세미나 초록

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발표 주제	Cell membrane-derived nanocarriers for systemic delivery
발표 내용	The unique biological characteristics and promising clinical potential of cell membrane-derived vehicles have led to their novel applications for therapeutic delivery. Intensive research on extracellular vesicles (EVs) has revealed their biological aspects, brought about advancements in development and functionalization of EVs, and opened up new avenues for their application in regenerative medicine. EVs play major roles in regulatory or pathologic intercellular communication and are thus being actively explored as potential biotherapeutics for tissue regeneration. A greater understanding of the molecular contents and biological functions of EVs has promoted the development of various engineering approaches that aim at improving the therapeutic or targeting activities of EVs in pre-clinical stages. In recent years, various engineering approaches such as preconditioning, drug loading, and surface modification have been developed to potentiate the therapeutic outcomes of EVs. Also, limitations of natural EVs have been addressed by the development of artificial EVs that offer advantages in terms of production yield and isolation methodologies. Herein, systemic administration of artificial EVs isolated from mesenchymal stem cells and their therapeutic outcomes in central nervous system injuries are presented. Next, we report cell membrane-functionalized lipid nanoparticles (LNPs). LNPs are widely used as drug carriers for cancer therapy, as well as mRNA delivery carriers in clinics. During the delivery of anti-cancer drugs, unwanted leakage of the encapsulated drugs and poor tumor-targeting efficiency of LNPs may generate toxic side effects on healthy cells and lead to failure of tumor eradication. To overcome these limitations, we functionalized LNPs with cell membrane to generate the hybridized formulation. A lipid adjuvant was also embedded in the lipocomplex to promote the anticancer immune response. The LNPs functionalized with cancer cell membrane and lipid adjuvant generated cytotoxic reactive oxygen species in photodynamic

	therapy and effectively induced anticancer immune responses, inhibiting primary tumor growth and lung metastasis in homotypic tumor-bearing mice. Comprehensive research has revealed that LNPs efficiently encapsulate the mRNA for stable intracellular delivery. However, due to the potential toxicity caused by intravenous administration of multiple doses of LNPs, the alternative substances are needed to be introduced. Polyethylene glycol (PEG) has been commonly utilized as a major component of currently commercialized (e.g.Moderna) LNPs. Because of its unique characteristics of structural stability and prolonged blood circulation of LNPs, the injection of PEG can cause toxicity by production of anti-PEG antibodies in vivo. To overcome such drawbacks, we present a hybrid form of clinically available LNPs. The hybrid form is consisted with integrated form of red blood cell (RBC) membrane-derived nanovesicles and LNP lipids. We report the methods for integrating cell membranes extracted from RBC ghost into a hybrid delivery platform.