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Proteomics analysis of rat serum seeking for new transporters across blood-brain barrier

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Blood-brain barrier (BBB) is a protective structure in central nervous system (CNS) for the immunological and physiological safety. However, this protection system could cause unmet medical needs for CNS disease therapy. Transport of drugs by receptor-mediated transcytosis (RMT) has been investigated as a means for many drugs to penetrate the BBB. However, proteins that could be used as a transporter of drugs or drug carriers via RMT on BBB have been scarcely known, such as transferrin and apoE lipoprotein. In this study, we screened transporters from rat serum by proteomics to expand the pool of RMT transporters. *In vitro* RMT assay system was set up and several candidate proteins were proposed as the transporter by the analysis of protein profiles using an inhibitor of RMT. The proteins that showed over five fold decrease in RMT when treated with chlorpromazine, an inhibitor of clathrin-dependent endocytosis, were selected and identified by Maldi-TOF mass spectroscopy. 11 proteins including transthyretin were identified as being capable of penetrating the endothelial cell layer by RMT. Among them, 10 proteins have not yet been used as the transporter across BBB. To validate their activity as transporters *in vivo*, transthyretin was conjugated to the surface of nano-sized quantum dots (QDs) and injected intravenously. After 8 hours, the distribution of transthyretin-QDs in brain tissue was analyzed. The results showed that transcytosis of nano-sized particles were increased by incorporation of transthyretin. Taken together, proteomics of serum proteins were applied successfully to find out new transporter through BBB which would be a promising tool in CNS-related disease therapy by targeting of drugs directly to brain tissues.

Biography

Eunjoon Kim is a Principal Research Scientist of Division of Nano & Energy Research, DGIST. She completed her BS and MS in Biochemistry at Yonsei University and PhD in Environmental Toxicology at Seoul National University, Korea. Currently, her research interest includes "The nanomedicine and nanotoxicology, especially for the development of diagnostic and therapeutic tools based on nano-bio materials". She also concentrates in developing new types of biomarkers and their detection system for liquid biopsy, such as exomes and circulating tumor cells based on nano-bio technologies. She is also an Editorial Board of *Toxicology* and *Environmental Health Sciences* published by Society of Environmental Risk Assessment and Health Sciences.

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