Fine-Tuning Synthetic Strategies for Decorating Porous Silicon with Carbohydrate Moieties: Towards Enhanced Delivery Systems

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In recent decades, nanotechnology has gained prominence in diagnostic and therapeutic fields, offering safer and more efficient approaches to diagnosis, treatment, and tumour targeting. Traditional chemotherapy entails the indiscriminate elimination of rapidly dividing cells, encompassing both tumour and healthy cells, leading to severe side effects.[1] Consequently, there has been a concerted effort to develop drugs that selectively target tumour cells while sparing normal cells.

PSiNPs-based systems have demonstrated several advantages in this field, including precise targeting of tumour cells and mitigation of side effects. Previously we developed a functionalization procedure for PSiNPs via hydrosilylation[2] but the protocol presented some drawbacks because it was a time-consuming multistep technique that required high temperatures which were unsuitable for thermolabile molecules. Hence we aimed to establish an innovative one-pot protocol for PSiNPs hydrosilylation, which combined mild temperatures with the use of a Lewis acid as a catalyst, to conjugate PSiNPs with the Allyl-tetra-O-acetyl-β-D-glucopyranoside (Al-s), a carbohydrate presenting an allyl group. We evidenced by thermogravimetry that employing this hydrosilylation protocol yields optimal protection against nanoparticle degradation The Hydrosilylation process with a carbohydrate holds a significant promise in the field of brain drug delivery, in fact this methodology has the potential to enable us to exploit PSiNPs as vehicles for active targeting, particularly towards brain cancer cells overexpressing GLUT receptors.

References

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