J Bioremed Biodeg 2016, 7:5(Suppl)
http://dx.doi.org/10.4172/2155-6199.C1.003

Development of high strength biofilm using sodium carboxy methyl cellulose and graphene oxide

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There is great demand of high strength biomaterials in various kinds of industries. In current studies, we developed a strategy for fabricating high strength biofilm from sodium carboxy methyl cellulose and graphene oxide (GO) using simple and facile method. Well known hummer method was used to synthesize GO from graphite powder and a simple two step procedure was adopted to get biofilm having the required superb qualities. This film showed splendid mechanical properties having additional fire retardant behavior comparing with pure sodium carboxy methyl cellulose film. Film surface morphology was studied by scanning electron microscope (SEM) with energy dispersive spectroscopy (EDS) mode. Tensile test of film samples were performed using universal testing machine equipped with 500 N load cells at room temperature and an average humidity 20%. Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy were used to confirm crosslinking mechanism. The nanostructure of prepared biofilm clearly indicated layers under SEM. The stress-strain curve indicated five folds increase in the tensile strength with 0.7% GO and 0.09% borate in biofilm when compared with pure sodium carboxy methyl cellulose film. This modified biofilm showed fire-retardant behavior when exposed to flame, thus confirmed that compactly arranged graphene layers not only improve the mechanical properties but also improve fire resistivity of the biofilm. The simple and novel method used for the preparation of film provides a potential approach that may be utilized in the field of aerospace, tissue engineering and synthesizing flexible supercapacitor electrodes to be used in different electronic devices.

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Clinical trial: Calcium alginate dressing incorporating nanoparticles in the treatment of diabetic neuropathic foot ulcers zinc oxide nanoparticles skin patches

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Introduction: Diabetes Mellitus in developed countries have a prevalence of 11%. Diabetic foot is a complication of diabetes mellitus. The presence of diabetic foot ulcers varies between 4% and 10%. Foot infections are most common cause of hospitalization and often precede amputation. The indicated debridement in almost all ulcers is recommended to maintain a "moist wound healing", using the appropriate dressing.

Aim: Aim of the study is to evaluate the effectiveness of a calcium alginate dressing with zinc oxide nanoparticles in the treatment of neuropathic diabetic foot ulcers.

Materials & Methods: A prospective randomized controlled trial was conducted in 26 patients. The patients were randomized to two groups: group one (n=28) received treatment with calcium alginate dressings with nanoparticles, while the other group two (n=29) received the treatment (without nanoparticles). The dressing change was performed every 48 h. The duration of observations was at the interval of every 10 weeks.

Results: After 10 weeks, healing was achieved in 24 (85.7% of n=28) patients in group one under treatment with calcium alginate nanoparticles versus 21 (72% of n=29) in the other group two (calcium alginate without nanoparticles) (p=0.03). The mean time to healing was 36 days±5 in the group one and 42 days±3.4 in group two (p=0.002), with significant differences between the two groups (p<0.028).

Conclusion: Most patients included in both groups were not receiving proper treatment of the ulcer, the analysis of the results support the hypothesis that the use of calcium alginate dressings with nanoparticles induces a better tissue regeneration.

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