Center for Lung Biology Pulmonary NewsLetter

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What's New in Pulmonary Science?

CLB Pulmonary hypertension research team. Bottom Row: Natalie Bauer, Salina Gairhe, and Michie Toba; Middle Row: Ivan McMurtry, Masahiko Oka, and Sachin Gupta; Back Row: Karen Fagan, Wiltz Wagner, Troy Stevens, Abdallah Alzoubi, and Kotaro Abe. Mark Gillespie, William Gerthoffer, Diego Alvarez, Brian Fouty and Jack Olson are not shown.

Study on the causes and treatment of pulmonary arterial hypertension (PAH) remain an important research priority today. In the past 20 years, four new drug therapies have been developed for use in this disease, but presently, there is no evidence that these drugs significantly extend life. The absence of an animal model that closely replicates the human condition has been a major limiting factor for discovery of the causes and treatment of PAH. Our group of scientists in the Center for Lung Biology now reports on an animal (rat) model that develops increased pulmonary arterial pressure with characteristic medial hypertrophy and hyperplasia of pulmonary arteries, and obliterative concentric and plexiform lesions in pulmonary arterioles (Figure 1). With time, these animals develop right heart failure. Using this animal model, rigorously designed preclinical studies are underway to determine how clinicians might be better able to disrupt the extensive vascular dysfunction so prominent in PAH. Our research team, which includes Drs. Ivan McMurtry, Masahiko Oka, Karen Fagan, William Gerthoffer, Sachin Gupte, Natalie Bauer, Diego Alvarez, Troy Stevens, Brian Fouty, Mark Gillespie, and Jack Olson, plans to utilize these ongoing preclinical studies as a way to translate new therapies into more effective patient treatment. Look for their forthcoming studies.

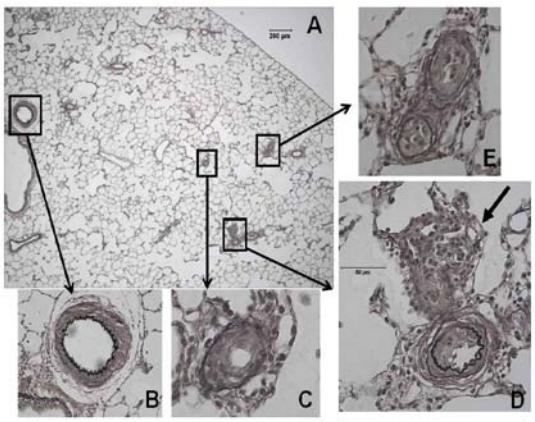


Figure 1. A: A representative low magnification photomicrograph showing various types of pulmonary vascular lesions in the hypertensive lung of a very late stage SU5416/hypoxia/normoxia-exposed rat. B-E: Higher magnification photomicrographs of medial wall thickening (B), a concentric cellular laminar neointimal lesion (C), a plexiform lesion (arrow) adjacent to a small pulmonary artery with medial wall thickening and eccentric neointimal proliferation (D), and a nearly complete occlusion of two small pulmonary arteries by concentric neointimal proliferation (E). Verhoeff-Van Gieson stained.

PERCIPIO™

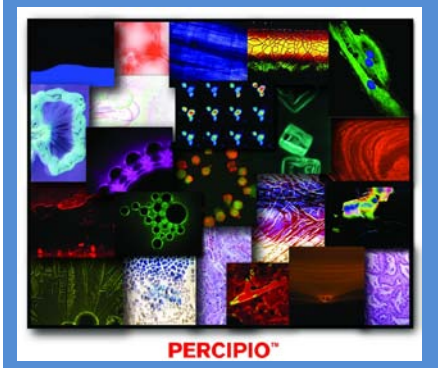
The Art in Science Program was developed to increase community awareness about biomedical research performed at USA and provides an opportunity for scientists to present aesthetic aspects of their data to the public. The primary purpose of this program is best defined by its title, PERCIPIO, which means "to learn through the senses".

Upcoming Events!!!

February 26, 2010
Scarborough Middle School
1600 Phillips Lane
Mobile, AL 36618

March 19, 2010
Chastang Middle School
2800 Berkley Street
Mobile, AL 36617

***To be announced*:**
Grand Bay Middle School
12800 Cunningham Road
Grand Bay, AL 36541



Visit us at:
http://www.southalabama.edu/PERCIPIO

Art in Science!!!

Percipio has been busy with its community outreach component of the Art in Science program. In October, we were invited to participate in Med School Café, a lunch and learn lecture series sponsored by the USA Physicians Group. The Mobile Museum of Art hosted the fall series and The Palette Café located in the museum catered the events. Using images from our Art in Science Gallery, Dr. Troy Stevens, Professor of Pharmacology and Medicine, and Director of the CLB, presented a lecture on how art interfaces with science and medicine, specifically relating to lung diseases. A collection of framed images used in the presentation were on display resulting in the sale of "Aurora" a fluorescence microscopy image of lung tissue submitted by Dr. Khair ElZarrad. We received positive feedback from the well attended (approximately 100 people) lecture.

Downtown Mobile comes alive the second Friday of each month with the LoDa Artwalk celebrated in the Cathedral Square arts district. Numerous venues, including art galleries, studios, and specialty shops hold an open house inviting the public in for a personal glimpse. Brad Robertson of the Robertson Gallery graciously hosted a collection of our framed images during October's Artwalk. Artists represented during Artwalk were Abu-Bakr Al-Mehdi, Kathy Bonness, Clayton Campbell, Judy Creighton, and Judy King.

Images displayed during Artwalk at Roberson Gallery, 450 Dauphin Street, in downtown Mobile. (http://robertsongallerymobile.com)

Percipio has a busy schedule this spring with in-classroom art in science presentations on the respiratory system for three local middle schools. Dr. Donna Cioffi, Assistant Professor of Biochemistry and Molecular Biology, will present the first presentation at Scarborough Middle School for Ms. Natasha Cox's 7th grade science classes on February 26, 2010. The second presentation will be given by Dr. Natalie Bauer, Assistant Professor of Pharmacology, for Ms. Natasha Laxton's 7th grade science classes at Grand Bay Middle School on March 19, 2010. Our third request in the works is from Ms. Sheela Bhat at Chastang Middle School who is interested in using our art in science presentation as an incentive for her life sciences students.

What's New in Research Training?

We continue to build and strengthen our advanced lung biology curriculum for predoctoral students in the Basic Medical Sciences PhD program. This spring we are offering "Skills in Lung Biology", a hands-on laboratory course designed for second or third year graduate students. Students will engage in laboratory sessions on lung gross anatomy, lung imaging modalities, lung histology, blood histology, basic spirometry techniques, and clinical pulmonary function testing. We have recruited a number of Center faculty to participate in the course to ensure a low student-faculty ratio. Students will develop an extensive annotated laboratory notebook which will serve as resource tool.

The Center for Lung Biology's "Did you know..." series published its latest on-line article on pulmonary hypertension and scleroderma, authored by David Clark (December, 2009). Finally, we are currently recruiting short term research projects for the T32 training program in "Cell signaling and lung pathobiology" for summer 2010.

In 2009, two medical students and two engineering master's students participated in projects focused on microRNAs and respiratory syncytial virus, mitochondrial DNA damage in the developing lung, vascular stiffness in hypertensive lungs, and applications of fluorescence spectral imaging.

What's New in Pulmonary & Critical Care?

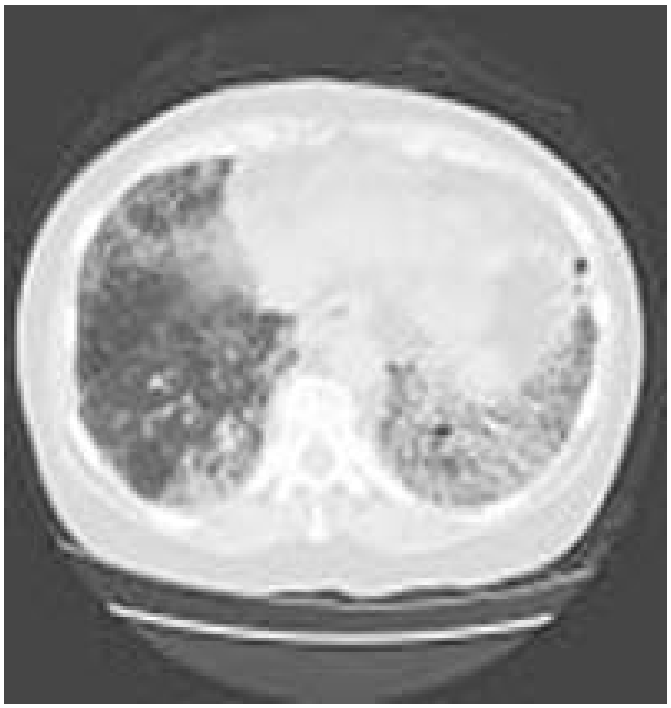
The Division of Pulmonary and Critical Care Medicine in the Department of Medicine at the University of South Alabama continues to provide outstanding pulmonary disease to the northern Gulf Coast and participate in research, both basic science and clinical. We have recently added a full-time research coordinator to the division to allow USA to participate in clinical research for a wide variety of lung diseases.

Recently the USA Pulmonary Hypertension Clinic and one of the patients cared for in the clinic were featured on the front page of the Mobile Press-Register. The story focused on clinical care of patients with pulmonary hypertension and the basic science research taking place at USA in the hopes of identifying better treatment and ultimately a cure for this progressive, fatal disease.

The other major focus of the Division is the training of future Pulmonary and Critical Care Medicine physicians. Training focuses on providing outstanding clinical training and focused research training with the goal of training physician investigators (in basic science and clinical research). The current training program has 2 fellows per year for a total of three years of training. The recruitment for the fellows starting in 2011 is well underway with over one hundred applications for the two positions.

Did You Know...

...that secondary pulmonary complications are the leading cause of disease-related morbidity and mortality in patients with scleroderma? Scleroderma, also known as systemic sclerosis, is a rare, chronic, connective tissue disorder that typically affects women between the ages of 30 and 60. Though the term scleroderma (from the Greek for "hard skin") was coined by Giovambattista Fantonetti in the 1830s, the disease has far earlier origins. The initial description of a scleroderma patient may have been made by Hippocrates when he described a man with general pruritus and thick skin in the early 4th century B.C.E[1]. The first generally accepted modern description of a patient with scleroderma was published by Carlo Curzio in 1753[1]. Despite this long and varied history, surprisingly little is known about either the underlying causes or the factors that regulate disease progression.



A transverse computed tomography (CT) scan of the lungs of a patient with scleroderma and associated lung disease. The scan shows relatively normal tissue (black regions) and the typical ground-glass opacity with reticular patterns characteristic of this disease.

As scleroderma progresses it impacts many other organ systems. Most scleroderma patients exhibit some level of pulmonary injury. The pulmonary manifestations will typically comprise either fibrosis or pulmonary arterial hypertension (PAH)[2]. While the underlying trigger that instigates pulmonary vascular damage in scleroderma is unknown, it is likely to involve a cascade of inflammatory and fibrotic processes that leads to a stiffening of the pulmonary vessels and airways[3]. The associated lung disease accounts for roughly one third of all deaths in scleroderma patients[3]. Though the median 10-year survival for scleroderma patients is 65%, patients who develop PAH have an average survival of less than two years[4].

PAH can be defined simply as the increase of the mean pulmonary artery pressure from the normal 12-16 mm Hg to greater than 25 mm Hg. PAH can also be associated with numerous other diseases, involve both genetic and environmental components, and comprise a range of pathological symptoms[5]. PAH is a progressive disorder that can lead to difficulty breathing, diminished activity levels, vascular remodeling, right ventricular dysfunction, and eventually heart failure and death.

Currently, the only “curative” therapy available for PAH is lung transplantation. However, lung transplantation is extremely rare in scleroderma patients. The standard methods of treatment for PAH are directed toward improving quality of life, delaying clinical deterioration, and improving mean survival time. Presently, the most important factor is early diagnosis of pulmonary disease, which allows for intervention of the pulmonary remodeling process and significantly improves the prognosis. Currently approved treatments for PAH in scleroderma patients include prostacyclins, endothelin-receptor agonists, and phosphodiesterase inhibitors. Supplemental oxygen is also used to improve arterial oxygenation and patient comfort. Pulmonary complications remain the primary determinate of morbidity and mortality in scleroderma patients, research conducted in the last decade could soon provide a more effective treatment for this debilitating disease.

References:

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Author: David Clark

Chief Editor: Natalie N. Bauer, Ph.D., Dec. 2009.