Chitosan-containing composites for biomedical applications

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Microbial infections are the cause of more than 275.000 deaths yearly in Europe, and over 1.41 million deaths worldwide.[1] Developing antimicrobial materials is vital to combat microbial propagation and subsequent infections. Chitosan (CS) is a well-known biopolymer with antimicrobial properties governed by its molecular weight, degree of deacetylation, chemical functionalization, and origin. Furthermore, it is considered a waste product of several food industries, whose repurpose would contribute to circular economy. However, Chitosan lacks solution stability and processability to obtain final products.[2,3] A substantial effort has been made to identify the best characteristics for an antimicrobial CS; nevertheless, the lack of systematic methodology has hindered this aim. The postulated antimicrobial mechanisms of CS comprise cellular membrane disruption and interaction with intracellular macromolecules (DNA, RNA, enzymes, etc)[4]. Thereby, we systematically evaluated the antimicrobial activity and mechanism of action of a library of CS via a range of molecular, optical, and microbiological assays against reference bacterial (*S. aureus*, *E. coli*, and *P. aeruginosa*) and fungal (*C. albicans*) species to identify the best features. In addition, *C. elegans* was employed as in vivo model to study the biocompatibility of the CS compounds that displayed antimicrobial activity.[5] Finally, active CSs were incorporated in different organic matrices for various biological applications (Figure 1), including antimicrobial dressings, wound healing or 3D scaffolds with promising results.

References

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Figures

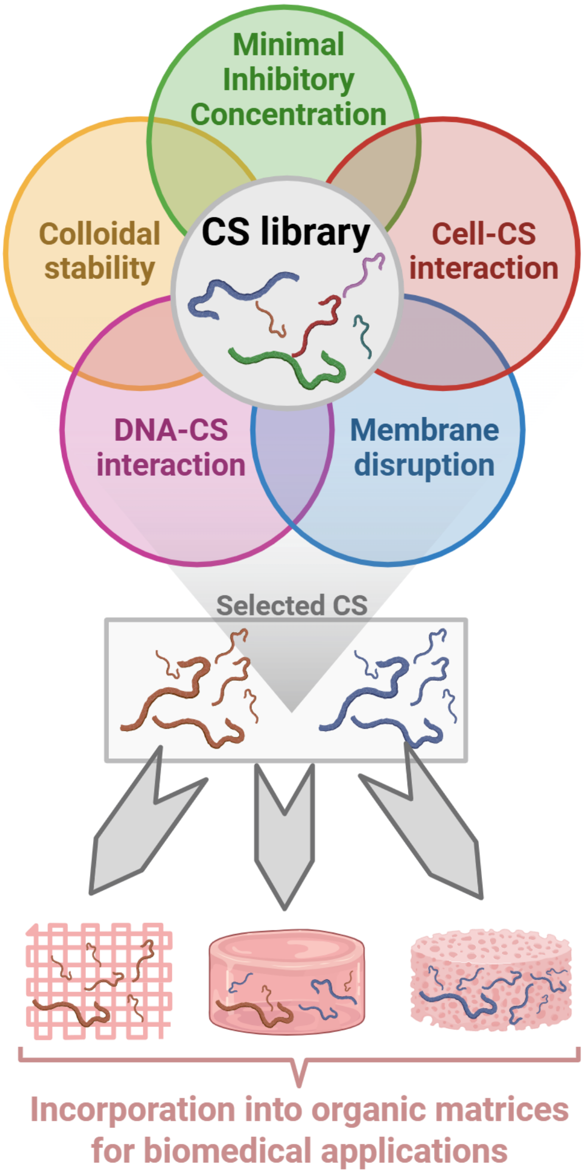

Figure 1. Scheme of the screening and incorporation of antimicrobial CSs into organic matrices.