PRESENTER INFORMATION

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BIOGRAPHICAL SKETCH

After completing her degree in Chemistry at the University of Valladolid (Spain), she carried out her Ph.D. and first postdoctoral research at the University of Montpellier under the supervision of Dr. Frédérique Cunin working on different types of nanoparticles for Rhabdomyosarcoma theranostic. Currently, she holds an Enterprise Partnership Postdoctoral Fellowship from the Irish Research Council to work at Dublin City University under the supervision of Prof. Silvia Giordani on the CAROTENE project (design of Carbon bAsed nanoplatform tO TargEt pancreatic cancEr). Her research project aims to develop new smart carbon-based nanomaterials capable of improving chemotherapeutic drug delivery.

TITLE

Non-toxic mesoporous silicon nanoparticles as a vector for two-photon light triggered siRNA transfection in cancer cells

ABSTRACT

Gene therapy is a rapidly evolving treatment consisting of the delivery of exogenous nucleic acid sequences designed specifically to target diseased tissues. It has been originally efficiently performed with viral systems. [1] However, they may exert immunologic and oncogenic adverse effects. Non-viral gene delivery systems, despite their current lower efficiency in terms of transfection, offer to overcome most of the shortcomings displayed by viral vectors, i.e. severe immune responses, low carrying capacity, small-scale production, and high production cost. [2]

We present here a simple system made of biocompatible porous silicon nanoparticles (pSiNP) for siRNA photocontrolled delivery and gene silencing in cells upon two-photon excitation. pSiNP are linked to an azobenzene moiety possessing a lysine group (pSiNP@ICPES-azo@Lys) to efficiently complex siRNA. After non-linear excitation of the two-photon absorber system (pSiNP) followed by intermolecular energy transfer (FRET) to trans azobenzene moiety, we observe efficient silencing in MCF-7 expressing stable firefly luciferase. Furthermore, siRNA against inhibitory apoptotic protein (IAP) leads to over 70% of MCF-7 cancer cell death.

[1] S. Huang, M. Kamihira, *Biotechnol. Adv*. **2013**, 31, 208-223.

[2] a) G. Lin, L. Li, N. Panwar, J. Wang, S. C. Tjin, X. Wang, K.-T. Yong, *Coord. Chem. Rev*. **2018**, 374, 133-152; b) M. Foldvari, D. W. Chen, N. Nafissi, D. Calderon, L. Narsineni, A. Rafiee, *J. Control. Release*. **2016**, 240, 165-190.