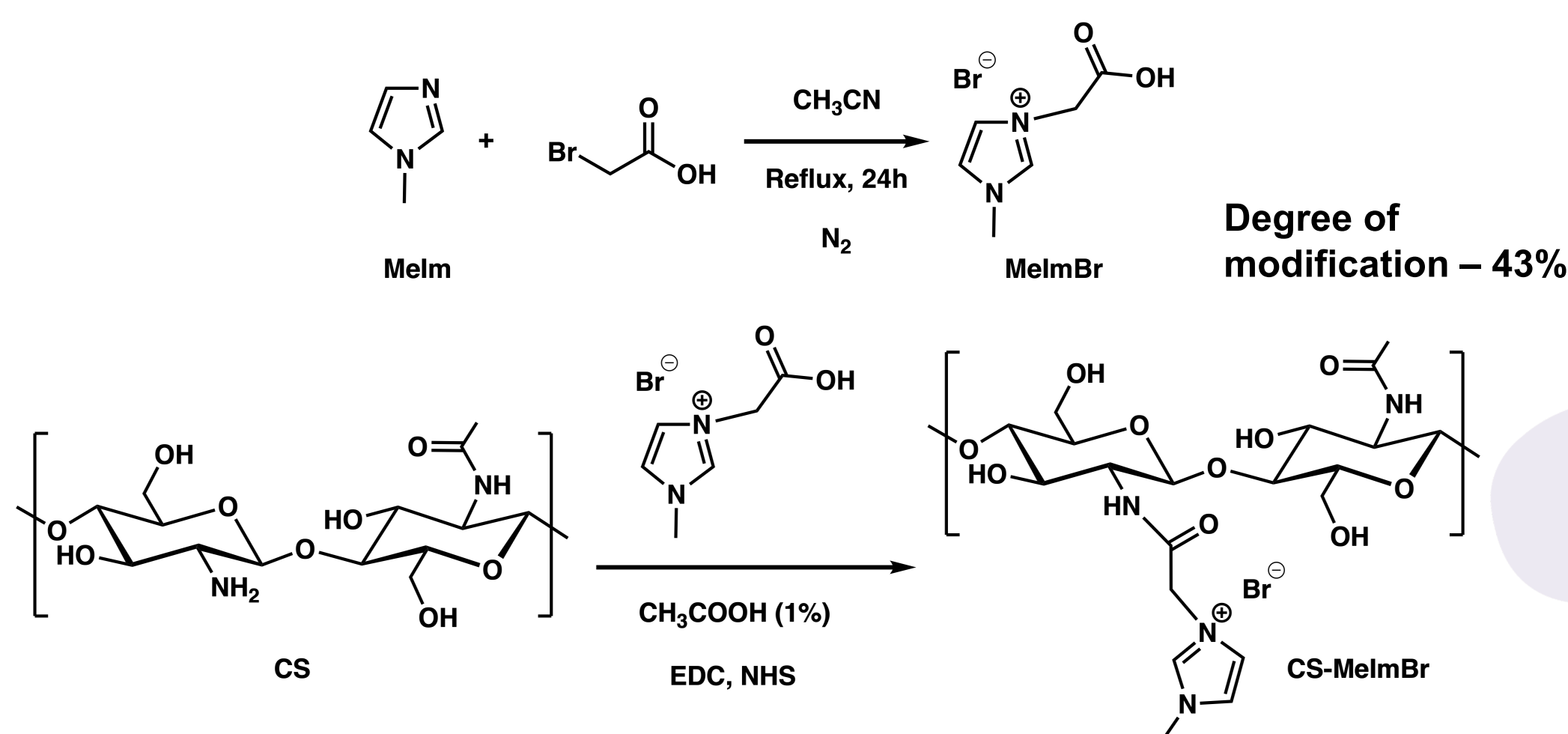


Bioactive Chitosan Films via Methylimidazole Functionalization: Antimicrobial and Antioxidant Enhancement

Carolina Muñoz-Núñez^{1*}, Alexandra Muñoz-Bonilla¹, Marta Fernández-García¹
Institute of Polymer Science and Technology, Madrid (Spain)
*carolinamunoz@ictp.csic.es

INTRODUCTION

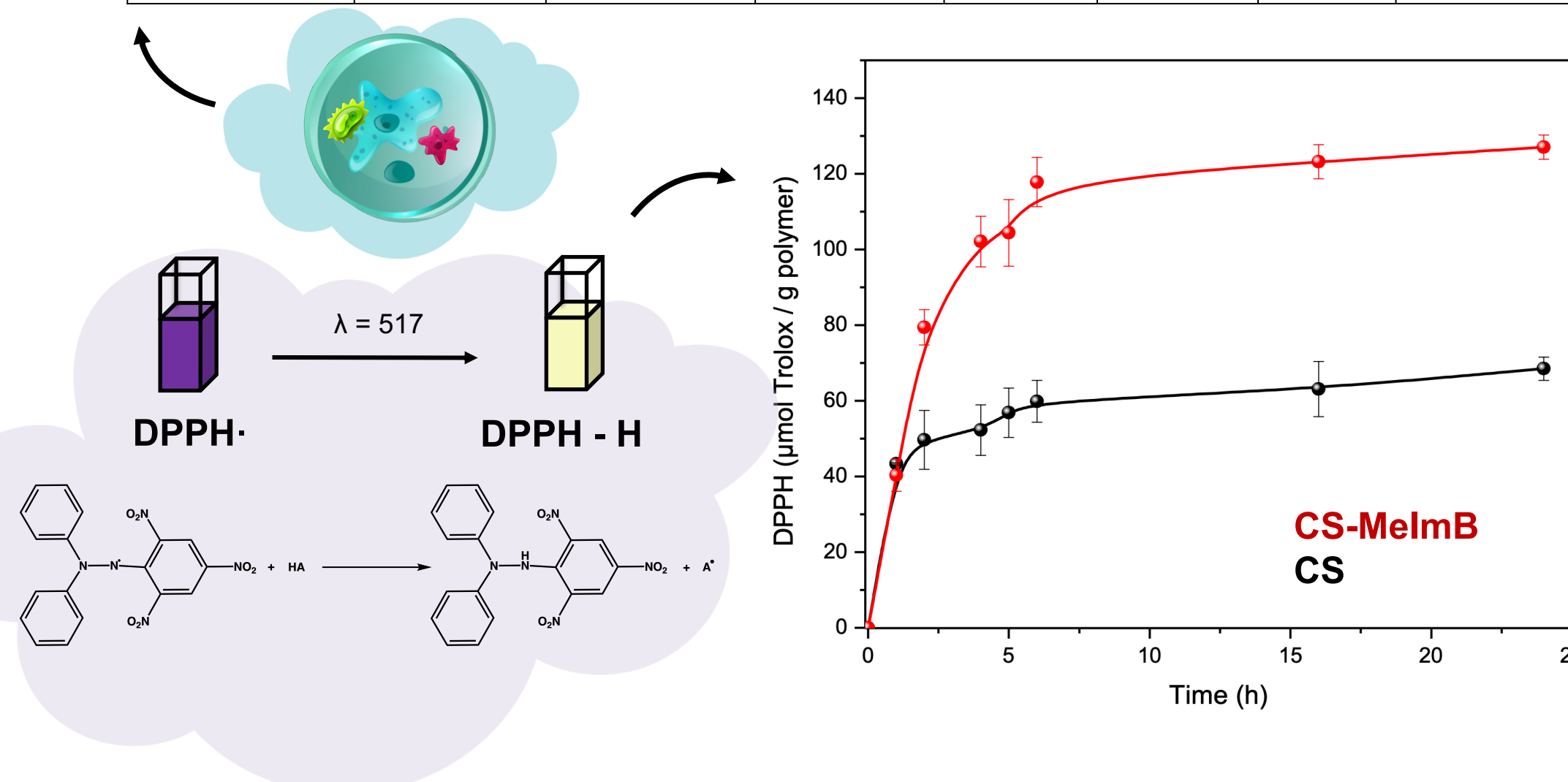
Chitosan (CS) was chemically modified with 1-methylimidazole (MeImB) via EDC/NHS coupling to enhance its bioactivity. The resulting derivative (CS-MeImB) was characterized by NMR and elemental analysis and processed into reinforced films with chitin nanowhiskers. The films showed improved mechanical stability, strong antimicrobial activity against Gram-positive and Gram-negative bacteria, and high antioxidant capacity. This modification offers a simple route to develop multifunctional CS-based films for sustainable packaging applications.



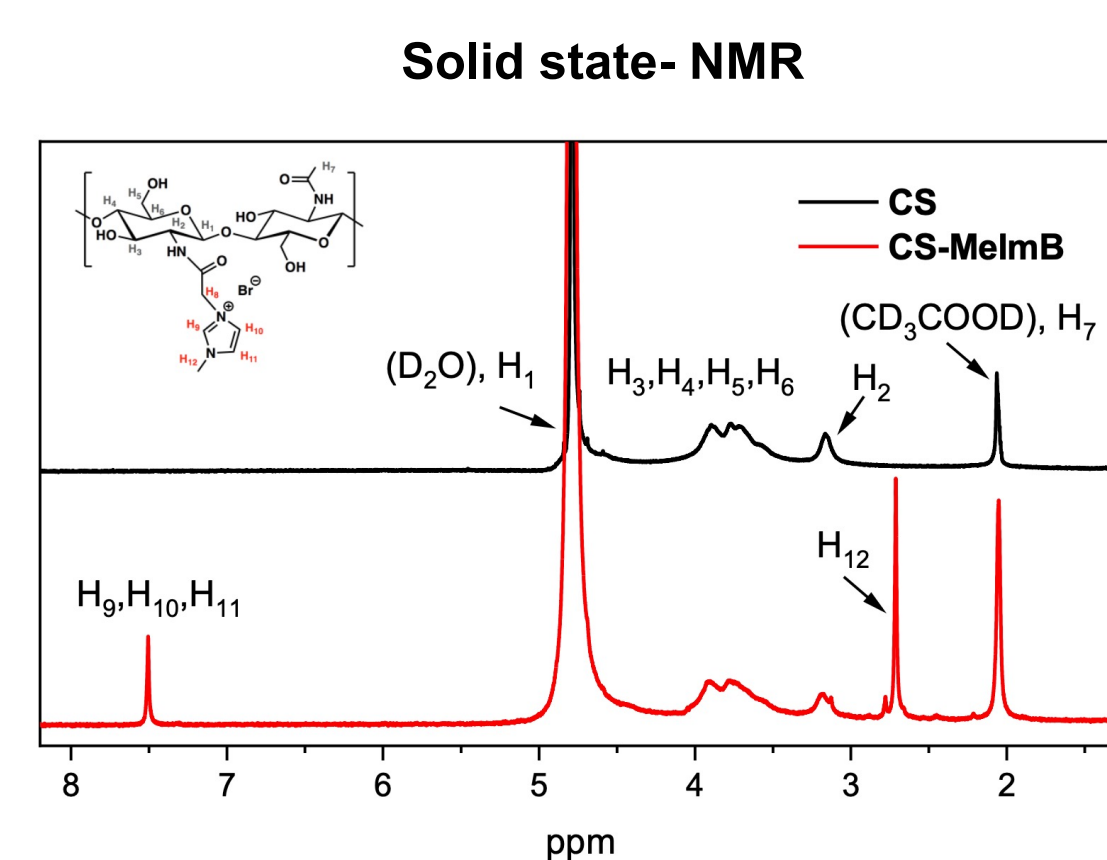
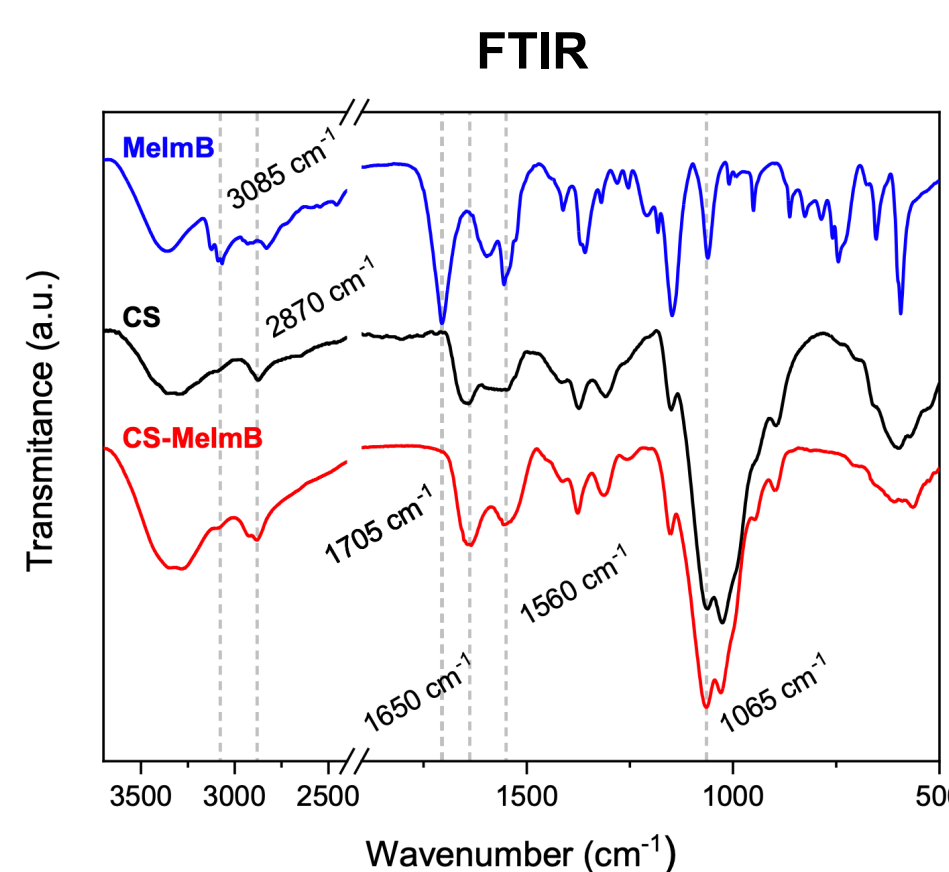
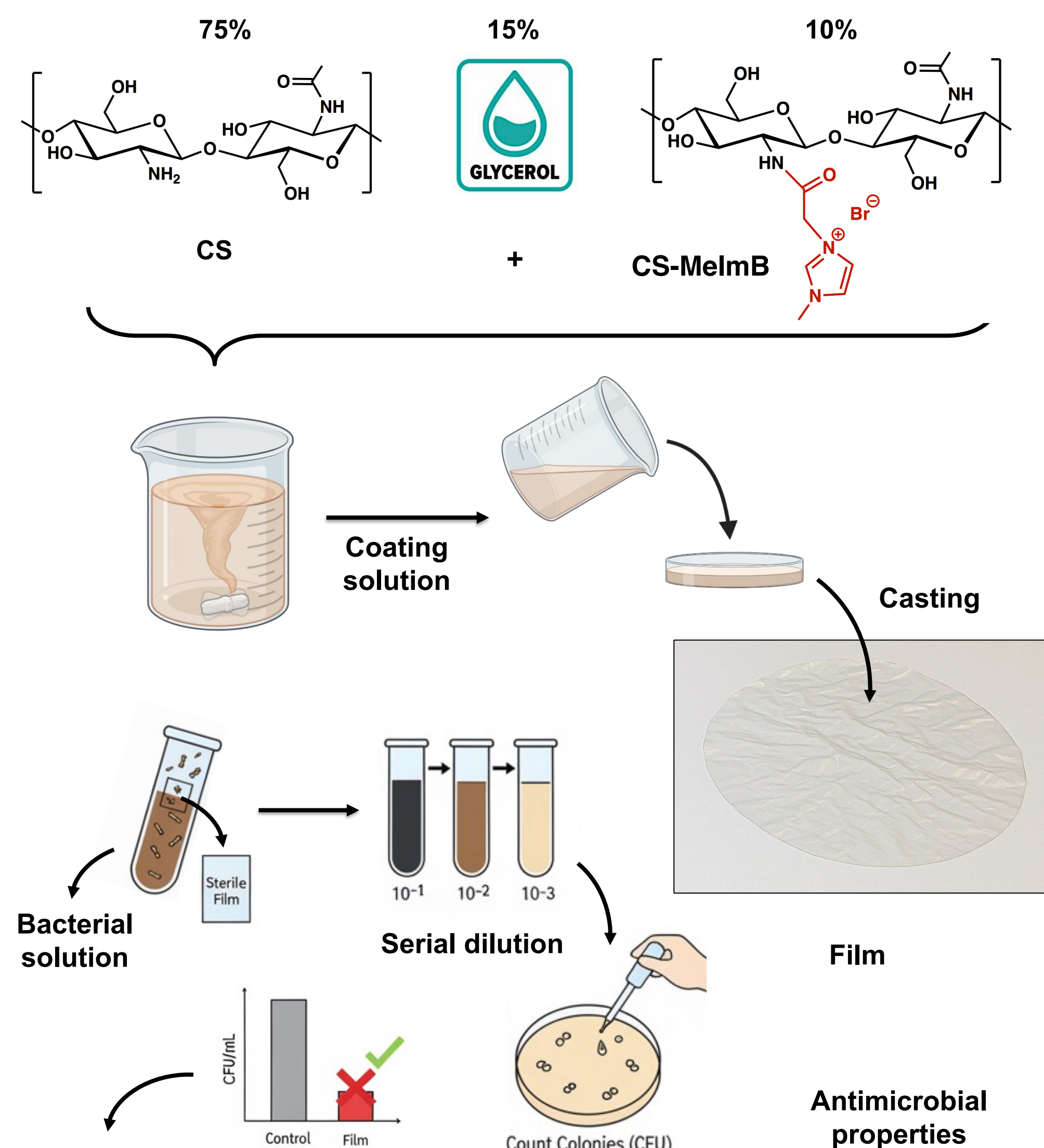
RESULTS & DISCUSSION

Antimicrobial activity of CS and CS-MeImB

MIC (μg/mL)	<i>Pseudomonas aeruginosa</i>	<i>Staphylococcus aureus</i>	<i>Staphylococcus epidermidis</i>	<i>Escherichia coli</i>	<i>Enterococcus faecalis</i>	<i>Candida albicans</i>	<i>Listeria monocytogenes</i>
CS	>1000	>1000	>1000	>1000	>1000	>1000	>1000
CS-MeImBr	13	52	32	0.97	32	0.97	1.3



METHOD



CONCLUSION

- ❖ Chitosan was successfully modified with 1-methylimidazole (MeImB) via EDC/NHS coupling, achieving an efficient synthesis.
- ❖ The resulting derivative (CS-MeImB) reached a degree of modification of ~43%, sufficient to impart strong antimicrobial and antioxidant properties.
- ❖ CS-MeImB (10%) was incorporated into chitosan-based films plasticized with glycerol.
- ❖ The obtained films were homogeneous, transparent, and flexible, confirming good miscibility of the derivative within the CS matrix.
- ❖ The functionalized films exhibited remarkable antimicrobial activity against both Gram-positive and Gram-negative bacteria, and enhanced antioxidant performance.
- ❖ These results demonstrate that MeIm modification is a promising strategy to develop bioactive, sustainable films for active packaging and biomedical application

ACKNOWLEDGMENT

This work was funded by MICINN (PID2022-136516OB-I00). C. Muñoz-Núñez acknowledges MICINN for the FPI fellowship: PRE2020-093596.