Heart WATCH

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A Physician Newsletter Produced by the Texas Heart Institute

Texas Heart® Institute

at St. Luke's Episcopal Hospital

The THI Risk Score, Along With Clinical Variables, Correlated With the SYNTAX Score

Abstract: The THI risk score and clinical variables supplement the SYNTAX score to help physicians select patients for percutaneous intervention or bypass graft.

Coronary artery disease

(CAD) is the leading cause of death worldwide. Whereas coronary artery bypass grafting (CABG) has historically been the predominant treatment for CAD, percutaneous coronary intervention (PCI) offers a nonsurgical way to treat this disease. Accordingly, physicians must decide whether their patients with CAD are better candidates for CABG or PCI.

The SYNTAX score, an angiographic tool that assesses the complexity of CAD, can help guide patient selection for these procedures. The tool was developed in connection with the SYNTAX Trial (Synergy Between PCI With Taxus and Cardiac Surgery), an ongoing study of PCI versus CABG in patients with complex, high-risk left main disease, 3-vessel disease, or both. The SYNTAX system assigns a numeric value to each coronary lesion involving more than 50% narrowing in a vessel greater than 1.5 mm in diameter. Patients with higher SYNTAX scores (ie, more complex disease) are better candidates for CABG. Patients with lower scores are better candidates for PCI: they have lower stroke rates with PCI, and their risk of major adverse cardiac events is the same as with CABG.

The SYNTAX score is based on coronary lesion anatomy alone and does not involve any clinical factors. In 2008, researchers at the Texas Heart Institute (THI) at St. Luke's Episcopal Hospital (St. Luke's) published their own risk-scoring method for predicting adverse outcomes after PCI. The THI risk score identifies both angiographic and clinical variables associated with adverse cardiac events. Recently, THI investigators (Anwarullah Mohammed, MD, a research fellow; James M. Wilson, MD, Director of Cardiology Education; and José Díez, MD, Senior Research Scientist) retrospectively calculated the SYNTAX scores for 211 patients who underwent PCI on the basis of the THI score. The patients were divided into 3 groups, according to whether the SYNTAX score was low, intermediate, or high. Univariate analysis of the THI score, clinical variables, and SYNTAX score showed that the THI risk score correlated with the STYNAX score and that the SYNTAX score correlated significantly with congestive heart failure and a history of CABG. The THI risk score, combined with 6 clinical variables, correlated with the SYNTAX score.

> *"There was a significant correlation between the SYNTAX score and the THI score plus clinical variables. This correlation held true in multivariate analysis adjusted for age, sex, and history of PCI or CABG."*

"In our study, age greater than 65 years, male sex, congestive heart failure, low creatinine clearance, and a history of PCI or CABG strongly correlated with higher SYNTAX scores," says Dr. Díez. "Patients with intermediate to high SYNTAX scores had a higher mean age, lower creatinine clearance, and more frequent history of CABG than did patients with low SYNTAX scores, and they tended to be men and to have congestive heart failure. There was a significant correlation between the SYNTAX score and the THI score plus clinical variables. This correlation held true in multivariate analysis adjusted for age, sex, and history of PCI or CABG." The THI team presented these findings at the recent Cardiovascular Research Technologies 2012 meeting in Washington, DC.

"Our study showed that the THI risk score, together with these 6 clinical factors, is a useful supplement to the SYNTAX score in guiding patient selection for PCI or CABG," concludes Dr. Díez. "Therefore, physicians can now use both clinical factors and vessel-lesion characteristics to help select the optimal revascularization strategy." ●

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The Texas Heart Institute is Again Selected to Participate in the Cardiovascular Cell Therapy Research Network

The Texas Heart Institute at St. Luke's Episcopal Hospital (THI at St. Luke's) has been selected to be 1 of 7 centers involved in the Cardiovascular Cell Therapy Research Network (CCTRN), a national consortium funded by the National Heart, Lung, and Blood Institute (NHLBI). Over the next 7 years, the consortium will receive $63 million from the NHLBI, which will be divided among the 7 centers, to achieve the CCTRN's goal of advancing cell therapy for the treatment of cardiovascular disease. THI at St. Luke's contributed to the success of the first CCTRN initiative, which comprised 5 US centers that conducted 3 major cardiac cell therapy trials of bone marrow mononuclear cells over a 5-year period. THI at St. Luke's provided the study protocol and top enrollment for 1 of the 3 trials (FOCUS-CCTRN), in which Emerson C. Perin, MD, PhD (Medical Director of THI's Stem Cell Center), and James T. Willerson, MD (President and Medical Director of THI at St. Luke's), served as principal investigators. Additionally, Dr. Perin's study protocol for examining cell therapy in patients with intermittent claudication will be used in one of the first trials conducted by the new CCTRN.

The Texas Heart Institute Participates in the Largest Trial to Date of Cell Therapy for Chronic Ischemic Heart Failure

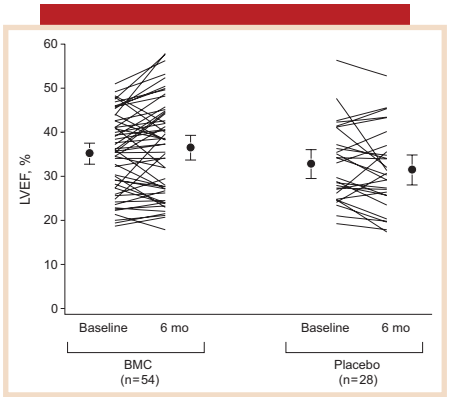
Abstract: The FOCUS-CCTRN trial found no effect of therapy on prespecified endpoints but showed improved ejection fraction in patients with severe heart failure and coronary disease.

As 1 of the 5 centers in the original Cardiovascular Cell Therapy Research Network (CCTRN), the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at St. Luke's) participated in the largest trial to date of autologous bone marrow mononuclear cell (BMC) therapy in patients with chronic ischemic heart failure—FOCUS-CCTRN (First mononuclear Cells injected in the United States conducted by the CCTRN) (*JAMA* 2012;307:1717-26). In this phase 2, double-blind trial, 92 patients were enrolled between April 2009 and April 2011 at the 5 CCTRN sites. The patients had to have coronary artery disease, left ventricular ejection fraction (LVEF) of ≤45%, limiting angina and/or congestive heart failure, a perfusion defect by single-photon emission computed tomography (SPECT), and no revascularization options. All patients underwent bone marrow aspiration and were randomized to receive transendocardial injections of BMCs (100 million) or placebo.

"Initial studies showing that transendocardial delivery of BMCs was safe in patients with ischemic heart failure were not powered to definitively assess efficacy," says Emerson C. Perin, MD, PhD, co-principal investigator of the study and Director of the Stem Cell Center at THI at St. Luke's. "FOCUS-CCTRN was a larger study, designed to examine the effects of BMCs in patients with chronic ischemic heart disease and left ventricular dysfunction."

At 6 months, the study showed no significant differences between the cell-treated and control groups in the 3 prespecified endpoints: left ventricular end-systolic volume, maximal oxygen consumption, and reversibility on SPECT. Similarly, secondary endpoints showed no effect of therapy.

"Identifying meaningful endpoints for cell therapy studies in patients with chronic heart disease is challenging," explains Dr. Perin. "In previous trials of heart failure patients, endpoints were arbitrarily chosen because of the paucity of data in this group. Understanding the mechanisms of cell therapy and the role of cell function will help improve the design and interpretation of future studies."



Change in global left ventricular ejection fraction. Solid circles denote the mean values at baseline and at 6 months. Error bars indicate the 95% confidence intervals.

Accordingly, the CCTRN investigators performed several exploratory analyses and showed that the LVEF increased by 1.4% in cell-treated patients and decreased by −1.3% in control patients; this 2.7% difference was significant (95% CI, 0.3-5.1; *P*=.03). Younger patients fared even better with cell therapy: cell-treated patients aged 62 years (the median patient age) or younger showed a mean increase in LVEF of 3.1%, whereas control patients of the same age showed a −1.6% decrease in LVEF (4.7% difference; 95% CI, 1.0%-8.4%; *P*=.02).

In another exploratory analysis, the researchers examined the relationship between LVEF and bone marrow cell characteristics. They found that improvements in LVEF correlated with higher percentages of CD34 and CD133 cells in bone marrow samples. Every 3% increase in the bone marrow content of CD34 cells or CD133 cells was associated with an average absolute LVEF increase of 3% or 6%, respectively.

"These findings are intriguing because CD34 and CD133 cells give rise to endothelial and vascular progenitor cells, which are known to recruit cells and promote cell survival," says James T. Willerson, MD, co-principal investigator of the study and President and Medical Director of THI at St. Luke's. "This suggests that CD34 and CD133 cells may improve cardiac function by helping to rescue ischemic or hibernating myocardium."

"Although we found no effect of BMC therapy on our prespecified endpoints, FOCUS-CCTRN has contributed greatly to furthering cell therapy in these patients," says Dr. Perin. "We showed a significant improvement in LVEF with treatment. Moreover, our additional analyses highlight the importance of the quality of the bone marrow or cell product in cell therapy. Ultimately, closer scrutiny of bone marrow composition will help us improve outcomes and select patients most likely to benefit from autologous therapy." ●

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Contents

Endothelial Progenitor Cells Engineered to Overproduce Prostacyclin Enhance Vascular Cell Protection

Abstract: Endothelial progenitor cells expressing a hybrid enzyme that increases prostacyclin production show promise as a novel method of prostacyclin therapy.

Prostacyclin (PGI2) provides vasoprotection through its vasodilative, anti-inflammatory, and antithrombotic properties and is used to treat diseases characterized by endothelial dysfunction, such as pulmonary arterial hypertension. However, PGI2 has a short half-life (less than 2 minutes), and patients must use a continuous-infusion pump to administer PGI2. Because the current methods of PGI2 therapy are cumbersome, a new approach is needed that promotes the continuous biosynthesis of PGI2 in vivo from a biologically relevant source.

To meet this need, researchers at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at St. Luke's) have engineered endothelial progenitor cells (EPCs) that overproduce prostacyclin (*J Cell Physiol* 2011;227:2907-16). Prostacyclin is synthesized from arachidonic acid in a multistep process involving the coupling of a cyclooxygenase (COX) isoenzyme (COX-1 or COX-2) to prostacyclin synthase (PGIS). These researchers introduced into rat outgrowth EPCs a non-viral DNA plasmid that continuously expresses a hybrid enzyme linking COX-1 to PGIS.

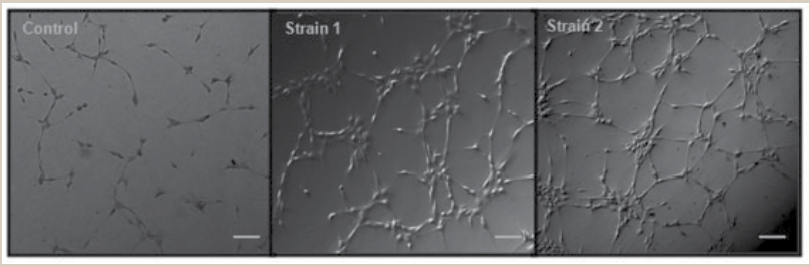
"We know that PGI2 is responsible for the pro-angiogenic properties of EPCs, so we hypothesized that increasing PGI2 production would boost the intrinsic angiogenic capabilities of EPCs to a level that might restore endothelial function in cardiovascular patients," states Richard A. F. Dixon, PhD, Director of the Wafic Said Molecular Cardiology Research Laboratory at THI at St. Luke's and senior author of the study.

Dr. Dixon and his research team engineered 2 strains of rat outgrowth EPCs that were stably transfected with the hybrid enzyme and that produced approximately 4 times more PGI2 than native EPCs do. The transfected strains, called PGI2-EPC strain 1 and strain 2, exhibited equal levels of cell proliferation but significantly lower levels of pro-apoptotic caspase-3/7 activity than did native EPCs ($P<0.01$), indicating that PGI2-EPCs have enhanced protective properties.

To determine whether the PGI2-EPCs provide vascular protection, the researchers examined the ability of these strains to enhance angiogenesis. As early as 4 hours after cells were seeded onto a reduced growth factor–membrane matrix, total endothelial tube length was significantly greater for both PGI2-EPC strains than for native EPCs ($P<0.05$; see Figure). Furthermore, when culture medium from each cell type was added to native EPCs, endothelial tube formation was markedly stimulated by either of the PGI2-EPC culture media but not by native EPC culture medium, indicating that PGI2-EPCs enhance endothelial tube formation through a paracrine mechanism. Moreover, the siRNA-mediated knockdown of the hybrid enzyme expressing COX-1 and PGIS in PGI2-EPCs significantly reduced the effects of PGI2-EPCs or PGI2-EPC culture medium on endothelial tube formation, suggesting that the effects of PGI2-EPCs resulted directly from the overproduction of PGI2.

"An important function of PGI2 is to maintain vascular tone by relaxing the underlying smooth muscle. This PGI2-induced relaxation is largely attributed to smooth muscle cell (SMC) hyperpolarization through the activation of K+ channels, so we examined whether the PGI2-EPC strains promote the hyperpolarization of vascular SMCs under hypoxic conditions," states Dr. Dixon. Whole-cell patch-clamp studies showed that the K+ channel activity of rat SMCs under hypoxic conditions was inhibited after co-culturing with native EPCs but was unaffected after co-culturing with PGI2-EPCs. These results indicated that PGI2-EPCs preserve the K+ channel activity of SMCs to maintain vascular tone.

"Our results provide evidence that these engineered PGI2-EPCs can promote the repopulation of damaged vasculature and restore vascular tone balance," concludes Dr. Dixon. "The clinical use of PGI2-EPCs may be an innovative way to increase the efficiency of cell therapy in cardiovascular patients, and we are continuing to investigate the in vivo biologic activity of PGI2-EPCs." ●



Endothelial tube formation as seen under an inverted microscope in native endothelial progenitor cells (EPCs) (control) and in EPCs that overproduce prostacyclin (PGI2-EPC strain 1 and strain 2). Scale bar = 50 μM. Reprinted from *J Cell Physiol* 2011;227:2907-16, with permission.

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Noted Surgeon and Physician Join the Multidisciplinary Team at St. Luke's Cooley Transplant Center

Abstract: Hari R. Mallidi, MD, and Ramachandra R. Sista, MD, have been recruited to lead the lung and heart-lung transplant programs at the Cooley Transplant Center.

Heart-lung transplantation has a long history at the Texas Heart Institute (THI) at St. Luke's Episcopal Hospital (St. Luke's). In 1968, Dr. Denton A. Cooley, founder of THI, performed the world's first heart-lung transplant, in a 2½-month-old girl. Since then, heart-lung transplants have become fairly standard, although never widely performed. The operative technique that Dr. Cooley introduced in 1968 is still used for these procedures.

Today, St. Luke's Cooley Transplant Center continues to develop new approaches for treating patients with organ failure. In addition to offering heart, heart-lung, liver, kidney, and pancreas transplants, the center has one of the world's foremost ventricular assist device (VAD) programs, which is under the direction of O. H. Frazier, MD. It recently gained 2 new leaders when Hari R. Mallidi, MD, was appointed Surgical Director and Ramachandra R. Sista, MD, was appointed Medical Director of the lung and heart-lung transplant programs. Dr. Mallidi was also named Associate Director of the entire Cooley Transplant Center. Before coming to Houston, both of these physicians were prominent members of the heart-lung transplant team at Stanford University Medical School, which has one of the longest continuously active programs in this field.

Drs. Mallidi and Sista are continuing to work closely together at the Cooley Center. One of their immediate goals is to establish a lung transplant program to complement the center's heart-lung transplant program. Because of a shortage of suitable donor organs, fewer than 100 heart-lung transplants are performed worldwide each year, and this number is not expected to increase. In contrast, the number of lung transplants is growing, partly because of changes in the nationwide rules for lung allocation. Also, a new technique known as ex vivo lung perfusion is allowing the successful use of donor lungs that might otherwise be considered unacceptable.

"By expanding its program to include lung transplants alone, the Cooley Center hopes to benefit the increasing number of patients with end-stage lung disease for whom transplantation is the only option," says Dr. Mallidi. "The success of this procedure has increased in the past few decades, but many complex challenges remain. Ongoing focuses of research include posttransplant infection, tissue rejection, and chronic lung allograft dysfunction—especially bronchiolitis obliterans, the leading cause of late death in these patients."

Dr. Hari R. Mallidi (left) and Dr. Ramachandra R. Sista (right) evaluate a computed tomographic image of the thorax of a patient with advanced lung failure.

Dr. Mallidi's primary interests include not only transplantation and mechanical circulatory support (VADs and extracorporeal membrane oxygenators) but also the surgical treatment of adult congenital heart disease, hypertrophic cardiomyopathy, and valvular heart disease—all of which can result in heart failure. To learn more about surgical outcomes and the clinical effectiveness of procedures, Dr. Mallidi is establishing a comprehensive database that will capture data from all heart failure patients treated at the Cooley Transplant Center.

Dr. Sista's main interests include lung and heart-lung transplantation, advanced lung disease, critical care medicine, clinical outcomes, and quality and performance improvement. He also has a special interest in mechanical circulatory support, particularly extracorporeal membrane oxygenation and novel extracorporeal lung assist technologies.

"I am fortunate to work in such a fascinating and challenging field," comments Dr. Sista. "To see a patient restored to a normal, active life after struggling to breathe at all is a real blessing. Although lung and heart-lung transplantation has come a long way, we are still seeking to improve several aspects of this process, such as donor-recipient selection, organ preservation and rescue, and early diagnosis, prevention, and treatment of acute and chronic lung rejection. Chronic rejection is the single major hurdle for long-term patient survival after lung and heart-lung transplantation."

The addition of Drs. Mallidi and Sista has enhanced an already stellar transplant program at THI at St. Luke's. ●

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Heart Stop Beating

In March 2011, Drs. O. H. (Bud) Frazier and William E. Cohn, of the Texas Heart Institute at St. Luke's Episcopal Hospital, implanted the first continuous flow total heart replacement device into a 55-year-old man. Continuous flow cardiac assist devices are not new, but this was the first time a combination of 2 such devices had been used to completely replace the human heart. The patient survived for 5 weeks before succumbing to problems unrelated to the device.

Heart Stop Beating, a new documentary film directed by Jeremiah Zagar, tells the story of the patient and his surgeons. Only 3½ minutes long, it features surgical footage and interviews with both doctors. The film was chosen to be part of Focus Forward: Short Films, Big Ideas, a series of documentaries about "innovative people who are reshaping the world through act or invention," and it premiered at the Sundance Film Festival in May 2012. Later, the filmmakers were asked to show the documentary at the Tribeca, Dallas International, and Martha's Vineyard Film Festivals. The video also has been viewed more than 450,000 times on the video-sharing website Vimeo (http://vimeo.com/33741794). Praised as "a brilliant short film," *Heart Stop Beating* will continue to be shown at major film festivals during 2012.

Texas Heart Institute Surgeons Examine the Outcomes of Aortic Endograft Removal

Abstract: When endografts placed in the aorta by means of endovascular procedures must be removed surgically, outcomes are generally good except in cases of graft infection.

Endovascular repair has become standard for treating aneurysms of the abdominal aorta and is increasingly being used for the thoracic aorta as well. In these repairs, a catheter is inserted into the femoral artery and used to deploy an expanding endograft into the aneurysmal portion of the aorta, excluding the aneurysm from the region of blood flow. For aneurysms confined to an area of the aorta where an endograft would not block flow to important arterial branches, endovascular treatment is often the technique of choice because it is far less invasive than surgery and entails lower mortality and morbidity. In rare cases, however, post-procedural complications such as disease progression, endoleak, and graft infection compromise the durability of aortic endografts, and surgical intervention may be necessary to remove part or all of the device.

Recently, Joseph S. Coselli, MD, and Scott A. LeMaire, MD, 2 surgeons at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at St. Luke's), examined the outcomes of surgical device-removal procedures. Dr. Coselli is Chief of Adult Cardiac Surgery at THI at St. Luke's and Professor and Cullen Foundation Endowed Chair in the Division of Cardiothoracic Surgery at Baylor College of Medicine (BCM). Dr. LeMaire is a cardiovascular surgeon at THI at St. Luke's and Professor and Director of Research in the Division of Cardiothoracic Surgery at BCM. They reviewed data from their practice regarding 35 consecutive patients who underwent surgical aortic endograft removal (*see Table*) between November 1996 and June 2011. The results of this review were published in the *Annals of Thoracic Surgery* (2012;93:726–33).

Most of the 35 patients had previously undergone at least one additional endovascular procedure to address the failure of the original one. The surgical removal operations were performed 2 weeks to 4 years after the endovascular procedure. The device was completely removed from 26 patients and partially removed from 9.

"The decision whether to remove part or all of the endograft was made once the aorta was exposed," says Dr. Coselli. "If we saw evidence of endograft infection, we completely removed the device, and we frequently took additional surgical steps to reduce the risk of recurrent infection or to treat a concomitant fistula. On the other hand, if there was no infection, and if part of the endograft had adhered firmly to a nonaneurysmal portion of the vessel wall, we removed only the nonadherent part of the endograft."

Table: Characteristics of Endografts Surgically Removed from Patients (N=35)

Endograft location	
Descending thoracic aorta	27
Abdominal aorta	8
Reason for endograft removal*	
Continued aneurysm expansion	23
Device infection	8
Fistula formation	5
Aneurysm rupture	2
Pseudoaneurysm formation	2
Restenosis	1

**Some patients had more than 1 indication.*

Drs. Coselli and LeMaire examined the following outcomes: operative mortality (ie, death within 30 days or before hospital discharge), late mortality, permanent paraplegia or paraparesis, permanent renal failure, and hospital length of stay. The mean follow-up period was 26±31 months (range, 1–115 months).

"The 27 patients who did not have an infected endograft generally did well after device removal," says Dr. LeMaire. "In that group, there were no early deaths or renal complications, and only a few patients had cardiac [n=2] or pulmonary complications [n=6]. In contrast, the 8 patients with endograft infection had worse postoperative courses; 2 of them died perioperatively, and 6 were transferred to long-term acute care facilities before being discharged home."

Patients with infected endografts also had poorer long-term outcomes than the other patients. Two (33%) of the 6 patients with infected endografts who survived the perioperative period died during the long-term follow-up period, compared with 6 (22%) of the 27 patients without infection. Furthermore, 2 patients with infected endografts needed reoperation during the follow-up period, whereas only 1 of the patients without infection did.

"Overall," says Dr. Coselli, "our results show that patients who undergo open removal of uninfected endografts tend to do well postoperatively. However, patients with endograft infection have a grim prognosis. We hope that future studies will reveal more about the best ways to treat these patients and to monitor them postoperatively." ●

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Texas Heart Institute Recruits a Leading Regenerative Medicine Scientist

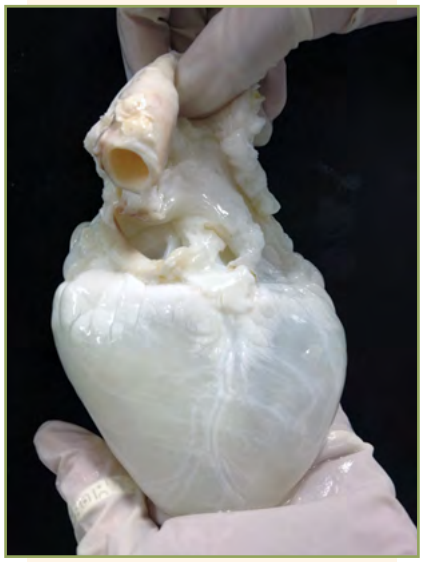
Abstract: THI at St. Luke's has recruited Doris Taylor, PhD, to head its newly established Regenerative Medicine Research Center.

A staggering 5 million

Americans have heart failure, and that number grows yearly by 400,000 to 700,000. For many patients, the only treatment option is heart transplantation, but the 2000 donor hearts that become available each year are not enough to cover the 3000 patients on the transplant list at any given time. The Texas Heart Institute at St. Luke's Episcopal Hospital (THI at St. Luke's) is committed to developing additional therapeutic options through its innovative research programs. One exciting new area of research is regenerative medicine, in which the goal is to replace or regenerate human cells, tissues, or organs to repair injury. Ideally, this research will eventually enable researchers to grow a fully functional human heart in the laboratory. To this end, THI at St. Luke's has recruited Doris Taylor, PhD, as Director of its newly established Regenerative Medicine Research Center. Dr. Taylor comes to THI from the University of Minnesota (UMN), where she was Director of the Center for Cardiovascular Repair and held appointments as the Medtronic Bakken Chair and Professor, Integrative Biology and Physiology, and Professor of Medicine.

As one of the world's leading scientists in cardiac regeneration, Dr. Taylor has garnered international acclaim for her ground-breaking work, first in cell therapy in the late 1990s and then in whole-organ decellularization. Using her pioneering technology, she and her group created a beating heart in the laboratory at UMN. They perfused cadaveric rat hearts with a detergent to remove cells, generating an acellular native scaffold. Then, they reseeded the hearts with cardiac or endothelial cells and allowed the reconstructed hearts to mature under physiologic conditions. By day 4, the engineered heart contracted, and by day 8, it was pumping artificial blood.

"We created a cardiac scaffold of extracellular matrix that had a native architecture and mechanical properties, perfusable vessels, and patent valves," says Dr. Taylor. "This early work in rats showed that perfusion decellularization is feasible."



A decellularized pig heart.

Dr. Taylor recently collaborated with investigators in Spain to use perfusion decellularization to strip the cells from human hearts rejected for transplantation. The investigators showed that the human heart could indeed be decellularized. Moreover, they cultured human mesenchymal stem cells or rat myocardial cells on the ventricular surface of the cardiac constructs and found that the cells attached properly and re-integrated.

"Generating a scaffold has been a big impediment in creating a bioartificial heart, but our studies show we can use nature's own platform," she explains. "Now, the challenge is to identify cells that can seed the scaffold and grow mature heart cells. But we have many options, including adult or embryonic stem cells and cells derived from bone marrow, skeletal muscle, the heart, or even fat. Determining the best cells for this process will require careful, meticulous study."

For the past 5 years, Dr. Taylor has served as the principal investigator (along with co-investigator, Christopher R. Cogle, MD, of the University of Florida College of Medicine) of the Biorepository and Cell Profiling Laboratory of the Cardiovascular Cell Therapy Research Network (CCTRN). The goal of the federally funded CCTRN is to advance cell therapy for cardiovascular patients by conducting large, multi-institutional clinical trials. The role of the Biorepository is to support the CCTRN's efforts by storing blood, plasma, and bone marrow specimens from patients enrolled in the CCTRN trials and performing phenotypic and functional studies on the patient samples. These studies are designed to gain insight into the mechanisms underlying cell therapy, with an ultimate goal of improving outcome for patients with heart disease.

Dr. Taylor is also interested in the effects of a person's age and sex on stem cells. "Aging is a failure of stem cell–based repair, which normally occurs throughout life," says Dr. Taylor. "Establishing a link between aging and reduced stem cell number and efficacy will have important implications for autologous cell therapy and for the treatment of aging." Her interest in sex differences in cellular repair has led to collaborations worldwide, which she can bring to joint studies with THI's Center for Women's Heart & Vascular Health.

"Although we don't expect to see clinical studies of bioartificial hearts for 10 to 15 years, we could see simpler engineered tissues such as valves, blood vessels, and cardiac patches being used routinely much sooner," says Dr. Taylor. "The applications of regenerative medicine are numerous, and our research promises to open a new door in organ transplantation. It's a privilege to work in this area of research, and I am excited to be helping to further the study of regenerative medicine at THI." ●

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Calendar of Events

Texas Heart Institute Continuing Medical Education Symposia

Eighth Annual St. Luke's Episcopal Hospital Diabetes Symposium: Diabetes for Primary Care in 2012
Texas Heart Institute
September 15, 2012 • Houston, Texas
Program Director: Glenn R. Cunningham, MD

Future Direction of Stem Cells in Cardiovascular Disease
Westin Bonaventure
November 2, 2012 • Los Angeles, California
Program Director: James T. Willerson, MD

Third Annual Symposium on Risk, Diagnosis, and Treatment of Cardiovascular Disease in Women
Texas Heart Institute
November 17, 2012 • Houston, Texas
Program Director: Stephanie Coulter, MD

For information about Texas Heart Institute CME activities, please e-mail cme@texasheart.org or call 713-218-2200. To view or complete selected online CME courses (certificates are available online), please visit www.cme.texasheart.org. New courses are added regularly.

Selected Upcoming Local, National, and International Meetings

International Academy of Cardiology 17th World Congress on Heart Disease
Annual Scientific Sessions 2012
July 27–30, 2012 • Toronto, Ontario, Canada
www.cardiologyonline.com

American Society of Nuclear Cardiology 17th Annual Scientific Session
September 6–9, 2012 • Baltimore, Maryland
www.asnc.org

Heart Failure Society of America 16th Annual Scientific Meeting
September 9–12, 2012 • Seattle, Washington
www.hfsa.org

International Society for Rotary Blood Pumps: 20th Annual Meeting
September 20-22, 2012 • Istanbul, Turkey
www.isrbp2012.org

American College of Surgeons Annual Clinical Congress
September 30–October 4, 2012 • Chicago, Illinois
www.facs.org

American Heart Association 2012 Scientific Sessions
November 3–7, 2012 • Los Angeles, California
www.scientificsessions.org

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For 21 consecutive years, the Texas Heart Institute at St. Luke's Episcopal Hospital has been ranked among the top 10 heart centers in the United States by *U.S. News & World Report*'s annual guide to "America's Best Hospitals."