Near-infrared laser light mediated antibacterial activity of polyaniline coated surface film

The optical absorption abilities of surface-coated films for photothermal application have been relatively less explored in the construction of antibacterial coatings. Here, we report catechol-conjugated poly(vinylpyrrolidone) sulfobetaine (PVPS) and polyaniline (PANI) tightly linked by ionic interaction (PVPS:PANI) as a novel photothermal antibacterial agent for surface coating capable of absorbs broadband near-infrared (NIR) light. Taking advantage of the NIR light absorption, this coating film can release eminente photothermal heat for the rapid killing of surface bacteria. Although considerable progress has been made in the design of antibacterial coatings, the user control of NIR-irradiated rapid photothermal destruction of surface bacteria holds increasing attention beyond the traditional boundaries of typical antibacterial surfaces.

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Keywords: Antimicrobial surface, NIR light, Polyaniline, Photothermal effect

Tumor-targeted delivery of polymerized veg sirna using thiolated glycol chitosan nanoparticles for treatment of avastin resistant head and neck cancer

Various anticancer agents have been used in cancer therapy due to therapeutic effect based on its own mechanism of action. But, tumor resistance to current antitumor agents is a main defect in cancer therapy. Avastin is a therapeutic antibody neutralizing VEGF to suppress the growth of cancer. But, it also has side effects such as high blood pressure and bleeding limiting its therapeutic application. In this study, small interfering RNA(siRNA) suppressing VEGF expression was delivered to Avastin resistant tumors to overcome the drug resistance of cancer.

Keywords: poly siRNA, VEGF, Avastin

HA/calcium phosphate gene delivery system boosted transfection of human stem cells

Human mesenchymal stem cells (hMSCs) have shown enormous potential in regenerative medicine and tissue engineering. One of the possible approaches to direct differentiation of hMSCs would be transferring extraneous genes to guide the cells’ differentiation to desired fate. However, differentiation of hMSCs to desired cells is often difficult to control especially in vivo situation. Genetic modification of hMSCs may provide an opportunity of controlling behaviors of the cells in an active manner.

One of the major hurdles for genetic manipulation of hMSCs would be the lack of efficient and safe gene delivery system. Herein, an organic-inorganic hybrid gene delivery system based on calcium phosphate (CAP) nanoparticles stabilized with catechol-derivatized hyaluronic acid (dopa-HA) conjugate. Taking advantage of specific interactions between HA and CD44 + bone marrow-derived hMSCs, dopa-HA/CAP nanoparticles showed significantly higher transfection in hMSCs than PEI 25KDa, and delivery of BMP2 pDNA with the dopa-HA/CAP formulation achieved desired level of osteogenic differentiation of hMSCs. So it can be potentially used for genetic manipulation of hMSCs in clinical settings.

Keywords: calcium phosphate, hyaluronic acid, human stem cell

Improved delivery of polypelxes and chemotactic peptide based on microneedle for enhancing immune response

The approach of gene delivery with microneedles has been got many attentions in diverse studies. Although the outstanding capability of carrying DNA into body with microneedle, there is a problem on stability of DNA coated on microneedle surface when it is stored during plenty of times in room temperature. And the period of generating immune responses is important portion to verify efficiency vaccine system with microneedle. In this study, we developed the novel polypelxes delivery system based on microneedle which was accompanied with polyplexes and IMPL peptides. We could be sure that the polyplexes were delivered stably and IMPL peptide was able to increase immune responses due to the ability of immune cell recruitment. Also, the microneedle injection showed more excellent induction of antigen and antibody expression than subcutaneous injection.

Keywords: Vaccination, Microneedle, DNA vaccine, Chemotactic peptide, Immune response

Enhanced cellular delivery of siRNA mediated with micelle-templated dendritic gold nanoparticles

RNA interference (RNAi) has received wide attention for possibility of treat hard to cure disease and gene-related disease in gene therapy. However, due to its short length and rigid structure, cellular delivery of siRNA is often not as efficient as that of plasmid DNA using conventional cationic polymer- and lipid-based carriers. Herein, we synthesized a dendritic gold nanoparticle (Au@MC)-based siRNA delivery system, which provides efficient protection of siRNA and improved cellular uptake. The Au@MC can be synthesized from a block copolymer micelle template with a dendritic structure. Au@MC can efficiently form a stable complex with the siRNA by neutralizing the negative charge of RNA and improving cellular delivery.

Keywords: Antibacterial surface, NIR light, Polyaniline, Photothermal effect

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Keywords: Vaccination, Microneedle, DNA vaccine, Chemotactic peptide, Immune response
bioconjugation, resulting in microarray of protein.

Immersion the biotin-patterned films in rhodamine-conjugated strep-biotin ligand on the poly(NAS-co-OEGMEMA) films and subsequent copolymerization of a biotin ligand was directly performed on poly(NAS-co-OEGMEMA) films without an activation step, resulting in biotinylated, phosphate and azido group of Az-P-LMC was confirmed using 31P-CP) of the polynucleotide membrane, and they exhibited 500% higher light scattering compared to their matrices. We report synthetic method that can provide highly monodisperse gold NPs with gram scale. These nanoparticles can be utilized as a targeting agent in practical applications. Assembled gold nanoparticles based pasmonic magnetic structures for bio applications

We prepared activation-free copolymeric films with high selectivity to biomolecules by surface-initiated Activators Regenerated by Electron Transfer Atom Transfer Radical Polymerization (SI-ARGET ATRP) by monomers such as N-acryloxysuccinimide (NAS) and oligo(ethylene glycol) methyl ether methacrylate (OEGMEMA). Subsequently the coupling of a biotin ligand was directly performed on poly(NAS-co-OEGMEMA) films without an activation step, resulting in biotinylated, poly(NAS-co-OEGMEMA) films. Micro-contact printing (μCP) of the biotin ligand on the poly(NAS-co-OEGMEMA) films and subsequent immersion the biotin-patterned films in rhodamine-conjugated streptavidin solution was performed for evaluating feasibility of selective bioconjugation, resulting in microarray of protein.

Preparation of photocurable natural polymers derivatives and medical applications

We prepared activation-free copolymeric films with high selectivity to biomolecules by surface-initiated Activators Regenerated by Electron Transfer Atom Transfer Radical Polymerization (SI-ARGET ATRP) by monomers such as N-acryloxysuccinimide (NAS) and oligo(ethylene glycol) methyl ether methacrylate (OEGMEMA). Subsequently the coupling of a biotin ligand was directly performed on poly(NAS-co-OEGMEMA) films without an activation step, resulting in biotinylated, poly(NAS-co-OEGMEMA) films. Micro-contact printing (μCP) of the biotin ligand on the poly(NAS-co-OEGMEMA) films and subsequent immersion the biotin-patterned films in rhodamine-conjugated streptavidin solution was performed for evaluating feasibility of selective bioconjugation, resulting in microarray of protein.

Keywords: Activation-Free, ARGET ATRP, Selective Bioconjugation

Preparation of dual functional low-molecular-weight chitosan derivatives for medical application

Dual functional low molecular weight chitosan derivative (LMC) was prepared by introducing phosphate and azido group to LMC (Az-P-LMC). Az-P-LMC has two properties, which are adherable to titanium and photo-curable. The titanium-adherable property of Az-P-LMC promote cell attachment test and photo-curing test. Also, for medical application, cytotoxicity test was proceeded by WST assay. And for checking the capacity of drugs immobilization, the protein releasing test was carried out. Keywords: chitosan, dual function, reforming of titanium surface, medical application

Preparation of photoreactive natural polymer derivatives for the stabilization protein drugs and its medical application

Diverse biological effects are known by binding to cell surface receptors of bio-signal molecules. Therefore, the stabilization of bio-signal molecules such as hormones and growth factors are especially important for clinical therapeutics like drug delivery system and tissue regeneration system. Many methods for immobilization of biomolecules have been examined and developed. Among the methods, light-induced immobilization techniques have been investigated and used up to recently. These immobilization techniques have many advantages that are temperature and pH independent. So, I have been studying various natural polymers with the photo immobilization techniques to stabilize protein drugs for medical application.

Keywords: photo-reactive, chitosan, protein drug, photo-immobilization

Preparation of photocurable natural polymers derivatives and medical applications

Many types of proteins have been investigated for their therapeutic benefits, resulting in various reports of high efficiency and low side effects. In particular, research on protein stabilization is needed to protect the specific activity of proteins in different conditions. Several methods are immobilizing on matrices and can prevent their specific activity. Many methods for immobilization of biomolecules have been examined and developed. Among the methods, light-induced immobilization techniques have been investigated and used up to recently. These immobilization techniques have many advantages that are temperature and pH independent. So, I have been studying various natural polymers with the photo immobilization techniques to stabilize protein drugs for medical application.

Keywords: natural polymer, Drug immobilization, Photo-reactive, Medical application

Scale-up of SERS nanoprobes with high reproducibility and long-term stability

Surface-enhanced Raman scattering nanoprobes (SERS dots) were prepared using a large-scale synthetic method. High sensitivity of the SERS dots was demonstrated by analyzing single particles, and their long-term stability was proved by storing them in buffer solution and deionized water for 300 hours. These features suggest that the SERS dots can be utilized as a targeting agent in practical applications.

Keywords: Metal, bioapplication

Assembled gold nanoparticles based pasmonic magnetic structures for bio applications

We report synthetic method that can provide highly monodisperse (104.2nm ± 2.4nm) silica coated magnetic nanoparticles (MNP(SiO2 NPs) with gram scale. The MNP(SiO2 NPs exhibited superparamagnetic property and no aggregation was detected even after 3 months storage. In addition, a plasmon and magnetic materials using gold NPs (MNP@SiO2 NPs) were fabricated by simple addition of Au NPs to magnetic NPs, and they exhibited 500% higher light scattering compared to same sized gold NPs.

Keywords: Gold, magnetic...