

Generation of Cardiac Valve Cells for Regenerative Valve Repair

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Background

Heart valve disease affects millions of patients worldwide and remains a major cause of morbidity and mortality. Current treatments rely primarily on surgical repair or replacement using mechanical or bioprosthetic valves. While these interventions are effective, they are also associated with important limitations, including limited durability, calcification, thrombosis risk, immune complications, and the inability to grow or remodel within the patient.

Technology

Researchers from the Max Planck Institute for Heart and Lung Research have identified **Early Growth Response 3 (EGR3)** as a **key regulator of cardiac valve cell differentiation, independently of cardiac contractions**, and developed a novel method for generating cells with the phenotype of cardiac valve cells. This technology opens new opportunities for regenerative therapies, tissue-engineered heart valves, and advanced *in vitro* disease models.

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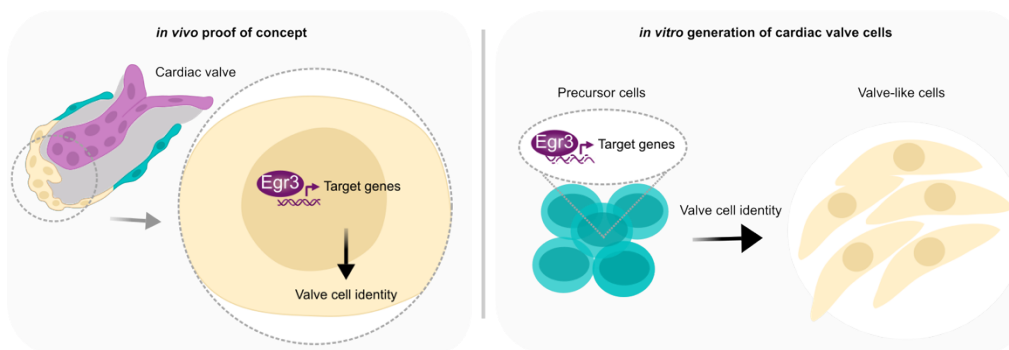


Figure 1
Generation of cardiac valve cells for regenerative valve repair.

Key Advantages

- **Novel biological mechanism:** EGR3 as a master regulator of cardiac valve differentiation.
- **Simplified differentiation strategy** compared with conventional protocols requiring complex growth-factor combinations.
- **Generation of valve-specific cell types** for tissue engineering and regenerative medicine.
- Potential for autologous therapies (patient-derived cells), reducing immune rejection risks.
- Platform technology applicable to cell therapy, tissue-engineered valves, gene therapy, and disease modeling.

Applications are gene or mRNA-based approaches for heart valve repair and regeneration, while also providing standardized human valve cell models for disease modeling, drug discovery, and cardiovascular research.

Opportunity

We are seeking industrial partners to further develop and commercialize the technology.

Patent Information

International Patent Application (PCT): **WO 2025237949**

Scientific Publication

Da Silva AR et al., Sci Adv. 2024, "egr3 is a mechanosensitive transcription factor gene required for cardiac valve morphogenesis", doi: 10.1126/sciadv.adl0633