

Accepted Manuscript

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PII: S0169-409X(17)30315-0
DOI: <https://doi.org/10.1016/j.addr.2017.12.012>
Reference: ADR 13230

To appear in: *Advanced Drug Delivery Reviews*

Received date: 21 September 2017
Revised date: 24 November 2017
Accepted date: 16 December 2017

Please cite this article as: Biranche Tandon, Adrián Magaz, Richard Balint, Jonny J. Blaker, Sarah H. Cartmell, Electroactive biomaterials: Vehicles for controlled delivery of therapeutic agents for drug delivery and tissue regeneration. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Adr*(2017), <https://doi.org/10.1016/j.addr.2017.12.012>

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Electroactive biomaterials: Vehicles for controlled delivery of therapeutic agents for drug delivery and tissue regeneration

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Abstract

Electrical stimulation for delivery of biochemical agents such as genes, proteins and RNA molecules amongst others, holds great potential for controlled therapeutic delivery and in promoting tissue regeneration. Electroactive biomaterials have the capability of delivering these agents in a localized, controlled, responsive and efficient manner. These systems have also been combined for the delivery of both physical and biochemical cues and can be programmed to achieve enhanced effects on healing by establishing control over the microenvironment. This review focuses on current state-of-the-art research in electroactive-based materials towards the delivery of drugs and other therapeutic signalling agents for wound care treatment. Future directions and current challenges for developing effective electroactive approach based therapies for wound care are discussed.

Keywords

Piezoelectrics; Conductive polymers; Photovoltaics; Electrets; Electric signals; Drugs; Wounds

Abbreviations: CP, conductive polymers; PPy, polypyrrole; PEDOT, poly(3,4-ethylenedioxythiophene); PANI, polyaniline; PLLA, poly(L-lactide); PVDF, poly(vinylidene fluoride); PVDF-TrFE, poly-(vinylidene fluoride-co-trifluoro-ethylene); PHB, polyhydroxy-butyrate; HA, hydroxyapatite; BT, barium titanate; LNKN, lithium sodium potassium niobate; LN, lithium

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