Nano composites commonly used in medicine and veterinary

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Abstract

Nanocomposite in various fields were discussed and tested and show various results. Assessment of polycaprolacton (PCL) nanocomposite scaffold compared with hydroxyapatite (HA) on healing of segmental femur bone defect in rabbits. Assessment of tricalcium phosphate/collagen (TCP/collagene) nanocomposite scaffold compared with hydroxyapatite (HA) on healing of segmental femur bone defect in rabbits. Alteration in the trace minerals of cutaneous wounds of rabbits grafted with calciumsilvernanocomposite films. Development of shampoo, soap and ointment formulated by green synthesised silver nanoparticles functionalised with antimicrobial plants oils in veterinary dermatology: treatment and prevention strategies. The impact of potential feed additive nanocomposite (Ag, Cu, Fe, and Mn Dioxide) on eggs quality parameters of laying hens compared with metal salts. Biomimetic synthesis of bone-like nanocomposites using the self-organization mechanism of hydroxyapatite and collagen. Synthesis and Properties of Silicone Rubber/Organomontmorillonite Hybrid Nanocomposites. Self-healing hybrid nanocomposites consisting of bisphosphonatedhyaluronan and calcium phosphate nanoparticles.

Keywords: Nanocomposite, hybrid nanocomposite, wound and bone healing.

Introduction

Nanocomposite is a multiphase solid material where one of the phases has one, two or three dimensions of less than 100 nanometers (nm), or structures having Nano-scale repeat distances between the different phases that make up the material. In the broadest sense this definition can include porous media, colloids, gels and copolymers, but is more usually taken to mean the solid combination of a bulk matrix and nano-dimensional phase(s) differing in properties due to dissimilarities in structure and chemistry. Nanocomposites are found in nature, for example in the structure of the abalone shell and bone. In mechanical terms, nanocomposites differ from conventional composite materials due to the exceptionally high surface to volume ratio of the reinforcing phase and/or its exceptionally high aspect ratio.

Nanocomposite in various fields were discussed and tested


Result and discussion

Segmental bone loss due to trauma, infection, and tumor resection and even non-union results in the vast demand for replacement and restoration of the function of the lost bone. utilize novel inorganic-organic nanocomposites for biomedical applications. Biodegradable implants have shown great promise for the repair of bone defects and have been commonly used as bone substitutes, which traditionally would be treated using metallic implants. Nanocomposite PCL granules exhibited a reproducible bone-healing potential [1-5].

The current state and challenges towards developing bioactive and biodegradable nanocomposite TCP/collagen, while highlighting...
the promising steps taken to improve the mechanical and biological properties for application in bone regeneration. Due to rapid advances made in the field, it was not possible to include all aspects of the work. However, every effort was made to ensure that seminal works and significant research findings are included, with minimal bias. The need for bone graft materials has led to the synthesis of various materials with different properties. Various attempts have been made to exploit the novel properties of TCP/collagen nanocomposite scaffold for orthopaedic applications. In conclusion, it seems that TCP/collagen nanocomposite has an important role in the reconstruction of bone defects and can be used as scaffold in bone fractures. Nanocomposite TCP/collagen granules exhibited a reproducible bone-healing potential. It seems that TCP/collagen nanocomposite has an important role in the reconstruction of bone defects and can be used as a scaffold in bone fractures [6-10].

Based on the observations in the present study it is concluded that calcium-silver nanocomposite films could be used safely for cutaneous wound healing without any adverse effects. On the basis of biochemical changes of wounds it was concluded that the treatment of wounds with calcium-silver (45:45) nanocomposite films enables the wounds to heal early in comparison with calcium-silver (35:55) nanocomposite films [11-14].

The current study revealed that AgNPs can be synthesised with a simple method using plant extract AgNPsfuctionalised with mixed plant oils showed a higher antimicrobial activity compared with plant oil alone or AgNPs. AgNPsfuctionalised with plant oils help to maximise benefit for veterinary, pharmaceutical and biological products. Disease control in animals is multifaceted, and the more traditional emergency products are required for preventive measures. In professional hospitals and home, attention is being paid to veterinary needs. Antimicrobial products of plant origin are valuable, versatile and safe and have a crucial and specific role in controlling bacterial diseases in animals [15-20].

Introduction with feed of metal nanocomposite (Ag, Cu, Fe and Mn dioxide) affects the quantity and quality of productivity of laying hens, predominating the effect of salts of the metals, that is characterized by increased levels of egg laying during the experiment in poultry. Introduction of metals as additives in macro and nanoscale form causes changes in the pH level of egg white and yolk, but within the norms regulated by the requirements of DSTU 5028:2008 ‘Hen’s eggs for human consumption’ [21-25].

The HAp/Col bone-like nanocomposite material was synthesized using the self-organization mechanism between the HAp and collagen surfaces. The composite obtained demonstrated excellent biocompatibility and biointegrative activities, equivalent to autogenous bone and much better than other artificial bone materials. The HAp/Col composite will be used in the medical and dental fields in near future, and reduce the patients’ loads including pain at the donor sites of autogenous bone after transplantation. Bone tissue reactions of the composite demonstrated osteoclastresorption of the composite followed by new bone formation by osteoblasts, which is very similar to the reaction of a transplanted autogenous-bone. From these results, we conclude that the HAp/Col composite can be successfully utilized as an artificial bone material in both the medical and dental fields as an in vivo filler and in vitro tissue regenerator [26-29].

Organo-MMT particles could be exfoliated into ca. 50-nm thickness and uniformly dispersed in the silicone rubber matrix. PDMS molecules could be intercalated into the galleries of organo-MMT. The interlayer distance of organo-MMT expanded due to the polymer intercalation. Silicone rubber / organo-MMT nanocomposites showed excellent mechanical properties compared with the unfilled silicone rubber, which were very close to those of the aerosilica-filled silicone rubber. The decomposition temperatures of silicone rubber / organo-MMT nanocomposites were [30,31].

We have presented a non-covalently cross-linked hybrid nanocomposite, which outperforms conventional, covalently cross-linked analogs in terms of self-healing capacity as well as adhesiveness to mineral surfaces. Most importantly, these non-covalently cross-linked composites were surprisingly robust yet biodegradable upon extensive in vitro and in vivo testing, thereby confirming that cohesive nanocomposites can be developed based on reversible bonds between polymer-grafted bisphosphonate ligands and calcium ions as present on the surface of nanoscale inorganic particles. The biological observation that a hydrogel based on such reversible bonds aids in the progression of bone formation throughout the material is particularly appealing for bone regenerative applications [32-40].

Conclusion
Nanocomposite various fields were discussed and tested. Nanocomposite PCL granules exhibited areproducible bone-healing potential. TCP/collagen nanocomposite has a significant role in the reconstruction of bone defects and can be used as scaffold in bone fractures. calcium-silver nanocomposite films could be used safely for cutaneous wound healing without any adverse effects. Antimicrobial products of plant origin with AgNPs are valuable, safe and have a specific role in controlling diseases. The authors believe that this approach will be a good alternative therapy to solve the continuous antibiotic resistance developed by many bacterial pathogens and will be utilised in various animal contacting areas in medicine. Introduction of NeMe with feed affect quantity and quality characteristics of laying hens productivity, predominating the effect of salts of the metals, that is characterized by increased levels of egg laying during the experiment in poultry. Bone tissue reactions of the composite demonstrated osteoclastresorption of the composite followed by new bone formation by osteoblasts, which is very similar to the reaction of a transplanted autogenous-bone. From these results, we conclude that the HAp/Col composite can be successfully utilized as an artificial bone material in both the medical and dental fields as an in vivo filler and in vitro tissue regenerator.

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