



TITOLO
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Exploring *Hermetia illucens*-derived chitosan for wound healing applications: comparative analysis and sponge-like dressing development

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Riassunto

Chitosan (CS) is known for its antioxidative and antimicrobial properties. Commercial CS primarily comes from marine crustaceans, and it suffers from drawbacks such as seasonal availability and environmental dependency. Alternative sources like the black soldier fly (*Hermetia illucens*), offer a promising solution.

This project aims to compare the functional properties and bioactivity of chitosan obtained from *H. illucens* (CSh) with commercial chitosan (CSm), and to develop CSh based sponge-like scaffolds for wound healing.

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Bleached and unbleached CSh were obtained from *H. illucens* pupal exuviae and compared with CSm of similar molecular weight. Rheological properties of CSh and CSm solutions (1% v/v acetic acid) at different concentrations were assessed. *In vitro* tests on human dermal fibroblasts were performed to evaluate biocompatibility, fibroblast proliferation, and antioxidant potential. Sponge-like dressings were prepared by freeze-drying CSh solutions and characterized for morphology, absorption capability, mechanical and rheological properties. *In vitro* bioadhesion, biodegradation, and capability to support fibroblast migration and proliferation were evaluated.

Unbleached CSh exhibited comparable rheological properties to CSm, with a predominant elastic behaviour above 4% w/v concentration, suggesting its suitability for wound dressings. *In vitro* tests on human dermal fibroblasts showed that all the CS were biocompatible and enhanced fibroblast proliferation. Unbleached CSh showed the highest efficacy (135 (±6)% cell viability) and antioxidant potential, reducing oxidative stress induced by hydrogen peroxide. Cells treated with unbleached CSh and exposed to the oxidant agent exhibited viability values of up to 83(±4)%, compared to 50(±2)% observed for untreated cells. The higher antioxidant potential of unbleached CSh might stem from melanin presence. Melanin, known for its antioxidant properties, forms complexes with chitosan, possibly boosting its antioxidant effects.

Furthermore, CSh-based sponge-like dressings displayed higher porosity and smaller pore size compared to CSm-based ones, enhancing hydration capability and viscoelastic properties, resulting in improved overall performance for wound healing applications.

H. illucens-derived chitosan demonstrates improved functional properties to commercial sources for scaffold development for wound healing applications. This research underscores the prospect of utilizing insect-based chitosan as a sustainable solution in wound care.

Acknowledgements: EMBO Postdoctoral fellowship (EMBO ALTF 189-2023) for M.G.A

References:

1. Triunfo, M, Tafi, E, Guarnieri, A, Salvia, R, Scieuzo, C, Hahn, T, Zibek, S, Gagliardini, A, Panariello, L, Coltelli, M.B, De Bonis, A, Falabella, P. *Sci Rep.*, 2022:12(1):6613.
2. Khayrova, A, Lopatin, S, Varlamov, V. (2021). *Int J Biol Macromol.*, 2021:167:1319-1328.
3. Valentino, C, Vigani, B, Zucca, G, Ruggeri, M, Boselli, C., Icaro Cornaglia, A, Malavasi, L, Sandri, G, Rossi, S. *J Biol Macromol.*, 2023:242:125000

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