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As a multimodality cardiac imaging specialist, Dr. Abidov combines the strengths of different image-capturing techniques to maximize their clinical value. Here, a 3D Computer Tomographic image of the heart (left screen) reveals anatomic details of the heart vessels, while a perfusion nuclear scan (right screen) is used to assess the blood flow to the heart muscle and the organ's pumping function.

Aiden Abidov, MD, PhD, Named to the C. Leonard Pfeiffer Chair in Cardiology

Summer at The University of Arizona College of Medicine has been overshadowed by the passing of Eugene Morkin, MD, founding co-director and cardiovascular researcher at the Sarver Heart Center, on July 19, 2009 (see article on page 11). His retirement in 2007 vacated the C. Leonard Pfeiffer Chair in Internal Medicine, established in 1977 to foster basic and clinical research leading to better treatments for patients with heart and vascular disease.

“Following Dr. Morkin’s retirement, we focused our recruiting efforts on finding an individual with a proven academic track record to occupy the chair,” said Gordon A. Ewy, MD, Chief of Cardiology and Director of the Sarver Heart Center. “The availability of this endowed

chair allowed us to recruit Aiden Abidov to the Department of Medicine. Dr. Abidov comes to the UA with an impressive portfolio of clinical accomplishments and research experience. He is one of very few board-certified cardiologists also certified in cardiovascular computerized tomography angiography, cardiovascular magnetic resonance imaging, nuclear cardiology and peripheral vascular ultrasound. His training included a fellowship dedicated exclusively to cardiovascular imaging at Cedars-Sinai Medical Center in Los Angeles. When he joined the Sarver Heart Center, he hit the ground running.”

Dr. Abidov explains: “We are planning to apply for federal funding of several research projects. One, for example, will focus on early and

...from the Director




In this issue of the Sarver Heart Center Newsletter, we pay our respects to College of Medicine/Sarver Heart Center founding faculty member Dr. Eugene Morkin. I felt that the article, "Life stories: Heart Center co-founder was pioneer in cardiology," originally published in the Arizona Daily Star, was so well written that we obtained permission to reprint it in its entirety on page 11 of this newsletter. Dr. Morkin held the C. Leonard Pfeiffer Endowed Chair in Cardiology, so when he retired in 2007 because of poor health, we began our search for a young academic cardiologist to fill this position. The lead story is about Aiden Abidov, MD, PhD, who was recently appointed to this endowed chair.

This year marks the 30th anniversary of Dr. Jack Copeland's cardiac transplantation program, which has been one of the major contributions of The University of Arizona College of Medicine and University Medical Center to those whom we serve. We take this opportunity to highlight our cardiovascular surgery colleagues' accomplishments.

Prompted by the moving story of a high school student who recently collapsed from sudden cardiac arrest and was saved only because his school happened to have a defibrillator on campus, the Steven M. Gootter Foundation stepped forward and donated the life-saving devices to all high schools in Southern Arizona who did not already have at least one. For this project, the foundation teamed up with the Sarver Heart Center to provide training in continuous chest compression CPR and the use of the AED to school staff.

As you might know, one of our priorities is to assemble a top-notch program to investigate the molecular causes of heart disease and use those findings to develop new and improved risk assessment and treatment options. I am excited to share with you how a "ripple effect" of philanthropic support allowed us to recruit Jeff Walker, PhD, and his research group from the University of Wisconsin to the UA Department of Physiology to bolster the Sarver Heart Center's basic cardiovascular research contributions. He describes their search for molecular markers or clues to the prevention of heart failure and out-of-hospital cardiac arrest.


GORDON A. EWY, MD
Director, UA Sarver Heart Center

*'Aiden Abidov'
continued from page 1*

effective diagnosis of aggressive coronary artery disease in patients with heart disease in their families. These individuals face a high risk of disability despite their relatively young age and must be identified."

"My goal is to take advantage of the great research potential at the university to constantly improve clinical care," Dr. Abidov adds and goes on to explain some of the specifics of that endeavor: "With computer tomography angiography, we can diagnose patients who come into the emergency room with chest-pain symptoms faster and speed up their admittance or discharge them home in just a couple of hours. The technique allows us to look into a patient's coronary arteries and check for blockages, much like in a conventional angiogram."

"Noninvasive cardiac imaging is almost like holding the beating heart in our hands. It allows us to better visualize the heart's arteries and veins. The result is the best available patient care," says Vincent Sorrell, MD, professor of Clinical Medicine in Cardiology, Radiology and Pediatrics at the UA College of Medicine, who specializes in noninvasive cardiovascular imaging.

In addition to maximizing

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The C. Leonard Pfeiffer Chair was established in 1972 by Henry R. Herold (center) and George R. Pfeiffer (right), here pictured with John P. Schaefer, then-president of The University of Arizona.

the clinical benefits of cardiovascular imaging, Dr. Abidov intends to closely work with Dr. Sorrell in strengthening and expanding the training of cardiology fellows. “We want our cardiologists of tomorrow to be versed in the various types of non-invasive imaging so they can choose the type of test that is the most beneficial and cost-effective for the specific case at hand. Of course, educational efforts include the support staff as well. We also are developing lectures and workshops for nurses and technicians to make them familiar with all aspects of cardiovascular imaging.”

Born in Baku, the capital of former Soviet Union member state Azerbaijan, Dr. Abidov represents the fifth generation in a family of physicians. He graduated from medical school at the age of 20. In 1993, he immigrated with his family to Israel, where he completed his residency in cardiology and internal medicine at Assaf Harofeh Medical Center in Zerifin. In addition, Dr. Abidov had his Cardiovascular Fellowship at the William Beaumont Hospital, Royal Oak, Mich., and his Cardiac Imaging Fellowship at Cedars-Sinai Medical Center in Los Angeles.

When asked about his first impressions about working at the Sarver Heart Center, University Medical Center and University Physicians Healthcare Hospital, Dr. Abidov says, “I immediately sensed an atmosphere of extraordinary devotion and passion. The faculty has been incredibly supportive with respect to novel ideas that require some investment to develop further into clinical applications. It seems that everybody who works here will push very, very hard to make ideas and goals a reality.” ♥

The Enduring Power of Endowments

In 1972, The University of Arizona College of Medicine received its first endowed chair through a gift from the Gustavus and Louise Pfeiffer Research Foundation. At the dedication luncheon of the C. Leonard Pfeiffer Endowed Chair in Cardiology on Dec. 14, 1972, the president of the Pfeiffer Research Foundation, Dr. Henry Herold, said, “The fact that the other chairs we have established have been at Harvard, the University of Pennsylvania, Stanford and The Menninger Foundation, indicates the class with which we put you [The University of Arizona] and the high regard we have for this fine medical school, which reached such a high place in such a short time.”

Endowments such as this one are permanent funds established by the University of Arizona Foundation. They exist in perpetuity and are invested for preservation and growth of the original gift while providing a stream of revenue for the purpose set forth by the donor, in this case to foster basic and clinical research leading to better treatments for patients with heart and vascular disease.

Frank Marcus, MD, who was chief of cardiology at the time, recognized the talent of Eugene Morkin, MD. “Without the support of the Pfeiffer Foundation through this endowment it would have been impossible to recruit Dr. Morkin from the East Coast.” For the next three decades, the Pfeiffer Chair provided support to help Dr. Morkin move forward his research on the molecular biology of cardiac hypertrophy (thickening of the heart muscle wall). Over time, Dr. Morkin received more than \$26 million in research funding through the National Institutes of Health. His research focused on the mechanisms that control heart muscle function. Most notably, Dr. Morkin discovered a protein that regulates calcium levels in the heart. His work helped understand how calcium controls the strength and rapidity of heartbeats and paved the way for later research on drugs to control heart failure.

The Pfeiffer Foundation’s contribution has been multiplied many times—not only through medical advances but also through the economic boosts the resulting national grants have provided to our community. ♥

Heart Transplant Program Celebrates 30-Year Anniversary

When Jack G. Copeland, MD, started a heart transplantation program at University Medical Center in 1979, the idea of taking a heart from a donor and implanting it into another person seemed more like science fiction than medicine, even to many members of the medical community. Dr. Copeland belonged to a visionary few who were passionate about starting what nowadays is almost a routine procedure performed at a number of hospitals around the world. Only five years before Dr. Copeland joined the faculty at the UA, he was chief cardiovascular resident at Stanford Hospital, one of a handful of places at the time pursuing the science of heart transplantation. It was there that Dr. Copeland performed the first successful re-transplant of a human heart. Nobody had ever before survived a second transplant. The patient, 13-year-old Patrick Sherlock from Boston, needed a second heart when his body rejected the first heart transplant barely two months out from surgery. Patrick lived for 13 more years following his second heart transplant.

During those times, rejection of a transplanted organ by the recipient's immune system was a major hindrance on the road to success in transplantation medicine. The science of anti-rejection drugs was still in its infancy. These drugs work by suppressing the patient's immune defense. Dr. Copeland recalls that his suggestion of starting a heart transplant program in Tucson was initially met with a great deal of skepticism because of the prevalence of valley fever in this area. Doctors feared that a patient with a compromised immune system would run a high risk of contracting valley fever.

"It took a lot of discussion to alleviate those concerns," Dr. Copeland says. "In the end, though, people realized that a heart transplantation program was desperately



Ryan Mihalayi

Members of the University Medical Center Transplant Team

needed in the Southwest, and we had the facilities, the staff, and the know-how to make this ambitious enterprise a reality."

Today, 30 years later, the endeavor started at the UA has become the most successful heart transplant program in the entire southwest, catering to patients from Arizona, Utah, New Mexico, Colorado, Nevada and beyond. For many patients with end-stage heart failure, a donor organ is the only option to stay alive. Much of the science and medical expertise surrounding heart transplantation was discovered right here in Tucson. Of the 902 heart and heart-lung patients who received transplants at UMC, 386 are still alive.

Unfortunately, many individuals who qualify for a heart transplant never receive one. The lack of organ donors has been and still is a most pressing issue. The United Network for Organ Sharing typically has more than 4,000 potential cardiac recipients on the waiting list at any time. Each year, between 2,000 and 2,500 heart transplants are performed in the United States. Because of the gap in donors vs. recipients, about 1,000 people die while on the waiting list, and the number of those in need of an organ continues to climb. At UMC, typically about 40 patients are awaiting a transplant, with about six of those in critical condition. Over the course of a year, 12 of those 40 are expected to die because no suitable donor heart can be found.

"Clearly, we need everyone to consider the gift of a heart that will give someone a new lease on life," says Dr. Copeland. "We have made incredible strides in medicine over the last 30 years, and we continue to make new discoveries and advances that further extend life expectancies after a transplant, but we are just the docs – we need everyone's help." ♥



How to sign up to be an organ donor

Laws that oversee donation vary from state to state. It is important for you to know how to ensure your decision to be a donor is carried out. For general information on organ donation, visit the "Donate Life America" organization online at <http://www.donatelife.net>. The site lists instructions and sign-up websites for all states. Residents of Arizona can sign up online in the Arizona Donor Registry at www.DonateLifeAZ.org.

Selected Milestones of the UA/UMC Transplant Program

1973: First transportation of a human donor heart from Oakland to Stanford. The case set a legal precedent for the recognition of brain death.

1974: First successful re-transplant of a human heart at Stanford Hospital. Jack G. Copeland, MD, was chief resident at the time.

1979: Dr. Copeland makes history by performing Arizona's first heart transplant on Norman "Dutch" Tarr. UMC becomes one of only six heart transplant centers in the United States.

1980: Norman "Dutch" Tarr successfully sued Medicare for reimbursement of the transplant procedure. The case prompted the National Heart Transplantation Study, which took five years to complete. The objective was to determine whether heart transplantation qualified as a cost-effective, necessary and reasonable procedure. The case set the precedent for the operation to be a reimbursable procedure.

1981: The International Society for Heart and Lung Transplantation (ISHLT) is founded by Drs. Jack Copeland, Michael Hess, Ed Stanson and Jacques Losman. The first meeting is held the following year in San Francisco.

1982: William DeVries implants the world's first artificial heart.

1983: The first use of cyclosporine as an immunosuppressant dramatically extends the survival rates of transplant recipients by preventing the body's immune system from rejecting the organ.

1985: Arizona's first heart-lung transplant. The patient lived for 24 more years.

1987: Drs. Gulshan Sethi and Jack Copeland perform the first lung transplant in Arizona.

1998: Dr. Copeland successfully uses a Thoratec heart assist device as a bridge-to-transplant. Only 7 years old and weighing 37 pounds, patient Willy Maskiell is the youngest and smallest person in the world ever to receive the device.

2000: Dr. Copeland is the first in North America to use the Berlin Heart Assist Device. Carlos Ochoa, 7, receives the device as a bridge-to-transplant. Dr. Copeland also was the first in the United States to use the device in small children and infants.

2004: The Food and Drug Administration (FDA) approves the Total Artificial Heart (TAH) for routine use.

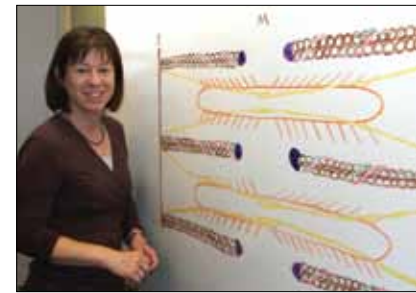
2004: The American Heart Association names the Total Artificial Heart the "Top Research Advance of the Year."

2006: Dr. Copeland uses the Berlin Heart as a bridge-to-recovery in Tiana Lopez, a 15-month-old girl, and in Ixair Rodriguez, 8 months at the time. While on the device, their hearts fully recover and both children no longer need a transplant.

2009: To date, UMC has performed over 1,000 heart, heart-lung, single or double lung transplants, and more than 100 Total Artificial Heart and 250 Ventricular Assist Device implants. The members of the Artificial Heart Program have published more than one hundred articles in the field of heart device medicine and technology.

Sarver Heart Center Co-Director Appointed Head of the Department of Cell Biology and Anatomy at the College of Medicine

Carol Gregorio, PhD, a nationally recognized leader in heart muscle research, has been appointed head of the Department of Cell Biology and Anatomy at The University of Arizona College of Medicine in Tucson. Dr. Gregorio served as interim department head since 2008.



Dr. Gregorio also is co-director of the UA Sarver Heart Center, where she directs the Molecular Cardiovascular Research Program. She holds dual appointments as professor in the Department of Cell Biology and Anatomy and the UA College of Science Department of Molecular and Cellular Biology, and is a member of the UA BIO5 Institute.

"Dr. Gregorio has a proven track record in establishing and nurturing a cutting edge research program. She also has shown remarkable leadership skills and the ability to promote college-wide collaboration," says Steve Goldschmid, MD, dean of the UA College of Medicine.

Dr. Gregorio joined the UA College of Medicine faculty in 1996. Prior to joining the UA, she was a senior research associate with the Department of Cell Biology at The Scripps Research Institute in La Jolla, Calif. She earned her bachelor's degree in 1983 and her master's degree in biological sciences in 1986 from the State University of New York at Buffalo, and her doctorate in molecular immunology from Roswell Park Cancer Institute in Buffalo, N.Y., in 1992.

Her research involves deciphering the cellular mechanisms of cardiac muscle development in health and disease. In particular, her laboratory studies the mechanisms by which the protein actin, the major component of heart muscle, functions. Single point mutations in actin are a frequent cause of several forms of human cardiomyopathy (a disease of the heart muscle leading to decreased function). As such, her laboratory is determining how genetic defects in actin affect muscle contraction, which may lead to heart failure and, in rare circumstances, to sudden cardiac death.

She is the author or co-author of more than 50 articles published in professional journals, including *Nature*, *Cell*, *Developmental Biology*, *Trends in Cell Biology*, *Annual Review of Cell and Developmental Biology*, *Journal of Cell Biology*, *Molecular Biology of the Cell* and *Journal of Biological Chemistry*.

"We are interested in investigating the causes that underlie heart muscle conditions on the molecular level," Dr. Gregorio explains. "Our research aims at making a difference by someday providing clues doctors can use to better predict who is at risk from heart disease, and even which patients face the risk of sudden cardiac arrest. If we can spare even one family the tragedy of losing a loved one to this silent killer, we have done our job." ♥

'I Saw Myself Flat-Lining Twice'



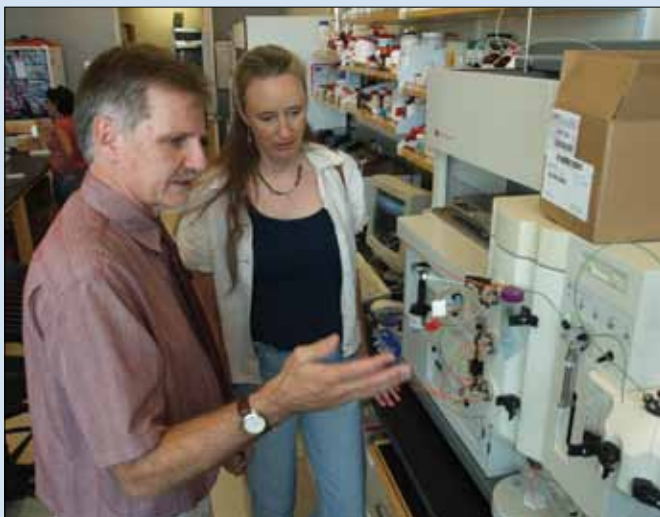
Sarver Heart Center researchers are developing new and better ways to predict individual risks of heart disease

Nina Gibson vividly remembers the night her heart stopped beating 11 years ago. Having suffered from heart failure for 29 years, she

remembers “trying everything to avoid a heart transplant. I’ve always walked a lot; I rode horses and played tennis.” When the paramedics got to her house, Nina was drifting in and out of consciousness. “I remember lying on the gurney inside the ambulance, and they were rushing me to University Medical Center in Tucson. I looked at the vital signs monitor and saw myself flat-lining twice!”

When the paramedics whisked her into the Emergency Room, Nina was about to lose her grip on life. “I saw clouds closing in from all directions. I thought to myself, ‘No, no, clouds go away!’” Richard Wagner, MD, the attending physician, asked, “How are you?” “I’m dying,” she replied. He said, “No, you’re not. Not on my shift.” Dr. Wagner summoned the help of emergency personnel and together, they performed CPR for almost an hour. With their help, Nina chased the clouds away. She was even able to go home and resumed working part time.

Still, Nina’s heart was failing because of an inherited genetic defect that caused her heart muscle to become progressively weaker. Over the following two years, it became too weak to keep her alive. At that point, doctors had to place Nina on a Thoratec assist device, a mechanical pump taking over some of her heart’s workload and keeping the blood circulating.



Donor Investments Build Strong Research Program

In October 2005, The Sarver Heart Center had just launched a campaign to create a world class heart disease in women program. This endeavor was catapulted into existence when an anonymous donor and Allan and Alfie Norville stepped forward and created the Allan and

Jeff Walker, PhD, explains how he and his co-workers purify samples of blood serum to analyze it by mass spectrometry to Lindsay Luke, who suffered a cardiac arrest and subsequent heart failure due to a genetic heart defect that was unknown at the time.

The time for a transplant had finally come.

On October 2, 2000, Nina became UMC heart transplant patient No. 583 under the hands of Chief of Cardiothoracic Surgery, Jack Copeland, MD. Only a little over a month earlier, her daughter Lindsay, who was 28 at the time, suffered a cardiac arrest. When she was brought into the hospital, doctors gave her little to no chance of surviving without brain damage. Nina says: “I told them, ‘Lindsay is a fighter. Give her a chance.’” Her daughter not only survived, but recovered from her ordeal.

However, it was not until two months later that Nina and Lindsay came a step closer to an answer as to what caused the problem with their hearts. Nina’s husband Nick, a neuroscientist at The University of Arizona, had come across a clinical study conducted by Christine Seidman, MD, at Harvard Medical School and Brigham and Women’s Hospital, which aimed at collecting data on genetic causes underlying heart failure. It turned out that Nina and Lindsay both carry a mutation – a “typo” – in the gene that serves as a blueprint for a heart muscle protein called Troponin I. The mutation, which was unknown to science at the time, causes a certain type of amino acid – the ‘letters’ that make up proteins – to be replaced by a different one. However, even with that information, no scientist in the world can answer the question why a small typo in a protein structure can cause the heart to become progressively weaker or go into sudden arrest.

Unraveling the molecular secrets of Troponin I

“We just don’t know enough yet about all the intricate mechanisms that keep such a fine-tuned machine as the heart in good running condition,” says Sarver Heart Center Researcher Jeff Walker, PhD, as he opens the door to his lab in the Medical Research Building. “But we’re working on it.”

With Dr. Walker, the Sarver Heart Center’s Molecular Cardiovascular Research Program gained an expert whose research combines traditionally distinct disciplines—molecular biology, analytical chemistry and physics—into a rare and powerful constellation that enables his research team to delve deeply into the realm of biomolecules that play key roles in heart disease. His unique approach to finding better ways of cardiovascular diagnostics has created a stir in the scientific community. Just recently, colleagues with similar interests in the United Kingdom and Sweden have approached him to initiate research collaborations.

Dr. Walker’s research also holds the potential of improving the ability of emergency room physicians to diagnose and triage patients presenting with symptoms of a myocardial infarction (heart attack).

Currently, the test most widely used by doctors to evaluate patients with heart attacks assesses the presence of a protein called Troponin-I in the bloodstream. A so-called biomarker, Troponin-I normally is found inside heart muscle cells, where

Continued on next page

Alfie Norville Endowed Chair for Heart Disease in Women Research (see newsletter issues 45 and 49). “This gift put us on the map – on a national level – because we were able to recruit a preeminent scholar and scientist in Dr. Henk Granzier,” says Carol C. Gregorio, PhD, co-director of the Sarver Heart Center. “But in the process we found other incredible candidates who we knew would bring a lot to the program.” It is here the first ripple from the impact of the Norville Chair was seen. Soon after Dr. Granzier accepted the offer, Mark and Mary Anne Fay (both are members of the Sarver Heart Center Advisory Board, and Mary Anne chairs the Heart Disease in

Women Education Committee) made a gift to the Center. After talking with Dr. Ewy, the Fays decided to designate their gift to help recruit another principle investigator for the blossoming program. In 2007, Jeff Walker, PhD, then at the University of Wisconsin-Madison, joined the faculty in the Department of Physiology at The University of Arizona. “Having this opportunity to join the world-class faculty at The University of Arizona is an honor, particularly given the quality of cardiovascular researchers already here,” said Dr. Walker. “The Sarver Heart Center has created something unique here for patients, clinicians and researchers and I am thrilled to be a part of it.” ♥

it interacts with other protein molecules to make the muscle contract, thus causing the heart to squeeze and pump blood. During a heart attack, a blood clot clogs one of the coronaries, the arteries that feed the hard-working muscle cells oxygen and nutrients. As a result, the cells in the affected area begin to die and disintegrate, spilling their contents, including troponin, into the blood stream. A blood test that comes back positive for troponin tells doctors that a patient has suffered from heart muscle damage, most likely due to a heart attack.

“Unfortunately, the Troponin-I test doesn’t tell the whole story,” says Dr. Walker. “The kits used to determine the levels of this protein don’t tell doctors anything about the exact nature of the damage inflicted on the heart.”

Knowing the exact level of Troponin-I could give doctors important clues to the exact nature of a heart attack, the best mode of treatment and the patient’s individual risk of a recurring event that might be fatal.

“With the existing tests, this is very hard to do,” Dr. Walker says. “They are fairly blunt weapons.”

His group, who works on sharpening those weapons through the use of a sophisticated analytical method called mass spectrometry, has garnered worldwide recognition for overcoming a seemingly insurmountable obstacle, namely the limitation of mass spectrometry to very small molecules. On the scale of

atoms and molecules, Troponin-I, like most proteins, is huge. So huge in fact, that even with recent improvements that earned their inventors the Nobel Prize in 2002, troponin remained off limits to mass spectrometry.

“We figured out a technological breakthrough that enabled us to tackle this molecule using mass spectrometry for the first time,” Dr. Walker says, and goes on to explain how it works.

“As a key player in heart muscle function, troponin interacts with many other proteins. You could say all those different and highly specialized proteins ‘talk’ to each other, attaching or removing portions of their chemical makeup, changing their shape and activating or inhibiting nearby proteins. We are only beginning to understand these highly complex interactions and how they influence the function of a healthy heart, let alone a heart fraught with damage of any sort. Right now, all the troponin test tells doctors is whether the biomarker is there. That’s it. It doesn’t give any information as to how much exactly is there, nor does it reveal anything about the chemical structure of the protein. We are on our way to developing better tests that will tell doctors the full story, so they have an accurate idea of the particular situation of an individual patient and can choose the treatment that is best for that patient.”

Unlike the available tests, which use antibodies to detect either the absence or presence of

troponin in a blood sample, mass spectrometry analyzes the exact molecular structure, revealing the smallest details, such as the state of activation.

A clinical study to assess cardiovascular risks in patients

But the possibilities do not end here. Dr. Walker’s group is about to embark on a clinical study whose results might help clinicians in assessing their patients’ cardiovascular risk profiles.

Using blood samples obtained from patients who underwent diagnostic testing, the researchers are planning to use their highly sensitive mass spectrometry to pan for and identify genetic variations that make an individual more or less susceptible to heart disease.

“Troponin-I controls the relaxation of the heart muscle after each contraction,” Dr. Walker explains, “so it is easy to understand why a disruption in its molecular structure could result in cardiomyopathies – heart malformations, or arrhythmias – abnormal heart beats.”

Only through the work of basic scientists like Jeff Walker, who systematically analyze and study the functional roles of the different kinds of genetic mutations in heart proteins and work closely with physicians, is there a possibility that, some day, doctors might be able to screen apparently healthy individuals for certain genetic predispositions, take preventive measures and choose individualized treatments to prevent heart failure or worse. ♥

Most High Schools Were Unprepared for Sudden Cardiac Arrest – Tucson Foundation Teams up With Sarver Heart Center to Solve the Problem

In an unparalleled move to prevent avoidable deaths from sudden cardiac arrest, the **Steven M. Gootter Foundation** is providing automated external defibrillators (AEDs) to all Southern Arizona public and private high schools that lack these life-saving devices. The foundation also will donate AEDs to the Tucson Boys and Girls Clubs and the Jim Reffkin Tennis Center. All schools and institutions received training on the AEDs through The University of Arizona Sarver Heart Center.

The initiative was triggered by the sudden collapse of Emilio Martinez, a student of Tucson's Cienega High School, during weightlifting class, said Gootter Foundation spokesperson Claudine Messing. The student survived only because his school had an AED readily accessible. Even though AEDs are becoming increasingly accessible in public places like airports, convention centers and shopping malls, schools often lack the funding to acquire a defibrillator or the resources necessary for training and overseeing their use.

"We realized that our foundation could make a real difference in alleviating this issue," Messing said. "The response and interest from the schools has been overwhelming."

"Sudden cardiac arrest is often associated with young athletes under intense physical stress. However, it is the leading cause of natural death in the United States and can strike anyone at any age," said Lani Clark, director of the SHARE program, which oversees AED programs across the state. SHARE stands for Save Hearts in Arizona Registry and Education (www.azshare.gov). Over the past several years, Arizona has become a national leader in improving the survival rates

for patients struck by sudden cardiac arrest through public education in Compression-Only CPR, developing modified protocols for Emergency Medical Services personnel and designation of hospitals as Cardiac Arrest Centers to provide optimal post-arrest care.

"High schools are concerned not only about their student population, but also about the safety of their staff, as well as parents and other members of the public that come together during the various events they hold during the year," she added.



Sarver Heart Center Member and Resuscitation Expert Lani Clark trained high school personnel in the use of the Automated External Defibrillators.

"For someone whose heart has stopped pumping blood, a quick response from bystanders is crucial," Clark explained. "If no one does anything except call 9-1-1, the chances of survival keep spiraling down by about 10 percent with every passing minute. By the time you get close to 10 minutes with no one doing uninterrupted chest compressions or getting an AED, the person's chance of survival is slim to none."

The Steven M. Gootter Foundation Board of Directors and supporters are committed to sparing families the tragedy of losing a loved one to



Medical Student K.C. Rosburg shows a participant where to attach the electrodes on a schematic drawing of a cardiac arrest patient.

the silent killer that takes 1,000 lives a day, more than cancer and AIDS combined, said Messing. Combating the condition that took the life of her then 42-year-old brother, Steven M. Gootter, whose life was cut short by sudden cardiac arrest while out on a morning jog, has been the driving force behind the foundation. In the four years since his untimely death, more than \$1 million has been raised through the annual Gootter Grand Slam tennis tournament and pro-exhibition held in honor of the late Mr. Gootter, who was an accomplished tennis player. The money has been used to fund research projects and create the Steven M. Gootter Endowed Chair for the Prevention and Treatment of Sudden Cardiac Death at The University of Arizona Sarver Heart Center. ♥

The Steven M. Gootter Foundation is a 501 (c) (3) non-profit charitable organization dedicated to the mission of defeating sudden cardiac death (SCD). To achieve this mission, the foundation has partnered with the UA Sarver Heart Center to fund scientific research into the causes and prevention of sudden cardiac death. The foundation works to increase awareness of SCD among those who may be at risk, and fosters education about SCD among health-care professionals and the public. For more information on sudden cardiac death and the Steven M. Gootter Foundation, please visit <http://www.gootter.org> or call Claudine Messing at (520) 615-6430.

Research Off the Beating Patch

It is an amazing sight: What looks like a tiny beating heart is actually a piece of synthetic, gauze-like mesh, barely the size of a fingernail, floating in a Petri dish. Yet it keeps squeezing away, nice and rhythmically. It is a three-dimensional scaffold of living, beating heart cells – a promising step forward on the quest for viable strategies of transplanting cells into diseased hearts.

stroke, the center's more than 150 scientist and physician members collaborate with the goal of applying new findings in the basic sciences to the clinical arena.

The latest example of this strategy, the "beating patch," has piqued the interest of news media, including *NPR's Science Friday* and *Scientific American*, and was picked by the American Heart Association as one of the most noteworthy

way that is much more efficient than the conventionally practiced method of injecting cells into heart tissue," says study leader Steven Goldman, MD. Dr. Goldman is a cardiologist and researcher at the Southern Arizona Veterans Administration Health Care System (SAVAHCS) and The University of Arizona's Sarver Heart Center.

Unlike most existing approaches, in which cardiac cells with no supporting structure are injected into heart tissue, Goldman's group uses a patch (Theregen Inc., San Francisco) made from microscopically thin fibers that serve as a scaffold to which the cells can adhere.

"Ultimately, we hope to use our system in patients with chronic heart failure and, possibly, to prevent heart failure in patients who had a heart attack," says Jordan Lancaster, a pre-doctoral fellow in Dr. Goldman's lab.

Dr. Goldman and his team discovered that when they "seed" a synthetic mesh patch with a sufficiently large number of heart muscle cells (2.5 million or more), the cells start behaving just like their counterparts in the real organ: They contract synchronously at about 70 beats per minute even without any outside stimulation.

"Our work shows that we can put living cells onto a biodegradable, 3-dimensional scaffold in a way that not only allows them to survive, but to spontaneously beat in a coordinated fashion," says Lancaster.

In addition to demonstrating the feasibility of using a synthetic mesh as a means to deliver living



Steven Goldman, MD, (right) and Jordan Lancaster look at an image of the beating patch taken under a microscope. Insets: the patch consists of a mesh of synthetic fibers similar to the material used for surgical sutures (left). When seeded with heart muscle cells and stimulated with electrodes, the mesh begins contracting rhythmically. The cells on the patch are not visible.

The Sarver Heart Center emphasizes a highly interdisciplinary research environment fostering innovative translational or "bench-to-bedside" research. Working toward a future free of cardiovascular disease and

achievements presented at this year's Cardiovascular Sciences Annual Conference in Las Vegas, Nev.

"We have developed a delivery system that allows us to introduce living, healthy heart muscle cells into damaged areas of the heart in a

heart cells into a diseased heart, the group has already shown that the patch improves left ventricular function and blood flow when implanted into damaged heart muscle in a rat model of myocardial infarction.

Dr. Goldman believes that the construct developed in his lab provides a better vehicle to introduce cells into damaged heart muscle than conventional cell transplantation techniques, in which cells are injected directly into the heart.

“I think the main reason for the disappointing results people have seen with those clinical trials is that the cells end up in an environment that is not optimal for them to thrive in. Scar tissue offers poor blood supply and weak structural support for new cells to attach, survive and grow. Our patch offers just what cardiac muscle cells need: structural support, increased blood supply and chemicals secreted by the supporting cells on the patch that help the heart muscle cells grow and function.” ♥

You can watch a video of the “beating patch in action” online at <http://www.sciencefriday.com/videos/watch/10230>

To listen to the story, “Engineering A Band-Aid Of Beating Heart Cells” on ‘NPR Talk of the Nation,’ go to <http://www.npr.org/templates/story/story.php?storyId=106974486>

Life stories: Heart Center co-founder was pioneer in cardiology

By Kimberly Matas

Originally published in the Arizona Daily Star on Aug. 7, 2009

Eugene Morkin was 12 when his father died of congestive heart failure. For years he'd watched as his father's condition became more and more debilitating. It was this tragedy early in his life that prompted Morkin to become a cardiologist, put through medical school by his mother, an English teacher.

Dr. Morkin's combination of life experience and education manifested as several scientific breakthroughs in his role as an academic physician. In the mid-1980s, he co-founded what is now called the University of Arizona Sarver Heart Center, to promote cardiovascular research and clinical care. He served as founding director until 1992.



Morkin, a pioneer in his field, spent his professional career trying to understand heart function as a way of furthering research into the prevention of heart disease and repairing a diseased heart genetically, precluding the need for transplants. Yet it was another disease — Alzheimer's — that claimed Morkin's life. After his diagnosis, the doctor and his wife, researcher Cynthia Adamson, a PhD who worked with her husband, retired two years ago to Uruguay, where Morkin enjoyed the stunning beaches of Punta del Este until his death on July 19. He was 75.

Morkin, the son of a stone mason, graduated magna cum laude from Oklahoma City University with a bachelor's degree in chemistry. He received his medical degree from the University of Oklahoma in 1959 and served his residency at New York's Bellevue Hospital Cornell Division and Presbyterian Hospital. He was awarded a research fellowship to the New York Heart Association at Columbia University.

Morkin was chief of cardiology at Beth Israel Medical Center and a faculty member of Harvard University when he was recruited by The University of Arizona in 1974, with the promise of an endowed chair that would allow him to focus on his research. He also was a professor in the UA departments of pharmacology and physiology. Some of his early research proved to be controversial, said colleague Joseph Bahl, a PhD and research scientist at the Sarver Heart Center. His breakthrough discovery of an intracellular protein that regulated calcium levels in the heart led to an understanding of how calcium works in the organ to control the strength and rapidity of beats.

“Once you start to understand all the gears and levers and how they connect, then you can rationally start thinking about, ‘OK, we need a drug that will do this,’” Bahl said. “Today there are many drugs that are used relating to the heart and calcium that have come along as our understanding of how things work has improved, and what Dr. Morkin did was an early step that opened doors.

“Back in the day, when Dr. Morkin discovered this, it was more than controversial. People stood up at meetings and said: ‘No, this is just not true. It doesn't work this way.’ He came under a lot of attack for presenting his results, and this happened at more than one meeting until people were able to go back to their own lab and try the same experiment and found he was right,” Bahl said.

Dr. Steven Goldman, a longtime colleague of Morkin's, works at the local Veterans Affairs hospital and is a member of the Sarver Heart Center. He arrived in Tucson a year after Morkin. “He was interested in the major control of the heart muscle, the mechanisms that control heart muscle function,” Goldman said. “His work was basically a setup for what we would do in the future to create drugs that would control heart failure.”

In a 1986 Arizona Daily Star article, Morkin, who had two daughters and two stepchildren, said he looked forward to the time when “we are able to restructure the heart genetically, so there is no need to do complicated surgery — perhaps no need to even put the person in the hospital.”

Said his wife: “The impact of his scientific discoveries cannot be overstated. He was esteemed in science. He was very quietly determined about what he knew was the truth. He always said the data doesn't lie.”

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Join us for

The Heart of the Matter

An Educational Luncheon
on Heart Disease in Women

Hosted by the Sarver Heart
Center Women's Heart Health
Education Committee.

This exciting program will examine heart disease from the inside out, literally! Our topics will include imaging, angiograms and other tests and what they tell us about heart disease; what a 'pear' vs. 'apple' shaped body tells us of our risks; why we should pay attention to the flutter in our chest; and what you should know to prevent heart attacks and stroke.

Saturday, October 17, 2009

Registration at 11:30 a.m.; Luncheon & Program begin at 12 noon

Skyline Country Club

5200 E. Saint Andrews Drive, Tucson

Gordon A Ewy, MD, Director of The University of Arizona
Sarver Heart Center, will facilitate discussions by:

Lori Mackstaller, MD, *Clinical Associate Professor, Medicine, The University of Arizona*
Molly Szerlip, MD, *Assistant Professor, Clinical Medicine, The University of Arizona*
Julia Indik, PhD, MD, *Associate Professor, Medicine, The University of Arizona*
Elizibeth Juneman, MD, *Assistant Professor, Clinical Medicine, The University of Arizona*

For information and to reserve your seat, please call the
UA Sarver Heart Center at (520) 626-3766 by October 13, 2009

Space is limited. Registration is non-refundable and is not tax-deductible.



Left: Investments propel research: In April, the Sarver Heart Center Advisory Board and several donors contributing to the SHC Investigator Awards Program gathered to hear firsthand about the research projects made possible through their gifts, ranging from studying risk factors for sudden cardiac arrest to identifying mutations causing heart malformations in children (see Sarver Heart Center Newsletter Issue #54). Pictured here is postdoctoral student Takehiro Tsukada, recipient of the Walter and Vinnie Hinz Investigator Award, with some of the participants. His was one of nine labs visited that day.

Right: Alliance Beverage President Robert Smith holds the son of Chuck Besen (far left). Mr Besen survived end-stage heart failure thanks to the artificial heart and a donor heart he received through the Cardiothoracic Surgery and Artificial Heart Program. By supporting the program and the work of Jack G. Copeland, MD, Mr. Smith and his company have helped to save the lives of those in need of a new heart. Alliance Beverage hosts an annual golf tournament and the Sarver Heart Center is honored to be one of its beneficiaries.

