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New biocompatible nanoparticles: Multistep chemical modifications and biological applications

Gerardo Byk
Bar Ilan University, Israel

We have developed new biocompatible, non-degradable NPs well tolerated both *in vitro* and *in vivo* with the particularity that peptide synthesis can be carried out on their surface. Although the NP's have a large range of well-defined sizes going from 20 to 400 nm, they are all composed of the same monomers. Their shell composition, in contact with the biological media, is uniformly composed of polyethylene-glycol, thus their biocompatibility remains high along the different sizes. A proposed peculiar mechanism of formation allowed maintaining uniform their shell composition. The conjugation of molecules to the NPs was a real challenge since they are nano-hydrogels with high colloidal stability that can only be dialyzed for eventual removal of reagents. Therefore we have designed and proved a novel solid phase peptide synthesis method for Merrifield synthesis on nanoparticles based on the embedment of the NPs in a permeable and removable magnetic matrix. The platform composed of the NPs and the synthetic peptide is a useful tool for imaging methods for intracellular localization of the NPs using microscopy as we have shown *in vitro* for PC-3 cells a system using TAT, NLS and TAT-NLS peptides on the nanoparticles, and for *in vivo* tracking using the Zebra fish model.

Biography

Gerardo Byk received his PhD (*summa cum laude*) at the Hebrew University of Jerusalem. In his PhD work, he developed a new generation of peptidomimetic molecules by the introduction of the new concept of backbone cyclization. Since August 1992, he has been in AVENTIS, where he was involved in the development of novel non-viral gene delivery complexes for gene therapy. He joined Bar Ilan University/Israel in 1999, was promoted to Associate Professor in 2002, where he is currently associated with the Marcus Center of Pharmaceutical Chemistry. His main scientific interests: peptide, peptidomimetics, combinatorial chemistry and gene therapy. Lastly, his group entered the field of nanotechnology with the design and development of biocompatible nanoparticles suited both for peptide synthesis, and for *in vivo* applications.

gerardo.byk@biu.ac.il

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