

JULY – DECEMBER 2010

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MESSAGE FROM THE CHAIR

Dear Colleagues,

I am pleased to share with you our second Semi-Annual Newsletter on July-December 2010 department-wide updates and achievements. As we closed 2010 with the Annual Faculty Retreat in December, we have had tremendous momentum and success in every Division, and I am delighted to highlight many of our recent Divisional activities in the clinical, research, community, and educational arenas.

As one of the largest departments within the School of Medicine, the Department of Pediatrics is currently comprised of 21 Divisions with 171 full-time faculty, 58 residents, 3 chief residents, 35 post-doctoral fellows and 268 staff employees. We anticipate revenues for FY2010-11 to be over \$53.5 million for research and approximately \$52 million from clinical revenues.

As we move forward in the year ahead, let us continue celebrating our successes and new initiatives together.

Best Regards,

Gabriel G. Haddad, MD

Professor of Pediatrics and Neuroscience
Chairman, Department of Pediatrics
University of California San Diego
Physician-in-Chief and Chief Scientific Officer
Rady Children's Hospital of San Diego

DEPARTMENTAL NEWS

Division of Allergy, Immunology and Rheumatology

CLINICAL

The Division continues to provide care for children with allergic, immunological, and autoimmune disorders throughout San Diego, Imperial, and Riverside counties. Currently, 200 new outpatient consults are performed per month at 6 sites throughout the three counties. Dr. Burns and the Kawasaki Disease(KD) team have diagnosed and treated 20 new Kawasaki disease patients since July of this year. The Eosinophilic Disorders Clinic continues to care for children with eosinophilic Esophagitis (EE) and other eosinophilic GI disorders and has become the tertiary referral center for the western United States.

RESEARCH

The Division presently has 5 NIH supported research faculty - Drs. Burns, Hoffman, Aceves, Tremoulet, and Franco. Since July, the Division has published peer-reviewed papers, including a notable paper published in *Journal of Allergy and Clinical Immunology* by Aceves et al. that demonstrated the role of growth factor-beta-1 (TGFb1) in increased esophageal smooth muscle contraction in vitro. A family-wide linkage study revealed the importance of a nucleotide transporter gene, *ABCC4*, in KD pathogenesis. These findings can now be translated into new approaches to treatment with drugs that specifically inhibit these pathways. On the clinical research front, the KD team completed enrollment of their 100th patient in the randomized, double blind, placebo-controlled study of infliximab added to standard therapy for patients with acute KD. Currently, the study is running smoothly and they are on schedule to complete the target enrollment of 200 patients by early 2013.

EDUCATION

New in 2010 was the establishment of a rotation for UCSD undergraduates interested in a career in medicine to attend KD Clinic. Students are taught how to take a cardiovascular family history and then fill out family tree that becomes part of the patient record. This is an opportunity to interest students in research and clinical pediatrics before they begin medical school. The Division is active in the training of medical and graduate students as well as post-doctoral researchers.

Division of Cardiology

CLINICAL

The Division of Cardiology is currently expanding by adding new programs and recruiting cardiologists to fulfill these new endeavors. New programs that are being organized include cardiac transplant and heart failure, cardiac intensive care, and adult congenital heart disease. Cardiologists with training and experience in each of these areas are being actively recruited. In addition, a cardiac transplant surgeon is also under recruitment. Cardiology and Cardiac Surgery support the University of Hawaii and Kapiolani Children's Hospital Cardiac Programs; Drs. Lamberti and Moore travelled to Hawaii to support this program several times this year, and we

received 60 to 80 high risk referral patients to Rady Children's Hospital for surgery and/or catheterization in 2010.

RESEARCH

Dr. Grossfeld was awarded a grant for the Children's Heart Foundation to support his work on the role of the ETS-1 cardiac transcription factor gene in neural crest cell function and cardiac development. Multiple members of the Division (Drs. Perry, Printz and Nigam) collaborated with Dr. Juan Carlos del Alamo in the Department of Bioengineering on investigations of cardiovascular flow dynamics. The studies were directed at developing new and innovative means of assessing myocardial mechanics, stress, strain and flow characteristics. Pilot studies were completed and more advanced studies in complex heart anatomies and ventricular dyssynchrony are underway. Due to high enrollment and excellent patient compliance with testing and follow-up, Dr. Grossfeld's work on the Pediatric Heart Network clinical study of losartan for the treatment of Marfan's related aortic root dilation was awarded an additional grant by the Foundation Network.

EDUCATION

As part of our Hawaii outreach, members of the Cardiology and Cardiac Surgery Division spoke at the Kapiolani/University of Hawaii CME course entitled "Mending a Broken Heart" in Honolulu in November. The Division will train advanced fellows in interventional catheterization and in electrophysiology, beginning the year 2012. These slots have been awarded to our current two third year fellows, Dr. Bratincsak and Dr. Tejman-Yarden.

Division of Child Development and Community Health

CLINICAL

The UCSD-Contracted Share the Care – Dental Health Initiative, led by Dr. Howard Taras, sponsors one large "dental sealant and fluoride varnish" clinic annually for low-income parents in South Bay. Beginning July 2010, this program has begun to sponsor free oral health screens and dentist referrals for 50 pregnant teens and 1,500 children age 0-5 years (figures are annual, anticipated). Between July 2010 and December 2010, faculty from the Division of CDCH were contracted to provide medical consultation to 12 school districts in San Diego County, 3 school districts in Orange County and 4 school districts elsewhere in Northern and Southern California.

RESEARCH

The CDCH Division has published several research articles and promoted collaborative pediatric research in health disparities. Since July 2010, Dr. Taras and Dr. Broyles have been leading the Community Engagement unit of UCSD's Clinical & Translational Research Institute. Patricia East, PhD, together with post-doctoral fellow Nina Chien, PhD, published two studies in the *Journal of Family Psychology* related to adolescent pregnancy. Chien also published an article in the journal *Child Development* and received national media attention in TIME Magazine. Dr. Maria Luisa Zúñiga, received two awards related to contributions to binational border health (Comisión de Salud Fronteriza México-Estados Unidos--US-Mexico Border Health Commission) and to serving persons living with HIV through research. In addition, Dr. Zúñiga was invited to be an advisor for the National Center for Complementary and Alternative Medicine. In an article currently in

press in *Pediatric Diabetes*, Dr. Gahagan, along with colleagues at the University of Chile, found that in a large clinical sample of overweight and obese Chilean youths, HOMA-IR \geq 75th percentile was significantly associated with the cluster of factors referred to as the metabolic syndrome (MetS).

EDUCATION

Dr. Sandra Daley was awarded \$1.9 million over three years, from the Health Resources Services Administration, to establish The Hispanic Center Excellence (HCOE) at the School of Medicine. The Health Careers Opportunity Program (HCOP) and The Hispanic Center Excellence (HCOE), both under the leadership of Dr. Daley were awarded \$428,281 by the American Recovery and Reinvestment Act (ARRA), to enhance their programs and help a greater number of students from disadvantaged backgrounds achieve their health career goals. UC San Diego's Hispanic Center of Excellence (HCOE) was one of only three HCOE programs in the nation to receive stimulus funding this year. Dr. Zúñiga served as course instructor for Epidemiology in the U.S. Mexico Border Region as part of the Masters in International Health program at Universidad Xochicalco. Our Division initiated a monthly Division of Child Health and Community Health Post-Doctoral Professional Development Seminar. The UCSD-Contracted Share the Care – Dental Health Initiative, under the leadership of Dr. Taras, educated community medical professionals, WIC, Head Start, and other professionals serving young children on oral health care. The Kids Health Assurance Network (SD-KHAN) program educated more than 1500 low-income parents of uninsured children on how to complete their applications for Medi-Cal and Healthy Families.

Division of Dermatology

CLINICAL

Dr. Sheila Fallon Friedlander was selected as President Elect of the Society for Pediatric Dermatology. Dr. Eichenfield recently served on the Coordinating Committee and Expert Panel for the development of the NIH/National Institute of Allergy and Infectious Disease Food Allergy Clinical Guidelines for the Diagnosis and Management of Food Allergies, published in December of 2010. The Vascular Lesion and Birthmarks center has expanded its services, with interdisciplinary evaluation including dermatology, plastic surgery, diagnostic and interventional radiology, otorhinolaryngology, pathology, orthopedics and ophthalmology services. Drs. Sheila Fallon Friedlander and Lawrence Eichenfield are Co-Directors, and Therese Cosan, RN, is the Clinical Coordinator. The Division was happy to welcome Nasreen Abbas, CPNP.

RESEARCH

Dr. Wynn Tom is developing the PeDRA, the Pediatric Dermatology Research Alliance, a collaborative research network, to study systemic therapies in severe atopic dermatitis patients. Dr. Tom was accepted as a member of the National Center of Leadership in Academic Medicine (NCLAM) at UCSD School of Medicine. Recent articles published by the members of the Division include *Pediatric "STUMP" lesions, evaluation and management of difficult atypical spitzoid lesions in children*, by Dr. Wynn Tom, et al., in January's *Journal of the American Academy of Dermatology*. Other recently published articles include work showing lower-than-expected rates of methicillin resistant staphylococcal aureus in children with atopic dermatitis (Pediatric

Dermatology; January, 2011), several articles on psoriasis and children, and ten articles published in 2010 on acne therapy, including the first clinical study of topical therapy for 8-12 year-olds with acne vulgaris.

EDUCATION

Dr. Lawrence Eichenfield chaired the 69th Annual American Academy of Dermatology meeting held in New Orleans, which was attended by over 16,700 individuals. Drs. Friedlander, Dohil, and Tom served as directors of the advanced pediatric dermatology course. Dr. Dohil also presented at the International Society of Atopic Dermatitis meeting in Germany.

Division of Dysmorphology/Teratology

CLINICAL

The Division continues active participation in clinical activities at birthing hospitals throughout San Diego County and at a twice-weekly clinic at Rady Children's Hospital. We also participate in a monthly Dysmorphology/Genetics clinic in Tijuana at the Hospital Infantil de las Californias where we see patients with birth defects from throughout northern Mexico. Four to six medical students from Mexico attend each of the clinics as well as a Mexican neonatologist.

RESEARCH

The Division continues to work actively in the area of Fetal Alcohol Spectrum Disorders Research throughout the world. In the last six months, Division faculty have worked with NIH-NIAAA to design a prevalence study in South Korea, and have consulted with the World Health Organization to design a WHO funded multi-country effort to measure regional or national patterns of maternal alcohol exposure and develop country-specific estimates of the number of affected children. We continue work on this issue in multiple countries. Recent publications include a study in the *American Journal of Medical Genetics* extending the spectrum of physical features seen more commonly with FASD, and a study describing nutritional status differences in pregnant women who drink heavily. The Division also continues to conduct federally and commercially funded studies on autoimmune diseases in pregnancy, H1N1 and seasonal influenza vaccine in pregnancy and asthma medications in pregnancy. The Division leads the National Children's Study site for San Diego County, and at the end of 2010 received NIH authority to launch recruitment for this landmark study.

EDUCATION

The Division's California Pregnancy Health Information Line continues to educate the public throughout California on prenatal exposures and risk to the developing fetus. In recent months, we have expanded this effort to multiple channels of communication and will launch the first web-based live "chat" service this month. Skaggs School of Pharmacy and Pharmaceutical Sciences students, medical students, and pre- and post-doctoral epidemiology students have rotated through the Division on a regular basis working on clinical research projects or independent study.

Division of Emergency Medicine

CLINICAL

In 2010, the Division provided emergency care to over 70,000 children at our main RCHSD campus and over 30,000 patients at our 3 urgent care centers. As a Level 1 trauma center, our ER has the highest volume of pediatric patients on the West Coast. We see over 100 trauma patients a month who are severely injured from automobile accidents, falls over 10 feet, pedestrian or automobile accidents, and other mechanisms of serious injury. We account for over 50% of the RCHSD hospital admissions. Our Division has grown to be the largest pediatric emergency medicine physician staff on the West Coast. We currently now employ 15 pediatric emergency medicine physicians, 5 pediatric intermediate care physicians, and 6 nurse practitioners or physician assistants. We are currently seeking to hire two new pediatric emergency physicians and are doing a national search for a Division Chief. Dr. Kathy Konzen is our present Urgent Care Director. We are excited to be opening a new Urgent Care site in Oceanside this year. We have three other sites at Escondido, Mid-City, and La Mesa.

RESEARCH

Dr. Kanegaye continues to work with Dr. Burns on a NIH-funded Kawasaki's disease study. Dr. Ishimine and Dr. Kanegaye were part of a multicenter trial looking at the clinical course of urinary tract infections in infants 29-60 days that was published in Archives of Pediatrics and Adolescent Medicine. Currently, we have two ongoing prospective clinical studies in the treatment of minor head injuries. The first study is examining the effect of hypertonic saline on the symptoms of concussion and the second is looking at the effect of Zofran on vomiting associated with minor head injury.

EDUCATION

The Division trains 2 fellows a year in Pediatric Emergency Medicine (for a total of 6 fellows). Dr. Paul Ishimine directs our fellowship program. The fellowship just received a 5 year accreditation from the ACGME. We continue to train pediatric residents and adult emergency medicine residents from UCSD and the Navy. Dr. Ghazala Sharieff recently won a national Educator of the Year award from the American Academy of Emergency Medicine.

Division of Endocrinology

CLINICAL

The Division of Endocrinology and Diabetes continues to provide care to children in San Diego, Imperial and Southern Riverside Counties. This past year there were over 8,000 patient visits to the endocrine, diabetes and lipid clinics. The Division has expanded its services in the Escondido, Murrieta and Encinitas satellites and will be present when the Sanford clinic in Oceanside opens this year. The diabetes program serves over 1,000 children and has a comprehensive program for insulin pump therapy and use of continuous glucose sensors. Recently a diabetes high risk clinic was started to assist those patients with very poor diabetes control. The Division is involved in three clinical trials regarding immunomodulation of type 1 diabetes and a novel therapeutic trial for adolescents with type 2 diabetes.

RESEARCH

Dr. Susan Phillips published on the “Mechanisms of adiponectin regulation and use as a pharmacological target” in *Current Opinion in Pharmacology*. She has also presented her work on the dependence of adiponectin secretion on fat cell size and on the critical role of endoplasmic reticulum chaperone proteins in the regulation of adiponectin secretion at the Endocrine Society annual meeting. Dr. Maike Sander and colleagues showed that Sox9+ ductal cells are multipotent progenitors throughout development but do not produce new endocrine cells in the normal or injured adult pancreas. The data was published in *Development*. Working with human embryonic stem cells, Dr. Alberto Hayek’s lab has identified and published the first microRNAs signature for definitive endoderm in the early transition from pluripotency to endocrine pancreas transition (a distinct microRNA signature for definitive endoderm derived from human embryonic stem cells.) This is an important step in the elucidation of the role of non-coding RNAs in organ development. Dr. Ulupi Jhala’s lab identified a novel kinase that regulates the initial steps in complex process of beta cell death in type 1 diabetes. More importantly, this kinase can be therapeutically targeted using small molecule inhibitors, enabling them to identify additional nodes of intervention to delay the progression of beta cell loss in type 1 diabetes. These studies were the cover page article for July issue of the *Journal of Biological Chemistry*.

EDUCATION

Dr. Ulupi Jhala was an invited speaker at the Genomics Institute of the Novartis Research Foundation where she spoke about drug targets in preventing beta cell apoptosis. Dr. Maja Marinkovic presented “Growth patterns: Short, Tall and In-between” at Pediatric Grand Rounds at Scripps Mercy Hospital. Dr. Maike Sander was an invited speaker at the EASD/JDRF Joint Strategic Meeting in Barcelona, Spain, at University of California, Irvine, CA, and the 15th EASD/Hagedorn Oxford Workshop in Oxford, UK. Dr. Audrey Briscoe, a second year fellow, received an award from the Genentech Center for Clinical Research in Endocrinology to fund her studies on the regulatory t-cell responses during the honeymoon phase in children with type 1 diabetes.

Division of Gastroenterology

CLINICAL

The Division is actively working on the development of an Obesity Center and an Intestinal Motility service. Multispecialty clinics included Cystic Fibrosis Clinic, Weight and Wellness and Fatty Liver Clinics, TPN, CCS for special needs patients, Chronic Constipation Clinic, celiac disorders and Eosinophilic Disorders Clinic have been established. We hope to soon start an IBD adolescent transition clinic which we will operate together with UCSD adult gastroenterologists.

RESEARCH

Over the past six months the Division of Gastroenterology has had some publications which have been of national significance. Dr. Schwimmer’s paper in *Pediatric Research* received much national media coverage demonstrating that infection with adenovirus-36 is associated with risk for obesity in children. An article published in *Gastroenterology* (Dohil et al) described not only the positive

results from a randomized placebo controlled study of topical, targeted steroid therapy for eosinophilic esophagitis, but also that the therapy reversed early fibrosis in this condition. Dr. Sherry Huang published her work on an hMSH3 defect in familial hamartomatous polyps in *Cancer*. Dr. Rebecca Cherry received intramural funding to study esophageal dysmotility in children and adults with eosinophilic esophagitis. Dr. Kerry Boutelle received a grant to develop a parent-child treatment for childhood obesity specifically tailored to Latinos. Dr. Dohil received a grant from the Hearst Foundation to fund research in various aspects of eosinophilic esophagitis including optimizing therapy, biomarkers, and setting up a database to help better understand the natural history of this disease.

EDUCATION

Teaching of fellows, residents and medical students is a daily undertaking. Dr. Sherry Huang is the pediatric residency director. Dr. Jeannie Huang is Chair of the Obesity Task Force at NASPGHAN and her project, Health and Obesity: Prevention and Education, is now offering American Board of Pediatrics' Maintenance of Board Certification Part IV credit (25 points) for free. Dr. Dohil co-organized the 2nd International Cystinosis Research Conference at the Beckman Center in Newport Beach.

Division of General Academic Pediatrics/Adolescent Medicine

CLINICAL

The General Academic Pediatrics and Adolescent Medicine Clinics offers comprehensive well, sick and chronic care for all children from infancy through adolescence, and averages 1,500 visits per month. Directed by Dr. Pickering, the Rady Children's Hospital Special Needs Clinic provides a medical home to medically fragile children from San Diego, Imperial and southern Riverside counties. The Clinic currently follows 300 medically fragile patients, and conducts approximately 60 visits per month. The Premature Infant Nutrition Clinic, directed by Dr. Boies, sees 25 patients per month.

RESEARCH

Dr. Boies' on-going Premature Infant Nutrition Clinic (PINC) project continues to actively collect information on the nutritional needs of premature breast-fed infants. In collaboration with the Division of Neonatology, Dr. Boies, along with a lactation consultant, evaluate breast-fed premature infants discharged from UCSD and other regional Neonatal Intensive Care Nurseries. Dr. Leff is involved with the National Children's Study, a multi-year research grant designed to collect longitudinal data on children to evaluate health outcomes.

EDUCATION

The General Academic Pediatrics /Adolescent Medicine Division is involved in medical education from the first year of medical school to post-fellowship years. This past year, Dr. Crow, has spearheaded the development of the continuity clinic curriculum, standardizing weekly pediatric topics to be discussed during that particular weekly resident continuity clinic. Dr. Boies revamped the fourth year medical student ambulatory pediatric sub-internship curriculum by adding a project requirement that enhances the students understanding of how the community is involved in child health.

Division of Genetics

CLINICAL

Beginning in March 2010, the Division of Genetics reinitiated the monthly Clinical Genetics Conference to review unusual and noteworthy teaching cases that our network of Genetics Attending Physicians has seen in their clinics during the preceding month. Clinical Geneticists and Genetics Counselors from RCHSD, UCSD, Balboa Naval Hospital, and Kaiser Permanente are regular participants, and all medical students, residents, and fellows are invited to attend this forum. The Division is also focusing their efforts to have an active Genetics Residency Program at Rady Children's Hospital, San Diego.

RESEARCH

Using induced pluripotent stem cells (iPSC), the Muotri group generated the first model of an Autism Spectrum Disease in a dish. Functional human neurons, derived from reprogrammed skin cells, recapitulated several aspects of the disease in culture. The researchers noticed that patient-derived neurons have a small soma size, reduced spine density and defects in glutamatergic synapses and connectivity. Moreover, they were able to reverse these deficiencies using candidate drugs. This is a proof-of-principle for a future drug-screening platform, diagnosis and personalized treatment. The work was published in the November issue of *Cell* (Marchetto et al, *Cell* 2010). In the following week, Dr. Muotri also reported in the journal *Nature* that L1 retrotransposons are highly active in the brains of patients with the neurological disorder Rett syndrome, an Autism Spectrum Disorder. (Muotri et al, *Nature* 2010).

EDUCATION

The *Genetics in Medicine* course at UCSD headed by Dr. Gabriel Haddad and Dr. Albert La Spada continued for a second year this fall. Comprised of multiple lectures and case discussion classes, 20 genetics professors and physicians are involved with the teaching of this successful course for first year medical students.

Division of Genome Information Sciences

CLINICAL

The Division of Genome Information Sciences is working at the UCSD Moores Cancer Center to establish a clinical sequencing program aimed at delivering personalized cancer care to pediatric and adult patients. We have devised a plan that includes clinical-interface, genomics, and mutation-validation teams working concurrently on specific steps in the sequencing process. We feel that UCSD is uniquely prepared to lead this "complete team" approach to implementing a cutting-edge clinical sequencing program.

RESEARCH

Researchers in the Genome Information Sciences Division have recently published four scholarly articles that largely involved genomic methods to improve identification of variant DNA bases and assemble genomes. Slated for publication in the first quarter of 2011, a *Nature* paper authored by Harismendy et al. focuses on the identification and analysis of enhancers in the 9p21 gene desert associated with coronary artery disease and Type 2 diabetes. Currently, members of the

Division are performing Whole Exome Sequencing (WES) of ~800 samples to study the genetic basis of venous thrombosis. Additionally, we are collaborating with Dr. Stephen Spector on a pilot study designed to identify the association of mitochondrial genes encoded in the nucleus with HIV-uninfected, antiretroviral-exposed children exhibiting phenotypes consistent with mitochondrial disease.

EDUCATION

The Division is active in the training of medical and graduate students as well as post-doctoral researchers. The Division Chief, Dr. Kelly Frazer, was a group instructor in the “Genetics in Medicine” Course for Medical and Pharmacy School Students. Drs. Frazer and Christian Barrett will also lecture in the Quantitative Methods in Genetics class offered through the UCSD Genetics Training Program. As a recipient of a 2010–2011 Socrates Fellowship, graduate student researcher Shawn Yost teaches science courses at Castle Park High School each week in addition to his ongoing bioinformatics research.

Division of Hematology/Oncology

CLINICAL

The Hematology/Oncology Division has comprehensive, multidisciplinary clinics in the following areas: Hematopoietic Stem Cell Transplantation, Hemophilia and Thrombosis, Long Term Follow-up of Cancer Survivors, Neuro-Oncology, and Sickle Cell Disease. On October 10, 2010 Rady Children’s opened its brand new 279,000 square foot, LEED-certified (green) Acute Care Pavilion. The entire second floor of the Acute Care Pavilion became home to the Peckham Center, including the new Viterbi Family Outpatient Clinic. The Peckham Center for Cancer and Blood Disorders at Rady Children's Hospital-San Diego is the largest pediatric cancer care facility in San Diego, Riverside and Imperial counties. Our physician faculty cared for over 14,000 outpatient visits and more than 7,500 inpatient visits in 2010, and approximately 180 new oncology patients were diagnosed at Rady Children’s.

RESEARCH

The RCHSD/UCSD/St. Jude Children’s Research Hospital Alliance has led to the development of ten joint clinical trials, which are currently open to accrual, recently completed, or soon to begin. Drs. Deborah Schiff and Donald Durden are leading that effort along with Dr. Raul Ribeiro from St. Jude. Dr. William Roberts is a founding member of the Neuroblastoma and Medulloblastoma Translational Research Consortium, a 10 institution collaboration focusing on early phase clinical trials. There are currently four Phase I and Phase II clinical trials from the consortium. Through the NCI RAID program, Dr. Durden has developed the first recombinant asparaginase for Phase I/II clinical trials in acute lymphoblastic leukemia and lymphoblastic lymphoma. Dr. John Crawford will be the PI of a clinical trial of a Toll like receptor 3 (TLR3) agonist polyICLC developed by Dr. Durden for patients with low grade glioma.

EDUCATION

The Hematology/Oncology Division’s Fellowship program is entering its third year with four current fellows and two more scheduled to arrive in July 2011. One of our fellows, Dr. Paula Aristizabal, recently won Best Poster at the SIOP meeting. The poster describes the successful

efforts of Rady Children's and St. Jude Children's Research Hospital to build a pediatric oncology program across the border in Tijuana.

Division of Hospital Medicine

CLINICAL

The Division provides clinical care for hospitalized children at the Rady Children's Hospital main campus as well as at Sharp Grossmont and Palomar. New activities include transition of the Palomar Unit to Rady licensure in August 2010, expansion of a sedation service and creation of a medical psychiatry unit. The Division is actively building a sedation practice. All hospitalists are certified and available to perform sedation consults, selecting the appropriate sedation method for patients not in critical care units. Mild to moderate sedation is used for procedures such as line placement, lumbar punctures, echocardiograms and electroencephalograms. Under the leadership of Dr. Wendy Wright, and in collaboration with the UCSD Department of Psychiatry and the Division of Adolescent Medicine, the Division is also creating a unit to provide specialized services for patients with eating disorders and those who have medical problems with a mental health component.

RESEARCH

Six papers, chapters, or abstracts have been published or accepted in the past 6 months addressing the prevalence of missed abusive head trauma, apparent life threatening events, acute dermatologic issues, respiratory failure and patient safety for the pediatric hospitalist. Areas of ongoing research include a clinical trial for complicated intra-abdominal infections in partnership with the Division of Infectious Diseases, assessment of risk factors for re-admissions in partnership with the Division of Community Pediatrics, asthma re-admissions, and palliative care outcomes. Research also continues on bronchiolitis in a current NIAID study; a new study will begin in 2012, in partnership with Massachusetts General and Baylor.

EDUCATION

The Division is active in teaching medical students, residents and fellows. Under the direction of Dr. Cannavino, the pediatric clerkship was the most highly rated third year medical student rotation this past year. An ongoing, annual educational program in quality improvement (INQUIRY) led by Dr. Stucky has graduated 21 residents and 22 fellows in the past 6 months at the certificate level. An additional 37 residents and fellows are in the process of completing the course. The Division members also participate in the fellow core curriculum series addressing topics such as advocacy, ethics, health information technology and the business of medicine. Our faculty provide over 200 faculty hours per week of teaching on the RCHSD inpatient service or roughly 10,000 hours annually. The Department, in partnership with the Chadwick Center, was awarded a \$1,000,000 training grant through CalEMA, the office of emergency services. The focus of this grant is to provide education to healthcare providers on sexual assault, violence and abuse. Drs. Jenn Davis, Premi Suresh and Cynthia Kuelbs will be working on this grant as will Dr. Adams from the Division of General Pediatrics and Adolescent Medicine.

Division of Pediatric Infectious Diseases

CLINICAL

The Division of Pediatric Infectious Diseases continues to provide in-patient and out-patient consultative services at Rady Children's Hospital and the community. Outpatient activities include twice weekly Infectious Diseases clinic, a weekly clinic for HIV-infected children and youth and a bi-weekly TB clinic at the Department of Public Health. Dr. Mark Sawyer directs San Diego County's Immunization Program. Dr. Rolando Viani is the medical director for the UCSD-Tijuana Bi-National Program for HIV-infected children.

RESEARCH

Drs. Viani and Spector published an article in the *Journal of the International Physicians in AIDS* that described the continued high maternal and neonatal morbidity and mortality associated with HIV infection in Tijuana, Mexico. Over less than a 3 year period, 10 newly infected infants were identified with half developing AIDS and 2 deaths. Tuberculosis was a major cause of illness and death in HIV-infected mothers and their infants. This report stressed the need for increased counseling and testing for HIV among pregnant women giving birth in Mexico. In basic research during this period, the Spector laboratory published an article in the highly cited *Journal of Biological Chemistry* that a cysteine to serine mutation at position 31, found in >90% of HIV-1 clade C Tat proteins provide further evidence that HIV-1 clades differ in their biological properties that may impact HIV-1 pathogenesis and disease progression. Dr. Spector was the recipient of the 2010 Rady Children's Hospital Excellence in Research Award, and was honored as the 20th recipient of the prestigious Herman and Gertrude Silver Award from the Children's Hospital of Philadelphia. The award honored Dr. Spector for "work on behalf of children, adolescents and families affected by HIV disease". In conjunction with the Silver Award and the Department of Pediatrics' Grand Rounds, Dr. Spector delivered a lecture at the Children's Hospital on "Host Factors that Alter HIV Pathogenesis: Identifying Novel Strategies for Vaccine Development and Improved Treatment."

EDUCATION

The Division of Pediatric Infectious Diseases continues to be actively involved with teaching medical students residents and fellows. Additionally, Dr. Spector has been involved with revising the Microbiology curriculum for 1st and 2nd year medical students. Dr. Sawyer continues to be co-organizer of the Department of Pediatrics/RCHSD highly successful Grand Rounds program. Dr. Spector gave a presentation at grand rounds entitled, "New Concepts in HIV/AIDS: Letting the Sun Shine In." Dr. Spector also gave the Kantor Memorial lecture at Children's Mercy Hospital in Kansas City, MO where he delivered a lecture on "Pediatric HIV/AIDS: Lessons Learned and Future Challenges."

Division of Neonatology (Rady Children's Hospital, San Diego)

CLINICAL

In September this year Dr. Gail Knight was named the new Chief of the Division of Neonatology. She continues on as the Medical Director of the NICU at RCHSD as well as the Chief of Staff Elect for RCHSD. Dr. Gail Knight was also recognized as one of San Diego's Top Docs by San Diego

Magazine for 2010. On October 10th the NICU at RCHSD moved into the newly constructed LEED-certified 'green' Acute Care Pavilion (ACP). The NICU now offers families semi private homelike rooms to aid in the bonding of parents and baby. Additionally, the Division achieved national ranking in the U.S. *News and World Report* in the top 30 of Children's Hospitals for the 3rd year in a row. At the lead of Dr. Denise Suttner, RCHSD was recognized as an ECMO Center of Excellence. Currently, the Division has a full-time faculty of 14 board-certified neonatologists and 12 neonatal nurse practitioners/physicians assistants providing state-of-the-art neonatal services to NICU's within the RCHSD, Scripps, and Palomar/Pomerado Healthcare Systems (96 neonatal beds total). In 2010 there were 2483 total neonatal admits at RCHSD.

RESEARCH

The Division's faculty members have published several peer-reviewed articles this year, including the *Journal of Perinatology* and *The American Journal of Human Genetics*. The Division has also received IRB approvals for a Multi-center Trial for iNO use to Prevent Premature Chronic Lung Disease, as well as a study on the Impact of Music on Physiological Measures of Stress in Neonates in the Neonatal Intensive Care Unit. Dr. Denise Suttner also published a chapter in International ELSO Registry on ECPR (Emergency Cardio Pulmonary Resuscitation), earlier this year.

EDUCATION

Division faculty contributed to the 26th Annual Conference: The Fetus and the Newborn, hosted in Chicago, IL in October 2010. Dr. Michael Segall was the conference co-chair, and many of the faculty members presented. Planning is underway for the 27th Annual Conference to be held in Las Vegas, NV in October 2011. In collaboration with the UCSD Neonatology Academic Division at Hillcrest, Division faculty continue to teach 9 Neonatal fellows who spend a significant portion of their 3-year fellowship at RCHSD NICU. Dr. Mark Speziale had a poster presentation on Central Line-Associated Blood Stream Infections in the NICU: A Quality Improvement Project at the CCS/NICU Improvement Collaboration in Fall 2010. The Division faculty are invited presenters locally, nationally and internationally at such conferences as 10th Annual Conference for the Health Professional, 1st Annual Regional Congress of Northeast Neonatology, March of Dimes, Congreso Regional de Neonatologia Del Noreste, in Baja California, Mexico, National Neonatal Medicine Conference, Keystone ECMO Conference, Hawaii ECMO Conference.

Division of Neonatology (UC San Diego)

CLINICAL

The planning for the development of a new Neonatal Intensive Care Unit for the UCSD Medical Center to be sited at the Jacobs Medical Center is continuing with active discussions regarding the final physical layout and planning for critical equipment and support needs. The new facility will be available for occupancy in early 2016. Our new unit will include plans for an in-unit MRI as well as in-unit operating/procedure room and adequate space to support Family Centered Care.

RESEARCH

We have continued to be the lead center and Dr. Neil Finer, Director of the Division of Neonatology, is the principal investigator for the NICHD Neonatal Research Network SUPPORT trial. Original manuscripts have been published and the results were both presented at PAS and

Hot Topics, as well as in the UK in the latter half of 2010. In addition, the Division has completed another publication related to the SUPPORT trial. The first author was Wade Rich, our Research Coordinator, describing the antenatal consent process and the limitations of such approach on the actual recruited population. There have been an additional 10 publications during these 6 months and one additional manuscript in press. Our program submitted 11 abstracts to the PAS meeting in Denver in May 2011, and we have resubmitted the PRESOX Grant to the NICHD with the hope to receive funding in the near future.

EDUCATION

Graduating fellow, Dr. Anup Katheria, who is now a junior faculty member of the Division, was given the Fellow of the Year Award by the pediatric residents. In the past 6 months, members of the Division were active at the Pediatric Academic Societies' Conference and have been invited participants at educational symposiums in the United Kingdom and Ireland.

Division of Pediatric Nephrology

CLINICAL

The Division of Pediatric Nephrology intends to assume all aspects of dialysis and apheresis treatment in an effort to lower costs and improve quality relative to what outside vendors have provided. The pediatric dialysis apheresis response team (DART) began providing acute inpatient hemodialysis services at Rady Children's Hospital in July 2010. New dialysis order sets and protocols have been implemented, and we are currently recruiting a nurse skilled in dialysis and apheresis to start our inpatient and outpatient apheresis program in 2011. The new Comprehensive Kidney Care Center (CKCC) is expected to open at the end of 2011. This will complement the new outpatient clinical service area, adjacent to the new outpatient dialysis and apheresis unit. The ambulatory blood pressure monitoring program has been significantly expanded and results of these studies can be easily found in EPIC. The monthly combined Pediatric Urology and Pediatric Nephrology stone clinic has been a tremendous success. A new CCS renal team clinic will start in 2011. There has been a significant increase in clinical faculty productivity. Four physicians now see more patients than six physicians previously (in late 2009-early 2010).

RESEARCH

Dr. Robert Mak's laboratory recently showed that Vitamin D Receptor Activation suppressed inflammation and reversed cachexia in a mouse model of chronic kidney disease leading to improvement in survival. The new data is the highest-scored abstract in its category chosen for oral presentation at the International Pediatric Nephrology Association Congress in New York City in September 2010. Dr. Mak was also invited to lecture at the same congress on the discovery of a novel central mechanism of renal osteodystrophy via melanocortin signaling. Eight papers by Division faculty were published or accepted between July and December 2010, including two to *Pediatric Nephrology*.

EDUCATION

Dr. Mak presented at the International Pediatric Nephrology Association Congress 2010, and Dr. Ingulli presented at the American Society of Nephrology Annual Meeting 2010. Nephrology fellow

Dr. Mathew presented on diabetic nephropathy at the American Society of Nephrology and the International Society of Nephrology Nexus in Japan and Geneva.

Division of Pediatric Neurology

CLINICAL

A new specialty clinic focused on diagnosis and management of autistic spectrum disorders was established in September 2010. Two additional faculty members were recruited in 2010, and are joining the Division in early 2011. Dr. MJ Harbert will bring expertise in neonatal neurology, and Dr. Robert Leshner will enhance our pediatric neuromuscular disease program.

RESEARCH

In 2010, 25 peer-reviewed publications were authored by 10 Division members. Several were published in high profile journals including *Nature*, *Cell*, and the *New England Journal of Medicine*. Three child neurology fellows presented papers at the annual Child Neurology Society meeting in Providence, R.I. in October. A poster by Drs. Harbert and Crawford on visual field defects in pediatric brain tumors was selected as one of four to be featured in a WebMD Medscape Medical News article about highlights of the meeting that was disseminated across the country.

EDUCATION

Dr. Jennifer Friedman has established a program for middle school students, called "Understanding Differences," that is designed to teach tolerance through lessons on neuroscience, simulations and interactions with individuals with disabilities. This program won the California Golden Bell Award in 2010 - a yearly award given to exemplary programs throughout California by the California School Board. The award was presented to Dr. Friedman in December, 2010 in San Francisco.

Division of Pharmacology & Drug Discovery

CLINICAL

Drs. Brookie Best and Edmund Capparelli continue to provide Therapeutic Drug Monitoring consultations for dosing of antiretroviral drugs in HIV-infected patients and research subjects locally, nationally and internationally, completing approximately 200 such clinical consultations in the latter half of 2010. Dr. Adriana Tremoulet is one of two physicians at RCHSD that cares for all children with KD (approximately 1200 families in total and 80-90 new patients/year) in both the inpatient and outpatient settings.

RESEARCH

In the 6-month period from July - December 2010, Faculty Members of the Division published 44 new manuscripts in the peer reviewed literature in journals including *Nature*, *Nature Immunology*, *Cell Host & Microbe*, *PNAS*, *Journal of Experimental Medicine*, *Journal of Biological Chemistry*, *Antimicrobial Agents & Chemotherapy*, and the *Pediatric Infectious Diseases Journal*. The NIH/NICHHD has awarded the new Pediatric Trials Network (PTN) contract for conducting pediatric clinical trials under the Best Pharmaceuticals for Children Act (BPCA) to a consortium led by Duke University, a contract to span 7 years (up to 95 million dollars). Dr. Edmund Capparelli will serve

on the PTN's Steering Committee and as Chair of the PTN Pharmacometrics Core. The program will design, conduct and analyze studies for the NICHD and can provide opportunities for UCSD/RCHSD pediatric sub-specialists to be involved in these trials. Additionally, Dr. Tremoulet has enrolled her 100th subject with Kawasaki disease in her FDA Orphan Drug grant funded clinical trial evaluating the use of infliximab in the treatment of primary Kawasaki Disease.

EDUCATION

Dr. Edmund Capparelli is Director of a joint UCSD/Pfizer Post-doctoral Fellowship program in Clinical Oncology, and successfully garnered additional industry support to increase the number of fellows from 2 to 4 in July 2010. Dr. Capparelli also led Biopharmaceutics workshops in Fall 2010 for first-year student pharmacists. Dr. Brookie Best directed the summer research training program for student pharmacists at UCSD. Along with supporting 5 student trainees in maternal and pediatric pharmacology on the first year of the T35 Training grant from NICHD, the program continued to expand with 27 pre-doctoral pharmacy trainees completing projects in the second half of 2010, supported by additional NIH grants, several different pharmaceutical companies, and the UCSD CTRI.

Division of Rehabilitative Medicine

CLINICAL

The Division of Rehabilitation Medicine continues to see change. In August, Dr. Tamara Zagustin, the previous medical director, relocated to Canada for personal reasons. In November, Dr. Andrew Skalsky joined the Division. The outpatient clinical services continue to expand by adding more clinics each week in an attempt to decrease patient wait time for outpatient visits. With the opening of the Acute Care Pavilion (ACP), the acute inpatient rehabilitation program has also relocated into the ACP. Due to the need for expansion to accommodate patient care needs, the Division is in the process of recruiting a second physician and possibly a nurse practitioner to join the Division. The Division now supports the director of the pediatric rehabilitation clinic, the spinal defects clinic and the chronic pain program in addition to the muscle disease clinic, spasticity clinics and the inpatient program. With the relocation of the CCS medical therapy unit (MTU) clinics to Rady Children's Hospital, there is an anticipated need for additional clinics.

RESEARCH

The Division will be participating in a botulinum toxin study for upper limb spasticity as well as muscle disease clinical trials.

EDUCATION

The Division continues to be involved in resident and medical school didactic lecture series and community advocacy.

Division of Respiratory Medicine

CLINICAL

We have been ranked in the U.S. News and World Report ranking of Top Children's Hospitals in

Pulmonology for the 2nd year in a row. Three of our physicians were listed among the Best Doctors in America (Haddad, Hagood, Pian) and one among QForma's "Most Influential Doctors" (Lim). Dr. Pian and Dr. Doug Conrad (adult pulmonology at UCSD) were honored as Health Heroes at the Cystic Fibrosis Foundation Breath of Life Gala in September. Drs. Lim and Lesser, along with Yoly Perez and Laurie Brust, have been working with our adult Pulmonology colleagues to develop a family-friendly plan for Transition to Adult-centered Care for our older patients. It is a triumph of pediatric subspecialty care when our chronically ill patients outgrow us!

RESEARCH

Dr. Haddad was awarded a Program Project Grant totaling \$10 Million. Dr. Xue was awarded the prestigious Young Investigator Award from the Emerald Foundation for her project entitled "Role of Secreted Phosphoprotein 1 in Cardiac Hypertrophy and Fibrosis." Dr. Quinton's redaction of his presentation for the Ussing Memorial lecture to the American Physiological Society was published "Role of epithelial HCO₃ transport in mucin secretion: lessons from cystic fibrosis" (*Am J Physiol Cell Physiol* 299: C1222–C1233, 2010), with full color illustrations and figures. Drs. Mucchekehu and Quinton were invited to comment on and review their work in understanding the relation between HCO₃- and mucus secretion published earlier in the *Journal of Physiology* (588: 2329-2342, 2010). Additionally, an image from their work was selected for the cover image (Cystic fibrosis – a micromolecular sticky problem) to accompany this commentary, "Cystic fibrosis: a lesson in chemistry" (*Physiology News*, Winter, 2010). Dr. Zhou and others of our faculty and trainees had a major breakthrough in discovering the role of Notch activation in hypoxia tolerance, (*PNAS* in press), by sequencing the entire genome of a hypoxia-adapted *Drosophila* strain, which was generated over 8 years and more than 200 generations of flies. Many of our faculty members have published journal articles and textbook chapters.

EDUCATION

Our Pediatric Pulmonary Fellowship Program, entering its 2nd year, has matched each position so far (3 fellows by July 2011). We are proud of our existing and future fellows.

AWARDS & RECOGNITION



Sander Awarded \$4.95 Million for Novel Diabetes Cell Therapy Research

Dr. Maike Sander, Associate Professor in Pediatrics and Cellular & Molecular Medicine, was awarded a \$4,950,000 grant from the Beta Cell Biology Consortium (BCBC) to lead an interdisciplinary team in cell therapy research for diabetes. Dr. Sander serves as a physician-scientist for UC San Diego's new Pediatric Diabetes Research Center (PDRC).

CIRM Awards \$1.48 Million to Muotri for Early Translational Study in Autistic Neurons

The California Institute for Regenerative Medicine (CIRM) awarded a \$1,481,471 million grant to Alysson Muotri, PhD, assistant professor of pediatrics, to help design a future drug-screening system for autism spectrum disorders (ASD) that employs human neurons. Muotri and colleagues are using induced pluripotent stem cells derived from skin cells taken from patients with autism spectrum disorders like Rett Syndrome to create "autistic" neurons.



Pian Honored by Cystic Fibrosis Foundation

Dr. Mark Pian, Director of the Cystic Fibrosis Clinic, has received the 2010 Health Hero Award from the Cystic Fibrosis Foundation for his many years of dedicated service to cystic fibrosis patients.

Spector Recognized for Research Excellence

Dr. Spector was the recipient of the 2010 Rady Children's Hospital Excellence in Research Award. Dr. Spector was also honored as the 20th recipient of the prestigious Herman and Gertrude Silver Award from the Children's Hospital of Philadelphia. The award recognized Dr. Spector for his "work on behalf of children, adolescents and families affected by HIV disease."



FACULTY WITH \$1 MILLION+ IN GRANT SUPPORT IN ONE BUDGET PERIOD

CHAMBERS, CHRISTINA, Ph.D., M.P.H *Dysmorphology/Teratology*

FRAZER, KELLY, Ph.D. *Genomic Information Sciences*

FRIEDMANN, THEODORE, M.D., Ph.D. *Genetics*

HADDAD, GABRIEL G., M.D. *Respiratory Medicine*

LA SPADA, ALBERT R., M.D., Ph.D. *Genetics*

NIGAM, SANJAY K., M.D. *Nephrology*

NIZET, VICTOR F., M.D. *Pharmacology and Drug Discovery*

SANDER, MAIKE, M.D. *Endocrinology/Diabetes*

SAWYER, MARK H. M.D. *Infectious Diseases*

SPECTOR, STEPHEN A., M.D. *Infectious Diseases*

NEW GRANTS JULY-DECEMBER 2010

ACEVES, SEEMA: \$27,500.00

Registry of Eosinophilic Gastrointestinal Diseases (REGID)

Awarded by: CHILDREN'S HOSPITAL MEDICAL CENTER

BARSHOP, BRUCE: \$131,985.00

Metabolic Studies of Lysosomal Storage Disorders: Correlation of Outcomes in Gaucher Disease and Pompe Disease

Awarded by: GENZYME CORPORATION

BARSHOP, BRUCE: \$65,304.00

Improvement to Intracellular Cystine Measurement

Awarded by: CYSTINOSIS RESEARCH FOUNDATION

BENNETT, CRAIG : \$1,494,325.00

Neuronal RNA processing defects in ALS4 caused by SETX mutations

Awarded by: NIH (NIGMS) NATL INST OF GENERAL MEDICAL SCIENCES

BIRD, LYNNE: \$64,188.00

A Phase II Randomized Placebo Controlled Trial of Levodopa in Angelman Syndrome

Awarded by: CHILDREN'S HOSPITAL CORP.

BODE, LARS: \$449,582.00

Effect and Mechanisms of Disialylated HMO in a rat NEC model

Awarded by: ABBOTT LABORATORIES

BODE, LARS: \$ 152,746.00

Oral transmission of HIV through breastfeeding
Awarded by: COLUMBIA UNIVERSITY

BOUTELLE, KERRI: \$595,987.00

Parents as the Agent of Change for Childhood Obesity
Awarded by: NIH (NIDDK) NATL INST OF DIABETES

DALEY, SANDRA: \$ 565,395.00

Hispanic Center of Excellence
Awarded by: PHS (HRSA) HEALTH RESOURCES & SERVICES

DALEY, SANDRA: \$180,000.00

Evaluation of Pipeline Programs
Awarded by: CALIF WELLNESS FOUNDATION

GOTTSCHALK, MICHAEL: \$105,118.00

T1D Exchange Clinic-based Registry
Awarded by: JAEB CENTER FOR HEALTH RESEARCH

GOTTSCHALK, MICHAEL: \$100,000.00

Fellowship
Awarded by: GENENTECH, INC.

HAGOOD, JAMES: \$741,989.00

Regulation of Fibroblast Phenotype in Lung Fibrosis
Awarded by: NIH (NHLBI) NATL HEART, LUNG & BLOOD

JHALA, ULUPI: \$230,050.70

Epigenetic Regulation of PDX1 Gene
Awarded by: JUVENILE DIABETES FOUNDATION

LA SPADA, ALBERT: \$330,000.00

Modeling Motor Neuron Degeneration in SBMA
Awarded by: MUSCULAR DYSTROPHY ASSOCIATION, INC

MUOTRI, ALYSSON: \$50,000.00

Modeling Autism Spectrum Disorders using human neurons
Awarded by: EMERALD FOUNDATION INC.

NEWFIELD, RON: \$408,600.00

Natural History Study of the development of Type 1 Diabetes (protocol TN-01)

Awarded by: UNIVERSITY OF FLORIDA

NIZET, VICTOR: \$703,902.00

Boosting Innate Immunity Through HIF to Treat Antibiotic-Resistant Infections

Awarded by: NIH (NIAID) NATL INST OF ALLERGY & Infectious Diseases

NIZET, VICTOR: \$115,874.00

DTRA Screening Effort

Awarded by: DOD DEFENSE THREAT REDUCTION AGENCY

PETERSON, KARIN: \$28,218.00

Childhood Arthritis and Research Alliance Network (CARRANet): Accelerating Toward an Evidence Based Culture in Pediatric Rheumatology

Awarded by: NIH (NIAMS) NATL INST ARTHRITIS, MUSCULOSKELETAL, SKIN DISEASES

RHEE, KYUNG: \$611,263.00

Role of parenting skills, style, and family functioning in pediatric weight loss

Awarded by: NIH (NICHD) NATL INST OF CHILD HEALTH & HUMAN DEVELOPMENT

SPECTOR, STEPHEN: \$690,000.00

Identifying Genetic Association for Targeted AMP Phenotypes

Awarded by: TULANE UNIVERSITY (INCL MEDICAL CENTER)

SPECTOR, STEPHEN: \$ 351,936.00

Pediatric HIV/AIDS cohort Study initiative (AMP Study)

Awarded by: NIH (NICHD) NATL INST OF CHILD HEALTH & HUMAN DEVELOPMENT

SPECTOR, STEPHEN: \$330,435.00

Pediatric HIV/AIDS cohort Study Initiative (SMARTT Study)

Awarded by: NIH (NICHD) NATL INST OF CHILD HEALTH & HUMAN DEVELOPMENT

SPECTOR, STEPHEN: \$232,118.00

International Maternal Pediatric Adolescent AIDS Clinical Trials Group

Awarded by: NIH (NIAID) NATL INST OF ALLERGY & INFECTIOUS DISEASES

XUE, JIN: \$ 75,000.00

Role of Secreted Phosphoprotein 1 in Cardiac Hypertrophy and Fibrosis

Awarded by: EMERALD FOUNDATION INC.



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