

Mending the Broken Heart

Bibliography of One Hundred Key Papers

selected by **Ira S. Cohen***[†], MD, PhD and **Glenn R. Gaudette‡**, PhD

*Department of Physiology and Biophysics - [†]Institute for Molecular Cardiology - Stony Brook University - NY

‡Department of Biomedical Engineering - Worcester Polytechnic Institute - Worcester - Mass - USA

- | | |
|--|--|
| Aghi M, Cohen KS, Klein RJ, Scadden DT, Chioocca EA. | <i>Tumor stromal-derived factor-1 recruits vascular progenitors to mitotic neovasculature, where microenvironment influences their differentiated phenotypes.</i>
Cancer Res. 2006;66:9054-9064. |
| Arnesen H, Lunde K, Aakhus S, Forfang K. | <i>Cell therapy in myocardial infarction.</i>
Lancet. 2007;369:2142-2143. |
| Balsam LB, Wagers AJ, Christensen JL, Kofidis T, Weissman IL, Robbins RC. | <i>Haematopoietic stem cells adopt mature haematopoietic fates in ischaemic myocardium.</i>
Nature. 2004;428:668-673. |
| Bauer A, McDonald AD, Nasir K, et al. | <i>Inhibitory G protein overexpression provides physiologically relevant heart rate control in persistent atrial fibrillation.</i>
Circulation. 2004;110:3115-3120. |
| Beltrami AP, Barlucchi L, Torella D, et al. | <i>Adult cardiac stem cells are multipotent and support myocardial regeneration.</i>
Cell. 2003;114:763-776. |
| Beltrami AP, Urbanek K, Kajstura J, et al. | <i>Evidence that human cardiac myocytes divide after myocardial infarction.</i>
N Engl J Med. 2001;344:1750-1757. |
| Berry MF, Engler AJ, Woo YJ, et al. | <i>Mesenchymal stem cell injection after myocardial infarction improves myocardial compliance.</i>
Am J Physiol Heart Circ Physiol. 2006;290:H2196-H2203. |
| Biel M, Schneider A, Wahl C. | <i>Cardiac HCN channels: structure, function, and modulation.</i>
Trends Cardiovasc Med. 2002;12:206-212. |
| Busk PK, Hinrichsen R, Bartkova J, et al. | <i>Cyclin D2 induces proliferation of cardiac myocytes and represses hypertrophy.</i>
Exp Cell Res. 2005;304:149-161. |
| Chien KR. | <i>Stem cells: lost in translation.</i>
Nature. 2004;428:607-608. |
| Cho HC, Kashiwakura Y, Marban E. | <i>Creation of a biological pacemaker by cell fusion.</i>
Circ Res. 2007;100:1112-1115. |
| Dai W, Hale SL, Martin BJ, et al. | <i>Allogeneic mesenchymal stem cell transplantation in postinfarcted rat myocardium: short- and long-term effects.</i>
Circulation. 2005;112:214-223. |

Bibliography of One Hundred Key Papers

- Deb A, Wang S, Skelding KA, Miller D, Simper D, Caplice NM.** *Bone marrow-derived cardiomyocytes are present in adult human heart: a study of gender-mismatched bone marrow transplantation patients.* **Circulation.** 2003;107:1247-1249.
-
- DiFrancesco D.** *The contribution of the “pacemaker” current (I_f) to generation of spontaneous activity in rabbit sino-atrial node myocytes.* **J Physiol.** 1991;434:23-40.
-
- DiFrancesco D, Tortora P.** *Direct activation of cardiac pacemaker channels by intracellular cyclic AMP.* **Nature.** 1991;351:145-147.
-
- Dimmeler S, Burchfield J, Zeiher AM.** *Cell-based therapy of myocardial infarction.* **Arterioscler Thromb Vasc Biol.** 2008;28:208-216.
-
- Dimmeler S, Leri A.** *Aging and disease as modifiers of efficacy of cell therapy.* **Circ Res.** 2008;102:1319-1330.
-
- Donahue JK, Heldman AW, Fraser H, et al.** *Focal modification of electrical conduction in the heart by viral gene transfer.* **Nat Med.** 2000;6:1395-1398.
-
- Donahue JK, Kikuchi K, Sasano T.** *Gene therapy for cardiac arrhythmias.* **Trends Cardiovasc Med.** 2005;15:219-224.
-
- Dowell JD, Field LJ, Pasumarthi KB.** *Cell cycle regulation to repair the infarcted myocardium.* **Heart Fail Rev.** 2003;8:293-303.
-
- Edelberg JM, Aird WC, Rosenberg RD.** *Enhancement of murine cardiac chronotropy by the molecular transfer of the human β_2 adrenergic receptor cDNA.* **J Clin Invest.** 1998;101:337-343.
-
- Engel FB, Schebesta M, Duong MT, et al.** *p38 MAP kinase inhibition enables proliferation of adult mammalian cardiomyocytes.* **Genes Dev.** 2005;19:1175-1187.
-
- Fazel S, Cimini M, Chen L, et al.** *Cardioprotective c-kit⁺ cells are from the bone marrow and regulate the myocardial balance of angiogenic cytokines.* **J Clin Invest.** 2006;116:1865-1877.
-
- Fleury S, Simeoni E, Zuppinger C, et al.** *Multiply attenuated, self-inactivating lentiviral vectors efficiently deliver and express genes for extended periods of time in adult rat cardiomyocytes in vivo.* **Circulation.** 2003;107:2375-2382.
-
- Fraidenraich D, Stillwell E, Romero E, et al.** *Rescue of cardiac defects in *id* knockout embryos by injection of embryonic stem cells.* **Science.** 2004;306:247-252.
-
- French BA, Mazur W, Geske RS, Bolli R.** *Direct in vivo gene transfer into porcine myocardium using replication-deficient adenoviral vectors.* **Circulation.** 1994;90:2414-2424.
-
- Hammond HK, Tang T.** *Gene therapy for myocardial infarction-associated congestive heart failure: how far have we got?* **Dialogues Cardiovasc Med.** 2009;14:27-34.
-



-
- He JQ, Ma Y, Lee Y, Thomson JA, Kamp TJ.** *Human embryonic stem cells develop into multiple types of cardiac myocytes: action potential characterization.*
Circ Res. 2003;93:32-39.
-
- Hou D, Youssef EA, Brinton TJ, et al.** *Radiolabeled cell distribution after intramyocardial, intracoronary, and interstitial retrograde coronary venous delivery: implications for current clinical trials.*
Circulation. 2005;112:1150-1156.
-
- Hsieh PC, Segers VF, Davis ME, et al.** *Evidence from a genetic fate-mapping study that stem cells refresh adult mammalian cardiomyocytes after injury.*
Nat Med. 2007;13:970-974.
-
- Hua F, Johns DC, Gilmore RF Jr.** *Suppression of electrical alternans by overexpression of HERG in canine ventricular myocytes.*
Am J Physiol Heart Circ Physiol. 2004;286:H2342-H2352.
-
- Hund TJ, Rudy Y.** *Rate dependence and regulation of action potential and calcium transient in a canine cardiac ventricular cell model.*
Circulation. 2004;110:3168-3174.
-
- Kashiwakura Y, Cho HC, Barth AS, Azene E, Marban E.** *Gene transfer of a synthetic pacemaker channel into the heart: a novel strategy for biological pacing.*
Circulation. 2006;114:1682-1686.
-
- Kehat I, Kenyagin-Karsenti D, Snir M, et al.** *Human embryonic stem cells can differentiate into myocytes with structural and functional properties of cardiomyocytes.*
J Clin Invest. 2001;108:407-414.
-
- Kehat I, Khimovich L, Caspi O, et al.** *Electromechanical integration of cardiomyocytes derived from human embryonic stem cells.*
Nat Biotechnol. 2004;22:1282-1289.
-
- Kinnaird T, Stabile E, Burnett MS, et al.** *Marrow-derived stromal cells express genes encoding a broad spectrum of arteriogenic cytokines and promote in vitro and in vivo arteriogenesis through paracrine mechanisms.*
Circ Res. 2004;94:678-685.
-
- Kochupura PV, Azeloglu EU, et al.** *Tissue-engineered myocardial patch derived from extracellular matrix provides regional mechanical function.*
Circulation. 2005;112:1144-1149.
-
- Kofidis T, Lebl DR, Martinez EC, Hoyt G, Tanaka M, Robbins RC.** *Novel injectable bioartificial tissue facilitates targeted, less invasive, large-scale tissue restoration on the beating heart after myocardial injury.*
Circulation. 2005;112:1173-1177.
-
- Kolossov E, Bostani T, Roell W, et al.** *Engraftment of engineered ES cell-derived cardiomyocytes but not BM cells restores contractile function to the infarcted myocardium.*
J Exp Med. 2006;203:2315-2327.
-
- Kraitchman DL, Tatsumi M, Gilson WD, et al.** *Dynamic imaging of allogeneic mesenchymal stem cells trafficking to myocardial infarction.*
Circulation. 2005;112:1451-1461.
-

Bibliography of One Hundred Key Papers

- Laflamme MA, Chen KY, Naumova AV, et al.** *Cardiomyocytes derived from human embryonic stem cells in pro-survival factors enhance function of infarcted rat hearts.* **Nat Biotechnol.** 2007;25:1015-1024.
-
- Laflamme MA, Murry CE.** *Regenerating the heart.* **Nat Biotechnol.** 2005;23:845-856.
-
- Lai NC, Roth DM, Gao MH, et al.** *Intracoronary adenovirus encoding adenylyl cyclase VI increases left ventricular function in heart failure.* **Circulation.** 2004;110:330-336.
-
- Lau DH, Clausen C, Sosunov EA, et al.** *Epicardial border zone overexpression of skeletal muscle sodium channel, SkMI, normalizes activation, preserves conduction, and suppresses ventricular arrhythmia: an in silico, in vivo, in vitro study.* **Circulation.** 2009;119:19-27.
-
- Laugwitz KL, Moretti A, Lam J, et al.** *Postnatal isl1+ cardioblasts enter fully differentiated cardiomyocyte lineages.* **Nature.** 2005;433:647-653.
-
- Leferovich JM, Bedelbaeva K, Samulewicz S, et al.** *Heart regeneration in adult MRL mice.* **Proc Natl Acad Sci U S A.** 2001;98:9830-9835.
-
- Leor J, Gerecht S, Cohen S, et al.** *Human embryonic stem cell transplantation to repair the infarcted myocardium.* **Heart.** 2007;93:1278-1284.
-
- Li F, Li W, Johnson S, Ingram D, Yoder M, Badylak S.** *Low-molecular-weight peptides derived from extracellular matrix as chemoattractants for primary endothelial cells.* **Endothelium.** 2004;11:199-206.
-
- Lieu DK, Chan YC, Lau CP, Tse HF, Siu CW, Li RA.** *Overexpression of HCN-encoded pacemaker current silences bioartificial pacemakers.* **Heart Rhythm.** 2008;5:1310-1317.
-
- Ludwig A, Zong X, Jeglitsch M, Hofmann F, Biel M.** *A family of hyperpolarization-activated mammalian cation channels.* **Nature.** 1998;393:587-591.
-
- Mahmud N, Patel H, Hoffman R.** *Growth factors mobilize CXCR4 low/negative primitive hematopoietic stem/progenitor cells from the bone marrow of nonhuman primates.* **Biol Blood Marrow Transplant.** 2004;10:681-690.
-
- Mangi AA, Noiseux N, Kong D, et al.** *Mesenchymal stem cells modified with Akt prevent remodeling and restore performance of infarcted hearts.* **Nat Med.** 2003;9:1195-201.
-
- Matsubayashi K, Fedak PW, Mickle DA, Weisel RD, Ozawa T, Li RK.** *Improved left ventricular aneurysm repair with bioengineered vascular smooth muscle grafts.* **Circulation.** 2003;108(suppl 1):II219-II225.
-
- Mauritz C, Schwanke K, Reppel M, et al.** *Generation of functional murine cardiac myocytes from induced pluripotent stem cells.* **Circulation.** 2008;118:507-517.
-
- Menasche P.** *Current status and future prospects for cell transplantation to prevent congestive heart failure.* **Semin Thorac Cardiovasc Surg.** 2008;20:131-137.
-



-
- Menasche P, Alfieri O, Janssens S, et al.** *The Myoblast Autologous Grafting in Ischemic Cardiomyopathy (MAGIC) trial: first randomized placebo-controlled study of myoblast transplantation.*
Circulation. 2008;117:1189-1200.
-
- Menasche P, Hagege AA, Vilquin JT, et al.** *Autologous skeletal myoblast transplantation for severe postinfarction left ventricular dysfunction.*
J Am Coll Cardiol. 2003;41:1078-1083.
-
- Messina E, De Angelis L, Frati G, et al.** *Isolation and expansion of adult cardiac stem cells from human and murine heart.*
Circ Res. 2004;95:911-921.
-
- Miake J, Marban E, Nuss HB.** *Biological pacemaker created by gene transfer.*
Nature. 2002;419:132-133.
-
- Miake J, Marban E, Nuss HB.** *Functional role of inward rectifier current in heart probed by Kir2.1 overexpression and dominant-negative suppression.*
J Clin Invest. 2003;111:1529-1536.
-
- Mills WR, Mal N, Kiedrowski MJ, et al.** *Stem cell therapy enhances electrical viability in myocardial infarction.*
J Mol Cell Cardiol. 2007;42:304-314.
-
- Mizuno T, Yau TM, Weisel RD, Kiani CG, Li RK.** *Elastin stabilizes an infarct and preserves ventricular function.*
Circulation. 2005;112:181-188.
-
- Murata M, Cingolani E, McDonald AD, Donahue JK, Marban E.** *Creation of a genetic calcium channel blocker by targeted gem gene transfer in the heart.*
Circ Res. 2004;95:398-405.
-
- Murry CE, Reinecke H, Pabon LM.** *Regeneration gaps: observations on stem cells and cardiac repair.*
J Am Coll Cardiol. 2006;47:1777-1785.
-
- Murry CE, Soonpaa MH, Reinecke H, et al.** *Haematopoietic stem cells do not transdifferentiate into cardiac myocytes in myocardial infarcts.*
Nature. 2004;428:664-668.
-
- Narazaki G, Uosaki H, Teranishi M, et al.** *Directed and systematic differentiation of cardiovascular cells from mouse induced pluripotent stem cells.*
Circulation. 2008;118:498-506.
-
- Nussbaum J, Minami E, Laflamme MA, et al.** *Transplantation of undifferentiated murine embryonic stem cells in the heart: teratoma formation and immune response.*
FASEB J. 2007;21:1345-1357.
-
- Ott HC, Matthiesen TS, Goh SK, Black LD, Kren SM, Netoff TI, Taylor DA.** *Perfusion-decellularized matrix: using nature's platform to engineer a bioartificial heart.*
Nat Med. 2008;14:213-221.
-
- Passier R, van Laake LW, Mummery CL.** *Stem-cell-based therapy and lessons from the heart.*
Nature. 2008;453:322-329.
-
- Pfister O, Mouquet F, Jain M, et al.** *CD31- but Not CD31+ cardiac side population cells exhibit functional cardiomyogenic differentiation.*
Circ Res. 2005;97:52-61.
-

Bibliography of One Hundred Key Papers

- Pittenger MF, Mackay AM, Beck SC, et al.** *Multilineage potential of adult human mesenchymal stem cells.* **Science.** 1999;284:143-147.
-
- Pittenger MF, Martin BJ.** *Mesenchymal stem cells and their potential as cardiac therapeutics.* **Circ Res.** 2004;95:9-20.
-
- Planat-Benard V, Menard C, Andre M, et al.** *Spontaneous cardiomyocyte differentiation from adipose tissue stroma cells.* **Circ Res.** 2004;94:223-229.
-
- Plotnikov AN, Bucchi A, Shlapakova I, et al.** *HCN212-channel biological pacemakers manifesting ventricular tachyarrhythmias are responsive to treatment with I_f blockade.* **Heart Rhythm.** 2008;5:282-288.
-
- Plotnikov AN, Shlapakova I, Szabolcs MJ, et al.** *Xenografted adult human mesenchymal stem cells provide a platform for sustained biological pacemaker function in canine heart.* **Circulation.** 2007;116:706-713.
-
- Plotnikov AN, Sosunov EA, Qu J, et al.** *Biological pacemaker implanted in canine left bundle branch provides ventricular escape rhythms that have physiologically acceptable rates.* **Circulation.** 2004;109:506-512.
-
- Poss KD, Wilson LG, Keating MT.** *Heart regeneration in zebrafish.* **Science.** 2002;298:2188-2190.
-
- Potapova I, Doronin S, Kelly D, et al.** *Enhanced recovery of mechanical function in the canine heart by seeding an extracellular matrix patch with mesenchymal stem cells committed to a cardiac lineage.* **Am J Physiol Heart Circ Physiol.** 2008;295:H2257-H2263.
-
- Potapova I, Plotnikov A, Lu Z, et al.** *Human mesenchymal stem cells as a gene delivery system to create cardiac pacemakers.* **Circ Res.** 2004;94:952-959.
-
- Qu J, Plotnikov AN, Danilo P Jr, et al.** *Expression and function of a biological pacemaker in canine heart.* **Circulation.** 2003;107:1106-1109.
-
- Ouraishi A, Losordo DW.** *Ischemic tissue repair by autologous bone marrow-derived stem cells: scientific basis and preclinical data.* **Handb Exp Pharmacol.** 2007:167-179.
-
- Ramirez RJ, Nattel S, Courtemanche M.** *Mathematical analysis of canine atrial action potentials: rate, regional factors, and electrical remodeling.* **Am J Physiol Heart Circ Physiol.** 2000;279:H1767-H1785.
-
- Regula KM, Rzeszutek MJ, Baetz D, Seneviratne C, Kirshenbaum LA.** *Therapeutic opportunities for cell cycle re-entry and cardiac regeneration.* **Cardiovasc Res.** 2004;64:395-401.
-
- Robertson P, Means TK, Luster AD, Scadden DT.** *CXCR4 and CCR5 mediate homing of primitive bone marrow-derived hematopoietic cells to the postnatal thymus.* **Exp Hematol.** 2006;34:308-319.
-
- Rosen AB, Kelly DJ, Schuldt AJ, et al.** *Finding fluorescent needles in the cardiac haystack: tracking human mesenchymal stem cells labeled with quantum dots for quantitative in vivo three-dimensional fluorescence analysis.* **Stem Cells.** 2007;25:2128-2138.
-



-
- Rosen MR, Brink PR, Cohen IS, Robinson RB.** *Genes, stem cells and biological pacemakers.*
Cardiovasc Res. 2004;64:12-23.
-
- Rosen MR, Danilo P Jr, Robinson RB.** *Gene and cell therapy for life-threatening cardiac arrhythmias: will they replace drugs, surgery, and devices?*
Dialogues Cardiovasc Med. 2009;14:44-51.
-
- Santoro B, Liu DT, Yao H, et al.** *Identification of a gene encoding a hyperpolarization-activated pacemaker channel of brain.*
Cell. 1998;93:717-729.
-
- Sasano T, McDonald AD, Kikuchi K, Donahue JK.** *Molecular ablation of ventricular tachycardia after myocardial infarction.*
Nature Med. 2006;12:1256-1258.
-
- Schachinger V, Aicher A, Dobert N, et al.** *Pilot trial on determinants of progenitor cell recruitment to the infarcted human myocardium.*
Circulation. 2008;118:1425-1432.
-
- Schachinger V, Erbs S, Elsasser A, et al.** *Improved clinical outcome after intracoronary administration of bone-marrow-derived progenitor cells in acute myocardial infarction: final 1-year results of the REPAIR-AMI trial.*
Eur Heart J. 2006;27:2775-2783.
-
- Schenk S, Mal N, Finan A, et al.** *Monocyte chemotactic protein-3 is a myocardial mesenchymal stem cell homing factor.*
Stem Cells. 2007;25:245-251.
-
- Schuldt AJ, Rosen MR, Gaudette GR, Cohen IS.** *Repairing damaged myocardium: evaluating cells used for cardiac regeneration.*
Curr Treat Options Cardiovasc Med. 2008;10:59-72.
-
- Schuster MD, Kocher AA, Seki T, et al.** *Myocardial neovascularization by bone marrow angioblasts results in cardiomyocyte regeneration.*
Am J Physiol Heart Circ Physiol. 2004;287:H525-H532.
-
- Seeger FH, Tonn T, Krzossok N, Zeiher AM, Dimmeler S.** *Cell isolation procedures matter: a comparison of different isolation protocols of bone marrow mononuclear cells used for cell therapy in patients with acute myocardial infarction.*
Eur Heart J. 2007;28:766-772.
-
- Shmelkov SV, Meeus S, Moussazadeh N, et al.** *Cytokine preconditioning promotes codifferentiation of human fetal liver CD133+ stem cells into angiomyogenic tissue.*
Circulation. 2005;111:1175-1183.
-
- Simpson D, Liu H, Fan TH, Nerem R, Dudley SC Jr.** *A tissue engineering approach to progenitor cell delivery results in significant cell engraftment and improved myocardial remodeling.*
Stem Cells. 2007;25:2350-2357.
-
- Smith RR, Barile L, Cho HC, et al.** *Regenerative potential of cardiosphere-derived cells expanded from percutaneous endomyocardial biopsy specimens.*
Circulation. 2007;115:896-908.
-
- Su H, Joho S, Huang Y, et al.** *Adeno-associated viral vector delivers cardiac-specific and hypoxia-inducible VEGF expression in ischemic mouse hearts.*
Proc Natl Acad Sci U S A. 2004;101:16280-16285.
-

Bibliography of One Hundred Key Papers

- Takahashi K, Tanabe K, Ohnuki M, et al.** *Induction of pluripotent stem cells from adult human fibroblasts by defined factors.*
Cell. 2007;131:861-172.
-
- Tse HF, Xue T, Lau CP, et al.** *Bioartificial sinus node constructed via in vivo gene transfer of an engineered pacemaker HCN channel reduces the dependence on electronic pacemaker in a sick-sinus syndrome model.*
Circulation. 2006;114:1000-1011.
-
- Valiunas V, Doronin S, Valiuniene L, et al.** *Human mesenchymal stem cells make cardiac connexins and form functional gap junctions.*
J Physiol. 2004;555:617-626.
-
- Virag JA, Rolle ML, Reece J, Hardouin S, Feigl EO, Murry CE.** *Fibroblast growth factor-2 regulates myocardial infarct repair: effects on cell proliferation, scar contraction, and ventricular function.*
Am J Pathol. 2007;171:1431-1440.
-
- Wall ST, Walker JC, Healy KE, Ratcliffe MB, Guccione JM.** *Theoretical impact of the injection of material into the myocardium: a finite element model simulation.*
Circulation. 2006;114:2627-2635.
-
- Wollert KC, Drexler H.** *Does cell therapy for myocardial infarction and heart failure work?*
Dialogues Cardiovasc Med. 2009;14:35-41.
-
- Wollert KC, Meyer GP, Lotz J, et al.** *Intracoronary autologous bone-marrow cell transfer after myocardial infarction: the BOOST randomised controlled clinical trial.*
Lancet. 2004;364:141-148.
-
- Xaymardan M, Tang L, Zagreda L, et al.** *Platelet-derived growth factor-AB promotes the generation of adult bone marrow-derived cardiac myocytes.*
Circ Res. 2004;94:E39-E45.
-
- Xiang Z, Liao R, Kelly MS, Spector M.** *Collagen-GAG scaffolds grafted onto myocardial infarcts in a rat model: a delivery vehicle for mesenchymal stem cells.*
Tissue Eng. 2006;12:2467-2478.
-
- Xue T, Cho HC, Akar FG, et al.** *Functional integration of electrically active cardiac derivatives from genetically engineered human embryonic stem cells with quiescent recipient ventricular cardiomyocytes: insights into the development of cell-based pacemakers.*
Circulation. 2005;111:11-20.
-
- Yoon YS, Wecker A, Heyd L, et al.** *Clonally expanded novel multipotent stem cells from human bone marrow regenerate myocardium after myocardial infarction.*
J Clin Invest. 2005;115:326-338.
-
- Zimmermann WH, Melnychenko I, Eschenhagen T.** *Engineered heart tissue for regeneration of diseased hearts.*
Biomaterials. 2004;25:1639-1647.
-