Supplementary Information

Supplementary Table 1. Representative technological advances from conventional organ preservation to xenotransplantation

Technology/strategy	Main application	Major advantage	Current limitation	References
Static cold storage (SCS)	Conventional organ preservation	Simple and widely used	Limited protection against ischemia–reperfusion injury	[1, 2]
Hypothermic oxygenated perfusion (HOPE)	Kidney and liver preservation	Reduces ischemic and mitochondrial injury	Clinical benefits vary across donor settings	[3, 4]
Normothermic machine perfusion (NMP)	Kidney, liver, and heart preservation	Ennctional assessment and organ reconditioning	Cost, complexity, and standardization remain issues	[5-7]
Targeted immunomodulation	Desensitization and rejection control	Improves immune compatibility and graft survival	Long - term balance between efficacy and safety remains unresolved	[8-10]
Multi-gene-edited porcine donor organs	Xenotransplantation	Expands potential donor pool and reduces major xenoantigenicity	Residual immune, coagulation, and biosafety barriers persist	[11-13]

Note: This table summarizes representative technological advances in organ transplantation and xenotransplantation discussed in the main text.

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