Polysaccharide Complex Coacervates as Antibacterial Underwater Adhesives

Mehdi Vahdati[1,2*], Muhammad Haseeb Iqbal[1,2], Pierre Schaaf[1,2,3,4], Fouzia Boulmedais[1*]

[1] Institut Charles Sadron, CNRS, UPR 22, 67200 Strasbourg, France
[2] Faculté de Physique & Ingénierie, Université de Strasbourg, 67000 Strasbourg, France
[3] Institut National de la Santé et de la Recherche Médicale, INSERM U1121, Biomatériaux et Bioingénierie, 67000 Strasbourg, France
[4] Université de Strasbourg, Faculté de Chirurgie Dentaire, 67000 Strasbourg, France

ABSTRACT: Soft materials from the complexation of oppositely charged polyelectrolytes in water, known as complex coacervates, have shown great promise for the development of underwater adhesives.[1,2] Currently, most complex coacervates are based on complex bioinspired macromolecules or synthetic model polyelectrolytes, with little known about their suitability for potential biomedical applications. To address these issues, we introduce underwater adhesives based on complex coacervates of commercial polysaccharides, namely Chitosan (Chit) and Hyaluronic Acid (HAc). Chit-HAc complex coacervates are prepared via a simple mixing method at pH = 5 in the presence of NaCl as the salt. Soft and viscoelastic, these water-rich (85 - 97 wt%) materials feature pull-off adhesion strengths of up to 70 kPa when immersed in a medium at 0.1 M NaCl. The complex coacervate with the strongest mechanical properties is shown to be non-cytotoxic and antimicrobial. These adhesives underline the untapped potentials of nontoxic, bio-based complex coacervates for biomedical applications.

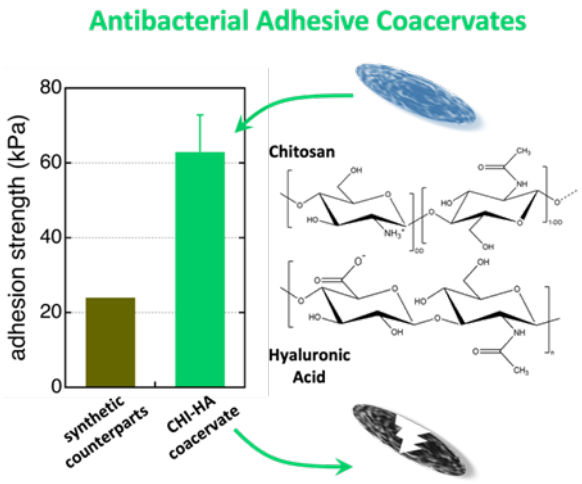

Figure: The adhesion strength and antimicrobial performance of CHI-HA complex coacervates.

KEY WORDS: polyelectrolytes, physical hydrogels, biomaterials, tissue adhesives

References

1. Vahdati, et. al., *ACS Appl Polym Sci*, **2020**
2. Dompé, et. al., *Adv Mat Interfaces*, **2019**