Use of pseudoboehmite for drug delivery system of simvastatin

MARCOS ANTONIO AGUENA HERRERA VICENTE[1], Antônio Hortêncio Munhoz Jr.[2], Leila Figueiredo de Miranda[2], Bruno Filipe Carmelino Cardoso Sarmento[3], Ayrton Bernussi[4], Rene Olivier[5], Roberto Rodrigues Ribeiro[1], Denison Angelotti Moraes[1]

[1]Universidade Presbiteriana Mackenzie, [2]Universidade Presbiteriana Mackenzie (*Engenharia de Materiais*) , [3]i3S - Institute for Investigation and Innovation in Health (*Pharmacy*) , [4]Texas Tech University (*Whitacre College of Eng*) , [5]Instituto de Pesquisas Energeticas e Nucleares

e-mail: Aguena123456@gmail.com

Simvastatin is a well known anti-cholesterol drug that is commercially available in Brazil in various strengths including Simvastatin Tablets, with 10, 20 and 40 mg. Simvastatin is a drug, which is used for treating patients with hypercholesterolemia, in order to prevent atherosclerosis, cardiovascular disease, and stroke[1]. Today cardiovascular disease is still the leading cause of death worldwide. It should also be noted that the treatment of cardiovascular diseases was responsible for just over a third of what the Brazilian federal government disbursed between the years 2013 and 2016 in the purchase of medicines for the population. However, the side effects of simvastatin include muscle pain and liver problems. When diet and exercise are not enough to reduce cholesterol levels, drugs as simvastatin are the medication prescribed. One problem of simvastatin is the low solubility. Simvastatin is practically insoluble in water (30 µg/mL), and 0.1 M HCl (60 µg/mL) [1,2,3]. This paper presents pseudoboehmite nanoparticles synthesized via sol-gel process. The pseudoboehmite were synthesized by an ethanol/water sol–gel method using aluminum nitrate as precursos and sodium hydroxide. The pseudoboehmite with simvastatin entrapped was characterized by X-ray diffraction (XRD), scanning electron microscope (SEM) using secondary electrons detector and EDS detector, thermal analysis (thermogravimetric analysis and differential thermal analysis) and Fourier transform infrared spectrometer (FTIR). The data shows that the simvastatin was incorporated homogenously in the pseudoboehmite. The Fourier transform infrared analysis shows that there was no degradation of the drug.

Acknowledgments

The authors thanks the Mackenzie Presbyterian University (UPM), Mack

Pesquisa, CAPES, Cnpq and FAPESP (grant 2010/19157-9 and grant 2017/22396-4) for the sponsorship to this project.

References:

[1] HEART Protection Study Collaborative Group ; *The lancet*, Volume 361, No. 9374, p2005–2016, 2003.

[2] Kotrotsios, *A correlation of in-vitro drug dissolution and in vivo drug absorption of various therapeutically equivalent pharmaceutical solid dosage forms of simvastatin*, PhD Thesis -Philadelphia College of Osteopathic Medicine - The Graduate Program in Biomedical Sciences -Sigmapharm Laboratories, Bensalem PA, 2012

[3] MURTAZA, G. *Acta Poloniae Pharmaceutica* - Drug Research, Vol. 69 No. 4 pp. 581-590, 2012