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Chitosan doped with nanoparticles of copper, nickel and cobalt

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ABSTRACT

Metal colloids in 2 propanol using nanoparticles (NPs) of copper, nickel and cobalt were prepared by Chemical Liquid Deposition (CLD) method. The resulting colloidal dispersions were characterized by Transmission Electron Microscopy (TEM). The colloids were supported in chitosan. Then, microbiological assays were performed using *E. coli* and *S. aureus* in order to determine the bactericide/bacteriostatic activity of nanoparticles (NPs) trapped or chelated with chitosan.

Finally, the toxicity of the metal colloids Cu, Ni and Co was tested. Bio-assays were conducted in three different animal species. First of all on earth warms (*Eisenia foetida*) to evaluate the toxicity and the biocompatibility of chitosan in lactic acid (1% and 0.5%). Secondly bio-assay done in fishes (rainbow trout), the liver toxicity of NPs *in vivo* was evaluated. Finally, a bio-assay was conducted in Sprange-Dawley rats of 100 g weight, which were injected intraperitoneally with different solutions of chitosan metal colloids. Then, the minimum and maximum concentration were determined for copper, nickel and cobalt. The purpose of the use of chitosan was acting as a carrier for some magnetic NPs, which toxicity would allow to obtain new polymeric materials with potential applications as magnet future drugs carrier.

1. Introduction

Different experimental technique currently used will allow the study, design, creation, synthesis, manipulation, characterization and implementation of NPs. The new physical properties in different types of NPs have piqued scientific curiosity of potential applications in medicine, thus being born a new concept called "Nanomedicine", which corresponds to one of the most promising branches within the potential new technological developments in this area. You could venture a definition by setting it as "branch of nanotechnology that would allow the possibility of curing diseases from the inside of the body at the cellular or molecular level". It is considered that certain fields can be object of a revolution, especially: monitoring, tissue repair, control of the evolution of diseases, defense and improvement of human biological system, diagnosis, treatment and prevention of diseases, pain relief, administration of drugs to cells affected in a selective manner, among others. All of this would be new technological advances in health, which positioned it in a new era of scientific and health care. The use of these NPs with magnetic properties can have a huge impact on phenomena such as hyperthermia and the transport of drugs, both promising future in the therapy against cancer, in addition to the cellular Endocytosis-based applications, selective whereby cell captures and incorporates internal magnetic NPs (MNPs) [1].

Statistical data provided by the WHO (World Health Organization) reveals that cancer is the leading cause of death in the world, representing 7.6 million deaths (13% of all deaths) in 2008. Lung, stomach, liver, colon and breast cancer causes the most deaths by cancer each year and expected that deaths from this disease continue to increase, with an estimate of 13.1 million deaths in 2030 [2].

In the last decade, there has been an exponential growth in the development and approval by the regulatory authorities of

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