May 2008

# Clinical Center

In this issue

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# CTSA scholars visit CC

The Clinical Center is anxious to embrace new Clinical and Translational Science Award (CTSA) partnerships. That's the message 18 CTSA scholars and program administrators heard from Dr. John I. Gallin, CC director, during a recent visit.

They represented Emory University, Johns Hopkins University, the Mayo Clinic College of Medicine, Rockefeller University, University of Pittsburgh, and Washington University, six of the 24 academic health centers that are part of a national consortium aimed at transforming how clinical and translational research is conducted at academic health centers across the country.

The 2008 CTSA recipients are slated to be announced later this month. When fully implemented in 2012, 60 institutions will be linked together to energize the discipline of clinical and translational science.

Gallin told the visitors that new CC-CTSA partnerships would complement and enrich research that is done intramurally and extramurally. Nearly 1,500 clinical studies are currently being conducted at the CC, with about half involving rare diseases. These special cohorts of patients

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# NIH specialists volunteer time, expertise at Cardozo Community Health Center

by Jenny Haliski

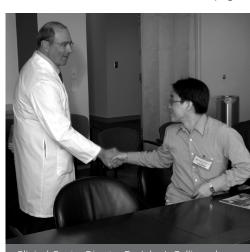
Editor's note: This is the second in a three-part series on NIH's relationship with Cardozo Community Health Center. The first segment is in the April edition of the Clinical Center News.

The NIAMS Community Health Center (CHC) isn't the only way that NIH physicians are getting involved with the Upper Cardozo Health Center, which is operated by Unity Health Care, Inc. Some also volunteer their time and expertise to provide specialty care at no cost.

Seven years ago, Dr. Mark Gladwin, senior investigator with the Clinical Center's Critical Care Medicine Department and

the chief of NHLBI's Vascular Medicine Branch, founded the Unity Healthcare Asthma/Pulmonary Clinic Mission at Cardozo, where he, other NIH physicians, and Intramural Research Training Award (IRTA) students deliver pulmonary subspecialty care to homeless and indigent patients.

The program's sustained success with patients and support from NIH staff will allow the clinic to add another no-cost clinic on Thursday afternoons, in addition to the Wednesday evening clinic. A maximum of 16 patients can be scheduled within their three-hour clinic period, and although there are sometimes no-shows, many arrive for the opportunity to see a specialist about their asthma, emphycontinued on page 3



Clinical Center Director Dr. John I. Gallin welcomes CTSA scholar Dr. George Tseng from the University of Pittsburgh before a presentation in the hospital's medical board room about the unique CC resources available and opportunities for extramural collaboration.

## Take Your Child to Work, Earth Day fill campus, CC with smiles



The Critical Care Medicine Department's Sarah Allen shows Jeremy Kato and Shelby Ellis a pig lung



Development, made their own identification badges before they came to NIH for the day.



thew Fall and Jae Lee under the Earth Day tent in front of Building 1.



CC nurse Reggi Parker shows Anna Panyutin, daughter of Irina and Igor Panyutin, scientists in the CC Nuclear Medicine Department, how they prepare for a blood draw with a device that illuminates the veins through the skin. The nurses also described the role they play in research to support the clinical protocols, including measuring vital signs and taking precise weight measurements.

#### **Clinical Center News online:**

www.cc.nih.gov/about/news/newsletter.html

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## Cardozo trains IRTAs on bilingual patient interactions

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sema, lung fibrosis, or even lung cancer. Other NIH physicians who volunteer at the clinic include NIMH's Shrinivas Bishu; NHLBI's Richard Cannon, Joseph Fontana, and Roberto Machado; NIEHS' Bill Martin; and NIAID's Ken Olivier and Tara Palmore. Cannon's team comes on the first and third Wednesdays of the month, while Gladwin's team comes on the second and fourth. "It was amazing to me how many people wanted to participate in the clinic," Gladwin said. "We created a network without even trying."

The first thing that strikes you walking into Cardozo's entrance is the long line of patients waiting at the pharmacy window that stretches across the path to the elevators. Walking into the second floor clinic space, you hear intercom announcements all in Spanish. Patient education posters in both Spanish and English paper the walls. Gladwin will conduct most of his patient visits entirely in Spanish, as a large number of Latino patients visit the clinic.

A handful of IRTAs, just a few of the 400-500 the CC hosts on campus at any given time, arrive carrying large

cardboard boxes filled with pulmonary supplies. IRTAs stay for one or two years to assist with basic clinical research or laboratory work after college, often in the hopes of confirming career ambitions in the medical field. Many value the opportunity to interact with patients, and Cardozo takes those interactions to the next level by requiring cultural awareness and Spanish language skills as the IRTAs shadow the physicians and assist them with patient education. The IRTAs at Cardozo also set up and provide portable pulmonary function tests (PFT), which assess lung obstruction and restriction.

Virginia Liu, now in her second year as an IRTA and volunteering at Cardozo, is teaching the new student volunteers what she's learned, including how to instruct patients to take the PFT, decipher the test's abbreviations and tracings, and make the most of their clinic experience. "Watching Dr. Gladwin inquire about a patient's habit of feeding birds, I witnessed how seemingly trivial details about lifestyle can serve as evidence for a keen clinician for identifying the disease culprit, which in this case was hypersensitivity pneumonitis," Liu said.

On this particular day, Cardozo patient Calix Inglesias and his daughter Maria are consulting with Gladwin about Inglesias' wheezing, which received treatment for the first time two months ago. Inglesias lived with and compensated for the condition most of his life, assuming that he had emphysema, although he never smoked. He only sought health care when he was gravely ill. His first PFT at Cardozo showed that he had severe asthma and was only at 30 percent of his breathing capacity. However, his air flow restrictions were reversible with medications. At this visit, Inglesias' PFT shows that he's regained 50 percent of his airflow thanks to his prescription. His hands still show good circulation when Gladwin presses on his nails to see how quickly the oxygen returns.

Gladwin asks him to demonstrate his inhalation technique, knowing that asthma medicines are technically challenging for most patients, and many pharmacists dispense them without demonstrating how to take them properly. If the patient doesn't inhale or click the container that pops a metal packet and releases the drug at the right time, they might receive less than the full dose of their medicine. Inglesias had the same problem. Gladwin also learns that Inglesias' family has a cat, which can make his asthma worse, and needs to switch to hypoallergenic blankets instead of down comforters.

For Gladwin, taking time out to volunteer at the clinic provides an opportunity to reconnect. Detaching from his oncampus demands, fighting traffic, missing his family, and wondering why he's doing this, Gladwin arrives at Cardozo. "When I'm there I feel reconnected to reality and humanity, as well as the patients, who are really grateful," he said. The NIH physicians' service ethic makes an impression on the next generation of physicians, the IRTAs who are in various phases of their medical careers.

"Seeing how prominent NIH physician scientists successfully juggle responsibilities of their career and family while still finding the time to give back to the community at Cardozo encourages me to believe that I can do the same in the



a pulmonary function test, while fellow IRTA James Kim and Howard Hughes fellow Shashank Sinha

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## New tool measures biochemical environment of trigger points

You've always had that knot of tissue and tension in your neck and shoulders. You've tried several therapies to get it to relax, to no avail. Some doctors may not think it's real, but actually it is.

You're experiencing myofascial pain, a very common type of musculoskeletal pain. It arises from hyperirritable nodules—known as myofascial trigger points (MTrPs)—in taut bands of skeletal muscle that often develop from muscle overload, overuse, or repetitive strain. Many healthy adults have MTrPs. It's different from muscle spasm, which is an entire muscle contraction that can not be released voluntarily. Accurate diagnosis depends on systematic palpation of the soft tissue by a trained examiner. "If one is unfamiliar with myofascial pain, or hasn't learned how to palpate the soft tissue for MTrPs, it may be overlooked," said Dr. Jay Shah, a physiatrist in the Clinical Center's Rehabilitation Medicine Department. "As a result, myofascial pain is often undiagnosed or misdiagnosed as non-specific musculoskeletal pain, arthritic pain, or tendonitis," said Shah. On the other hand, MTrPs and myofascial pain often accompany these and other conditions.

Shah developed a personal interest in

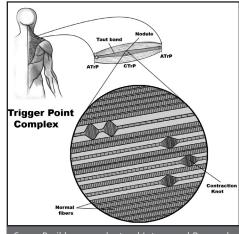


MTrPs and mechanisms of chronic pain when he had difficulty finding an accurate diagnosis and effective treatment for his own chronic foot pain. He learned that MTrPs in his calf and foot muscles were a major component of his pain and that dry needling them provided substantial relief and allowed him to stretch and strengthen his muscles and eventually walk without

Dry needling is a form of mechanical myofascial release whose goal is to reduce abnormal muscle contractures, relieve pain, and restore range of motion and function. It's quite different from traditional acupuncture—a practice from ancient China based on the flow of energy through acupuncture meridians—according to Shah. The intriguing spatial overlap between well-described referred pain patterns of MTrPs and locations of acupuncture meridians suggest commonalities between these two systems, Shah said.

MTrPs in the trapezius, a large muscle between the neck and shoulder, are a common cause of neck pain. They are typically caused or exacerbated by emotional stress, poor posture, activities such as using a telephone receiver without elbow support, or carrying a heavy handbag. Shah is the principal investigator of an on-going study examining two types of MTrPs in the upper trapezius muscle. An "active" MTrP causes spontaneous pain at rest, with an increase in pain on contraction or stretching of the involved muscle, and a restricted range of motion. A "latent" MTrP shares the same physical characteristics of an active MTrPs but without spontaneous pain. However, it also restricts range of motion. Shah is currently seeking people with MTrPs in their upper trapezius that are acutely painful, meaning they have had neck pain for less than three months. He is also seeking people with no or latent MTrPs in the upper trapezius muscle.

Injured muscles, unlike MTrPs, are associated with bleeding and inflammation. However, the pathophysiology of myofascial pain is unknown. To address this common yet poorly understood condition, Shah and his co-investigators—Drs. Terry Phillips, NIBIB; Jerome Danoff, CC; and Lynn Gerber, retired CC—developed a novel microdialysis needle to safely and quantitatively measure the local biochemi-



Sagar Parikh, a pre-doctoral Intramural Research Training Award fellow at the Clinical Center, drew this diagram to illustrate the current model of MTrPs' location within muscle fibers.

cal environment of muscle in vivo. Their microdialysis needles have the same size, shape, and handling characteristics of an acupuncture needle. They are using their device and microanalytical techniques pioneered by Phillips to sample and measure the biochemical milieu of muscles with and without MTrPs in the upper trapezius.

The novel microanalytical technique developed by Shah and his co-investigators enables continuous, real-time sampling from soft tissue of extremely small quantities—about one 10,000th of a level teaspoon. In Shah's procedure, subjects lie face down and the needle is inserted into the upper trapezius muscle. The needle remains in place for five minutes while chemical substances are collected from the muscle using saline as a transport mechanism. The needle is then advanced a bit deeper into the muscle until it twitches and remains in place for 10 more minutes while substances are collected for subsequent analysis by Philips in his laboratory.

The CC is seeking patent protection for the device because of its unique characteristics and potential applications. Using this microdialysis needle, tissue drug levels and binding properties could be monitored within desired sites to determine treatment delivery efficacy. This needle may also be able to transport drugs locally to a specific site.

Shah and his team have found that active or pain-producing MTrPs are as-

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## Platelets Across America picks NIH for Maryland donation

Alan Whitney, a retired factory worker from Avon Lake, Ohio, visited the NIH blood bank on March 27 to make his Maryland platelet donation as part of his Platelets Across America campaign.

In an effort to raise awareness for the need for platelet donations for cancer patients, Whitney's goal is to donate platelets in all 50 states. Maryland makes the tenth state he's donated in as part of this self-directed program. Because platelet donors can contribute 24 times each year, Whitney estimates that it will take him just over two years to reach his goal. California, Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, Virginia, and Wisconsin also received a visit from Whitney.

Another goal of his campaign is to demonstrate the diversity of places to donate blood and platelets and call attention to independent blood banks. NIH's blood bank drew Whitney's attention because it's a unique federal facility within the largest hospital dedicated to conducting clinical research.

Whitney began donating whole blood in 1965. He has given more than five gallons of whole blood during his first years as a blood donor before switching to platelets. After giving whole blood the first time, Whitney thought, "I can do more than this." He contacted his local blood bank and his church and started running blood drives every eight weeks. He continued giving blood, and when his blood bank started performing apheresis in the early 1970s, he started giving platelets. Whitney became an avid platelet donor and has made nearly 600 platelet donations in locations as diverse as Elyria, Ohio; Dallas, Texas; and Sydney, Australia.

In 1985, he again decided he could do more and expanded his blood drives to every Saturday and Monday evening. Whitney retired from running blood drives in 2000, a year when he helped collect 2,069 units in his community. In October of 2007, he again thought he could do more and came up with the idea to donate across America. "The reception to the idea has been fantastic. The most wonderful people in the world work at blood banks," he said.

Sometimes the blood banks Whitney

visits give T-shirts to donors. After wearing them while donating platelets he makes quilts out of them and gives them to hospital cancer units.

He even turns his time in blood bank waiting rooms into outreach opportunities. Whitney explains the platelet donation process to the people he meets, and often they change from donating whole blood to platelets. "It's education, education, education," he said.

Although neither Whitney nor any of his family members or friends have needed

blood transfusions, he's motivated by imagining all the hospital patients who need blood. "I think of the cancer patients, the people going in for surgery, and these people need it. It's a small thing that I'm able to do. I find that a lot of people don't donate because they don't understand it, or they haven't been asked. I'm going across the country to encourage other people—and ask them—to donate."

To learn more or donate platelets, call the blood bank at 301-496-4321.



Donor Al Whitney (center) with (from left) Al Decot, donor resources coordinator; Janet Miranda, platelet center supervisor; Sarah Harris, apheresis coordinator; and Halanzo Wilkins, recruitment supervisor stand outside the NIH blood bank before Whitney's donation.

### NIH specialists at Cardozo continued from page 3

years to come," Liu said. "To me, Cardozo is much more than a site for medical services; it is the heart of all that medicine embodies from student learning and scientific inquisition to cultural exchange. Most significantly, it is a free clinic and thus stands as the vanguard of philanthropy. I am proud to be able to contribute to such a great cause as a student volunteer."

This year the clinic plans to extend NIH specialists' expertise to more Cardozo patients. NIH specialists provide necessary referrals to other health care facilities for

patients with complicated respiratory problems, or with problems not responding to standard interventions. Some of these patients may also be eligible for participation in one of the NHLBI studies at the CC.

The next installment of this series will explore the future of the NIH-Cardozo relationship, including how NIH is reaching out to these diverse populations to physically bring them to campus, and bring the campus resources to them.

#### New policy for travel, meals, lodging

Research protocols initiated after May 1 will specify a uniform reimbursement rate to cover travel, meals and lodging for protocol participants. All protocols are reviewed annually, and protocols established before May 1, 2008, will set a uniform reimbursement rate at the time of the next review. The policy is designed to assure fairness in reimbursing clinical research protocol participants for travel and subsistence by taking into account the scientific needs of the studies and the financial and medical needs of individual participants. For more information about this new policy, protocol participants should contact their program's research coordinator. Trish Flock (flock@cc.nih. gov) is the Clinical Center's patient travel coordinator.

#### **CC Communications staff earn NIH Plain Language award**

The June 2007 issue of CC News won a silver award in NIH's 2008 ceremony celebrating plain language. A feature titled "Inside the Clinical Center," from the spring 2007 issue of NIH MedlinePlus magazine, earned a bronze award.

#### **New HHS ID badges coming**

Does your NIH ID badge expire in 2008? Your next one will be a PIV—Personal Identity Verification—card. That's because 2004's Homeland Security Presidential Directive 12 requires all federal agencies to use a reliable, commonly accepted form of government identification to enhance security, increase government efficiency, reduce identity fraud, and protect personal privacy. The PIV card will serve as

the common government identification for all HHS agencies. The switch began last year for NIHers whose badges expired in 2007, new employees, and contractors. Go online at www.idbadge.nih.gov for more information.

## Register for Team NIH at Race for the

Join your NIH colleagues at the 2008 Komen National Race for the Cure on Saturday, June 7. To join Team NIH/ CCMD, register online at http://2008nrftc. kintera.org/faf/home/default.asp?ievent=263218. Brochures are available in R&W stores for mail-in registration. Team NIH participants will meet on race day at the corner of 15th and Constitution Avenue at 7:15 a.m. Contact Georgie Cusack, Peter Kelly, or Pat Piringer with questions.

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## CC opens doors to increased extramural partnerships

provide unique opportunities for partnerships with the extramural community. "Our hope is that partnerships among intramural and extramural investigators will enrich both investigators' research programs," he said.

A major opportunity for collaborations is through the Bench-to-Bedside program created by the Clinical Center in 1999 to speed translation of promising laboratory discoveries into new medical treatments by encouraging collaborations among basic scientists and clinical investigators. The program has been open to research teams made up of intramural and extramural partners since 2006.

Informatics tools developed at the Clinical Center also offer specialized resources in support of clinical research. One is ProtoType, a Web-based clinical protocol writing tool that provides investigators with a standard protocol structure, online help, and templates of suggested language. Investigators use it to put ideas for new protocols into the proper format to satisfy regulations and facilitate review.

Gallin also shared with the group the vision for BTRIS—the Biomedical Translational Research Information System now in development. Investigators can use it to help identify promising new avenues for research and foster data-sharing



Alex Razzook, a project engineer in the CC Rehabilitation Medicine Department's Physical Disabilities Branch, gives the CTSA scholars an overview of the clinical movement analysis lab. It's a unique resource using cutting-edge imaging technology to map human muscle movement while patients walk or run so that therapists can help patients learn how to move better. It also gives researchers investigating stroke, Parkinson's disease, and brittle bone disease insights into how their patients move.

across NIH institutes and with extramural collaborators. "We're building this data repository so that it will be compatible with the CTSA sites' repositories. We envision that one day we will have a national clinical research data repository," Gallin said.

Gallin encouraged the visitors to consider participating in clinical research training opportunities at the Clinical Center, many with options for participation both at NIH and at other locations via teleconference or using lectures on DVD.

"The opportunity to tour the CC first

hand and meet outstanding leaders in the research community provided considerable excitement for each of the clinical research scholars. They identified important new resources at the NIH for support of their respective innovative multidisciplinary clinical research programs," said Joan M. Lakoski, associate vice chancellor for academic career development at University of Pittsburgh Health Sciences and CTSA program committee chair.

## CC staffer receives 2008 distinguished federal pharmacist award

Dr. Joseph Gallelli, senior advisor for biotechnology product development at the Clinical Center, received the 2008 distinguished federal pharmacist award



(from left): Winnie Landis, outgoing president of the American Pharmacists Association, presents the Clinical Center's Dr. Joseph Gallelli with the 2008 distinguished federal pharmacist

from the American Pharmacists Association (APhA).

The award recognizes pharmacists who have distinguished themselves and the profession through outstanding contributions in federal pharmacy practice that have significantly improved the health of the nation or population.

Gallelli devoted 45 years of service to NIH and his contributions in leadership and management have had national and international reach. In 1962 he became chief of the CC Pharmacy Department's Pharmaceutical Development Service (PDS) and was named department chief in 1970.

His 13-year compatibility and stability studies on intravenous drugs resulted in a 1974 text "Parenteral Drug Information Guide." Later editions were incorporated into Trissel's "Handbook of Injectable Products." Gallelli established at the CC one of the first post-graduate hospital pharmacy residency training programs; began the

unit dose system; and conducted studies and published guidelines for the safe handling, chemical inactivation, and disposal of antineoplastic drugs.

Gallelli earned a master's degree in manufacturing pharmacy from Temple University School of Pharmacy and a doctorate from Temple University. He has served on committees for numerous professional organizations, including the cell and gene therapy expert and the international health expert committees of the US Pharmacopia, where he is a lifetime honorary member.

His honors include an NIH Director's Award, the Abbott Laboratories Award for Research, the US Department of Commerce Inventor's Award, and the Andrew Craigie Award.

Founded in 1852, APhA is the firstestablished and largest US professional association of pharmacists.

## Recycled Reads campaign collects magazines for patients

Since the Clinical Center's Recycled Reads campaign launched in February, up to 500 magazines have been available for patients in waiting rooms around the Clinical Center each week. The magazines—all donated and mostly current—provide a steady stream of reading materials to help patients and their families pass the time between appointments and procedures.

"The program is a success because people who work and visit the CC have generously contributed reading materials," said Debra Byram, one of the effort's organizers. "Red Cross and Patient Library volunteers do a wonderful job sorting and distributing the magazines."

The program continues to seek current news magazines, along with relatively timeless periodicals on a variety of topics, including travel, crafts, or cooking. Especially needed are more materials that appeal to families and children.

Drop gently read magazines in the redroof collection bins located in the elevator lobbies of P2 and P3 parking garages and outside the patient library on the 7th floor of the Hatfield Building. Call the Patient Library for more information at 301-451-7603.



Denice Langat, a Clinical Center patient from Kenya, volunteers with the Recycled Reads program by sorting donated magazines, cutting off address labels, and distributing periodicals to patient waiting areas. Although he is only in the U.S. for a short time, he recognizes how important current reading material is to patients and wanted to volunteer. "I read magazines a lot while waiting for my doctor's appointments," Langat said, adding, "As soon as I was well again, I wanted to do something to thank NIH."

## **Upcoming Events**

#### Clinical Center Grand Rounds and Great Teachers Lectures

May 7, 2008

Hematopoietic Stem Cell Transplantation (HSCT): Through the Eyes of Research Participants and their Families

Margaret Bevans, RN, PhD, AOCN

Clinical Nurse Scientist,

Nursing Research and Practice Development, Nursing and Patient Care Services, CC

Symptoms and Functional Status: Targets for Intervention in Survivors of Allogeneic HSCT

Sandra A. Mitchell, CRNP, MScN, AOCN

Predoctoral Fellow.

Nursing Research and Practice Development, Nursing and Patient Care Services, CC

Oncology Nurse Practitioner, Chronic GVHD Clinic and Study Group,

May 14, 2008 **Great Teachers** 

Cancer Screening: The Intuition Versus the Science Barnett Kramer, MD, MPH Associate Director for Disease Prevention, NIH

Lecture will be videocast, http://videocast.nih.gov

May 21, 2008 **Ethics** 

Medical and Non-Medical Features of Execution by Lethal Injection Mark Heath, MD Assistant Professor of Anesthesiology Columbia University College of Physicians and Surgeons

May 28, 2008

**Neonatal Diagnosis** and Treatment of Menkes Disease Stephen G. Kaler, MD, Clinical Director, NICHD

## Trigger point study brings bench tool to bedside

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sociated with elevated levels of inflammatory mediators, neuropeptides, catecholamines, and pro-inflammatory cytokines—substances known to be associated with persistent pain states. These substances are released from injured muscle tissue, blood vessels, and immune cells and are capable of activating pain receptors in the muscles. However, pain may not be limited only

to the muscles that harbor MTrPs, but can be referred to other areas of the body through spinal processing. "MTrPs in the working together on an innovative approach to better understand a common

upper trapezius commonly refer pain into the back of the neck, jaw, and side of the head", said Shah, adding that the project is "a great example of the CC's bench-tobedside research—clinicians and scientists

## Pharmacotherapy frontiers seminar focuses on SIDS reduction, drug advertising

The CC Pharmacy Department's 14th annual Pharmacotherapy Frontiers symposium filled Masur Auditorium on April 12, a sunny Saturday morning. Three-hundred fifteen pharmacists and pharmacy technicians—many of them repeat attendees—heard current pharmacy information while at the same time earning accredited pharmacy continuing education (CE).

Presentation topics included the pharmacist's role in Sudden Infant Death Syndrome (SIDS) risk reduction, an HIV/AIDS antiretroviral update, treatment of gram-negative organisms, and the division of drug marketing, advertising, and communications in regulating the promotion of prescription drugs.

The 2008 symposium's speakers included Barbara Chong, team leader for the Division of Drug Marketing, Advertising,

and Communications at FDA's Center for Drug Evaluation and Research; and John McGrath, chief of NICHD's Public Information and Communications Branch. CC Pharmacy Department staff Kristin Busse, a pharmacy fellow, and Timothy Jancel, a clinical pharmacy specialist, also spoke to round out the four-hour program.

According to Chief Robert DeChristoforo, the department was "pleased to be able to partner with NICHD to promote their SIDS risk reduction program. Pharmacists can play an important role in disseminating information to the public as our seminar attracts pharmacists from diverse settings, not just hospitals."

DeChristoforo also noted that "the drug advertising topic was timely since we seem to be constantly bombarded by television ads for these products and it generated a lot of interest from the attendees."

cause of musculoskeletal pain."

In 2005, Shah and his team published their findings on the biochemical environment of MTrPs using this sampling technique in the Journal of Applied Physiology. In a second study, they demonstrated that the biochemical makeup in MTrPs in the upper trapezius differs quantitatively from a remote, uninvolved site in the gastrocnemius muscle. This suggests that the vicinity of the MTrP exhibits a unique biochemical milieu of substances associated with pain and inflammation. They published their most recent findings in the January 2008 issue of the Archives of Physical Medicine and Rehabilitation.

For more information about the study, contact 301-451-7514 or neckpainstudy@ gmail.com.



for sampling the biochemical environment of MTrPs. Saline circulates through the needle to draw chemicals from muscle into the needle for sampling.