Transcriptional and functional profiling of human embryonic stem cell-derived cardiomyocytes.

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Public Summary:

Scientific Abstract:
Human embryonic stem cells (hESCs) can serve as a potentially limitless source of cells that may enable regeneration of diseased tissue and organs. Here we investigate the use of human embryonic stem cell-derived cardiomyocytes (hESC-CMs) in promoting recovery from cardiac ischemia reperfusion injury in a mouse model. Using microarrays, we have described the hESC-CM transcriptome within the spectrum of changes that occur between undifferentiated hESCs and fetal heart cells. The hESC-CMs expressed cardiomyocyte genes at levels similar to those found in 20-week fetal heart cells, making this population a good source of potential replacement cells in vivo. Echocardiographic studies showed significant improvement in heart function by 8 weeks after transplantation. Finally, we demonstrate long-term engraftment of hESC-CMs by using molecular imaging to track cellular localization, survival, and proliferation in vivo. Taken together, global gene expression profiling of hESC differentiation enables a systems-based analysis of the biological processes, networks, and genes that drive hESC fate decisions, and studies such as this will serve as the foundation for future clinical applications of stem cell therapies.