HeartWATCH

FALL 2009

A Newsletter Produced by the Texas Heart Institute

Texas Heart® Institute

at St. Luke's Episcopal Hospital

Researchers Identify Genetic Variants Associated With Postoperative Atrial Fibrillation

Abstract: Genetic variants, or polymorphisms, independently predict atrial fibrillation after cardiac surgery.

Atrial fibrillation (AF) is the most common adverse event after cardiac surgery, occurring in up to 40% of patients who undergo coronary artery bypass grafting (CABG). Although often self-limiting, postoperative AF requires additional medications, longer hospital stays, and an overall increased use of healthcare resources. Furthermore, in some cases, postoperative AF can cause hemodynamic complications and stroke.

The genetic and clinical predictors of AF in ambulatory populations have been well studied. In fact, 4 polymorphisms, or genetic variants, on chromosome 4q25 have been associated with AF in studies of ambulatory European and Chinese populations (*Nature* 2007;448:352-8). However, genetic variants associated with new-onset postoperative AF have not been determined.

The CABG Genomics Program is a multi-institutional study of the effects of genetic make-up on adverse events after CABG surgery. As part of this program, Charles D. Collard, MD, professor, Baylor College of Medicine, and Chief of the Division of Cardiovascular Anesthesiology at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH), and Simon Body, MB, ChB, MPH, from the Department of Anesthesiology, Brigham and Women's Hospital, Harvard Medical School, collaborated with investigators at the Vanderbilt University School of Medicine to determine whether genetic variants in the chromosome 4q25 region are associated with postoperative AF (*Circ Cardiovasc Genet* 2009; epub ahead of print). These investigators prospectively studied 2 cohorts of patients undergoing CABG surgery. In a discovery cohort of 959 patients enrolled at Brigham and Women's Hospital and THI at SLEH, they studied clinical predictors of AF and used genotyping to evaluate 45 polymorphisms in the 4q25 chromosome region. Postoperative AF was seen in about 30% of patients, usually within the first week after surgery. Using a multivariable logistic statistical model, the researchers found that older age and previous AF increased the risk of postoperative AF, whereas statin use after CABG surgery was associated with a decreased risk of AF. Of the 45 polymorphisms examined in the discovery cohort, 7 were identified as independent predictors of postoperative AF. Of these 7 genetic variants, 3 were validated in a separate cohort of 494 patients who underwent CABG surgery and who were enrolled through the Vanderbilt Cardiac Surgery Registry.

> *"Overall, our results showed that the common genetic variants found at the 4q25 chromosome locus are independently associated with postoperative AF that occurs after CABG surgery."*
>
> *—Charles D. Collard, MD*
> *Chief of the Division of Cardiovascular Anesthesiology*

"Overall, our results showed that the common genetic variants found at the 4q25 chromosome locus are independently associated with postoperative AF that occurs after CABG surgery," states Dr. Collard. "Moreover, this association remained significant even after statistical tests were used to account for previous AF."

Specifically, the genetic variant rs2200733 at the 4q25 locus conferred a relatively higher risk (odds ratio [OR] =2.14) of AF than did the normal DNA sequence; the genetic variant rs13143308 conferred a modest risk (OR=1.75). The results indicate that the same genetic changes associated with AF in ambulatory populations extend to postoperative AF, suggesting a similar mechanism in both populations. However, the underlying mechanism by which genetic variants in the 4q25 region affect the development of AF is unknown.

"Our study lays the genetic groundwork for deciphering the biologic mechanisms involved in postoperative AF," says Dr. Collard. "Furthermore, identifying polymorphisms that predict AF in surgical candidates may help researchers develop therapeutic and preventive strategies for patients at risk." ●

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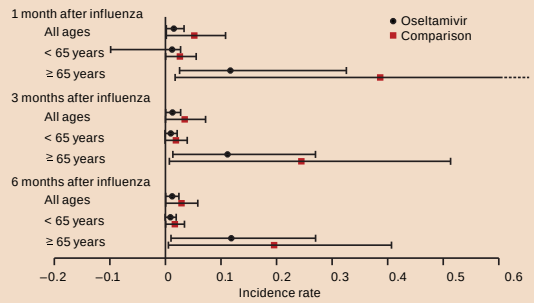
Texas Heart Institute at St. Luke's Episcopal Hospital Is Ranked 5th Among the Nation's Top 10 Heart Centers

In the 2009 *U.S. News and World Report*'s annual guide to "America's Best Hospitals," the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH) was ranked 5th among the top 10 heart and heart surgery centers in the United States. The Texas Heart Institute at SLEH was highly rated in several areas, including patient safety, patient services, and key technologies. James T. Willerson, MD, President and Medical Director of THI at SLEH, regards this achievement as "a great tribute to the doctors, nurses, scientists, support staff, and all of our friends who support our efforts to cure and ultimately prevent heart and vascular disease." The Texas Heart Institute at SLEH, which moved up 2 places in the rankings since 2008, has been listed for 19 consecutive years as one of the top 10 hospitals for heart and heart surgery.

Antiviral Treatment Reduces the Risk of Stroke After Influenza Infection

Abstract: Oseltamivir is associated with a reduced risk of stroke and transient ischemic attack in adults who receive antiviral treatment for influenza infection.

Acute infections, especially influenza, have been associated with an increased risk of cardiovascular events, including ischemic stroke. In addition, higher rates of cardiovascular events are usually reported in the winter—coincident with the influenza season. Although the majority of deaths during previous pandemics may be attributed to cardiovascular events triggered by influenza, the true burden of influenza-related cardiovascular morbidity and mortality is usually under-reported, because influenza is generally neglected as a contributing factor when cardiovascular events are reported.



Incidences of stroke and transient ischemic attack in patients who received oseltamivir and those who did not, with 95% confidence intervals (CIs). The broken horizontal line indicates an upper 95% CI of >0.6.

Mohammad Madjid, MD, MSc, Senior Research Scientist at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH), has long believed that preventing or treating acute infection with vaccines or antiviral agents, such as the neuraminidase inhibitor oseltamivir, can lower the risk of cardiac death and other adverse events (see *Heart Watch*, Fall 2003, Winter 2008, and Winter 2009; texasheart.org/heartwatch). Recently, Dr. Madjid and his associates examined the rates of stroke and transient ischemic attack (TIA) in adults given oseltamivir to treat influenza infection (*Cardiology* 2009;113:98-107).

"Given the proinflammatory and prothrombotic consequences of influenza, we hypothesized that a treatment that reduces proinflammatory cytokine levels, inflammation, the viral load, and the duration of illness would also reduce the risk of thrombotic events, such as stroke, after influenza infection," says Dr. Madjid.

In a retrospective cohort study that lasted from May 2000 to September 2006, outcomes at 1, 3, and 6 months after influenza diagnosis in adults (aged >18 years) were compared for patients given oseltamivir (n=49,238) and those not given antiviral medication (n=102,692). Patients were included in the oseltamivir cohort if they had a claim for oseltamivir within 1 day before or 2 days after their diagnosis and had no other antiviral drug claim within ±6 months of that date. Patients were included in the comparison cohort if they had no claims for antiviral medication (eg, oseltamivir, zanamivir, amantadine, or rimantadine) within 6 months of their diagnosis date. Patients given prophylactic oseltamivir were not included in the study.

"Adults who took oseltamivir had a 28% reduction in the risk of stroke or TIA during the 6 months after an influenza diagnosis compared to patients not given antiviral therapy," says Dr. Madjid. "Oseltamivir was associated with a reduced rate of stroke and TIA in adults younger than 65 years for up to 6 months after their influenza diagnosis. For adults 65 and older, the protective effect was highest in the first month, with a 51% reduction in risk."

The incidence of different types of stroke was also evaluated. Oseltamivir patients had significantly lower incidences of thromboembolic stroke than did patients in the comparison group at all follow-up intervals. The incidence of hemorrhagic stroke was lower in the oseltamivir group than in the comparison group during all follow-up periods but reached statistical significance only at 3 and 6 months. At 6 months' follow-up evaluation, the incidence of hemorrhagic stroke was 0.001 in the oseltamivir group and 0.002 in the comparison group (incidence rate ratio, 0.461; 95% CI, 0.269–0.756). Subarachnoid hemorrhage occurred in 3 patients in the oseltamivir group and in 18 patients in the comparison group.

"Although patients were not randomized to the oseltamivir or comparison groups in this study, our results provide the first evidence that oseltamivir, if prescribed when patients first present with clinically diagnosed influenza, is associated with a lower risk of stroke or TIA than is a lack of antiviral treatment," says Dr. Madjid. "If confirmed by future randomized studies, these results could lead to the development of a novel approach for preventing stroke and TIA." ●

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Contents

Heart Sounds Podcasts Help Teach the Art of Auscultation

Abstract: The Heart Sounds Research Laboratory is taking advantage of podcast technology to help medical students and clinicians hone their auscultation skills.

For more than 35 years, the Heart Sounds Research Laboratory at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH) has recorded heart sounds and murmurs from adult and pediatric patients. As the number of heart sounds (currently more than 1500) in the laboratory continues to grow, so do the ways in which those heart sounds are recorded and transmitted. The latest method includes a novel podcast series.

"The main purpose of the Heart Sounds Research Laboratory, as established in 1973 by Robert J. Hall, MD, was to record, for teaching purposes, the abnormal heart sounds of patients who came to THI at SLEH for diagnosis and treatment," says James M. Wilson, MD, the Robert J. Hall Chair in Cardiology at SLEH and Program Director of the Heart Sounds Podcast Series. "We wouldn't have the archives we have today if not for those patients and for the efforts of cardiology fellows and visiting physicians who made the early recordings. However, we owe the majority of our recordings to Arnulfo Martinez, Coordinator of the Heart Sounds Laboratory, who manages the recordings and is responsible for the laboratory's leap into cyberspace."

Initially, the laboratory recorded patients' heart sounds on reel-to-reel audiotape, which captured both the heart sounds and electrocardiographic signals. The signals, when played back, would yield a visual representation of the sounds, which could then be transferred to a video recorder. Later, a video camera was used to record audio and video simultaneously.

"During the late 1970s and early 1980s, a hardwired system was used to transmit the heart sounds to an audience or classroom," says Dr. Wilson. "The audio was transmitted via cables to distribution boxes fitted with 4 headsets. That necessitated a large network of cables throughout the room. For a classroom of 20 people, it was inconvenient, but for an audience of 200, it was a technical nightmare."

Today, that technical nightmare can be avoided through use of the Internet and podcasts. Podcasts are series of audio or video media files that are released episodically and downloaded from the Internet. Podcasts are differentiated from other Internet media files by their mode of delivery, which involves applications called "podcatchers" (eg, iTunes) that automatically download new episodic content as it becomes available and store it on the user's computer.

> *"In the physical examination of the heart, the old adage, 'you only see what you look for' could be modified to, 'you only hear what you listen for.'"*
>
> *—James M. Wilson, MD*
> *Robert J. Hall Chair in Cardiology*

"For several years, we have offered a sampling of heart sounds on the THI website, but that format allowed only transmission of the heart sounds, without a narrative," says Dr. Wilson. "The podcasts allow us to add a narrative that explains the important components of the sounds."

Users can access the podcasts online at texasheart.org or on iTunes by searching for "Texas Heart Institute" or "heart sounds" in the "Search iTunes Store" window. A subscription to the Texas Heart Institute Heart Sounds Series is free. Currently 10 podcasts are available for download to a computer or personal mp3 device, and other podcasts are being added regularly. The podcast narrative will also soon be available in Spanish.

"In the physical examination of the heart, the old adage, 'you only see what you look for' could be modified to, 'you only hear what you listen for,'" says Dr. Wilson. "Experienced clinicians can listen to a polyglot of noises, compare them to an internal matrix, and make a correct diagnosis; however, for less experienced clinicians, proper auscultation requires listening carefully and thoughtfully to one thing at a time. Any technology that can help students learn to do this is a valuable educational tool." ●

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Available Podcasts

texasheart.org/heartsounds

Check the site regularly for new podcasts.

Opening Snap of Mitral Valve Stenosis
Mitral Valve Stenosis
Flail Mitral Regurgitation
Mitral Regurgitation
Austin Flint
Midsystolic Click – Mitral Valve Prolapse
Aortic Valve Ejection Sound
Pulmonary Valve Ejection Sound
Aortic Stenosis
Aortic Insufficiency

Newer Ventricular Assist Devices Incorporate Technology That Eliminates Mechanical Bearings

Abstract: Third-generation ventricular assist devices utilize hydrodynamic or magnetic levitation technology to avoid the friction and mechanical wear associated with earlier versions of these devices.

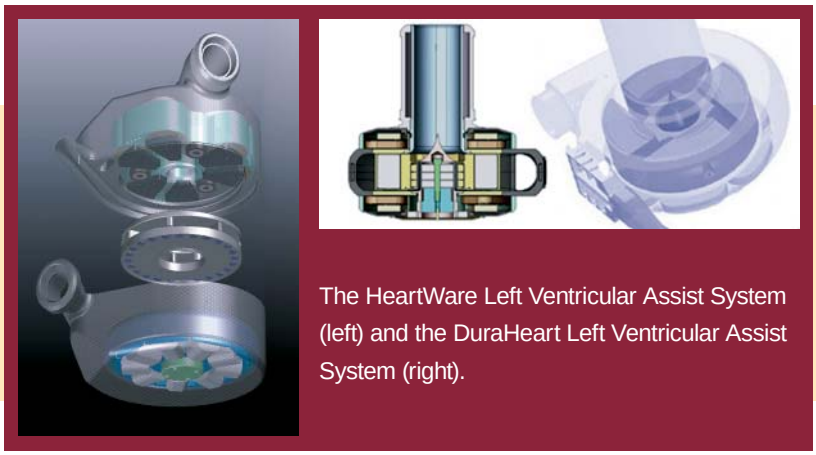
Implantable ventricular assist devices (VADs) are being successfully used in patients with severe heart failure, allowing many of these patients to survive and lead normal lives. In the last few years, researchers at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH) have been studying one type of VAD in particular—the continuous flow pump. Unlike their pulsatile forebears, continuous flow pumps are quite small because they have only 1 moving part—a rotating impeller that pushes blood forward like a fan pushes air. Being simpler than pulsatile pumps, axial flow VADs have the additional advantage of being less prone to mechanical failure.

"At present, 3 generations of VADs are either being used or being developed for clinical use," says O. H. Frazier, MD, Director of Cardiovascular Surgical Research and Chief of Cardiopulmonary Transplantation at THI at SLEH. "The generations are differentiated mainly by the way their rotating elements are supported and by the type of flow they produce."

First-generation pumps have valves and sealed, lubricated mechanical bearings that provide pulsatile flow. Second-generation implantable pumps lack valves and use blood-lubricated bearings to support a continuously spinning rotor. Third-generation implantable pumps also lack valves but rely on hydrodynamic or magnetic levitation instead of mechanical bearings to support the rotor.

"The second- and third-generation continuous flow VADs offer some important advantages over the earlier, pulsatile VADs," says Roberta Bogaev, MD, Medical Director of Heart Failure and Cardiac Transplantation at THI at SLEH. "The newer pumps are smaller, simpler, and quieter, and they promise a better quality of life for patients. It is also possible to use these pumps in patients with smaller body frames, including women and children."

One of the newer, third-generation VADs is the HeartWare Left Ventricular Assist System (HeartWare International, Inc., Framingham, MA), which was conceived in the 1990s by Dr. Frazier and Richard K. Wampler, MD, who developed the Hemopump Cardiac Assist System. The HeartWare is now being used under a clinical protocol at THI at SLEH. At the core of the HeartWare is a small, implantable, centrifugal blood pump, which spins at 2000 to 3000 rpm, drawing blood from the apex of the left ventricle and propelling the blood through an outflow graft connected to the ascending aorta. The device is capable of generating up to 10 L/min of blood flow. A driveline exits the skin and connects the pump to an external controller worn on the patient's belt or in a shoulder holster. The controller is powered by a battery pack, which has 2 batteries or 1 battery plus an adaptor that connects to an electrical outlet in the wall or in a vehicle.



The HeartWare Left Ventricular Assist System (left) and the DuraHeart Left Ventricular Assist System (right).

The HeartWare's impeller is suspended within the pump housing by means of hydrodynamic suspension, which is achieved by creating a gentle incline on the upper surfaces of the impeller blades. When the impeller spins, blood flows across these inclined surfaces, creating a "cushion" between the impeller and the pump housing. There are no mechanical bearings or any points of contact between the impeller and the pump housing.

Another type of third-generation axial flow pump is the DuraHeart Left Ventricular Assist System (Terumo Heart, Inc., Ann Arbor, MI), which underwent preclinical testing at THI at SLEH and was the first device of its kind to reach the clinical trial stage. The DuraHeart combines centrifugal pump and magnetic-levitation technologies to address the problems of friction, mechanical wear, and hemolysis associated with first-generation devices.

Magnetic levitation allows the impeller to be suspended within the blood chamber by means of electromagnetic force and position sensors. Flow rates, which vary with physiologic changes, range from 2 to 8 L/min, with pump speeds between 1200 and 2400 rpm. Like the HeartWare, the Duraheart's driveline exits the skin and connects the pump to an external controller. The controller is powered by a battery pack and displays system-status information on a small screen.

"The third-generation, bearingless devices are simple, small, and reliable," says Dr. Frazier. "Initial clinical results have been favorable, but more time and experience will be needed to validate the potential advantages of these improvements." ●

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Level of Experience Does Not Affect Outcomes of Operations Performed by Supervised Cardiovascular Surgical Residents

Abstract: A study conducted by THI surgeons shows that hands-on training of cardiovascular surgical residents does not entail additional risk for patients.

At academic institutions, residents play a large role in patient care. In highly specialized areas of medicine, such as cardiovascular surgery, questions have been raised about the level of skill that first- and second-year residents bring to the operating room.

Because coronary artery bypass grafting (CABG) is one of the most common cardiovascular procedures performed today, cardiovascular surgical residents receive a great deal of training in this operation. As a result, first- and second-year residents often serve as the primary surgeon for CABG procedures under direct, hands-on supervision by faculty members.

To determine what effect, if any, surgical residents' level of experience has on the outcomes of CABG procedures, Faisal Bakaeen, MD, Chief of Cardiothoracic Surgery at the Michael E. DeBakey Veterans Affairs Medical Center (MEDVAMC) and cardiovascular staff surgeon at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI at SLEH); Joseph S. Coselli, MD, Chief of Adult Cardiac Surgery at THI at SLEH and Chief of Cardiothoracic Surgery at Baylor College of Medicine; and their colleagues studied data regarding CABG procedures performed by first-year residents, second-year residents, and staff surgeons at the MEDVAMC, a primary teaching hospital for Baylor College of Medicine, where Drs. Coselli and Bakaeen are members of the surgical faculty. Their findings were published earlier this year in the *Annals of Thoracic Surgery* (2009;87:1127-34).

"We examined the outcomes of 1042 CABG procedures by using the Continuous Improvement in Cardiac Surgery Program—a Veterans Affairs database for which data are prospectively collected for quality-assurance purposes," says Dr. Bakaeen. "For most of the CABG procedures, the primary surgeon was a first- or second-year resident. In a minority of procedures—47 cases—the primary surgeon was a staff member."

The authors used multivariate analysis to compare outcomes among the 3 groups of cases, because there were some baseline differences among the patients: staff surgeons tended to perform the most difficult cases, whereas first-year residents often performed the cases involving the least risk.

> *"…as long as they have appropriate supervision and guidance from staff members, cardiovascular surgical residents can receive hands-on training at academic hospitals without exposing patients to additional risk."*
>
> *—Joseph S. Coselli, MD*
> *Chief of Adult Cardiac Surgery*

"Operative, perfusion, and cross-clamp times were longest for procedures led by first-year residents and shortest for procedures led by staff members, but the time difference was small and not clinically relevant," Dr. Coselli says. "After we adjusted for differences in the patients' baseline risk factors, neither these times nor the surgeon's level of experience appeared to affect operative mortality rates, major morbidity rates, or length of hospital stay. The 1- and 3-year survival rates were also nearly identical among the 3 groups of patients."

"The most likely explanation for our findings is that even when a resident serves as the primary surgeon for a procedure, staff surgeons are available both in and out of the operating room to provide supervision and guidance," says Dr. Bakaeen. "This resident-staff collaboration makes procedures take slightly longer, as does the greater care that less experienced residents must exercise, but both factors help residents produce good clinical outcomes."

Although this study had several limitations—it was performed at only one hospital, it was retrospective, and almost all of the patients were men—its findings are nonetheless compelling.

"Our results suggest that as long as they have appropriate supervision and guidance from staff members, cardiovascular surgical residents can receive hands-on training at academic hospitals without exposing patients to additional risk," says Dr. Coselli. "This appears to be true despite the technically demanding nature of our specialty." ●

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National "July Effect" Study Published

Earlier this year, Faisal G. Bakaeen, MD, of the Texas Heart Institute at St. Luke's Episcopal Hospital and the Michael E. DeBakey Veterans Affairs Medical Center published a large-scale study of the effect that academic seasonality has on outcomes in cardiac surgery (*Ann Thorac Surg* 2009;88:70-5). His study, which involved 70,616 patients treated at 44 Veterans Affairs hospitals nationwide, showed that the "July Effect"—the notion that cardiac operations performed by residents at the beginning of the academic year produce worse outcomes than operations performed at the end of the academic year—does not exist; patient mortality and morbidity rates did not differ for operations performed in July and August versus those performed between September and June. These results confirmed the findings of a smaller-scale study conducted by Dr. Bakaeen that was described in the Fall 2008 issue of *Heart Watch*.

Researchers Uncover the Pathogenesis of Arrhythmogenic Right Ventricular Cardiomyopathy

Abstract: The origin of adipocytes in arrhythmogenic right ventricular cardiomyopathy offers an explanation for the pathogenesis of this disease in cardiac muscle.

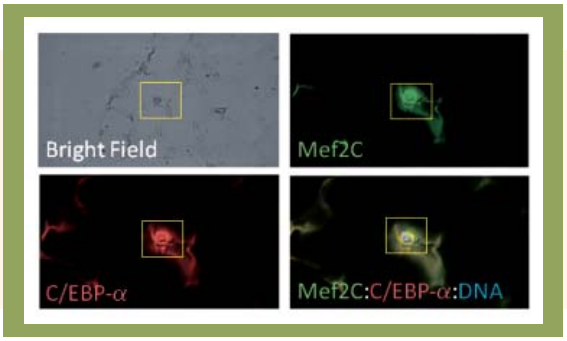
One of the leading causes of sudden cardiac death in young people is arrhythmogenic right ventricular cardiomyopathy (ARVC), a progressive myocardial disease characterized by the replacement of cardiac myocytes with fibrous adipocytes. Most cases of ARVC are inherited, typically in an autosomal dominant pattern. Mutations in at least 5 genes that encode desmosomal proteins have recently been shown to cause ARVC. Desmosomes are intercellular-junction structures that promote adhesion between epidermal cells and cardiac myocytes. Recently, some desmosomal proteins have also been shown to affect the Wnt signaling pathway, an important regulator for preventing the switch from myogenesis to adipogenesis.

Ali J. Marian, MD, and his colleagues are studying the molecular genetics and pathogenesis of ARVC. Dr. Marian is a member of the professional staff at the Texas Heart Institute at St. Luke's Episcopal Hospital, Professor of Cardiovascular Genetics and Medicine and Director of the Center for Cardiovascular Genetic Research at The Brown Foundation Institute of Molecular Medicine at The University of Texas Health Science Center at Houston. Dr. Marian's group recently identified a subset of cardiac progenitor cells that switch to an adipogenic fate as a result of suppressed Wnt signaling (*Circ Res* 2009;104:1076-84). Raffaella Lombardi, MD, PhD, who is a postdoctoral fellow in Dr. Marian's group, presented these findings at the 2008 Annual Scientific Sessions of the American Heart Association and was given the highly prestigious Louis N. and Arnold M. Katz Basic Science Research Prize for Young Investigators. The prize is given for the best scientific presentation at the annual sessions.

"The cellular origin of adipocytes in the hearts of patients with ARVC is not fully understood," says Dr. Marian. By conducting genetic fate-mapping experiments, he and his team set out to trace the cellular origin of adipocytes in a mouse model of ARVC. They identified second heart field progenitors as the cell type that undergoes a switch to an adipogenic fate in mouse hearts with ARVC. "The second heart field gives rise to the right ventricle, which is the main area of the heart affected in patients with ARVC. Until now, the predominant involvement of the right ventricle in this disease has been an enigma," says Dr. Marian.

Dr. Marian's group also showed that cardiac progenitor cells, presumably in transition from a myogenic to an adipogenic fate, coexpressed second heart field markers and adipogenic transcription factors in the regions of the heart undergoing adipogenesis in mice with ARVC. These findings validated the results of the genetic fate-mapping experiments. Furthermore, sections of right ventricular myocardium from 3 human patients with ARVC revealed similar results. "The corroborated findings in autopsy-proven cases of ARVC highlight the significance of these results, which may be used in the future to develop new diagnostic markers and therapeutic targets for this devastating disease," states Dr. Marian.

An important contribution of this work is the emphasis on the molecular role of the desmosomal protein plakoglobin in suppressing the Wnt signaling pathway. Researchers had previously demonstrated in a mouse model of ARVC that plakoglobin, which normally functions in desmosomes, is translocated into the nucleus of cardiac cells. Dr. Marian's group showed that nuclear plakoglobin suppresses Wnt signaling by interacting with proteins in the Wnt pathway. This interaction results in the expression of adipogenic transcription factors and the reduction of adipogenic inhibitors in second heart field progenitor cells of the right ventricle.



Immunostained cardiac cells from a patient with ARVC coexpress second heart field marker Mef2C and adipogenic marker C/EBP-α, distinguishing the second heart field progenitors as the origin of adipocytes in ARVC.

"In the heart, only cells of the cardiac myocyte lineage are known to express desmosomal proteins," says Dr. Marian. "Impaired myocyte-to-myocyte attachment due to defective desmosomes may explain cardiac dysfunction in ARVC, but our work has elucidated a unique role for desmosomal proteins in the pathogenesis of the excessive adiposis of the heart in ARVC." ●

For more information:

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Cover: Statue donated by Rabbi Samuel E. Karff for the Celebration of Hearts display in the Wallace D. Wilson Museum of the Texas Heart Institute at St. Luke's Episcopal Hospital —The Denton A. Cooley Building.

Calendar of Events

Texas Heart Institute Continuing Medical Education Symposia

Future Direction of Stem Cells in Cardiovascular Disease Satellite Symposium at the American Heart Association Scientific Sessions
The Peabody Orlando Hotel
November 14, 2009 • Orlando, Florida
Program Director: James T. Willerson, MD

Ninth Texas Update in Cardiovascular Advancements
Denton A. Cooley Auditorium
The Texas Heart Institute
December 4–5, 2009 • Houston, Texas
Program Director: James T. Willerson, MD

New Books

Delgado RM III, Arora HS, eds: *Interventional Treatment of Advanced Ischemic Heart Disease.* New York: Springer, 2009 (154 pp). This textbook assesses current guidelines, treatment options, and protocols for the care of patients who have advanced ischemic heart disease.

Selected Upcoming Local, National, and International Meetings

American College of Surgeons 95th Annual Clinical Congress
October 11–15, 2009 • Chicago, Illinois

American Heart Association Scientific Sessions 2009
November 14–18, 2009 • Orlando, Florida

Society of Thoracic Surgeons 46th Annual Meeting
January 25–27, 2010 • Fort Lauderdale, Florida

International Society for Heart and Lung Transplantation 29th Annual Meeting and Scientific Sessions
April 21–24, 2010 • Chicago, Illinois
Abstract submission deadline: October 2, 2009

American Association for Thoracic Surgery 89th Annual Meeting
May 9–13, 2010 • Toronto, Ontario, Canada
Abstract submission deadline: October 5, 2009

For information about Texas Heart Institute CME activities, please e-mail cme@heart.thi.tmc.edu or call 832.355.2157. To view or complete selected CME presentations (certificates are available online), please visit www.texasheart.org/cme. New courses are added regularly.

For 19 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."