Potential of aptamers as anti-fibrotic therapeutics

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Aptamers are single-stranded oligonucleotides that bind to specific target molecules. Once bound to specific targets, aptamers inhibit their activities. Monoclonal antibodies have been applied in the clinical field to suppress the activity of specific proteins. However, using antibodies to treat diseases is accompanied by some critical limitations, such as low bio-stability, the induction of undesirable immune responses, and high production costs. Aptamers are produced chemically requiring no organisms for production therefore enabling mass production at low costs. They also have advantages over antisense oligonucleotides or siRNAs in that aptamers could target not only intracellular proteins but also extracellular and cell surface molecules as well. In addition, aptamers are more stable under various environmental conditions and are less immunogenic compared to monoclonal antibodies. Due to these advantages, aptamers have been proposed as promising drug candidates to inhibit specific target molecules in various diseases. Animal studies as well as clinical research on aptamers targeting human immunodeficiency virus trans-acting responsive element, interferon ɤ, and vascular endothelial growth factor are ongoing to evaluate their potential as therapeutics for disease, such as HIV infection and age-related macular degeneration. Furthermore, a periostin-binding DNA aptamer was recently identified to suppress breast cancer growth and metastasis by inhibiting EMT in breast cancer cells.

Recent observations on the effect of using aptamers to ameliorate tubulointerstitial and peritoneal fibrotic changes in diabetic nephropathy and peritoneal dialysis animal models will be introduced. In addition, the potential of aptamers being used as anti-fibrotic therapeutics in the field of nephrology will be discussed.