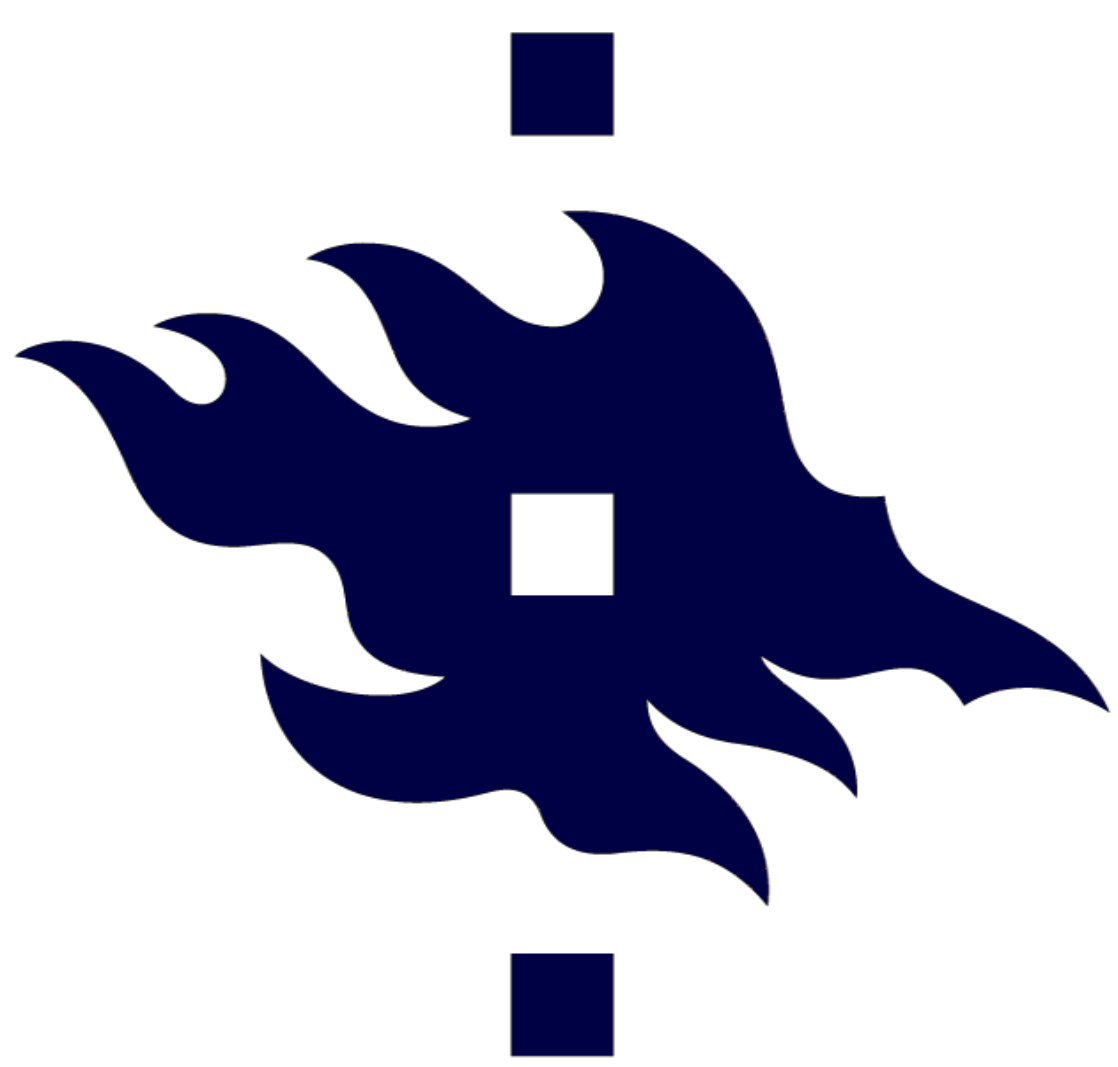




# IMPACT OF THE HYDROPHILIC CORONA ON THE PERFORMANCE OF POLYMERIC MICELLES AS DRUG CARRIER

Anna-Lena Ziegler<sup>1</sup>, Liliia Simagina<sup>1\*</sup>, Ekaterina Takmakova<sup>1</sup>, Robert Luxenhofer<sup>1</sup>

<sup>1</sup>Soft Matter Chemistry, Department of Chemistry, University of Helsinki, 00014 Helsinki, Finland  
\*liliia.simagina@helsinki.fi

## Hypothesis

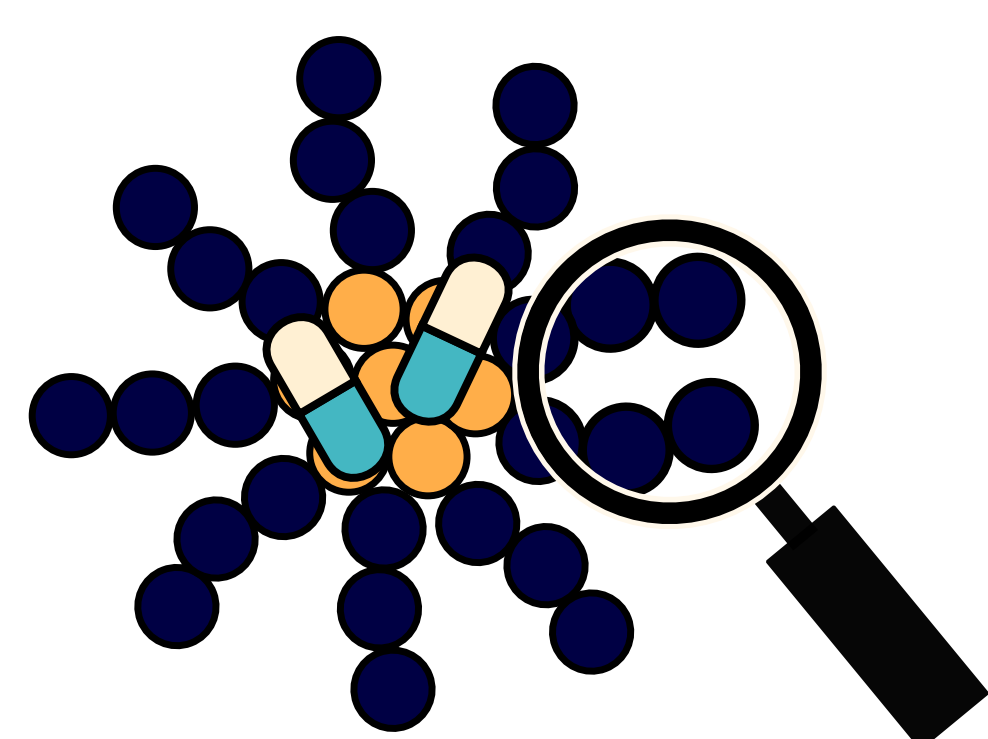
**Block copolymer micelles for drug delivery:**

**Classical picture:**

Hydrophobic drug resides in the hydrophobic core. Hydrophilic corona provides solubility.

**Recent findings:**

Hydrophilic corona interacts with hydrophobic drug in certain cases and influences the drug carrier performance.<sup>[1-3]</sup>

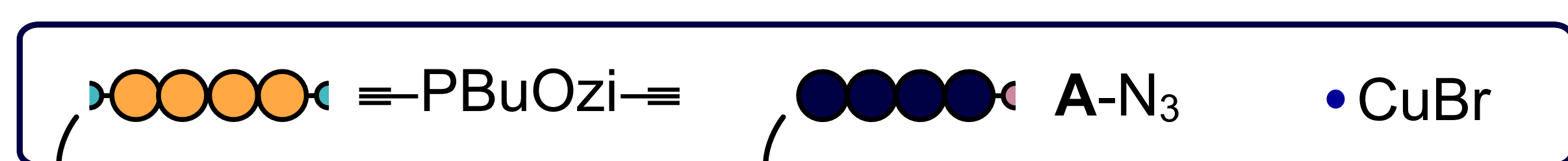
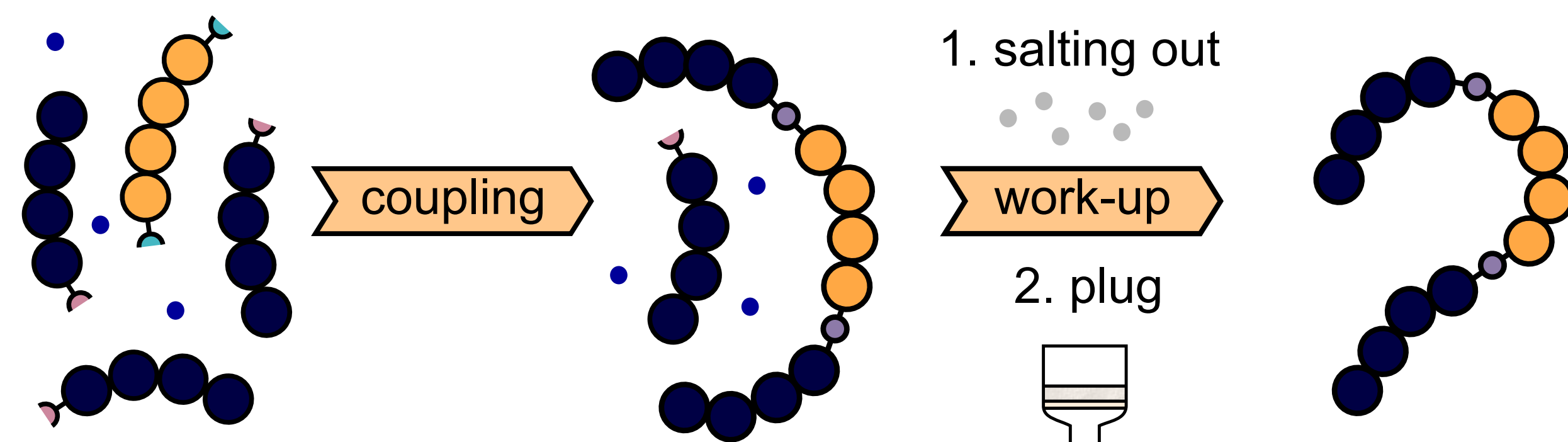


Drug-loaded block copolymer micelle

The hydrophilic corona of block copolymer micelles is of underappreciated importance for drug delivery applications.

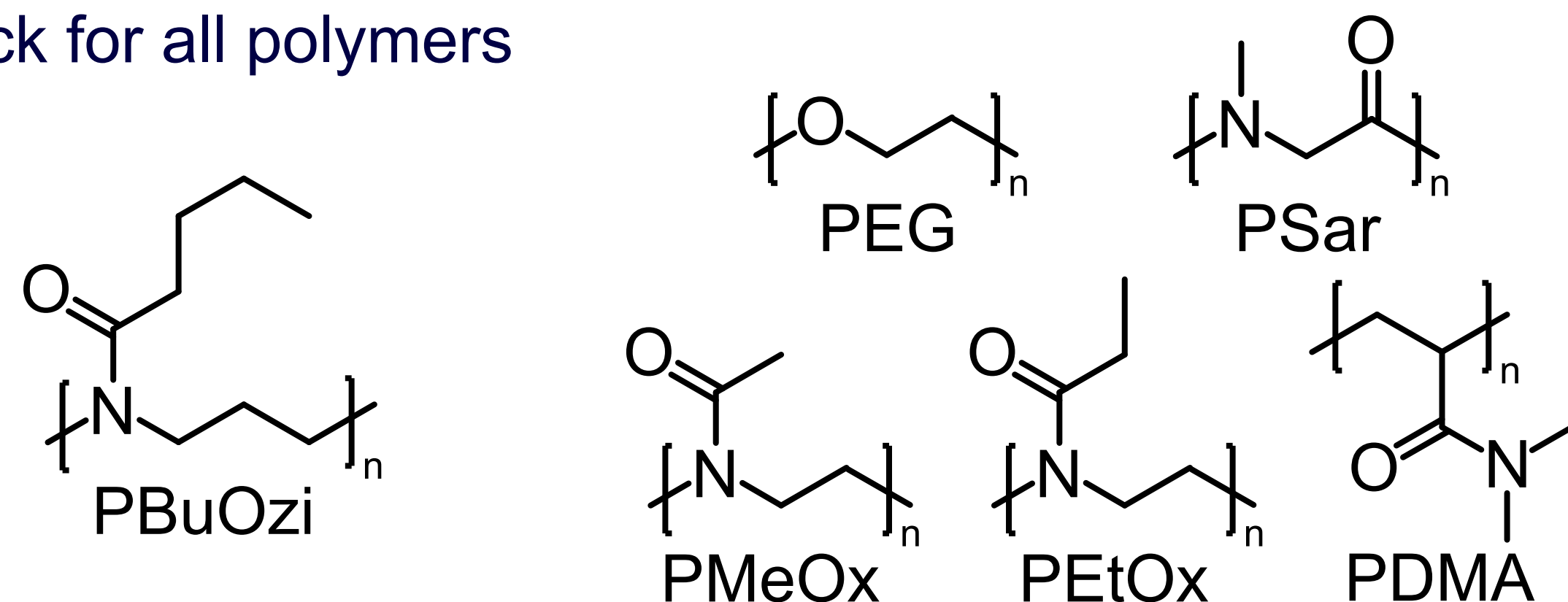
## Generation of a block copolymer library

**Polymer-polymer coupling via azide-alkyne cycloaddition:**



identical hydrophobic **B** block for all polymers

varying hydrophilic **A** blocks



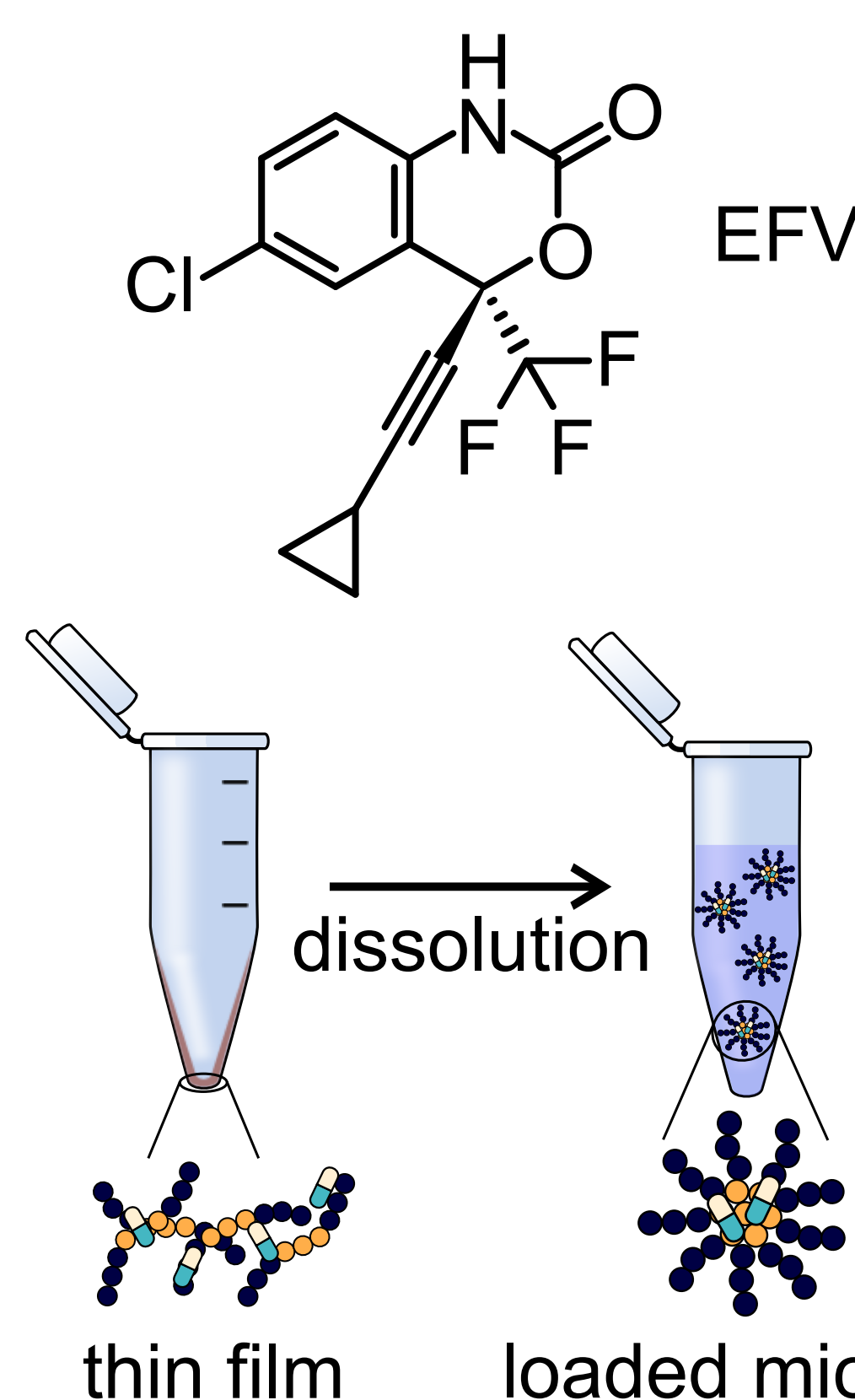
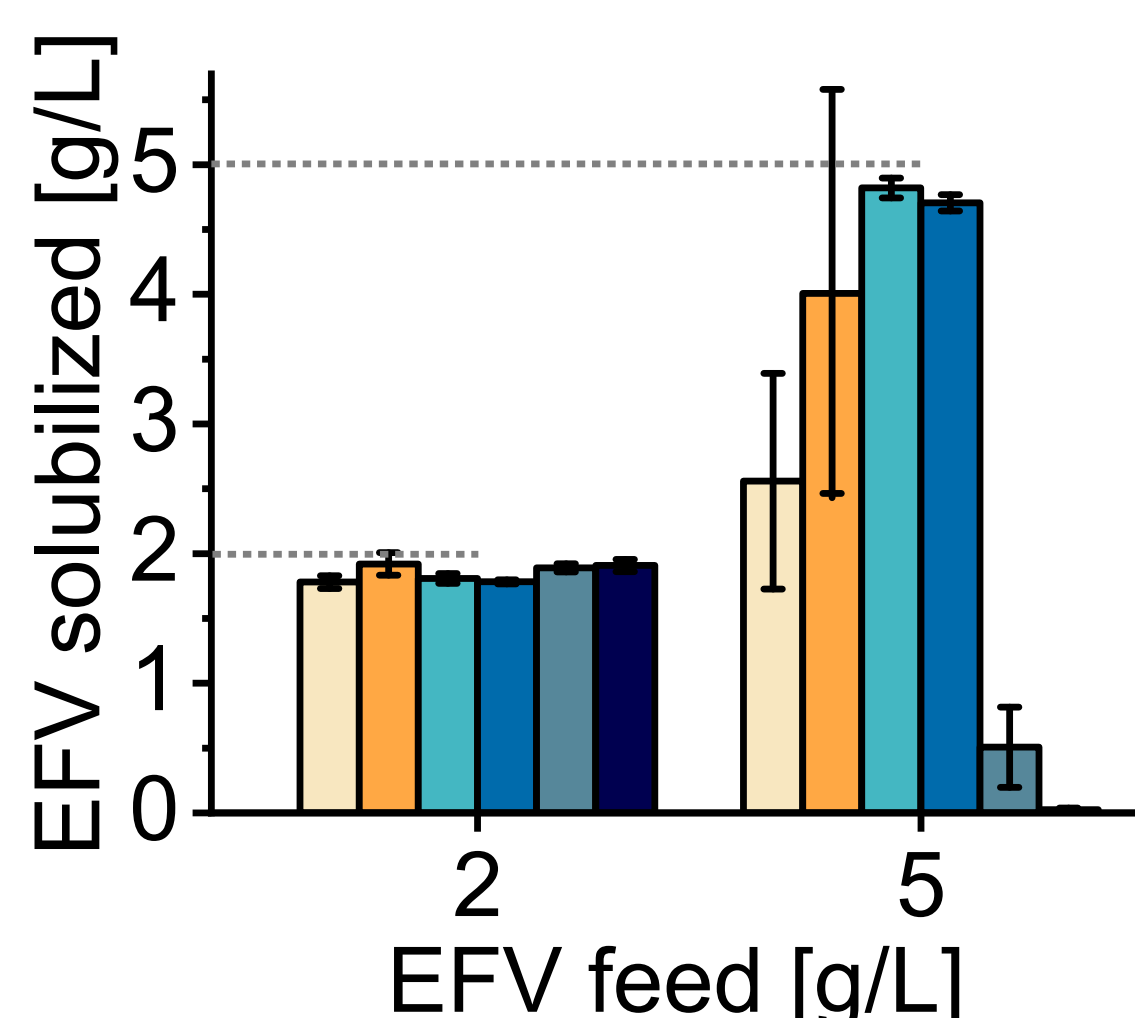
Our coupling procedure<sup>[4]</sup> enables systematic studies addressing the hydrophilic corona.

## Loading block copolymer micelles

**Solubilizing Efavirenz (EFV) via thin film method:**

**A =**

|        |          |
|--------|----------|
| PEG-2k | PEG-3.4k |
| PMeOx  | PSar     |
| PDMA   | PEtOx    |

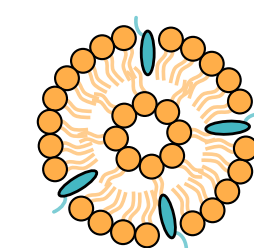


Drug solubilization ability depends on the hydrophilic corona.

## Aggregation pattern in biorelevant media

Fed State Simulated Intestinal Fluid = FeSSIF

components:



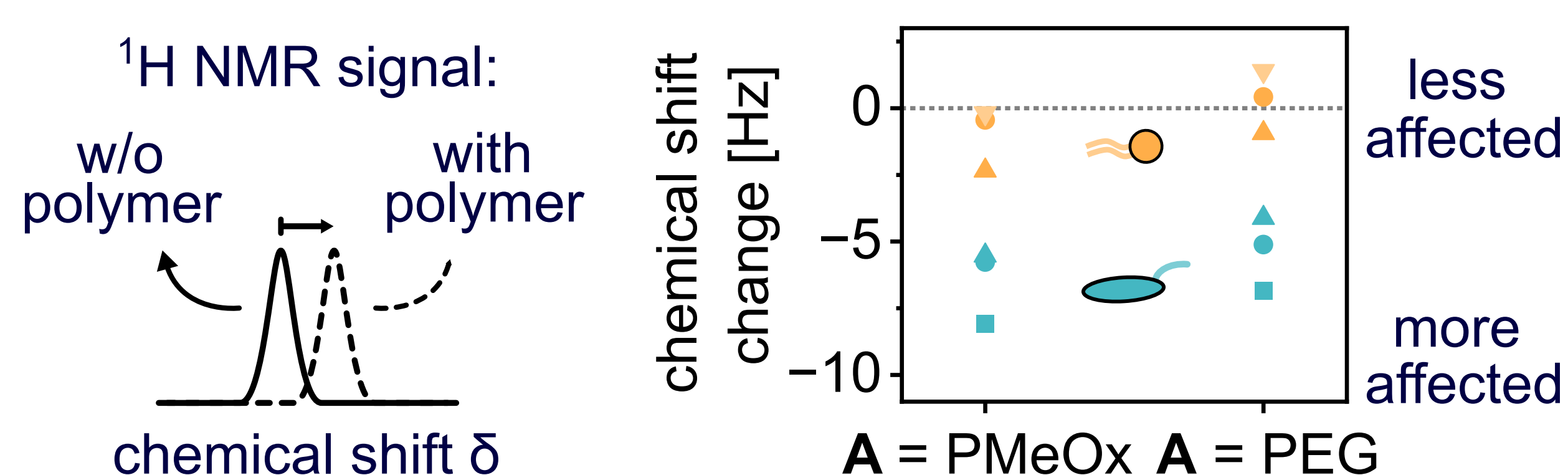
bile colloids



taurocholate

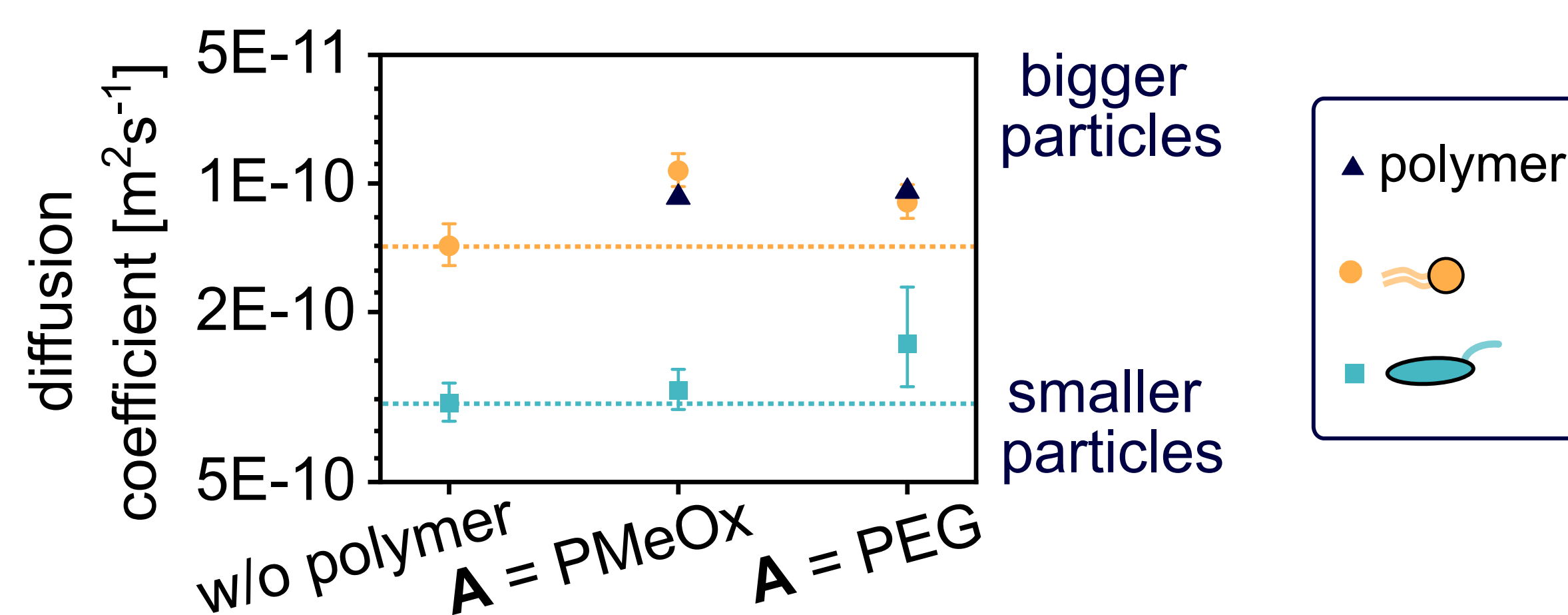
**1. <sup>1</sup>H NMR shift analysis:**

Changes in microenvironment of FeSSIF components induced by interactions with polymer result in shift of <sup>1</sup>H NMR signals.



**2. DOSY analysis**

Changes in diffusion indicate size changes of FeSSIF components induced by interactions with polymer.

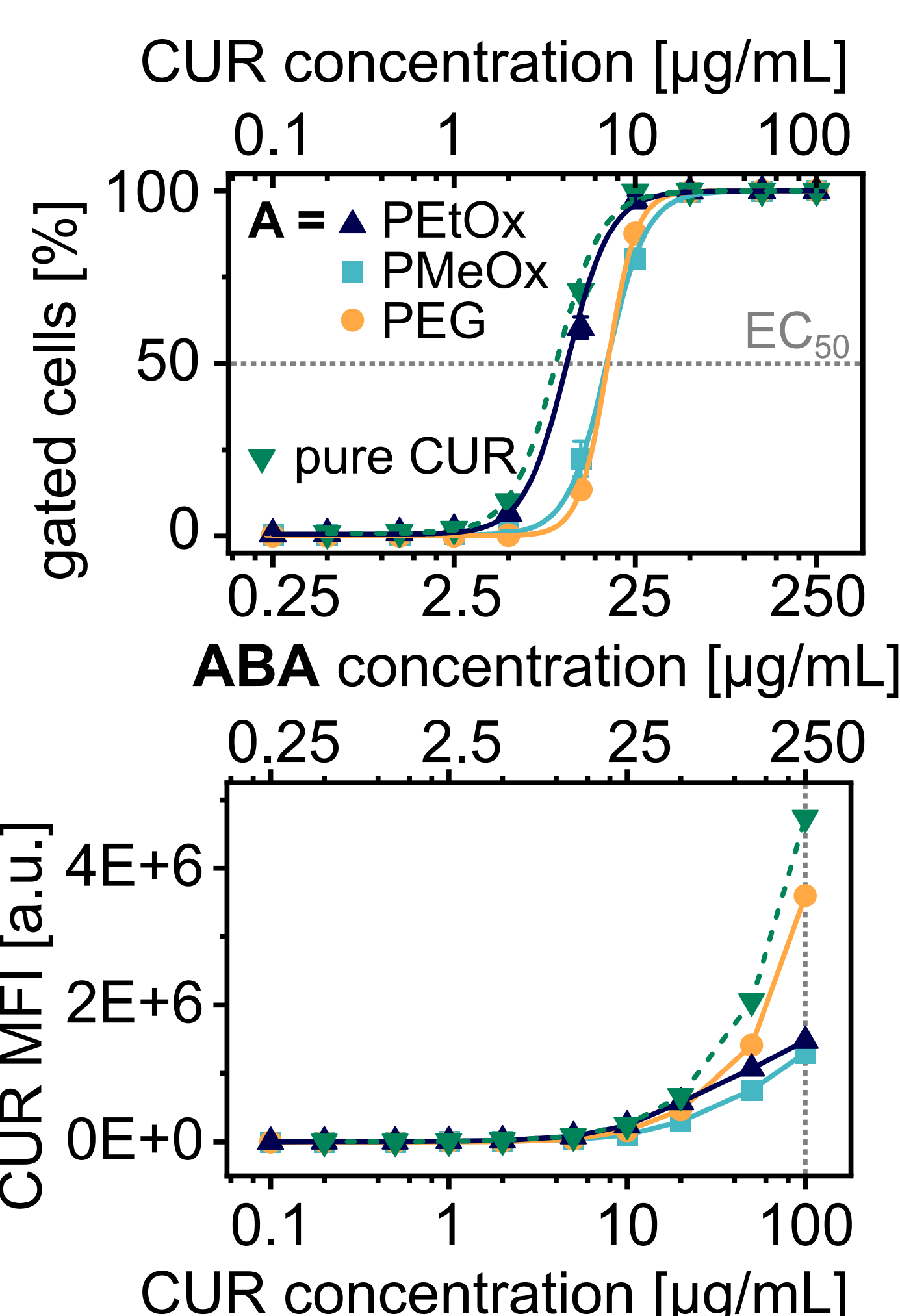


Minor differences between interaction patterns in biorelevant media.

## Cell internalization

**Endocytosis in NIH-3T3 cells:**

Analyzing curcumin (CUR) fluorescence after incubating NIH-3T3 fibroblasts with varying concentration of CUR-loaded polymeric micelles.



Hydrophilic corona affects cell uptake.

## References

- [1] Pöppler, A.-C. et al., Angew. Chem. Int. Ed. 2019, 58 (51), 18540. DOI: 10.1002/anie.201908914.
- [2] Slor, G. et al., Biomacromolecules 2021, 22 (3), 1197-1210. DOI: 10.1021/acs.biomac.0c01708.
- [3] Sochor, B. et al.; Langmuir 2020, 36 (13), 3494-3503. DOI: 10.1021/acs.langmuir.9b03460.
- [4] Ziegler, A.-L. et al., Polymer Chemistry 2025, 16 (12), 1383-1392. DOI: 10.1039/D4PY01345J.