

Natural products as wound healing agents

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Honey, pomegranate peel extract (PPP) and bee venom (BV), were used in combination with polyvinyl alcohol (PVA) to develop a novel nanofibrous wound dressing. Methanolic PPP was prepared and mixed with either manuka honey (MH) or lyophilized multiflora honey powder (LH) together with BV to have a total of three formulas: MH/PPP, MH/PPP/BV and LH/PPP/BV. The formulas were tested for their antibacterial activity, cytotoxicity, and wound healing activity in an excisional wound rat model. Scanning electron microscopy showed that LH fibers had smaller and more uniform diameter than MH fibers. Moderate swelling and higher weight loss capacities were detected when compared to PVA mats. Antibacterial tests showed significant antibacterial activity against *S. aureus* and *E. coli* compared to negative controls ($P < 0.0001$). No cytotoxicity was observed. *In vivo* wound healing study showed that all treatment groups enhanced wound healing as shown by increased wound closure percentages compared to negative control groups at days 3, 5 and 10 ($P < 0.0001$), and histological examination. In comparison to treatment groups, Medihoney® calcium alginate dressing significantly enhanced healing compared to negative controls at days 3 and 5. However, healing was delayed afterwards. These results indicate that MH/PPP/BV nanofibres are promising for wound healing.



Figure 3: Effect of honey based nanofibrous scaffolds on wound healing compared to No treatment, Polyvinyl alcohol nanofibers and Medihoney® calcium alginate commercial dressing. [↑]delay, [↓]accelerate)

Recent Publications:

1. Diana G Sami, Hana H Heiba and Ahmed Abdellatif (2019) Wound healing models: A systematic review of animal and non-animal models. *Wound Medicine* 24 (1): 8-17.
2. Balbaa A O, El-Fattah A A, Awad N M and Abdellatif A (2019) Effects of nanoscale electric fields on the histology of liver cell dysplasia. *Nanomedicine* 14(5): 515-528.
3. Wessam A Sarhan and Hassan M E Azzazy (2017) Apitherapeutics and phage-loaded nanofibers as wound dressings with enhanced wound healing and antibacterial activity. *Nanomedicine* 12(17): 2055-2067.
4. Wessam A Sarhan, Hassan M E Azzazy, and Ibrahim M El-Sherbiny (2016) Honey/Chitosan nanofiber wound dressing enriched with allium sativum and cleome droserifolia: Enhanced antimicrobial and wound healing activity. *ACS Applied Materials and Interfaces* 8 (10): 6379-6390.

5. Sarhan W A, Azzazy H M and El-Sherbiny I M (2016) The effect of increasing honey concentration on the properties of the honey/polyvinyl alcohol/chitosan nanofibers. *Materials Science and Engineering: C, Materials for Biological Applications* 67: 276-284.

Biography

Sara S Abouzekry has completed her BSc in Pharmacy from Ain Shams University, Cairo, Egypt in 2007. She has completed her Master of Science degree in Biotechnology from the American University in Cairo, Egypt early this year. She is interested in biomedical applications of nanofibers in wound healing. In her thesis project, multiple natural products known for their antibacterial and anti-inflammatory properties were electrospun into nanofibers in order to test their wound healing activity. Currently she is working on developing new formulas for wound healing while working as a Research Assistant in the biology department in the American University in Cairo.

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