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Properties of hydrochloric chitosan solutions modified with nano-calcium phosphate complex

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Nature itself uses materials like cellulose to provide the structure of plants, chitin as the exoskeleton of several insects and molluscs, collagen for mechanical support in connective tissues and so on. At present, the socioeconomic situation of the modern world has raised the interest in renewable materials to use in regenerative medicine. Hard tissue of the human body is very important. The skeletal system provides support and gives shape to the body and provides a network for all soft tissues. The most common problems with hard tissues are bone fractures, defects or diseases in addition other various problems which need to be cured. Bone consists of 69% calcium phosphate (mainly hydroxyapatite), 21% collagen, 9% water and 1% other constituents. It has a composite nature which is built up of mainly ceramic (hydroxyapatite) and polymer (collagen), with a complex hierarchical microstructure very difficult to imitate which gives most of the superior mechanical properties to bone. Biomaterials as an artificial bone are classified into surface-active materials such as hydroxyapatite (HAp), and resorbable materials such as ß-tricalcium phosphate (ß-TCP) and bioactive and biodegradable material as a chitosan and its derivatives. The composition of biomaterials as a ceramics, polymers and/or composite materials, with all advantages and drawbacks, are developed to be used for bone problems. When all these properties of polymers, ceramics are considered producing composite materials have a reasonable approach. In this studies composition of chitosan and/or calcium phosphates are derived from the junction of two or more different materials, containing organic and inorganic materials, including characteristics like bioactivity and biodegradability and biocompatibility with human tissues. The chemical characteristics of chitosan and nano B-TCP/HAp complex are showed by FTIR studies and can be seen the main peaks of energy vibration of both components organic/inorganic exist in the material complex, also can be seen a good stability of the nano-ceramic formation in the chitosan salt solution by potential zeta and ceramic particles size range from 12.8 to 58 nm. In this study, a new method of preparation of calcium phosphates ceramics from micro size to nano size using a common commercial calcium phosphates is also shown, the process consist in a simple dissolution process of the calcium phosphates in acid, however this solution was used to dissolve the chitosan creating a hydrochloric chitosan solutions modified with nano-calcium phosphate complex. These materials can be used in future for medical applications as a base for scaffolds production and as implants in regenerative medicine.

Biography

Luciano Pighinelli is currently an Associate Professor of Toxicology and Genetics Research Program at Lutheran University of Brazil and is an Assistant Professor of Research Program in Materials Engineering at the Lutheran University of Brazil. He has done his Doctorate in Biomaterials area for Regenerative Medicine and Tissue Engineering at the University of Innsbruck-Austria, in co-operation with the Institute of Biopolymers and Chemical Fibers in Lodz, Poland. He has several papers and patents in the field of Regenerative Medicine and Radiotherapy. Currently, he is developing research in biomaterials area and biodegradation of polymers used in regenerative medicine and drug-delivery. His research interests are in the field of Biomaterials and Tissue Engineering: bioactive ceramics; scaffolds for bone and tissue repair; musculoskeletal tissue engineering: bone; cartilage; articular joints; calcium phosphate-based drug delivery devices; and ceramics for orthopedics.

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