

Potential of Mesoporous Silica Nanoparticles for Applications in Targeted Treatment of Cancer

Minja Mladenović¹, Mirjana Mundžić¹, Aleksandra Pavlović¹, Nikola Knežević^{1}*

¹BioSense Institute, Center for Sensor Technologies, University of Novi Sad,

Dr Zorana Đinđića 1, 21000 Novi Sad, Serbia

*Corresponding author: Dr N. Ž. Knežević, nknezevic@biosense.rs



Mesoporous silica nanoparticles (MSNs) are being vastly demonstrated in the literature as efficient nanocarriers for cancer therapeutics. Their high surface area (ca. 1000 m²/g), well-structured porosity, versatile possibilities for obtaining nanocarriers of different morphologies, pore diameters and surface characteristics, allow construction of different nanosystems for efficient cancer targeting. In this study, the potential of mesoporous silica nanoparticles for applications in targeted treatment of cancer is presented. Mesoporous silica nanoparticles have substantial potentials for enhancing the efficacy and precision of cancer treatment.

BENEFICIAL PROPERTIES
 high drug loading capacity
 surface modification
 on-demand release
 biocompatibility¹
 large scale synthesis²

**CONSTRUCTION OF COMPLEX
 MULTIFUNCTIONAL NANOSTRUCTURES**

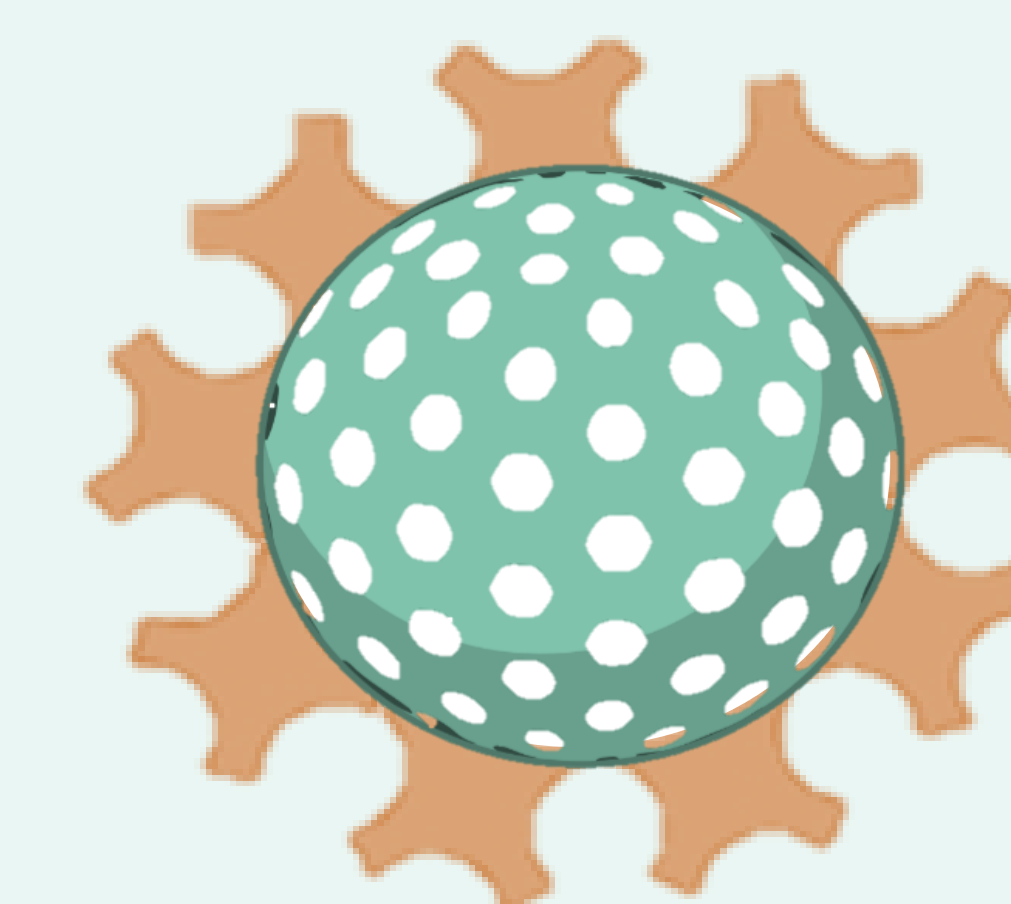
DEVISING COMBINED MODALITIES



Abstract

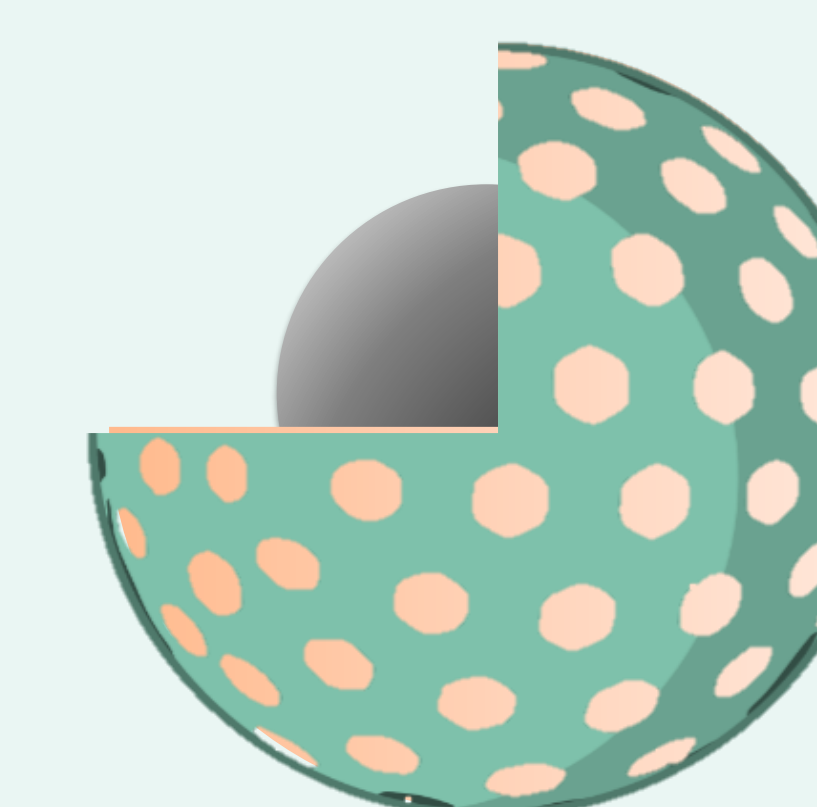
Conclusion

» Construction and surface functionalization of MSNs with different moieties for active cancer-targeting



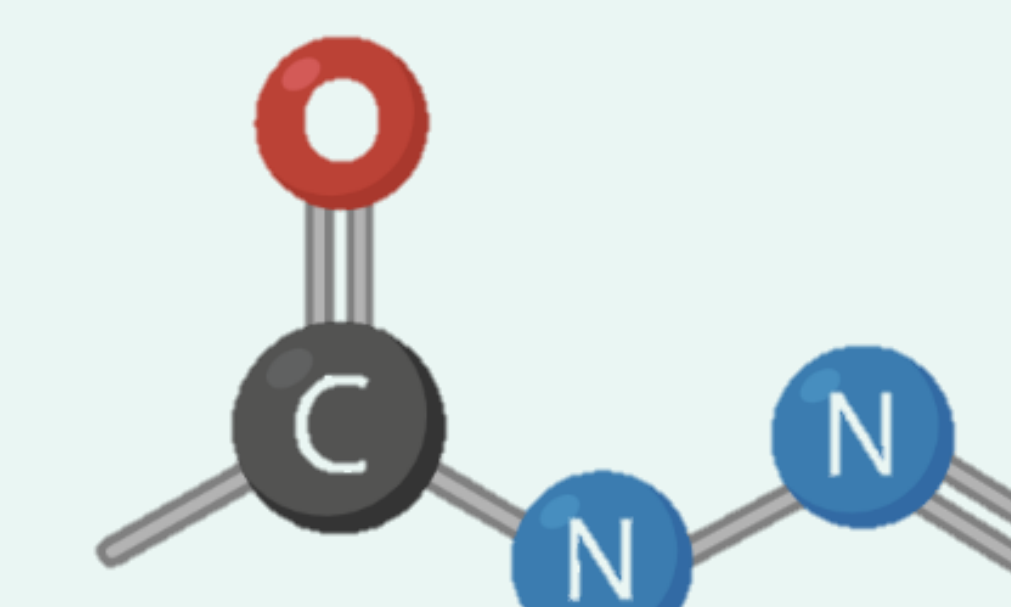
Surface attached
 Glioblastoma Multiforme
 targeting moiety

Specific moieties to enable imaging of cancer

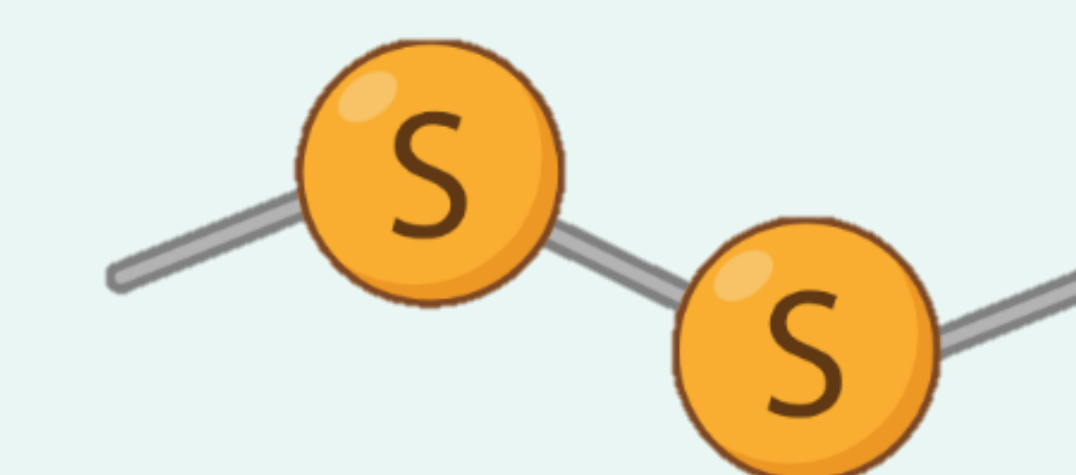


Magnetic core
 and loaded
 contrast agent
 enable MRI

» The drug release-controlled process upon exposure to intratumoral conditions



pH-responsiveness



redox-responsiveness



Simultaneous cancer therapy
 and diagnostics (theranostics)

1. Croissant, J. G., Butler, K. S., Zink, J. I., & Brinker, C. J. (2020). Synthetic amorphous silica nanoparticles: toxicity, biomedical and environmental implications. *Nature Reviews Materials*, 5(12), 886-909.
 2. Zhang, K., Xu, L. L., Jiang, J. G., Calin, N., Lam, K. F., Zhang, S. J., ... & Wu, P. (2013). Facile large-scale synthesis of monodisperse mesoporous silica nanospheres with tunable pore structure. *Journal of the American Chemical Society*, 135(7), 2427-2430.