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Promoting Sustainable Kidney Health: The Asia-Pacific and Beyond

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New Strategies for Improving Kidney dECM Recellularization Efficiency

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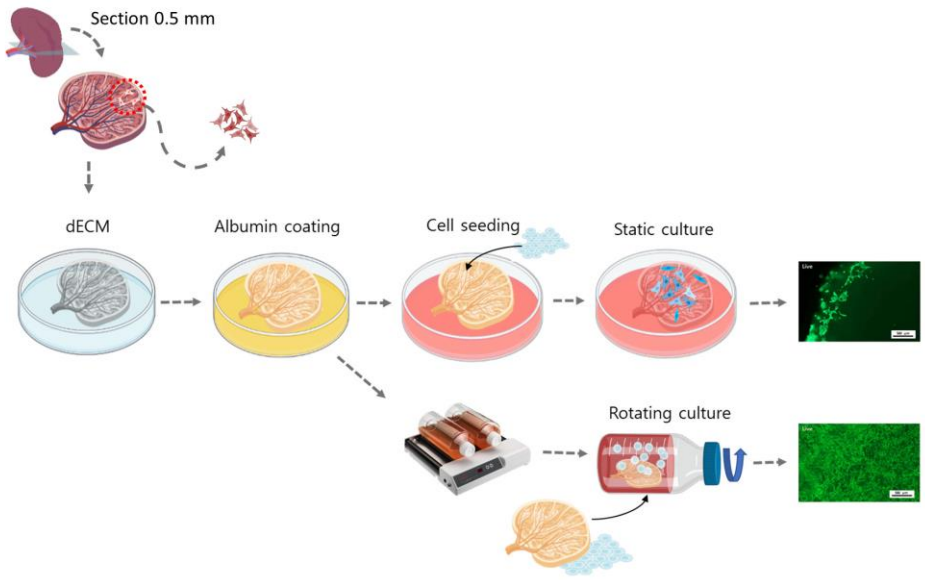
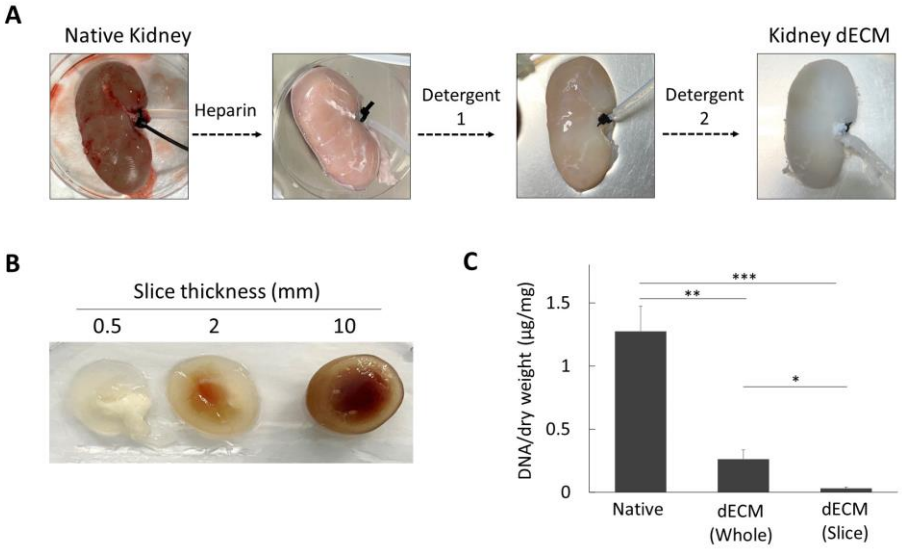
Objectives : The utilization of decellularized extracellular matrix (dECM) from kidneys has emerged as a pivotal strategy in renal tissue engineering, offering a natural scaffold for regenerative applications and as a bioartificial organ for transplantation. This study explores the synergistic impact of albumin coating on kidney dECM to enhance the recellularization processes. It introduces a novel approach employing albumin and a rotating culture system to elevate recellularization efficiency and mitigate thrombosis.
Methods : Porcine kidney decellularization was optimized through whole organ perfusion or slice immersion. Subsequently, the dECM was coated with an albumin solution and cultured in a rotating system. Cell proliferation was quantified using ELISA, while cell penetration into the tissue was evaluated through fluorescence staining.
Results : The application of albumin coating and a rotation culture system significantly improved the recellularization efficiency of kidney dECM. The albumin-coated dECM exhibited notable enhancements in cell attachment and spreading, fostering an advantageous microenvironment for renal cell repopulation. Furthermore, albumin coating demonstrated efficacy in preventing blood clot formation during perfusion post-recellularization. The rotation culture process contributed to an increased cell proliferation rate by enhancing cell penetration into the tissues.
Conclusions : Albumin coating of kidney dECM scaffolds emerged as a powerful strategy to augment recellularization by facilitating cell adhesion and proliferation. Notably, albumin coating exhibited efficacy in preventing thrombus formation. These findings advance the development of improved dECM-based scaffolds, offering enhanced recellularization potential and reduced thrombosis risk. Ultimately, this research contributes to the progress of kidney regenerative medicine and transplantation.

슬라이드 2.jpg


Section 0.5 mm
dECM
Albumin coating
Cell seeding
Static culture
Rotating culture

슬라이드 2.jpg


A
Native Kidney
Heparin
Detergent 1
Detergent 2
Kidney dECM
B
Slice thickness (mm)
0.5
2
10
C
DNA/dry weight (μg/mg)
1.5
1
0.5
0
***
**
*
Native
dECM (Whole)
dECM (Slice)