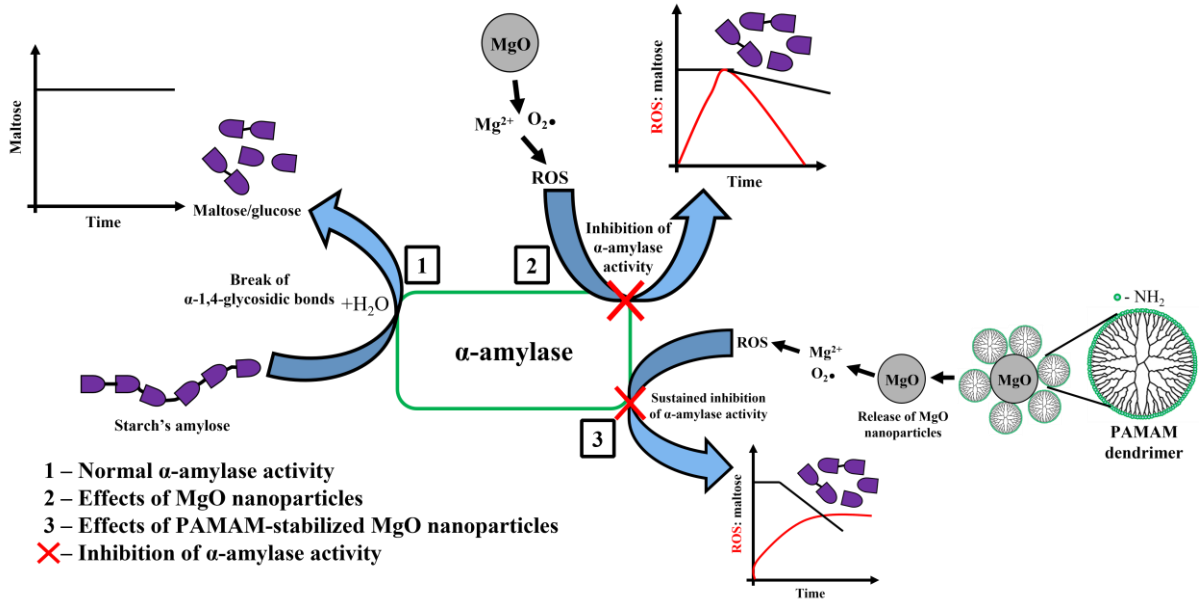
Excellence in research work for Sun Pharma Research Award

Jeevanandam, J., Gonçalves, M., Castro, R., Gallo, J., Bañobre-López, M., & Rodrigues, J. (2023). **Enhanced alpha-amylase inhibition activity of amine-terminated PAMAM dendrimer stabilized pure copper-doped magnesium oxide nanoparticles.** *Biomaterials Advances*, 213535.

The present work aims to prepare copper-doped MgO nanoparticles via a sol-gel approach and study their antidiabetic alpha-amylase inhibition activity with undoped MgO nanoparticles. The ability of G5 amine-terminated polyamidoamine (PAMAM) dendrimer for the controlled release of copper-doped MgO nanoparticles to exhibit alpha-amylase inhibition activity was also evaluated. The synthesis of MgO nanoparticles via sol-gel approach and optimization of calcination temperature and time has led to the formation of nanoparticles with different shapes (spherical, hexagonal, and rod-shaped) and a polydispersity in size ranging from 10 to 100 nm with periclase crystalline phase. The presence of copper ions in the MgO nanoparticles has altered their crystallite size, eventually modifying their size, morphology, and surface charge. The efficiency of dendrimer to stabilize spherical copper-doped MgO nanoparticles (ca. 30 %) is higher than in other samples, which was confirmed by UV–Visible, DLS, FTIR, and TEM analysis. The amylase inhibition assay emphasized that the dendrimer nanoparticles stabilization has led to the prolonged enzyme inhibition ability of MgO and copper-doped MgO nanoparticles for up to 24 h. Currently, we are working on the formulation of these nanoparticles as a medical gummy to commercialize them as a potential antidiabetic agent.



This work was proposed by the applicant and the funding for the research was provided by the Research and Development Ministry of Madeira, Portugal. The proposal was proven by the applicant and was reported in this research article. The co-author Dr. Mara Goncalves helped in the preparation and encapsulation of dendrimers and the co-author Dr. Rita Castro helped in the SEM analysis of the synthesized MgO nanoparticles. The co-authors Dr. Juan Gallo and Dr. Manuel Banobre-Lopez helped in the TEM analysis of the synthesized nanoparticles. Dr. Joao Rodrigues helped in the coordination of this research as the scientific coordinator of the research centre. The work showed that

the metal-doped MgO nanoparticles encapsulated in the dendrimer helped in the alpha-amylase enzyme inhibition activity. This eventually showed that the slow release of MgO nanoparticles helped to improve the magnesium level in the initial stage of digestion (saliva) to reduce the blood glucose. Later, the Mg ions in the body will lead to insulin resistance reversal in the diabetic cells as proposed and proven by the applicant in his previous studies. Thus, the applicant is willing to claim the esteemed Sun Pharma Research award for this research work.

Duly acknowledged by the applicant

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