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Ovarian Transplantation with Drug-Delivering Tissue Engineering: A Cross-Field in Vivo Transgenic Mouse Study.

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Objective: Frozen/thawed ovarian tissue cryopreservation by autotransplantation is an experimental option for fertility preservation of female cancer patients. The majority handicap caused by reperfusion/ischemia injury limits the lifespan of the ovarian grafts. The graft survival may be improved by vascular endothelial growth factor (VEGF) to promote angiogenesis, sphingosine-1-phosphate (S1P) to lessen apoptosis to protect ovarian grafts from ischemic reperfusion injury and Curcumin to be a reactive oxygen species scavenger. The biocompatible scaffolds can be served as connections between the host and grafts and as vehicles for drug delivery. This study aimed to investigate the efficacy of scaffolds for delivering different agents in promoting survival of ovarian grafts.

Materials and Methods: We use porous membranous poly-L-lactic acid scaffolds served as vehicles for drug delivery to promote the graft survival. Ovaries from 8-week-old FVB/N-Tg(*PollI-Luc*)Ltc transgenic mice with or without scaffolds loaded with S1P (2 mM, 5 μ L), VEGF (0.2 mg/ml, 5 μ L) or curcumin (50 μ M, 5 μ L) were transplanted into the peritoneum of wild-type mice. The graft survival was tracked in vivo by bioluminescence imaging (BLI), and histological examination was performed at the end of the experiment.

Results : Stronger intensity of bioluminescence was observed in the ovaries with S1P-and VEGF- loaded scaffolds than those in the scaffolds with curcumin or without drugs. Histological examination showed more follicles and surrounding vessels in the S1P group compared with other groups, indicating better survival of the grafts.

Conclusions: In spite of every effort to improved graft survival, we demonstrated that scaffolds loaded with S1P can promote the best ovarian graft survival. Scaffolds mimicking the structure and biological function of native extracellular matrix are beneficial for tissue growth, and applying tissue engineering technology may overcome part of limitations of ischemia/reperfusion on the graft.