

Keratin peptides from chicken feathers for biomedical applications

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A chronic wound is a wound that does not heal in the expected amount of time and has a high risk of infection that can and will delay the healing process. Nowadays, the healing of chronic wounds continues to represent a significant challenge to physicians, as many wounds remain recalcitrant despite optimal standard care. Besides the acute pain that these patients endure, the economic burden of chronic wound care is “huge” on the health system. The design of wound dressings has suffered continuous and significant changes over the years. The development goes from natural materials used to just cover and conceal the wound to interactive materials that can facilitate the healing process. Keratins have been shown to play a key role in wound healing. Keratinocyte migration is one of the initial events of reepithelialization and is an important phase of wound healing [1,2]. It is known that water-soluble keratin peptides derived from an oxidative extraction from human hair, enhance the proliferation of human dermal fibroblasts. The use of keratin from human hair, can pose a problem due to limited supply, although another source can be used, chicken feathers. Chicken feather waste from the poultry industry is considered a critical problem in many countries, as it is responsible for a waste of 3600 million tons each year world-wide. The most common method to dispose this “waste” is by burning or burying, which is not an environment friendly procedure. Our research group in collaboration with the Universidade do Açores isolated and characterized microorganisms capable of degrading chicken feathers using a liquid-state fermentation. The project results clearly demonstrated the keratinolytic activity of the microorganism as well as the increase of protein on the culture medium. Most importantly the size of the peptides recovered range from 900 to 3000 Daltons, the most bioactive fraction. *In vitro* assays demonstrated that the recovered keratin peptides are not cytotoxic and that they may have distinct effects on cell proliferation. If the chicken feathers were hydrolyzed by the S196D strain an increase on cell migration is observed, on the other hand if the peptides are a result of chicken feathers hydrolyzed by S188D there is a delay on the cell migration. The results obtained on this project are promising and will lead to the development of custom made wound dressings, depending on the migration rate required.

References

- [1] Batzer, A. T., Marsh, C. & Kirsner, R. S. The use of keratin-based wound products on refractory wounds. *Int. Wound J.* 13, 110–5 (2016).
- [2] Pechter, P. M. *et al.* Keratin dressings speed epithelialization of deep partial-thickness wounds. *Wound Repair Regen.* 20, 236–42