

Mucoadhesiveness evaluation of mannosylated chitosan nanoparticle for intranasal vaccine

Camila Machado França de Almeida¹; Fabiana Testa Moura de Carvalho Vicentini¹.

¹School of Pharmaceuticals Science of Ribeirão Preto, University of São Paulo, Ribeirão Preto - Brazil.
mfrancacamila@usp.br

INTRODUCTION

- Chitosan nanoparticles can reduce the mucociliary clearance and disorganize the tight junction of mucosal epithelial cells [1];
- Mannose has been associated with chitosan nanoparticles, due to its potential to increase the antigen presentation in vaccines [2].

AIM

To understand the mucoadhesiveness of mannosylated chitosan nanoparticles developed as carriers to enhance a peptide antigen delivery for an intranasal vaccine.

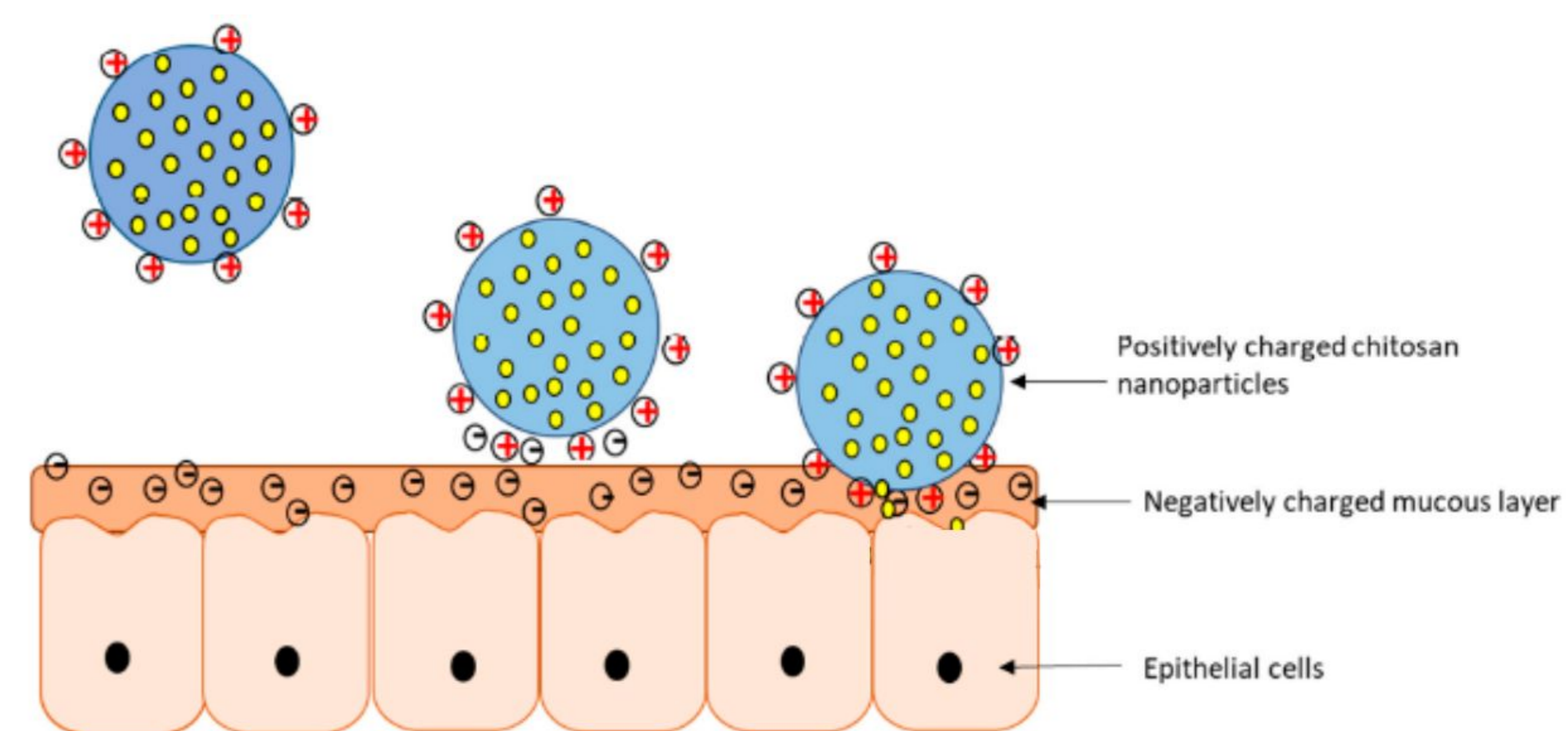


Fig. 1 – Schematic representation of chitosan nanoparticles and its interaction with the mucin on the mucus layer (adapted from [3]).

METHODOLOGY

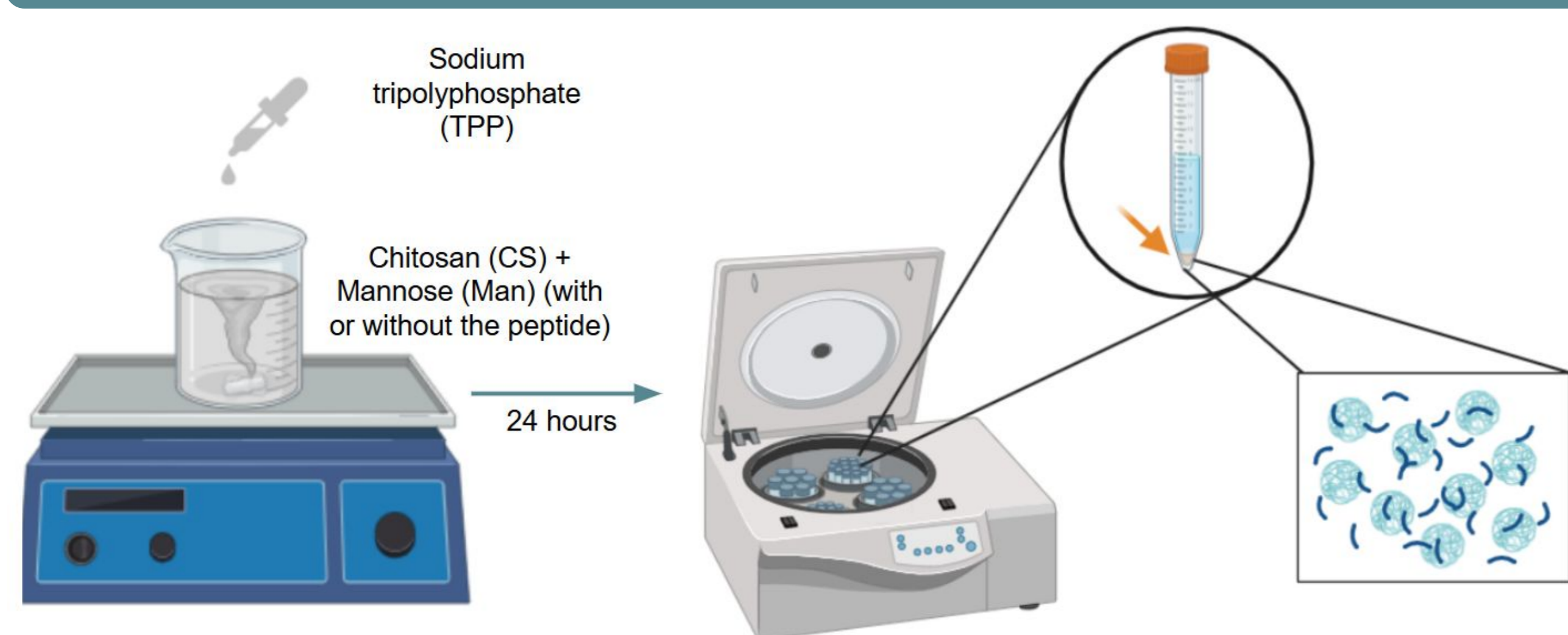


Fig. 2 – Nanoparticles obtained with the ionic gelation method (adapted from [4]).

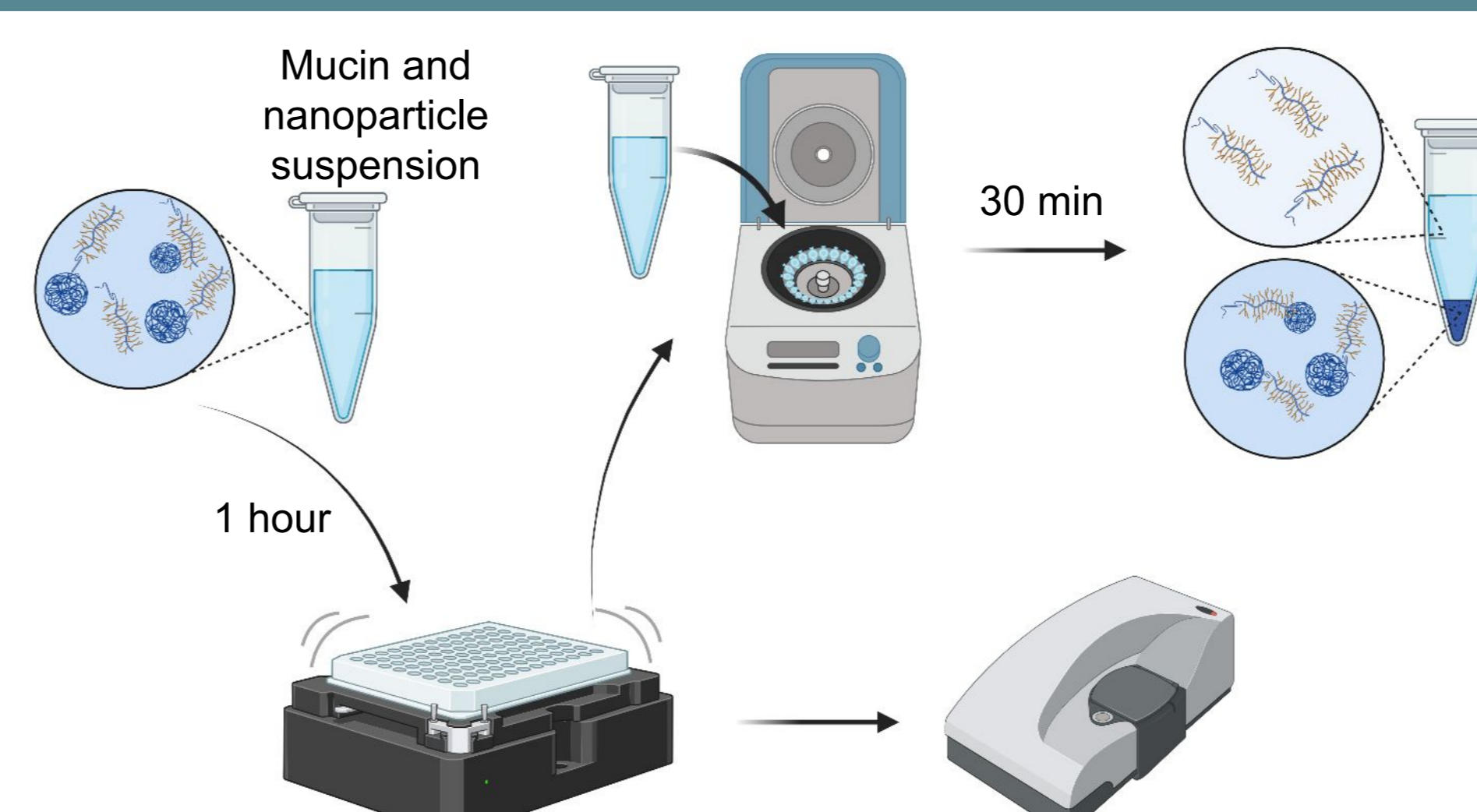


Fig. 3 – Mucin-nanoparticles interaction.

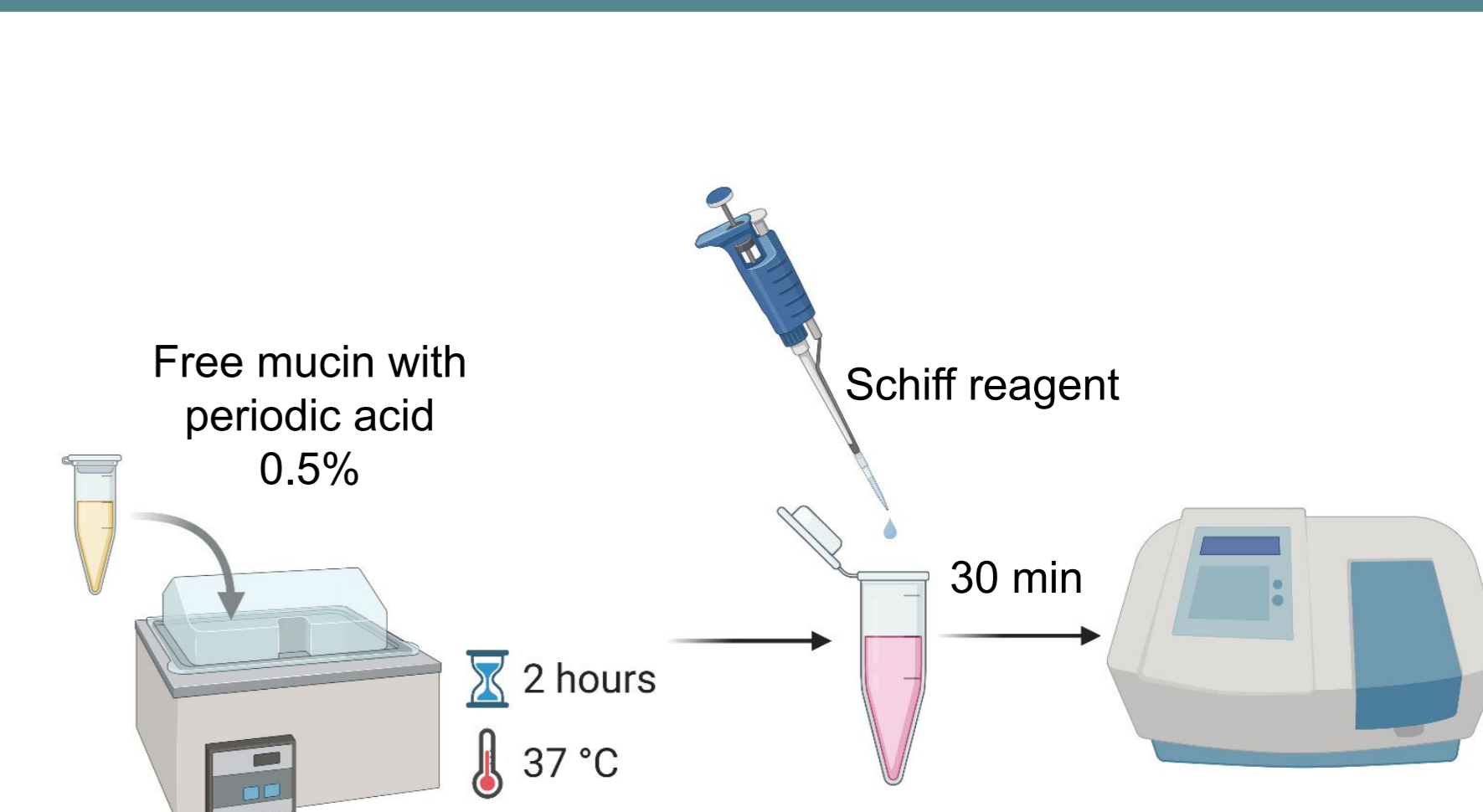


Fig. 4 – Periodic Acid/Schiff (PAS) method for mucin quantification (adapted from [5]).

RESULTS

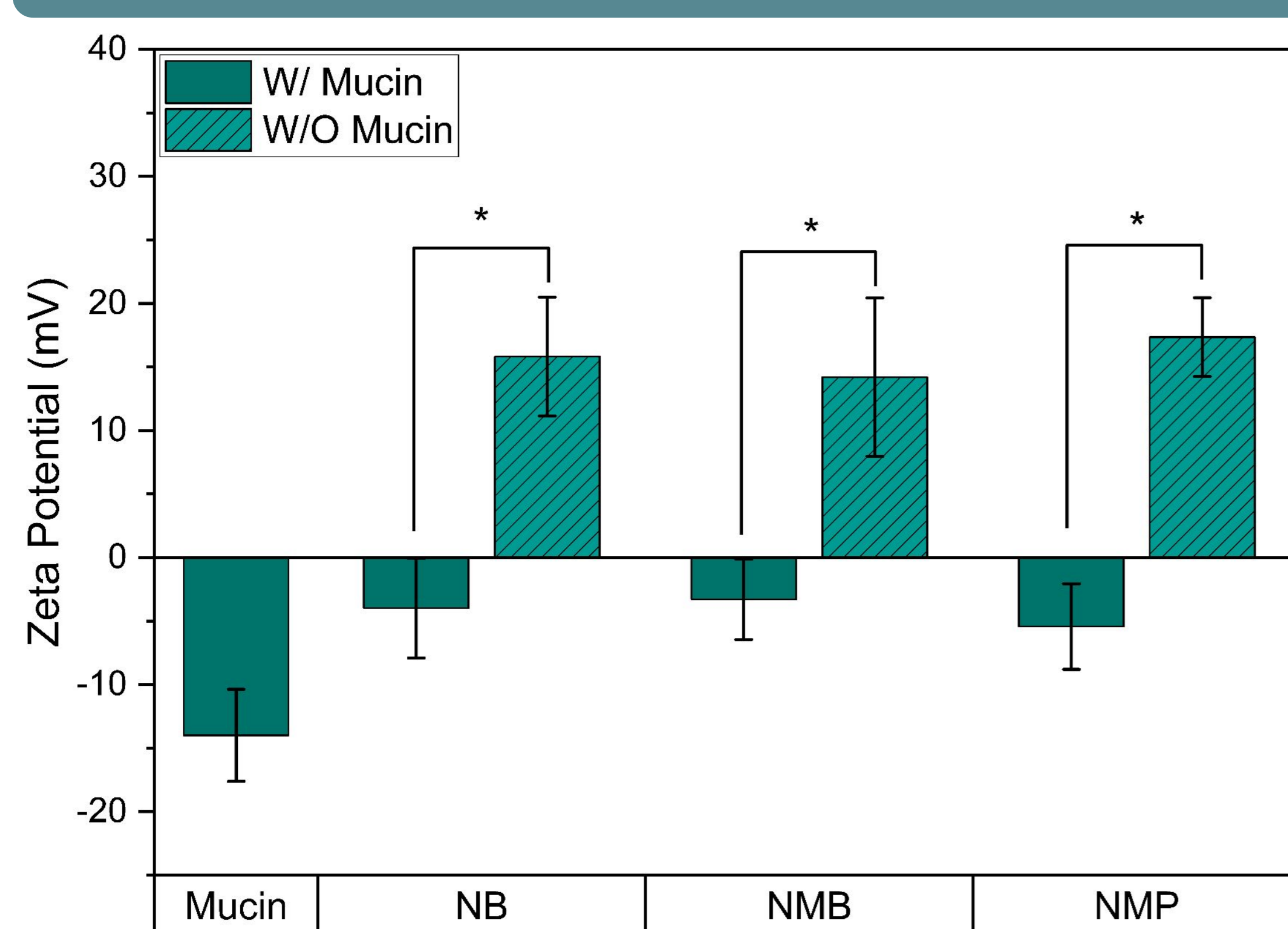


Fig. 5 – ZP values for chitosan nanoparticle without mannose (NB), chitosan nanoparticle with mannose (NMB) and NMB with the peptide (NMP), with (W/) and without (W/O) mucin, and for mucin solution, all with 0.2 mg/mL mucin. Data are presented as the mean \pm standard deviation (n = 4). *p < 0.05 after one-way ANOVA posttest.

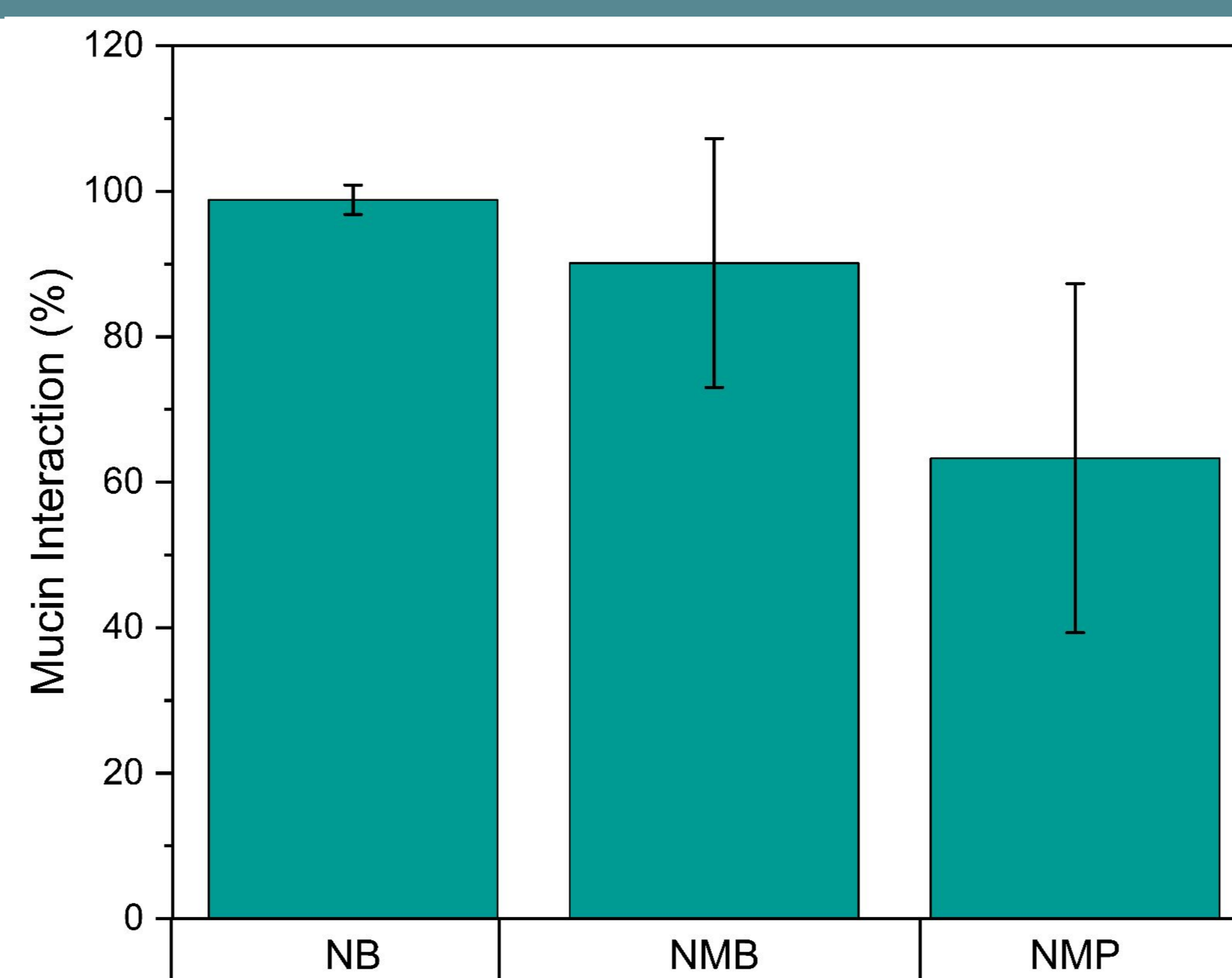


Fig. 6 – Mucin interaction of NB, NMB and NMP with 0.2 mg/mL mucin. Mucin solution was considered as 100% of interaction. Nanoparticles without mucin were used as a blank in the PAS method. Data are presented as the mean \pm standard deviation (n = 3).

- Nanoparticle superficial charge reduction in the presence of mucin, indicating the interaction between the components (Fig. 5).
- Although the indirect mucin quantification has shown no significant difference (Fig. 6), there is a tendency to decrease the mucin interaction with the nanoparticles in the presence of the peptide.

CONCLUSION

- The nanoparticles interacts with mucin, confirming its mucoadhesive properties;
- A reduction in mucin interaction with NMP was observed, suggesting that the peptide interacts with the positive charge of chitosan, impacting the nanoparticle mucoadhesiveness.

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