INFLUENCE OF RESIDUAL POLYVINYL ALCOHOL ON PROTEIN CORONA FORMATION OF POLYMERIC PARTICLES

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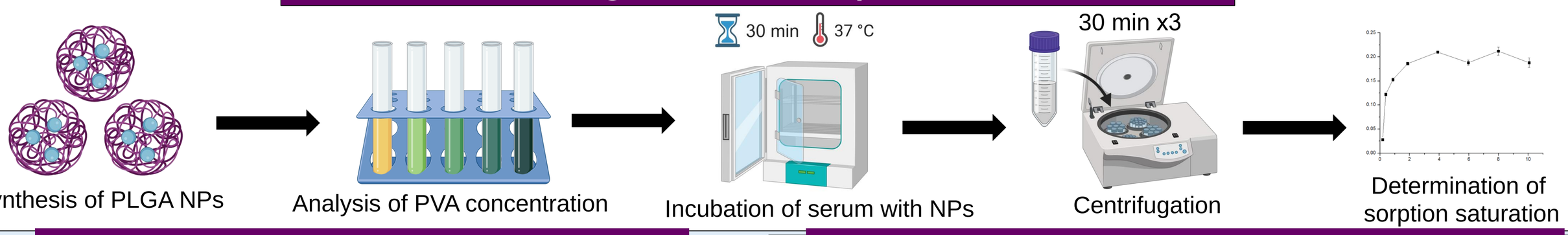
Introduction

The protein corona forms on the surface of nanoparticles (NPs) in biological media and plays an integral role in their biological fate. The concentration of polyvinyl alcohol (PVA) in NPs based on poly(lactic-co-glycolic) acid (PLGA) is known to affect their surface properties. Nevertheless, the impact of PVA on protein corona of PLGA NPs has not been studied before. The aim of this work was to study the influence of residual PVA concentration on the formation of protein corona of PLGA NPs.

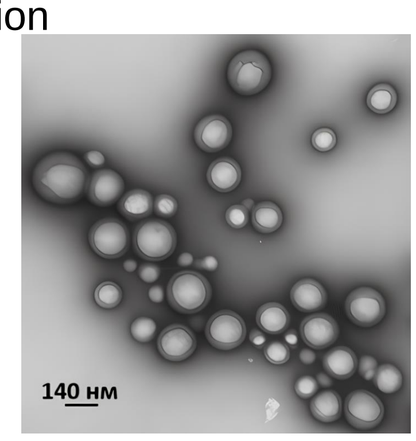
Design of the Experiment



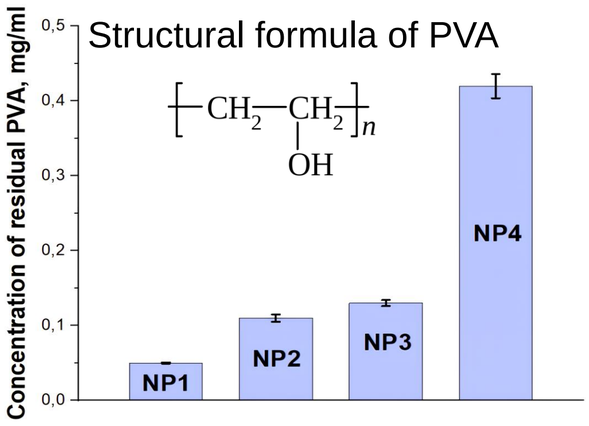
Synthesis of PLGA NPs → Analysis of PVA concentration → Incubation of serum with NPs → Centrifugation → Determination of sorption saturation

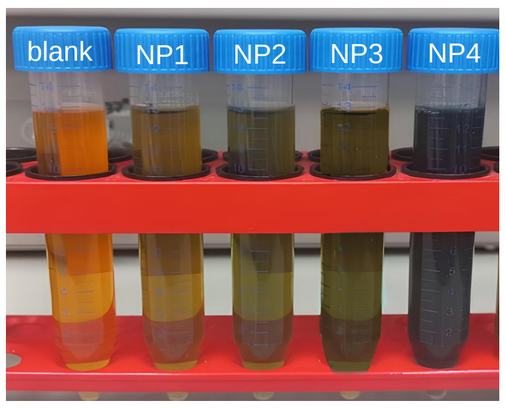
Synthesis of PLGA NPs

- Method of preparation: single emulsification
- Model drug: paclitaxel
- Used 0,5% (NP1), 1% (NP2), 2% (NP3), 5% (NP4) PVA as an emulsion stabilizer
- PVA: degree of hydrolysis is 87-90%, molecular weight - 30.000-70.000



Analysis of PVA concentration

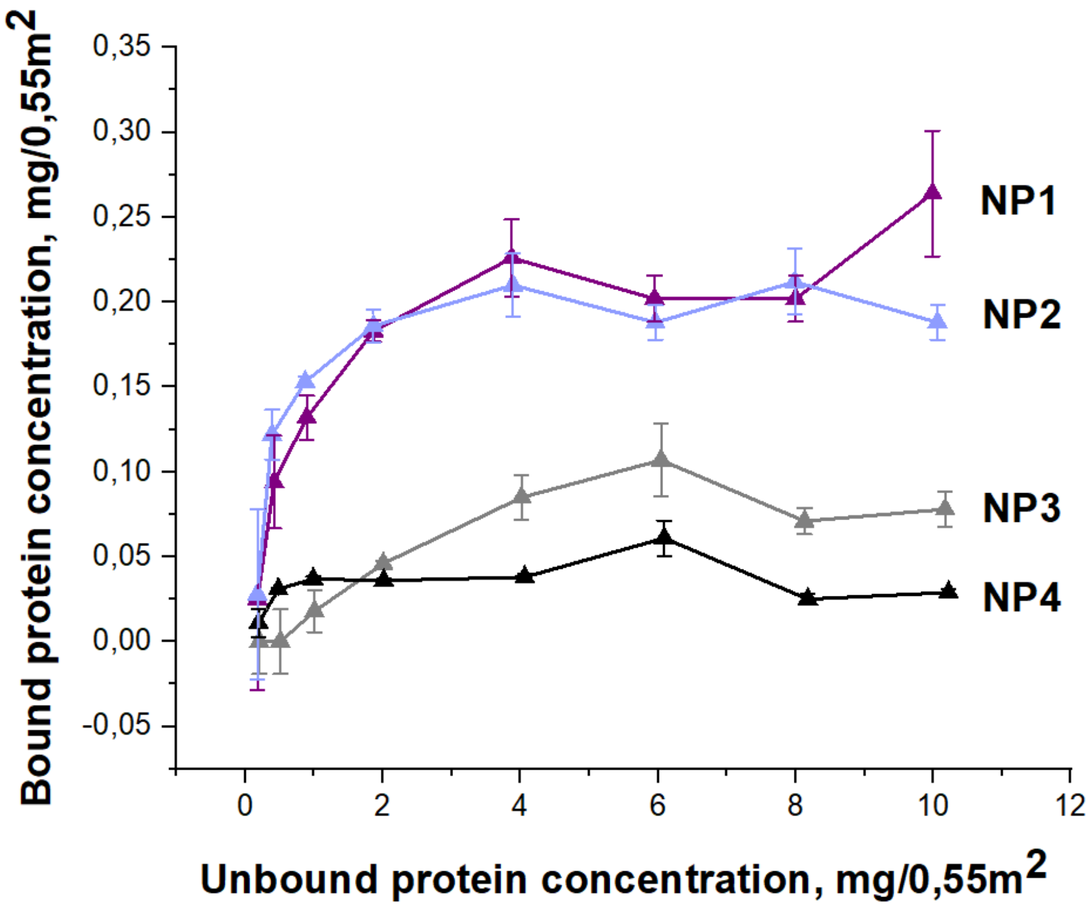




This method is based on the complex formation between hydroxyl groups of PVA and iodine molecules

Determination of sorption saturation of proteins on the NPs surface

Particles were incubated with fetal bovine serum



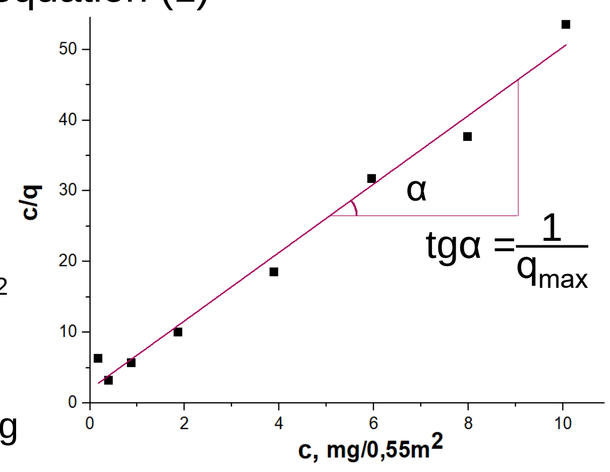
Adsorption isotherms of proteins on the surface of NPs obtained with different PVA content

The protein concentration was determined by the colorimetric method with bicinchoninic acid

The maximum protein sorption was calculated using the linear form of the Langmuir isotherm equation (1)

$$\frac{c}{q} = \frac{c}{q_{max}} + \frac{1}{K_L \times q_{max}} \quad (1)$$

c – unbound protein concentration, mg/0,55m^2
q – bound protein concentration, mg/0,55m^2
q_{max} – maximum binding capacity, mg/0,55m^2
K_L – enthalpic adsorption constant, 0,55m^2/mg



	Mean particle size, nm	Zeta potential, mV	Content of residual PVA, mg/ml	q_{max}, mg/0,55m^2	R^2
NP1	238,0±1,2	-14,0±0,8	0,005	0,263	0,9572
NP2	231,0±8,4	-13,4±0,2	0,011	0,207	0,9844
NP3	170,0±1,7	-23,3±0,2	0,013	0,070	0,9015
NP4	179,0±0,8	-19,2±0,4	0,042	0,038	0,8925

Conclusions

We found that increasing the residual concentration of PVA on the NPs surface reduces concentration of adsorbed proteins. The revealed interrelation will help to optimize the design of PLGA-based nanosystems to improve therapy efficiency.

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