APPLICATIONS OF CLAY NANOMATERIALS IN NANOTECHNOLOGYFORTHE BIOMEDICAL APPLICATIONS

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Introduction & Objectives:

The innate immune system consists of several complex cellular and molecular mechanisms. During inflammatory responses, blood-circulating monocytes are driven to the sites of inflammation, where theydifferentiate into tissue macrophages. The research of novel nanomaterials applied to biomedical sciences is often limited by their toxicity or dangerous interactions with the immune cell functions.[1]Modern science has experienced one of its major breakthroughs with nanotechnology in the last decades. This enabled nano-dimensional materials (in the 1–100 nm size domain) to be produced and applied in a number of technological and consumer fields due to their peculiar physico-chemical properties[2].

Methodology (Material andmethods):

Halloysite nanotubes (HNTs) constitute one of the most versatile nanomaterials utilized in several biomedical applications. with applications in the areas of biotechnology, pharmaceutical, and medical research.[3][4]In the other hand, the Halloysite nanotubes are aluminosilicate clay mineral which have a hollow tubular structure and occurs naturally. They are biocompatible and viable carrier for inclusion of biologically active molecules due to the empty space inside the tubular structure.[5]
Also, Soduim Alginate is a water-soluble linear polysaccharide extracted from several species of brown algae. The interest of using it concerns its gelationproperties in calcium chloride and its ability to encapsulate drugs leading to beads forming which are biocompatible and bioresorbable. The development of alginate as a selected polymer in various delivery systems can be adjusted depending on the challenges that must be overcome by drug or proteins or the system itself.[6][7]sodium alginate is known to be non-toxic when taken orally and to protect the mucous membrane of the upper gastrointestinal tract from the irritation of chemicals. So it was considered to be the best polymer and forms a reticulated structure when cross-linked with polyvalent or divalent ions. Since the property of reswelling is susceptible to the environmental pH, the incorporation of acid-sensitive drugs into the beads protects them from gastric juice.[8]

Communications Orales

Results and Discussion:

In this study, we set up a procedure to load HNTs (pristine, activated by H2SO4 acid, and, calcinated) with 5-aminosalicylic acid (5-ASA) as a typical anti-inflammatory drug for potential use in the treatment of Crohn's disease and ulcerative colitis.[9]Taking into consideration that the increased release of the drug into the intestinal zone by polymerization technique, using sodiumalginate as an acid-sensitive drug into the beads protects them from gastric juice attack.Also, wehavehighlightedthe special morphology and unique chemical properties of the halloysite clay nanotubes as a natural excipient with or without chemical modification. The bio-excipient particles were characterized for their size, and morphology, by using: FTIR, SEM, XRD, Zêta Potential, and XRF techniques.

Conclusion:

In conclusion, the results demonstrated that depending on experimental parameters, such as the ratio of Clay/Drug/Polymer, the hybrid bio-composite properties can be affected and modulated significantly. Moreover, the mechanism of drug release in simulated gastric medium showed an improved dissolution compared with the uncovered form of Clay/Drug complex. Inaddition a prolonged release profile of the different formulations was obtained for a period of two hours.

Keywords:
Nanomaterials,Biomedical,Nanotechnology,Halloysite,Encapsulation.

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