Nature Reviews Cardiology **9**, 67 (2012); published online 6 December 2011; doi:10.1038/nrcardio.2011.197

STEM CELLS

DO FETAL CELLS REPAIR MATERNAL HEARTS?

A new study has shown that fetal cells transfer to the maternal myocardium during pregnancy. Notably, these cells seem specifically to target, and might help repair, injured regions of the heart.

Dr Hina Chaudhry, from Mount Sinai School of Medicine, NY, USA, noticed the coincidence of a "high rate of recovery in patients with peripartum cardiomyopathy, whereby 50% of women spontaneously recover from heart failure" and "more stem cells in the hearts of younger patients with cardiomyopathy compared with older patients". She wondered, therefore, "if fetal cells might be contributing to the high rate of recovery".

Wild-type, virgin, female mice were crossed with transgenic male mice heterozygous for the enhanced green fluorescent protein (eGFP). The female mice had their left anterior descending coronary artery ligated to induce a ~50% anterolateral myocardial infarction at day 12 of gestation. Infarcted hearts harvested 2 weeks after myocardial infarction contained 12-fold more eGFP than controls, and 8-fold more eGFP than sham-operated mice. Quantitative PCR showed that 1.7% of the total injured maternal heart was composed of eGFP cells, and the fetal cells specifically targeted injured regions of the myocardium, where they differentiated into endothelial cells, smooth muscle cells, and cardiomyocytes. Fetal cells isolated from maternal hearts mimicked these differentiation pathways *in vitro*, and also formed vascular tubes and spontaneously beating cardiomyocytes.

"Although the stem cells that homed to the maternal heart included diverse stem-cell types, a significant proportion (almost 40%) appeared to express Cdx2, a marker of trophoblast stem cells, which have never previously been implicated in organ repair," says Dr Chaudhry. "We are now selecting specifically Cdx2 cells from mouse and human placentas and transplanting them into a rodent infarction model to test whether they cause recovery of cardiac function and differentiate to heart and blood-vessel cell types."

Microchimerism seems to be important in the maternal response to cardiac injury, and has wide-ranging implications for allogeneic stem-cell transplantation and regenerative biology in cardiac disease and beyond.

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Original article Kara, R. J. *et al.* Fetal cells traffic to injured maternal myocardium and undergo cardiac differentiation. *Circ. Res.* doi:10.1161/CIRCRESAHA.111.249037