

Fiber-Hydrogel Composites For Chronic Wound Management

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The conventional dressings used nowadays present a passive action against microorganisms. Here, a multifunctional sandwich-like system was proposed and examined for its potential in control CW infections. The scaffolding system was made of three layers: (outer) fibrous mat of polycaprolactone (PCL) working as a barrier for preventing other microorganisms from reaching the wound bed, and was prepared at 14% w/v in chloroform/dimethylformamide (CHF/DMF) at 90/10% v/v (4 h at 50°C); (middle) sodium alginate (SA) hydrogel loaded with the antibiotic, ampicillin (Amp), examined against *Staphylococcus aureus* and *Escherichia coli* using the broth micro-dilution assay (determination of minimum inhibitory concentration or MIC), and used to maintain a moisture environment and absorb exudates. The hydrogel was obtained by solvent casting-phase inversion method using a 2%w/v SA solution load with Amp at MBC (6,4 µg/mL) and coagulation bath of 2%w/v CaCl₂. Finally, (inner) a second fibrous mat composed of PCL and polyethylene glycol (PEG), also examined against *S.aureus* e *E.coli* (MBC of 256 µg/mL), was used to facilitate cell integration and recognition and reduce mat hydrophobicity. Mats were produced via electrospinning (12kV, 0.7mL/h, 17cm, 18G). The sandwich-like system was generated by pouring the hydrogel solution onto a casting mold lined with the inner layer and depositing the outer layer at the top of the viscous solution. After 1h of intimate contact, the casting solution was added and afterwards the scaffolding system was ready and totally detached from the mold. Data reports the effectiveness of this sandwich-like system for potential applications in CW care.

Keywords: ampicillin, chronic wounds, fibrous polymer films, hydrogel, sandwich-like system