Combating Antibiotic-Resistant Bacteria With Leptospermum Honey-Incorporated Calcium Alginate Dressing

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Over the past several decades, excessive antibiotic use has led to the rapid development of antibiotic-resistant bacteria. The decreasing effectiveness of antibiotics in managing chronic wounds has quickened, thus threatening patient health. Given honey's long history in wound treatment, this study had two goals: to assess the antimicrobial activity of honey; and develop an absorbent, biodegradable and antibacterial honey-based wound dressing. We compared the antimicrobial effect of honey from different floral sources and investigated the dose-dependent effect of the Leptospermum honey using agar well diffusion assays. In this procedure, the agar plate surface was inoculated with skin surface microorganisms, samples were introduced into wells, and plates were incubated at 28°C for 24 hours. Zones of inhibition were then calculated using NIH ImageJ. Among the 6 different floral sources tested, honey derived from Leptospermum scoparium exhibited the most potent antimicrobial ability. There was a positive correlation ($r=0.972$, $p=0.006$) between the concentration of Leptospermum honey and inhibited microbial growth. The hydrogel product is created by, firstly, integrating honey into sodium alginate, followed by a reaction with calcium chloride, which traps honey within the net structure of the polymer. From the swelling capacity experiment, honey-based hydrogel showed a maximum uptake of 25% of its original mass. From the biodegradability test, honey-based hydrogel demonstrated a biodegradation level >14% greater than the control hydrocolloid within the first week. This dressing is antibacterial, absorbent and biodegradable, and has the potential to substitute topical wound agents.