Biomaterial-mediated adeno-associated virus (AAV) engineering for gene-cell therapy applications

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Viral vectors are advantageous that are composed of highly homogeneous particles as well as gene delivery functions. They can be used as a therapeutic agent by themselves or in combination with cells for intractable diseases including various genetic and incurable diseases. Among those, adeno-associated viral (AAV) vector is the most widely utilized vector nowadays due to its outstanding safety and efficacy, and there are an aggressively increasing number of AAV-based clinical trials as well as commercially available products licensed by FDA and EMA. However, the naïve AAV delivery possess some drawbacks, for example, rapid clearance by spreading and immune reaction, and incontrollable emission which can cause the safety and efficiency issues for the clinical use. In this presentation, various strategies that combine the AAVs and biomaterials to enhance the delivery efficiency and target specific tissues in vivo and ex vivo approaches were suggested. Those engineered AAVs incorporated with biomaterials were able to target the specific tissues, evade the immune responses, induce certain patterns and enhance the transduction efficiency.