Injectable Multifunctional Hydrogel Dressing Composed of Alginate and Rhodomyrtus tomentosa Herbal for Chronic Wound Treatment

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Hydrogels are 3D networks of hydrophilic polymers and considered as potential wound dressing materials because of their unique properties to mimic the natural extracellular matrix. Particularly, in situ cross-linkable hydrogels exhibit rapid sol-gel phase transition, which provides advantages to accurately fill any irregular wound types and easily incorporate various therapeutic drugs for effective treatment. From many decades, alginate-based hydrogels have been widely used because of their biocompatibility and easy fabrication process. However, it is still challenging for chronic wound treatment, which usually deals with infection and excessive inflammation. Here, for the first time, we introduced Rhodomyrtus tomentosa extract (Rt) into the alginate hydrogel to produce a multifunctional hydrogel for chronic wound healing. It's hypothesized that the bioactive polyphenol compounds in Rt extract would accelerate the wound healing process, through their inherent antibacterial and anti-inflammatory activities. First, we extracted the polyphenols from the Rt leaves and well-suspended the extract in alginate solutions. Then, CaO2 was used to not only induce hydrogelation, but also produce H2O2 and O2 for bactericidal and cell proliferation effects, respectively. The Alg@Rt hydrogel showed high porosity (400 um) and swelling ratio (134%), which is beneficial in retaining moisture and transporting the active substances during wound healing process. The Rt polyphenol compounds were sustainedly released (49.56% within 24 h), therefore significantly improving the anti-inflammatory, antibacterial and biocompatible properties of the Alg@Rt hydrogel than pure Alg hydrogel. From these positive results, we expected that Alg@Rt hydrogel has potential in the treatment of chronic wounds.