



CYSTIC FIBROSIS CENTER NEWS

Asthma and Airway Reactivity in CF



Carol Conrad, MD and Scott Gesler in CF Clinic

Asthma and airway reactivity are chronic lung conditions common in people with and without CF. The classic asthma symptoms are wheeze, cough, chest tightness, dyspnea (shortness of breath), and mucus production, all common symptoms of CF. An estimated 2–37% of the general population and 17–31% of persons with CF have asthma, and up to 40–50% of persons with CF have airway reactivity, either with or without asthma. Asthma is the leading chronic illness among U.S. children, with incidence rates on the rise. It is characterized by the triad of:

- Reversible airway obstruction (as measured by lung function tests);
- Airway reactivity (as measured by constriction of the airways upon challenge with an irritative stimulus); and
- Airway inflammation (as measured by presence of a particular pattern of abnormal inflammatory cells and chemicals in the airway fluid and tissue).

Most people are never directly tested for airway reactivity or inflammation, so the diagnosis of asthma is often based on symptoms or evidence of reversible airway obstruction.

Many people with CF have airway reactivity or reversible obstruction without the other asthma components, leading to confusion about the overlap between CF and asthma. Research suggests that CF-related airway reactivity and reversible obstruction may have different causes than asthma, thus explaining some of the differences in treatment response. However, since asthma is so common, it is estimated that at least the same proportion of persons with CF have asthma as in the general population, and far more have airway reactivity.

Both asthma and airway reactivity require active management, monitoring and medication. Uncontrolled, they cause impaired lung function, lung damage and can be life threatening. Appropriate diagnosis and treatment provides significant symptomatic relief and effective intervention in disease progression. Routine monitoring of response to medications determines which offer symptomatic relief and ongoing benefit.

Asthma is caused by an inflammatory response to a variety of “triggers”, i.e. allergens such as pollen, house dust, or mold, or other stimuli such as exercise, cold air, reflux or illness. The asthmatic reaction narrows the airways, making breathing difficult, and over time produces changes in the structure of the airways (a process called remodeling). Asthmatic responses include:

- Muscles surrounding the airways tighten and contract; over time the muscles increase in bulk.
- Lining of the airways becomes inflamed and swollen; over time scarring occurs.
- Mucus production increases, sometimes resulting in mucus plugs; over time the number of mucus cells increases.

Airway reactivity, also called hyperresponsiveness, is an abnormal tightening of the muscles around the airways when an irritative stimulus is inhaled (e.g. smoke, cold dry air, allergens, or a chemical used in the PFT lab such as methacholine or histamine).

It is experienced as chest “tightness”, “twitchiness” and dyspnea. It may arise from CF-related lung damage rather than from an asthmatic response to an external stimulus. In the absence of asthma, it is not responsive to certain standard asthma bronchodilator treatments. Both of these conditions aggravate CF symptoms, and if untreated, can seriously impair quality of life and lead to lung damage.

REMEMBER CF AWARENESS WEEK

OCTOBER 12–18, 2003

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Asthma and Airway Reactivity in CF

Tests in the annual CF check-up help diagnose airway reactivity and asthma. These PFT tests help determine which medications, if any, will provide relief. Symptoms can occur—or worsen—if you don't adhere to your treatment plan and then encounter one of your triggers.

What are asthma and airway reactivity?

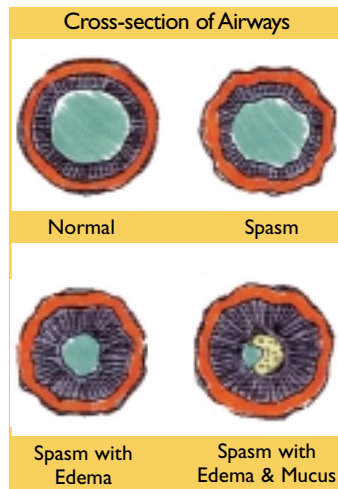
The airways are surrounded by muscles that are normally relaxed and loose, allowing the lungs to breathe easily. A thin layer of fluid lines the lungs, aiding the expulsion of mucus and foreign inhalants. In asthma and airway reactivity, the muscles constrict (bronchoconstriction) to some stimulus (the “trigger”), restricting the ability to breathe in and out. When this occurs, wheezing, cough and dyspnea often follow.

In asthma, the body also responds to a trigger with an immune response that causes inflammation and swelling of the cells lining the lungs and an increase in mucus production. Since CF airways are already inflamed and produce more mucus, asthma can worsen these symptoms if not adequately controlled. By definition, asthma refers to a condition that responds, at least partially, to treatment.

What causes asthma and airway reactivity?

The underlying causes of asthma and airway reactivity are not fully understood. The airway inflammation is an immunologic response that brings inflammatory cells into the lung tissues. The immunologic reaction can be to a variety of “triggers”, including allergies, infections, and exercise. Triggers differ from person to person, as does the severity of response. After experiencing a reaction to one trigger, airways often become more sensitive to things that previously did not cause a reaction. Also, airways can be constricted and inflamed due to asthma or reactivity, even though you don't feel significant symptoms, another reason daily treatment is important. Untreated, the inflammation can increase lung damage and make control of a severe episode more difficult. Identifying and avoiding known triggers, with allergy skin or blood tests, is key to successful management.

Gastroesophageal Reflux (or GERD), is a common CF complication also associated with asthma. Control of GERD may improve asthma and airway reactivity for some people.



Controlling Asthma and Airway Reactivity

In addition to identifying and avoiding known triggers, medications help control symptoms. These include bronchodilators (reliever or rescue meds) that relax the muscles surrounding the airways and anti-inflammatories to reduce swelling and mucus production. Maintenance anti-inflammatory medications (controller meds) help prevent asthma symptoms when taken regularly. Most doctors use three types of medications to control asthma: fast-acting bronchodilators, slow-acting bronchodilators and anti-inflammatories. Proper use of inhalers is very important, since incorrect dosages can worsen chronic asthma and make acute attacks difficult to control.

Bronchodilators (Reliever or Rescue Meds)

These medications relax and widen the airway muscles. Fast-acting bronchodilators work similar to the body's natural adrenaline by quickly relieving symptoms. They *do not* provide long-term symptom control and should be carried with you in case of an attack. These are sometimes used before an airway clearance session, although their effectiveness in improving mucus clearance should be evaluated periodically if this is their only use.

Long-term bronchodilators help prevent bronchoconstriction. They often are used with anti-inflammatory drugs to prevent symptoms and reduce the need for a faster-acting inhaler.

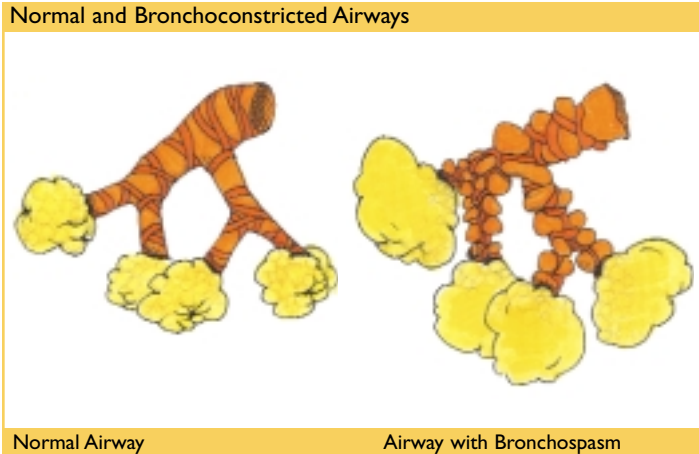
COMMON ASTHMA TRIGGERS

Pollen	Mold (both indoor & outdoor)
Dust mites	Some medications
Smoke, Pollution	Strong odors
Pets	Paint fumes
Colds and Infections	Sprays
Exercise	Sulfites in food
GERD	Seafood



Illustrations by Carrie Roberts

Common Asthma Triggers: Pollen and Dust Mites



Anti-inflammatory Agents (Controller Meds)

Inhaled corticosteroids help reduce airway inflammation, and the associated swelling and mucus production. They also can improve lung function, prevent asthma symptoms and reduce the need for fast-acting inhalers. Inhalation deposits the drug directly on the lungs, reducing the side effects typically associated with oral steroids. They do not act quickly; rather they require regular use to reduce inflammation. Severe asthma sometimes requires treatment with systemic, oral steroids. Inhaled non-steroidal anti-inflammatories are sometimes used, but are much less effective than corticosteroids.

A newer class of oral non-steroidal controller medications is the leukotriene modifiers that modify the body's response to a potent class of chemicals that recruits inflammatory cells to

[Continued on Next Page](#)

Bronchodilators (Rescue/Reliever Meds)

Names	How Taken	Brand Name for the Same Drug
Fast-acting bronchodilators:		
1. Albuterol	1. MDI , nebulizer	1. Ventolin®, Proventil®, Combivent®
2. Ipratropium bromide	2. MDI, nebulizer	2. Atrovent®, Combivent®
Longer-acting Bronchodilators:		
1. Theophylline	1. Oral	1. Theodur®, Slobid®, Uniphyll®
2. Salmeterol xinafoate	2. Dry Powder Inhaler (DPI)	2. Serevent®, Advair®
3. Formoterol	3. DPI	3. Foradil®

Anti-inflammatories (Controller Meds)

Names	How Taken	Brand Name for the Same Drug
Corticosteroids		
1. Budesonide	1. DPI, nebulizer	1. Pulmicort®
2. Fluticasone	2. MDI, DPI	2. Flovent®, Advair®
3. Beclomethasone	3. MDI	3. Vanceril®, Beclovent®
4. Prednisone	4. Oral, IV	4. Generic only
5. Methylprednisone	5. Oral, IV	5. Medrol®
Leukotriene-modifiers		
1. Montelukast	1. Oral	1. Singulair®
2. Zafirlukast	2. Oral	2. Accolate®
Other		
1. Cromolyn	1. MDI, nebulizer	1. Intal®
2. Nedocromil	2. MDI	2. Tilade®

Asthma and Airway Reactivity in CF

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the lungs during an asthma attack. However, since other chemicals are also associated with asthma inflammation, their effectiveness is often less than the corticosteroids, which have broader anti-inflammatory effects.

The most common medications used for asthma and reactive airways are listed in the chart on page 3. Combination medications include Advair (salmeterol and fluticasone) and Combivent (albuterol and ipratropium bromide).

Metered dose inhalers (MDIs) are being replaced by dry powder inhalers and discs (DPIs) to reduce the release of CFCs into the environment. Studies have shown DPIs and non-CFC MDIs are equally effective and less environmentally harmful.

Exercise is a frequent trigger for asthma. *Persons with CF who do NOT have asthma, generally experience bronchodilation and improved airflow with exercise, rather than the bronchoconstriction common in asthma.* For asthmatics, taking medications regularly, and **before** exercise, often prevents an attack. For people with impaired lung function, it is important to warm up for 5 to 10 minutes, stretch, and avoid the outdoors when pollution or pollen levels are high.

Importance of a Personal Asthma Management Plan

Effective control of asthma and airway reactivity depends on adherence to a personal plan that includes:

- Proper diagnosis and treatment;
- Regular medication to control and minimize symptoms;
- Ongoing monitoring to ensure appropriate medications and dosing;
- Emergency plan for control and treatment of severe symptoms and episodes.

The annual CF visit includes tests to determine responsiveness to bronchodilators. However, due to testing variability, it is important to know how **you feel** after taking prescribed medications. If you are experiencing increased symptoms, or feel the medications are ineffective, talk to your doctor about the need for further testing or a change. Like so many CF-related symptoms, each person responds differently, and there are no definitive treatments that work for everyone.

Summary

Effective control of asthma and airway reactivity requires management of exposure to triggers and use of the appropriate types and amounts of medication. Work with your doctor to develop a treatment plan that includes which drugs will prevent and control symptoms and what you need to manage an acute attack. An effective plan will let you gain control of your asthma, prevent serious attacks, and minimize lung damage.

Allergic Bronchopulmonary Aspergillosis

Allergic bronchopulmonary aspergillosis (ABPA) is a severe allergy to the common airborne fungus (mold) *Aspergillus fumigatus* (*Af*). It occurs in about 10% of persons with CF and 2% of persons with asthma. ABPA causes lung inflammation, symptoms of cough and/or wheezing, and if untreated, bronchiectasis (destruction of airways) and fibrosis (scarring). Because of the relatively high risk of ABPA in persons with CF, a 2001 CFF ABPA Consensus Conference chaired by Dr. Moss, recommended routine screening beginning around school age. Early diagnosis and treatment aimed at suppressing the inflammation is important to minimize lung damage.

Screening & Diagnosis of ABPA

Diagnosis of ABPA in CF is difficult and often delayed because many diagnostic criteria overlap with typical CF symptoms. Screening consists of a blood test to measure total IgE (immunoglobulin E). IgEs are proteins that control the immune response to foreign substances, e.g. bacteria, viruses, and, in ABPA, the *Af* mold. Our clinic includes IgE screening as part of the annual CF blood panel. If total IgE is >500 IU/mL (International Units per milliliter of blood), we do a test for IgE antibody against *Af*. If total IgE is between 200–500 IU/mL, the test is repeated if other factors suggest ABPA. Other factors considered in the diagnosis include:

- Clinical deterioration (cough, wheeze, exercise intolerance or exercise-induced asthma, decline in PFTs, increased sputum) not attributable to other causes (e.g. if little/no improvement from antibiotic therapy);
- New or recent abnormalities on chest xray or CT scan that haven't cleared with antibiotics and standard chest PT;
- Elevated eosinophils (a type of white blood cell);
- Total IgE concentration over 1000 IU/mL, unless the person is receiving systemic steroids.

ABPA can be episodic or chronic, with acute onset or continuing symptoms. Frequency of flare-ups varies widely; some people require persistent therapy, and others have periodic flare-ups with months or even years between a need for treatment. Diagnosis is most common in adolescents and young adults although young children can develop it.

Culturing *Af* in sputum is not the same as, and does not increase risk for ABPA. Likewise, failing to culture *Af* does not rule it out. Many persons with CF have intermittent *Af* colonization, without symptoms. Also, many lab cultures are suspect because they do not look for molds like *Af*; and the ABPA immune reaction can persist even after the mold has been eliminated (or confined to a section of the lung that is



Carl Robinson, a computer specialist, has asthma, ABPA and CF.

not accessed by a sputum culture). Patients who do not expectorate cannot be properly tested for mold.

Studies suggest that only CF patients with a particular immune response gene variant (called HLA alleles) are susceptible to ABPA. This variant codes for proteins expressed on the surface of antigen-presenting immune cells that “sample” the environment and “present” foreign substances to the responding cells. People without these particular HLA alleles do not react to *Af* in a way that causes the ABPA allergic reaction.

Treatment of ABPA

Treatment of ABPA aims to reduce inflammation and the immune response and reduce the foreign protein burden that arises from exposure to *Af*. Oral steroids such as prednisone are used to control inflammation and symptoms. Treatment typically entails a 7–20 day high-dose steroid “burst”, followed by a tapered dose to minimize the risk of relapse. Chronic steroid use is sometimes required to control symptoms.

Reducing the fungal burden in the lungs may decrease immune stimulation and inflammatory response, ameliorate symptoms and possibly limit disease progression. Oral itraconazole (Sporanox®), an anti-fungal drug, is helpful in some cases, allowing decreased steroid use. Inhaled corticosteroids are not effective for ABPA. In rare cases inhaling the antifungal drug amphotericin B is helpful.

Environmental Controls

Aspergillus fumigatus is a rapidly growing bluish-green mold, found in air, plants, food, soil, sand, woodpiles, compost, haystacks, and even fresh water. It can grow in

humid areas such as showers and indoor plants. It also can grow in damaged lung or sinus tissues. Optimal growth is at normal body temperature.

Removal or avoidance of environmental sources may alleviate the severity and frequency of ABPA reactions. Several of our patients have improved with environmental controls. Commercially available agar plates are used to identify possible sources of *Af*. The plates are left in suspected areas for a set time and then sent to a mold-testing laboratory via prepaid mailers. Removal and control methods include bleach, anti-mold solutions, air filters and dehumidifiers. One person found that moving his nebulizer treatments into an area with improved ventilation reduced mold counts in his bedroom, resulting in a significant reduction in symptoms. Another found installation of a centralized HEPA air filtration system eliminated her chronic ABPA symptoms and kept her IgE low.

Other Aspergillus-Related Conditions

Several conditions are caused by *Af*. It is one of the most common causes of systemic fungal disease in humans, causing acute and chronic respiratory infections and devastating infections in immunosuppressed people. Pulmonary aspergilloma is growth of *Af* in a damaged lung. The *Af* spores grow and form a fungal ball that secretes toxic and allergic products that cause some to feel ill. Often the aspergilloma causes no symptoms initially, though weight loss, chronic cough, exhaustion and coughing up blood (hemoptysis) can occur. X-ray, CT scan and blood tests make the diagnosis. Aspergillus sinusitis is a proliferation of *Af* in the sinuses that occurs in people with and without CF. Symptoms include chronic headache, stuffy nose or sinus pain. Surgical drainage of the sinuses often cures the problem. Invasive aspergillosis is a life-threatening condition in persons with low defenses, including AIDS, major burns, and transplants. The infection can begin in skin, lungs, sinuses or elsewhere, and sometimes transfers to the blood. Fortunately invasive aspergillosis is rare in people with CF.

Summary

Routine annual screening for ABPA is a new CFF recommendation, based on the importance of early treatment to minimize lung damage. ABPA may cause as many as 10% of CF pulmonary exacerbations requiring hospitalization. It does not respond to IV antibiotics, and it requires systemic steroids and, in many cases, itraconazole. Dr. Moss, a recognized expert on ABPA, states, “Diagnosis and aggressive treatment of ABPA is an important component of maintaining lung health in affected individuals. Untreated, ABPA leads to serious scarring that impairs the long-term health and survival of persons with CF.”

Frequently Asked Questions

Are asthma medicines safe?

Yes, they have been tested and used in millions of people. However, it is important that their use be discussed and monitored by your physician.

What about inhaled steroids?

The corticosteroids used in inhalers are deposited directly on the lungs and have minimal systemic absorption. In proper dosage, they have not been associated with the side effects found with prolonged use of oral steroids.

What are the side effects and how are they controlled?

Side effects of reliever medications can include rapid heart beat, shakiness, and upset stomach. Side effects of inhaled corticosteroids can include yeast in the mouth (thrush) or sore throat. If you experience any of these contact the nurse coordinator or your doctor to determine if you need to adjust your medication. Do not discontinue use of the medication since this could lead to uncontrolled asthma symptoms.

How often do asthma medications need to be adjusted?

Adjustments may be needed if symptoms such as cough, wheezing, and shortness of breath worsen or change with exercise or upon exposure to certain triggers or activities. The annual PFT test is used to monitor the effectiveness of treatment as well.

Why do I need to take medications regularly when I feel OK?

Asthma and airway reactivity are chronic conditions that do not go away when you're not "feeling" them. Controller medications prevent muscles around the airways from tightening and prevent or reduce swelling and mucus production, keeping the airways open to make breathing easier. If you can suppress the inflammation, you can maintain lung function more effectively and reduce the amount of lung damage caused by uncontrolled inflammation.

How long does it take for bronchodilators to work during an asthma episode?

For "as needed" reliever/rescue medicine like albuterol, try to take it within five minutes of the onset of symptoms for best results. Less medicine is needed early in an attack. Short-acting bronchodilators should only take 5-10 minutes to take effect. Liquids take about an hour, and pills take varying lengths of time. Anti-inflammatories are preventive and have no immediate effect on symptoms.

Can inhaled medications be overused?

Yes, misuse and overuse of an asthma medication can reduce effectiveness, or reduce the effectiveness of other medications during an attack. Overuse of reliever/rescue medication, particularly albuterol, is a common problem in asthma. If you are using albuterol more than 3-4 times a day, you should notify your doctor.



Katherine Boyle, RN Joins CF Team

Katherine Boyle (right) is the new pediatric nurse coordinator as Nicole Eden (center) enters a nurse practitioner program. Nicole will assist Mary Helmers (left) "behind the scenes" in the adult program. Katherine recently received an LPCH Grace Award, tribute to the hospital's most dedicated employees. Katherine's Irish brogue is familiar to many who know her from 3North. She is a certified diabetic educator and has worked with CF inpatients for the past 9 years. Katherine says, "I look forward to getting to know our CF families while they are healthy, and working closely great CF team."

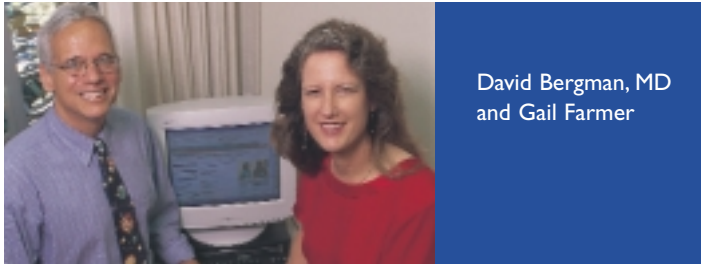
In Memoriam

James Theodore, MD Lung Transplant Pioneer

Dr. James Theodore, Professor Emeritus and former Director of Lung and Heart-Lung Transplantation at Stanford passed away on August 17, 2003. During his 33 years at Stanford, Dr. Theodore was instrumental in forming the world-renown Lung and Heart-Lung Transplantation program. Dr. Theodore is recognized internationally as a pioneer in the field. He championed the use of transplantation for persons with CF and forged a program in which 40% of recipients have CF, with the best survival rates in the country. Dr. Theodore was beloved by colleagues, students, patients, friends, and family. His passing is a great loss to us all.



CF.Doc Internet Pilot Takes Off



David Bergman, MD
and Gail Farmer

A new study to test an innovative use of the Internet to improve patient care is gearing up with the CF Center team, faculty David Bergman, M.D. and research coordinator Gail Farmer. The program will provide participants with a personal health record, secure messaging with the CF team, “virtual home visits”, and health education materials. Software will enable you to track height, weight and pulmonary function from home.

Dr. Bergman’s research interest is in children with chronic illness and the use of technology to improve care. The study will measure the benefits of technology-assisted communication and care management tools. Gail Farmer is the research coordinator for the study. Gail is a nutritionist who served as CF Coordinator at Kaiser Oakland for 18 years. She will be the “hub” of communications between enrollees and the CF Center team. Gail says the program is designed to help people maintain their health between clinic visits by providing tools for self-management and enhanced communications with the CF team.

Enrollment is open to Stanford CF Center patients through age 20. Some support is available to persons who do not currently have Internet access. Enrollees will design a “Healthy Changes Plan” with personal health goals. If you are interested in learning more about this study, contact Gail at 650-498-4898 or by email at gfarmer@stanford.edu.

Current Research Studies

Participating in clinical research is a great way to learn more about CF and get to know our wonderful research team. Please visit our website at www.cfcenter.stanford.edu or contact Research Coordinator Colleen Dunn for more information about current trials.

- INS37217 Inhalation Solution
- Phase IIB gene therapy
- BILL study
- CF.Doc internet-based clinical care pilot project
- Infant and toddler pulmonary function testing
- Concentrated TOBI
- Topical aminoglycosides
- Nasal Membrane Potential Difference
- CF Diabetes



Nanci Yuan, MD Joins Pediatric Team

Pulmonologist Nanci Yuan has joined LPCH following completion of a fellowship at Children’s Hospital of Los Angeles. A Bay Area native, she is a Cal grad and did a pediatric residency in Oakland. Dr. Yuan will be attending CF clinic in addition to general pulmonary and outreach clinics. She states, “I’m very happy and proud to be a part of such a well known institution and such a cohesive pulmonary group.”



New Adult Nurse Manager

Beverly Grenz, RN

Beverly Grenz has become acting manager of the adult CF inpatient unit, after being assistant manager for the past 8 years. She is looking forward to working with the CF team to oversee and coordinate patient care on the unit. Beverly says, “I enjoy working with people, and helping to see that our patients get the best care we can possibly give them.”

Stanford CF in the News

CFRI has awarded Parent Advisory Member **Kathleen Flynn** Volunteer of the Year and **Rick Moss, M.D.** Professional of the Year. **Terry Robinson, M.D.** published articles entitled “An Automated Approach to Quantitative Air Trapping Measurements in Mild CF” in the *May Chest* and “Composite Spirometric-CT Outcome Measure in Early CF Lung Disease” in the September *American Journal of Respiratory & Critical Care Medicine*. **Dr. Moss** is the closing plenary speaker at the 2003 NACFC Conference in October, where he will assess the state of CF clinical research. A CFF Consensus comprehensive review of ABPA, co-chaired by Dr. Moss was published in the September *Clinical Infectious Disease* devoted to Aspergillus. An international conference on Aspergillus will be held at Stanford in September 2004, with Dr. Moss a lead organizer. Dr. Moss will be speaking this fall on CF in Brazil and Spain.



**SAVE THE DATE: 2004 CF EDUCATION DAY AT LPCH
SATURDAY, MARCH 6, 2004**



Anne Anastasi: New Research Coordinator

Anne Anastasi is a new research coordinator with responsibility for regulatory compliance and administration. During her 14 years in corporate finance, she became interested in health research as a volunteer. Anne says, "I'm excited to be with an organization that's dedicated to helping patients and finding better treatments. The best part is working to facilitate the efforts of this dedicated research team."



**CFF GI Fellow
Jackie Fridge, MD**

The CF Foundation is sponsoring gastroenterology fellow, Jackie Fridge, MD as part of a 3-year training program. Dr. Fridge went to medical school and worked in England before coming to the US. She is beginning her 2nd year as a fellow during which she will attend CF clinic. She hopes to study intestinal bacterial overgrowth in children with CF, under the direction of Drs. Ken Cox and Carol Conrad. Dr. Fridge also hopes to work with Dr. Robinson on CT imaging studies of CF liver fibrosis.

Double Your Support of the CF Center!

The Campaign for Lucile Packard Children's Hospital was launched two years ago to support LPCH's leading edge pediatric care, research and training. The CF Center and Pediatric Pulmonary program were designated as one of six Centers of Excellence. A generous campaign match from the David and Lucile Packard Foundation, will *double all gifts* to support the CF Center. Checks should be made to Lucile Packard Foundation for Children's Health and mailed to:

Pulmonary Disease and Cystic Fibrosis Center
c/o Lucile Packard Foundation for Children's Health
770 Welch Road, Suite 350
Palo Alto, CA 94304

The LPFCH website www.lpfch.org has information on gifts of securities and planned giving. Join us in contributing to the support and development of a world class CF Center!

CF Center Email List

Center nurse educator and webmaster Judy Kirby is assembling a Center email list to facilitate distribution of materials and announcements about new website content and programs of interest to Center families and patients. Please call her at 724-3474 or email her at jkirby@stanford.edu with your email address, and if different, the name of your family member with CF, if you are interested.

CYSTIC FIBROSIS CENTER AT STANFORD

Center Physicians: Richard Moss, Director; Noreen Henig, Adult Center Director; Carol Conrad, Terry Robinson, Lauren Witcoff, Hugh Harris, Nanci Yuan

Clinic E Scheduling	650-497-8841
Clinic Fax	650-497-8837
Katherine Boyle, RN Pediatric Coordinator	650-736-1359
Mary Helmers, RN Adult Coordinator	650-736-1358
Kristin Shelton, Respiratory Coordinator	650-724-0206
Violet Hsieh, Nutritionist, Dietitian	650-736-2128
Joanne Asano, Social Work	650-736-1905
Research Coordinators	650-736-0388

For Urgent Issues:

Monday-Friday 8:30-5:00 pm contact RN Coordinator
All Other Times (ask for Pulmonary Physician On-Call)
650-497-8000

See our website at <http://cfcenter.stanford.edu> for more information about our center, CF and current topics.

To subscribe to this newsletter please call or email Judy Kirby at 650-724-3474 or jkirby@stanford.edu

We gratefully acknowledge the leadership of friend and parent Penny Stroud in producing this publication.



Lucile Packard Children's Hospital

STANFORD UNIVERSITY MEDICAL CENTER

CF Center at Stanford
701 Welch Road, Suite 3328
Palo Alto, CA 94304

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