

Polysaccharides as main tool for designing drug vectors.

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Targeting and biodegradability are some of the main assets supporting any controlled drug delivery modality. In this contribution we show that polysaccharides are functional for supporting such features in the design of micro/ nano devices for a theranostic approach. Recently we developed several poly (vinyl alcohol), PVA, based vectors [1] as potential new ultrasound contrast agent for a combined use as diagnostic and therapeutic devices and as thermosensitive “smart” microgels [2, 3] for supported drug delivery. Addressed use of polysaccharides together with the chemical versatility of the PVA surface of these devices offer a vast variety of coupling modalities useful for coating and specific targeting. We have designed several conjugation strategies to enable the localized doxorubicin delivery on tumor cells. The surface of PVA based microdevices was coated with (i) hyaluronic acid (HA), (ii) oxidized hyaluronic acid (HAox) [4], (iii) galactosylated chitosan (CHIGal) using traditional and “click chemistry” approaches. Bioadhesivity, localization, kinetics of release from differently coated microdevices were investigated as well as their cytocompatibility with respect to healthy fibroblasts (NIH 3T3), human adenocarcinoma cells (HT29) and hepatocarcinoma cells (HepG2). Biodegradation was addressed by using dextran as main component in designing thermosensitive microgels and controlling the drug release.

Both the “biointerface” as well as the biodegradability are pre-requisite for the localization and release functions supported by novel micro/ nano vector.

References

- [1] F. Cavalieri, A. El Hamassi, E. Chiessi, G. Paradossi “Stable Polymeric Microballoons as Multifunctional Device for Biomedical Uses: Synthesis and Characterization.” *Langmuir*, 2005, 21, 8758-8764.
- [2] S. V. Ghugare, P. Mozetic and G. Paradossi “Temperature-Sensitive Poly(vinyl alcohol)/Poly(methacrylate-co-N-isopropyl acrylamide) Microgels for Doxorubicin Delivery” *Biomacromolecules*, 2009, 10, 1589 - 1596
- [3] S. V. Ghugare, E. Chiessi, M. T. F. Telling, A. Deriu, Y. Gerelli, J. Wuttke and G. Paradossi “Structure and Dynamics of a Thermoresponsive Microgel around Its Volume Phase Transition Temperature” *J. Phys. Chem. B*, 114, 10285–10293 (2010)
- [4] B. Cerroni, E. Chiessi, S. Margheritelli, L. Oddo and G. Paradossi “Polymer shelled microparticles for a targeted doxorubicin delivery in cancer therapy” Submitted 2010