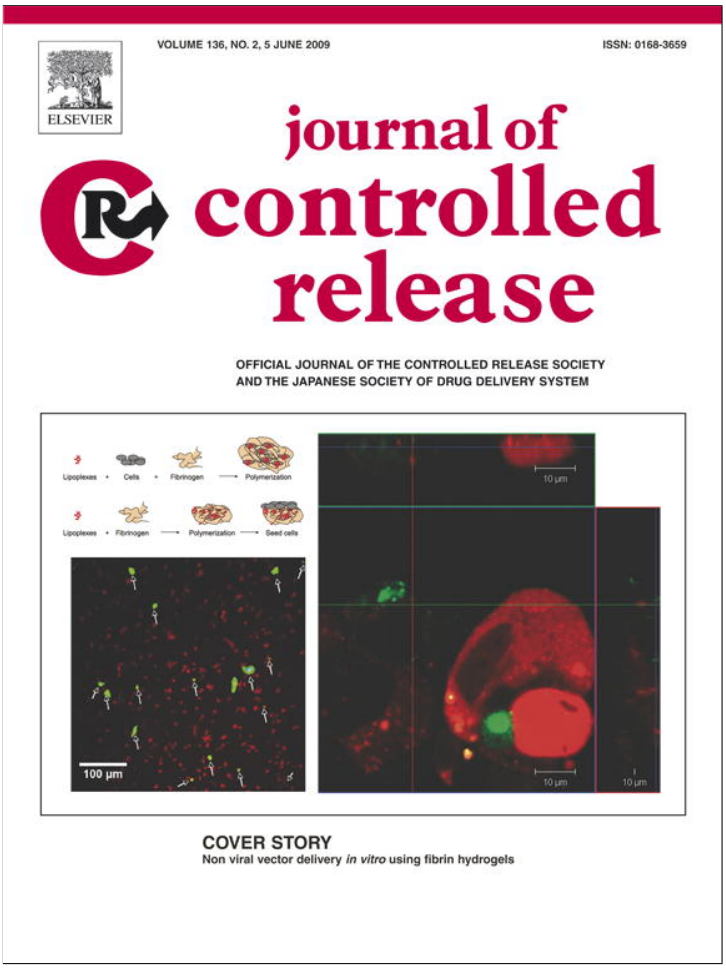

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Cover Story

Non viral vector delivery *in vitro* using fibrin hydrogels

Hydrogels have been used widely in various applications ranging from consumer products to drug delivery. Recently, hydrogels have been under development to provide controllable microenvironments for applications in promoting tissue growth both *in vitro* and *in vivo*. Basically, hydrogels are used to mimic the natural extracellular matrix (ECM). For such applications hydrogels need to create environments that simulate various properties (e.g., mechanics) and functions (e.g., cell adhesion) of the ECM. Hydrogels can have additional functions by modulating the delivery of drugs or genes to the cells which are in contact with them. The paper by des Rieux et al. in this issue describes a new unique application of hydrogels for improved gene delivery [1]. In their study, the authors used hydrogels made of fibrin, which is derived from fibrinogen, a natural component of the blood.

des Rieux et al. investigated gene transfer to cells within the fibrin gel or to cells infiltrating the hydrogel. The results suggest that the interactions between the hydrogel and vector are critical to maximizing the gene expression. Fibrin-based hydrogels were employed in their study, as they support cell adhesion and migration and have been widely used to model tissue growth *in vitro*. Non-specific interactions between the lipoplexes and the hydrogel maintain the original particle size by limiting aggregation, and retain the lipoplexes within the hydrogel for extended periods of time. Even though the lipoplex–fibrin interactions can potentially limit the quantity of the internalized particles, confocal microscopy indicates that cells had intracellular plasmid. Transfection was delayed for cells infiltrating to the hydrogels relative to that observed with encapsulated cells. Yet, transfection increased with culture time in both cases. Taken together, vector–hydrogel interactions, cell migration, and the targets of transfection (i.e., infiltrating or encapsulated) need to be considered for applying gene transfer to *in vitro* models of tissue growth to augment the intrinsic bioactivity of the hydrogel.

The study by des Rieux et al. shows that the bioactivity of hydrogels can be enhanced by delivering genes to the cells. The cells express the gene function as bioreactors for the localized and sustained protein production for long-term efficacy. Although the potential for gene delivery in regenerative medicine and tissue engineering has been demonstrated, its practical application is limited by delivery systems that cannot provide sufficient gene transfer. The fibrin hydrogel approach can be a highly useful method for efficient delivery of various genes into the target cells.

Reference

[1] A. des Rieux, A. Shikanov, L.D. Shea, Fibrin hydrogels for non-viral vector delivery in vitro, J. Control. Release 148 (1999) 148–154.

Kinam Park
Purdue University,
Departments of Biomedical Engineering and Pharmaceutics,
West Lafayette, Indiana, USA
E-mail address: kpark@purdue.edu.

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