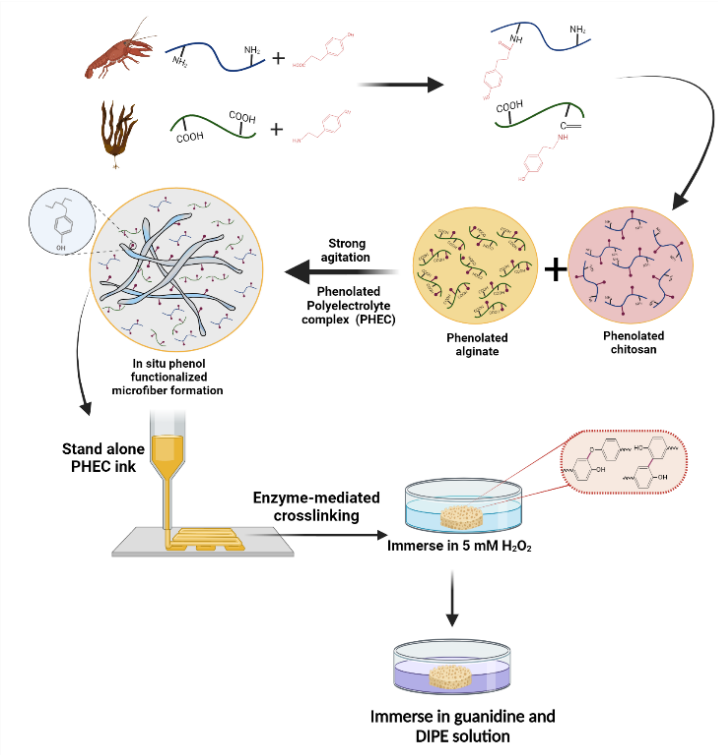
Antibacterial printable marine-based hydrogels

The design of 3D printable bio-based hydrogels with enhanced mechanical properties and minimal chemical modification can open new opportunities in the field of biomedical applications. A facile and safe approach is proposed to prepare mechanically reinforced chitosan-based hydrogels via a phenolated polyelectrolyte complex (PHEC) and enzyme-mediated crosslinking. PHEC will be formed between phenolated chitosan and alginate, leading to the formation of in situ phenol-functionalized microfibers. By replacing amino groups by phenol groups, the antibacterial activity of chitosan will be decreased, which has a critical role in tissue engineering. Therefore, to compensate the antibacterial activity of the chitosan and increasing antibacterial activity of the system, the guanidine groups will be conjugated on remaining amino groups of chitosan. To achieve this goal, it is required **A)** To conjugate phenol groups on chitosan and alginate, **B)** To synthesize a printable hydrogel based on phenolated chitosan and alginate by enzymatic crosslinking, **C)** To achieve a 3D hydrogel by 3D printing device, **D)** To conjugate guanidine groups on remaining amino groups of chitosan on 3D hydrogel surface by immersing the gel into guanidine solution, and **E)** To characterize physicochemical properties of 3D gels.



Abstract of the Master thesis project' created in Biorender.com

Please read the following articles for further details about the topic.[1-2]

1. Jafari, H.; Delporte, C.; Bernaerts, K. V.; Alimoradi, H.; Nie, L.; Podstawczyk, D. A.; Tam, K. C.; Shavandi, A., Synergistically complexation of phenol functionalized polymer induced in-situ microfiber formation for 3D printing of marine-based hydrogel. *Green Chemistry* **2022**.
2. Zhang, X.; Fan, J.; Lee, C.-S.; Kim, S.; Chen, C.; Lee, M., Supramolecular hydrogels based on nanoclay and guanidine-rich chitosan: injectable and moldable osteoinductive carriers. *ACS applied materials & interfaces* **2020,** *12* (14), 16088-16096.

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