

Poly(allylamine) - tripolyphosphate self-assemblies: Towards robust and biocompatible drug nanocarriers

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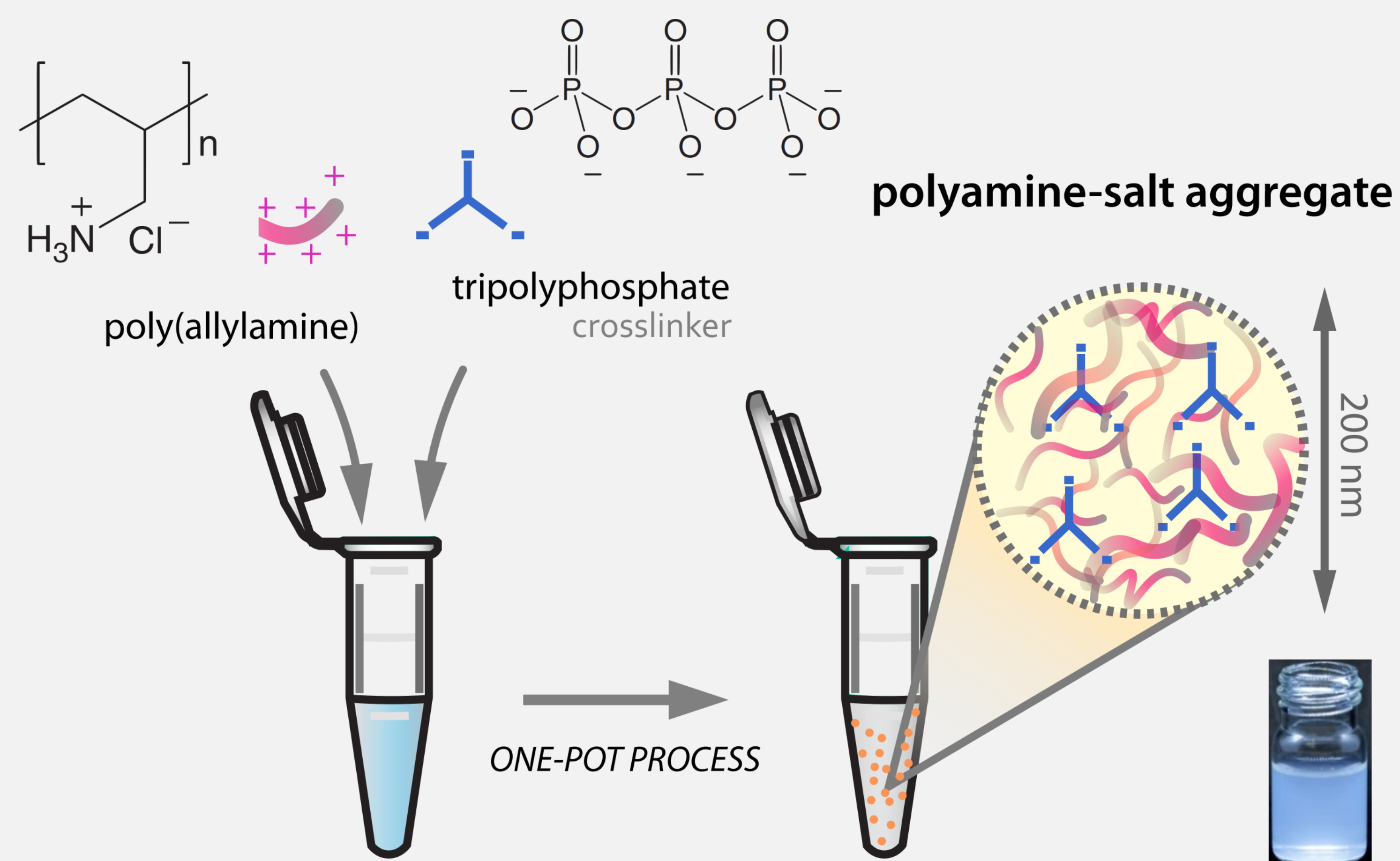
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Motivation

Nano-sized self-assemblies produced through ionic crosslinking of polyelectrolytes with multivalent ions are attractive platforms for delivery of drugs, genes, and imaging agents. They are formed under mild conditions and can be easily loaded with cargo molecules. Moreover, they can be designed for responding to different external stimuli such as pH, temperature, light, redox, among others. However, lack of stability during storage or when dispersed in relevant biological fluids combined with insufficient toxicological characterization, limits their ultimate application.

Nanocarrier Synthesis



PAH-TPP colloids are synthesized through a simple one-pot procedure in aqueous solution at room temperature

The formation of the assemblies is driven by the ionic crosslinking between positively charged amino groups of PAH and negatively charged TPPs in combination with hydrogen bonding and van der Waals forces

The colloids are stable and present a ζ -potential of -20 mV at neutral pH

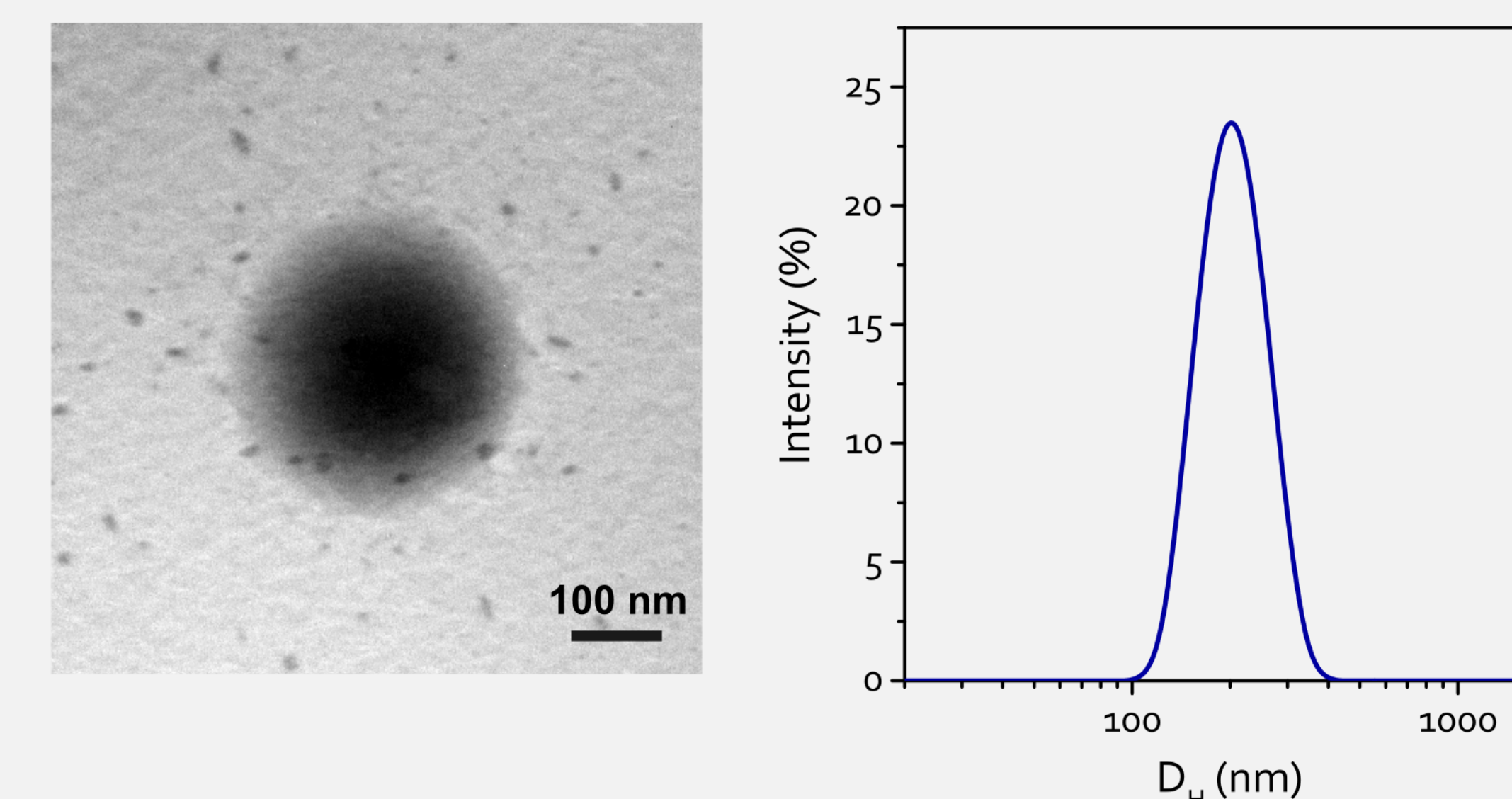
Highlights

PAH-TPP colloids of ~200 nm can be easily prepared using a one-pot protocol

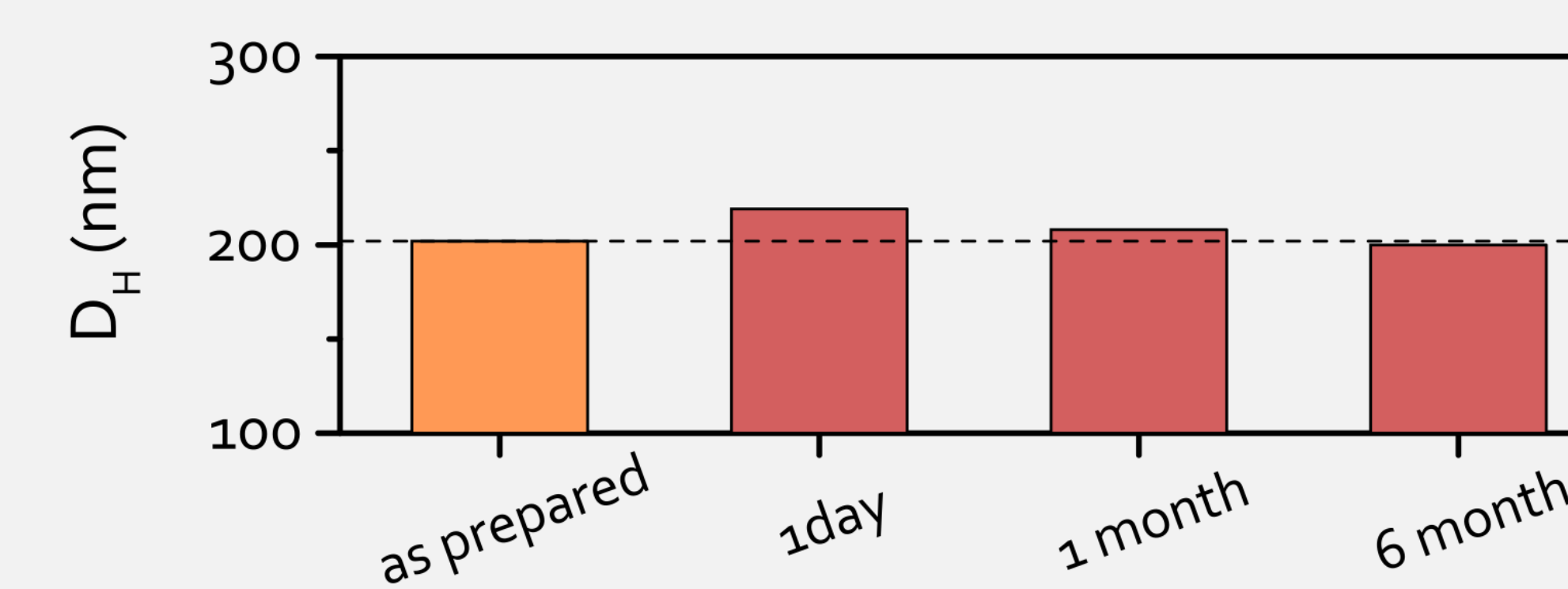
These nanoassemblies are storable for months and dispersible in complex cell culture media

The *in vitro* evaluation of PAH-TPP colloids revealed that they are not cytotoxic, neither genotoxic nor hemolytic.

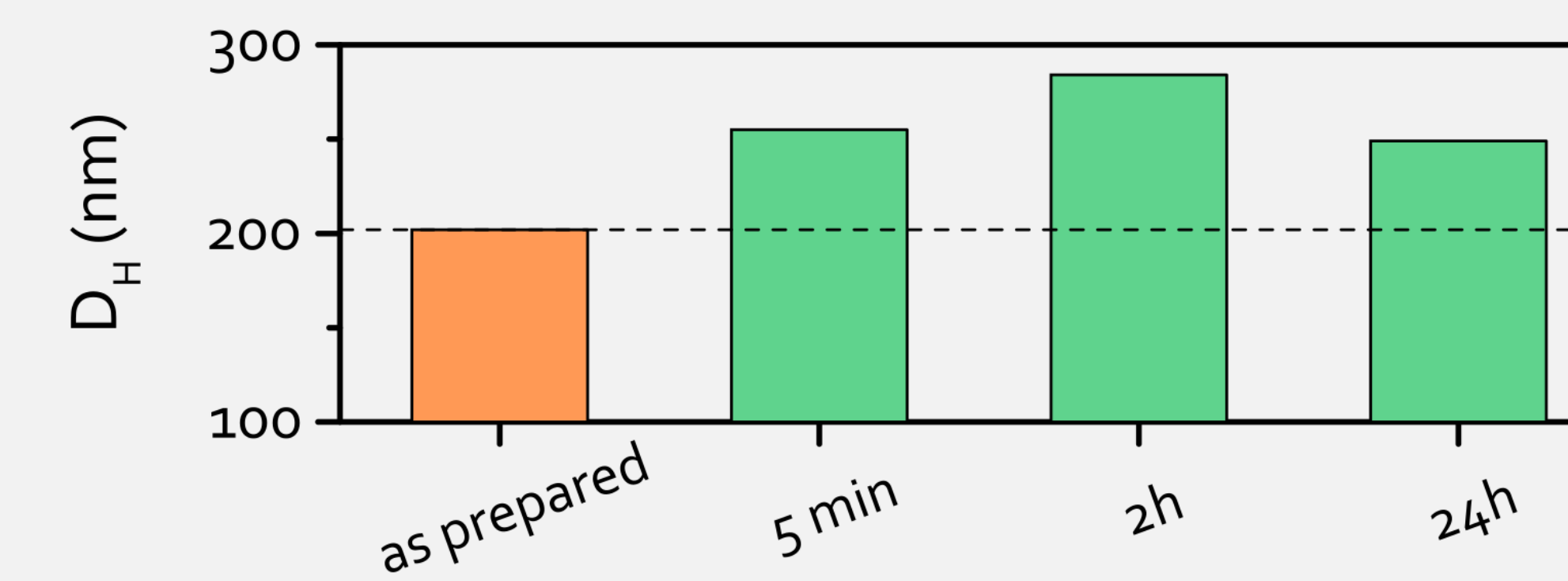
Size and Stability



PAH-TPP colloids present a size of ~200 nm as seen by TEM (negative stain; right figure) and DLS (left figure)



PAH-TPP colloids are stable up to 6 months showing negligible changes in hydrodynamic size as seen by DLS



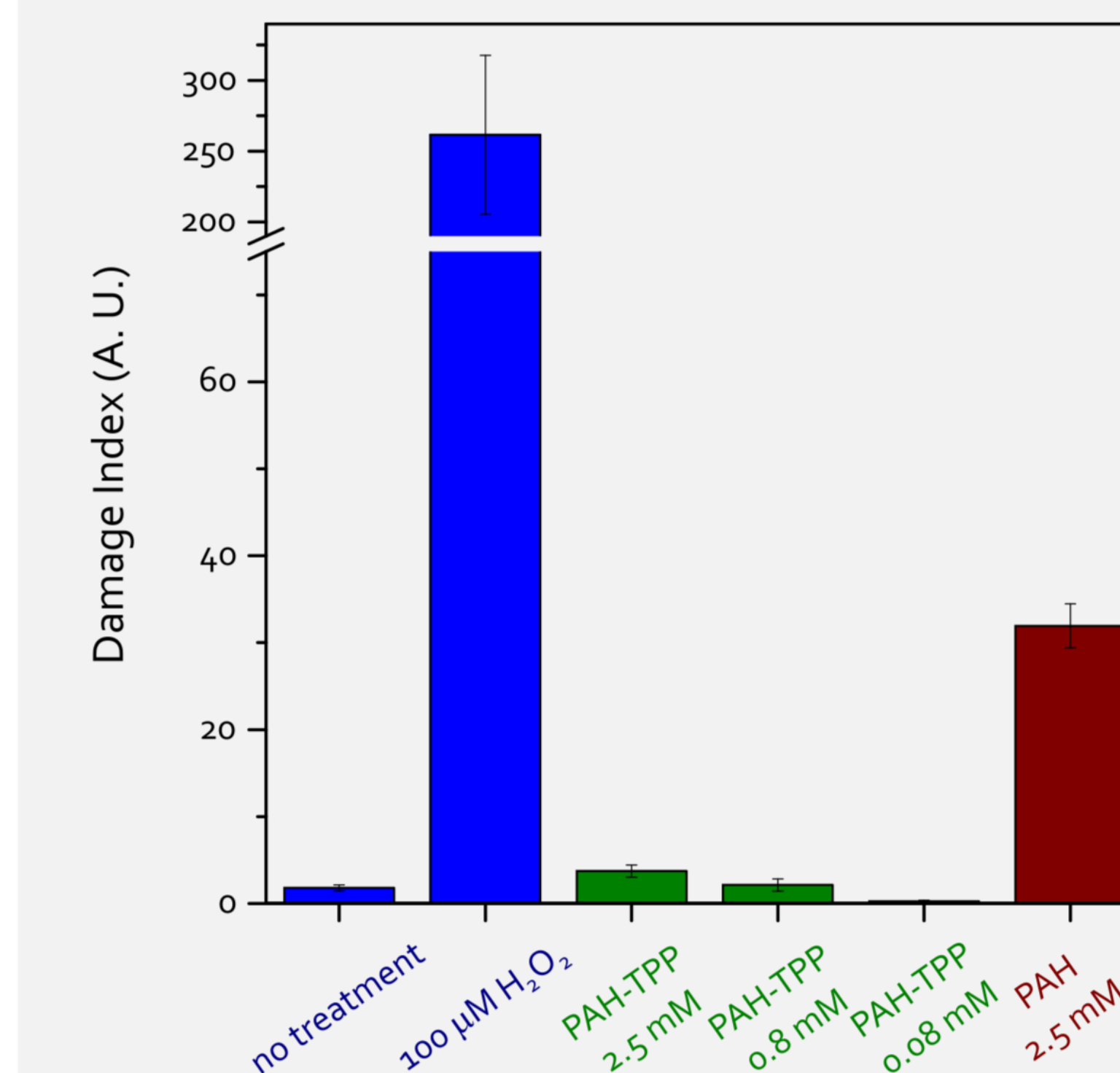
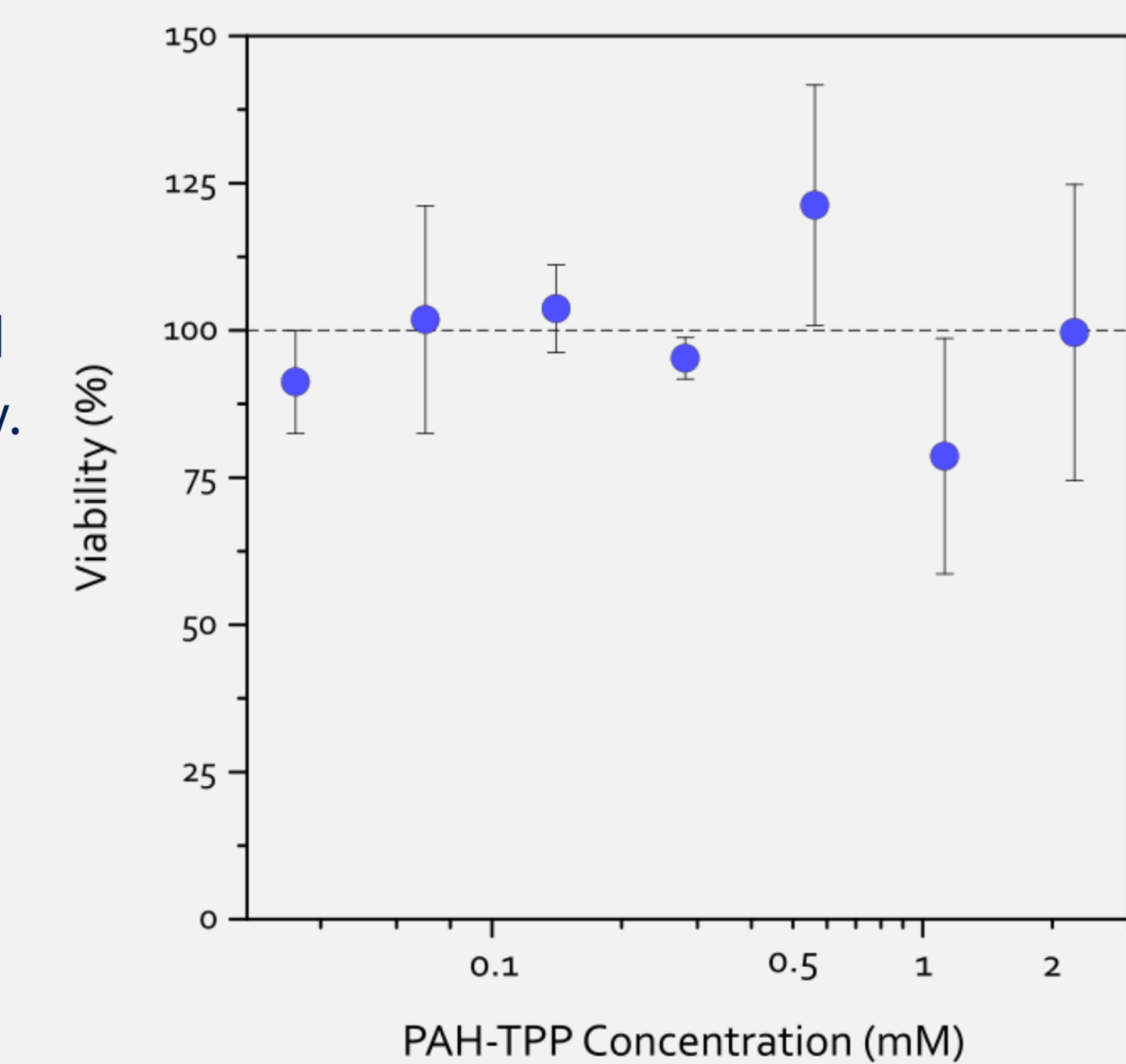
Upon dispersion in cell culture media (DMEM + 10% FBS) PAH-TPP colloids experiment a subtle size increase. They remain stable up to 24h. No massive aggregation, neither disassembly is observed

Thanks to



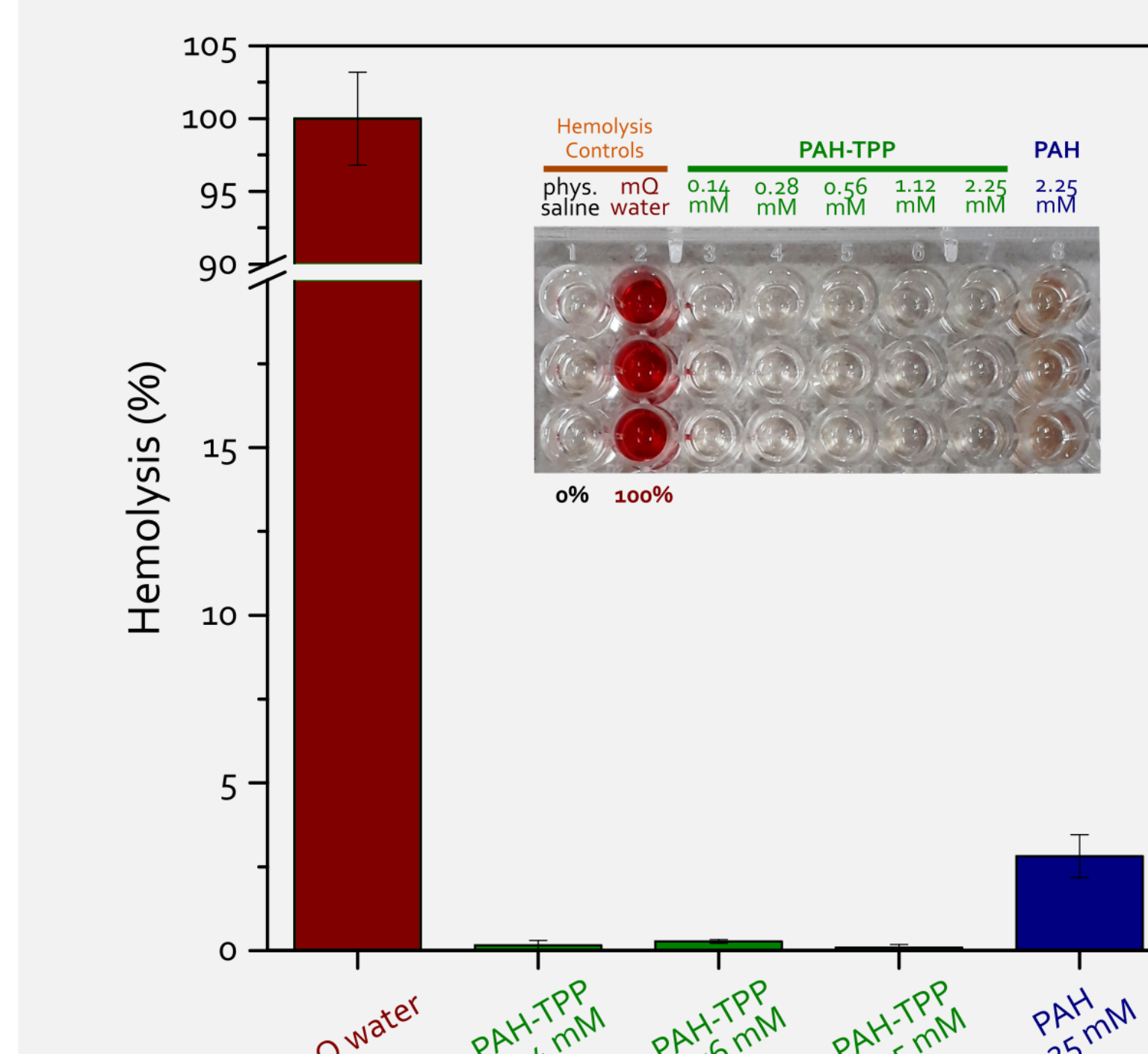
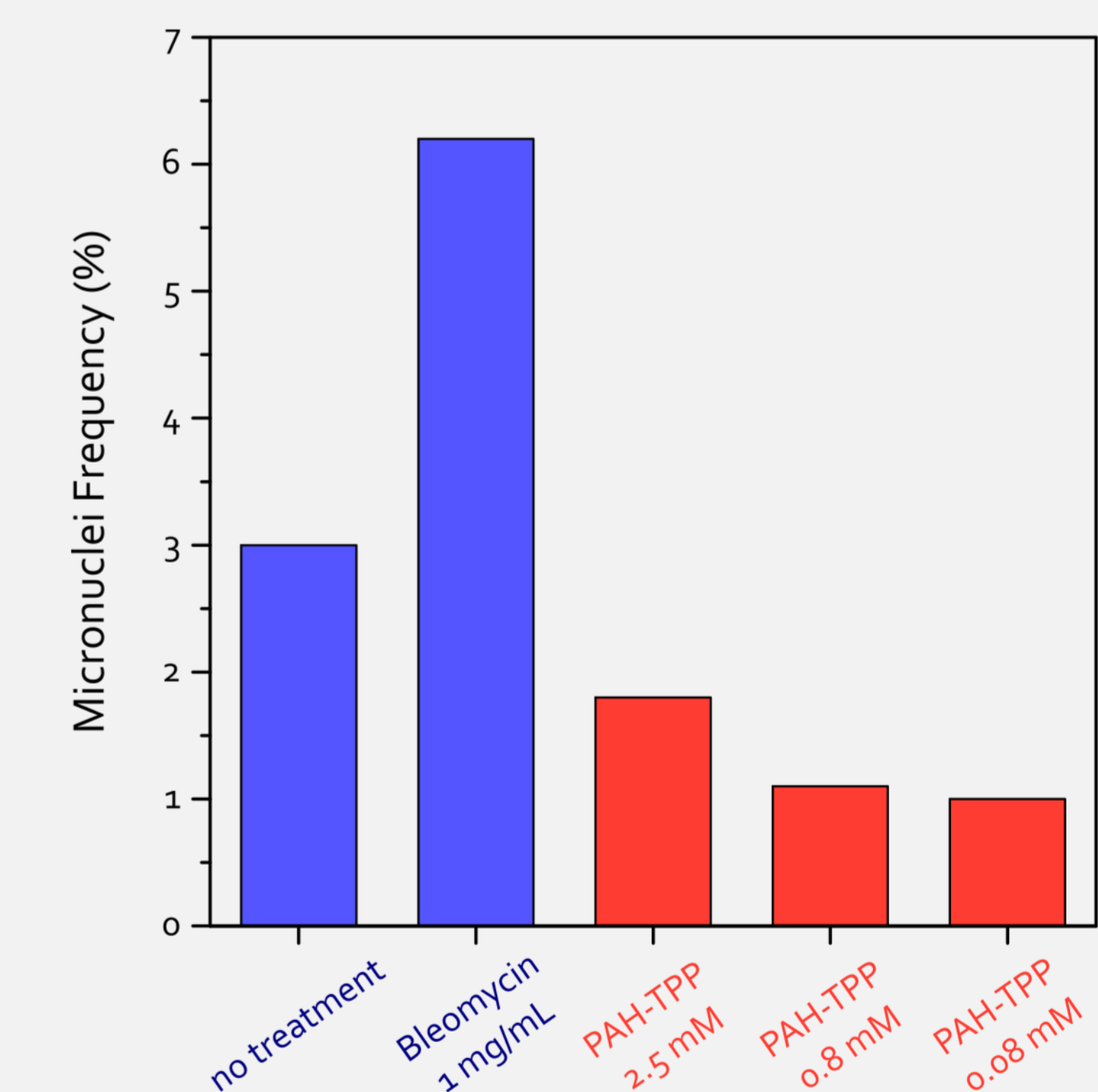
Toxicity evaluation

PAH-TPP colloids influence on A549 cell viability was evaluated by means of MTT assay. No cytotoxic effects were observed for colloid concentrations up to 2.25 mM



PAH-TPP do not present genotoxicity on A549 cells up to 2.5 mM of colloid concentration as evaluated by means of comet assay

PAH-TPP colloids do not generate aneuploid neither clastogenic effects in A549 cells, up to 2.5 mM, as evaluated by means of micronucleus assay



Hemolytic activity was evaluated using sheep red blood cells. PAH-TPP colloids do not induce hemolysis up to colloid concentrations of 2.25 mM