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Radiation crosslinked hydrogel wound dressings containing egg white proteins

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The wound healing process results in chronic wounds if the complex interplay between cytokines, growth factors, blood components and the extracellular matrix is disrupted by aging or underlying health conditions like diabetes.¹ In chronic wounds, an excessive inflammatory response prevents the proliferation of the healthy tissue, causing a serious infection which can even be life-threatening, if not treated properly.²

Egg white proteins, such as ovoalbumin, ovotransferrin and lysozyme, are attracting interest because of their demonstrated antioxidant and antibacterial activities.³ By incorporating these bioactive proteins, advanced wound dressing films gain the ability to manage oxidative stress in the wound. This promotes faster healing and potentially reduces the risk of bacterial infection.

Wound dressing films can be easily produced crosslinking polymers, such as polyvinyl alcohol (PVA) or polyvinyl pyrrolidone (PVP), by high-energy radiation.⁴ This technique does not require expensive initiators and catalysts and it can guarantee simultaneous product sterilization, depending on the irradiation doses. When PVA is mixed with selected polysaccharides, the hydrogel wound dressings have shown faster healing rates and scarless healing, probably due to antioxidant properties of polysaccharide fragments produced upon irradiation.⁴ The aim of this work is to develop novel hydrogel formulations incorporating egg white proteins and/or their peptides. The hydrogel systems demonstrated rheological and adhesion properties that make it suitable for a wound dressing. Fluid retention ability, morphology, protein release and the antibacterial and antioxidant properties were also assessed to investigate the applicability of the hydrogel formulation as an advanced wound dressing.

References:

- [1] S. Dhivya, V. V. Padma, E. Santhini, 2015; 5, 24-28.
- [2] Z. Xu, S. Han, Z. Gu, J. Wu, 2020, 9, 1-11.
- [3] J. Kovacs-Nolan, M. Phillips, Y. Mine, 2005, 53, 8421-8431.
- [4] E. A. Kamoun, E. R. S. Kenawy, X. Chen, 2017, 8, 217-233.

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