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Evaluation of the toxicity of pseudoboehmite for the controlled release of drugs

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Introduction: The nanotechnology research progressed significantly over the past 30 years, allowing for the development of new materials with applications that meet the interests of various sectors. In health, the pharmaceutical industry has used nanostructured materials to develop the release of drugs. Application of the nanoparticles offers numerous advantages compared to conventional release, such as progressive and controlled release of drugs from the matrix degradation, effective plasma levels with less fluctuation over time, less risk of toxicity, biological penetration through the barriers and targeting to specific tissue targets. In this study, the material used in drug delivery is pseudoboehmite. The pseudoboehmite consists in an advanced synthetic ceramic with enhanced characteristics of composition, morphology and desired particle size. It is based on an oxyhydroxide aluminum and its structure is similar to boehmite. **Objectives:** Analysis of the implementation of a pseudoboehmite obtained by the sol-gel process as pharmaceutical excipient for release of drug acyclovir *in vitro* and evaluation of their toxicity in rodents (*Wistar rats*). **Methods:** The pseudoboehmite was synthesized by sol-gel method and then subjected to aging treatment by wet process. The pseudoboehmite obtained was characterized by scanning electron microscopy (SEM), infrared absorption spectroscopy analysis (FTIR), by adsorption to a test dissolutor with gastrointestinal fluid and construction of the release profile by High Performance Liquid Chromatography (HPLC) to determine the kinetics of drug release by the tablet. Furthermore, acute toxicity tests in males albino rats were perfomed. These were treated with a single dose of pseudoboehmite (300mg/Kg e 2000mg/Kg) through oral administration by gavage and intraperitoneal injection – IP. The surviving animals were anesthetized by ketamine hydrochloride 10% intraperitoneally and then exsanguinated by the aorta to detecting the presence of aluminum in the systemic circulation by Atomic Absorption Spectroscopy. Blood samples were collected anticoagulant (EDTA 1mg/1ml) and centrifuged at 1500 rpm to obtain the plasma. The procedures described above were conducted individually and in isolated location to avoid any stress in other animals. All experimental procedures adopted for the study obeyed the rules established by the Research and Ethics Committee of Universidade Presbiteriana Mackenzie – process CEUA / UPM Nº 090/05/2012. **Results:** By SEM's analysis, it was observed that the pseudoboehmite is constituted by a highly porous surface and appears to have a homogeneous and fibrillar shape, which facilitates adsorption. Using FTIR analysis, it was observed that the pseudoboehmite has a high purity, without the presence of byproducts of the sol-gel process as contaminants. It was also observed, by characteristic absorption bands that through the high amorphous fraction, there is presence of nanocrystals in low amounts. In the adsorption test in a dissolutor with gastrointestinal fluid and construction of the release profile by HPLC, characteristics were observed on the release kinetics allowing the applying of pseudoboehmite the development of controlled release systems for drugs. With respect to acute toxicity, there were no deaths and no signs of toxicity after the administration of pseudoboehmite. In the analysis of plasma, there was no presence of aluminum in the systemic circulation of animals - below the limit of detection by equipment used atomic absorption spectrophotometry. **Conclusion:** The pseudoboehmite synthesized has a high porosity, with future expectations for its use as drug-releasing system. The absence of aluminum metal in samples of blood plasma of animals reveals the absence of absorption bodies, emphasizing the need for more detailed investigations such as the histological and biochemical parameters resulting from the administration of pseudoboehmite.

Keywords: drug delivery system, drugs, toxicity, pseudoboehmite