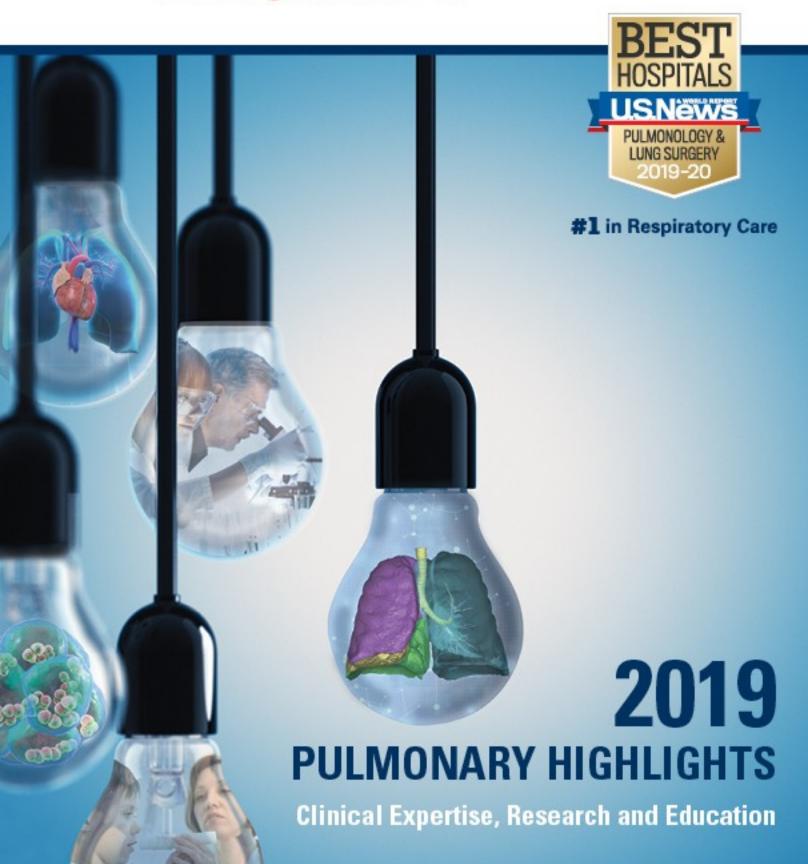


Breathing Science is Life.



THE TUCHMAN FAMILY

DIVISION OF PULMONARY, CRITICAL CARE AND SLEEP MEDICINE



National Jewish Health acknowledges The Tuchman Family Foundation and Debra and Ken Tuchman for their generous gift to establish The Tuchman Family Division of Pulmonary, Critical Care and Sleep Medicine.

For more than 20 years, Debra and Ken Tuchman and the Tuchman Family have been committed to National Jewish Health through board service and as outstanding advocates for the institution.



Dear Colleague,

At National Jewish Health, we welcome your most challenging pulmonary cases. For more than 121 years, we have focused exclusively on respiratory and related disorders. In any given week, we see patients with rare conditions that most pulmonologists see only a few times in their entire careers. Our unique, multidisciplinary model of care assures that patients will see not only our pulmonologists, but also any of our other specialists whose expertise can provide insight into their diagnosis and treatment.

National Jewish Health has one of the largest pulmonary divisions in the nation with recognized international leaders in fields ranging from asthma, COPD, cystic fibrosis and interstitial lung disease to hypersensitivity pneumonitis and granulomatosis with polyangiitis. This year we were named the #1 respiratory hospital in the nation for the 18th time by U.S. News & World Report.

Patients who come to us receive extensive evaluations by expert pulmonologists in collaboration with cardiologists, gastroenterologists, allergists, oncologists, rheumatologists and others, all under one roof at National Jewish Health. Our combination of tests — not available anywhere else — provide unique insight into patients' conditions. Evaluation, testing and consultation all occur in just a few days in most cases.

We have extensive experience developing effective treatment plans for patients with both common and rare conditions. Once patients return home, we work with their hometown physicians to implement their care plans. We also provide access to hundreds of clinical trials at National Jewish Health.

One of our top priorities is to share our expertise with the next generation of health care providers by training medical students, residents and postgraduate fellows in affiliation with the University of Colorado School of Medicine. Our robust, nationwide continuing medical education program keeps practicing physicians abreast of the latest developments, current research and best practices. Our dynamic clinical and basic research programs continuously seek answers to the many questions and challenges that remain in pulmonary medicine.

It is with great pleasure we present National Jewish Health Pulmonary Highlights 2019, our annual compilation of clinical, research and educational capabilities and accomplishments in pulmonary medicine. We hope you will take a few moments to read and discover how we are advancing pulmonary medicine and improving treatment options for patients.

Irina Petrache, MD

Medeche

Chief, Division of Pulmonary, Critical Care and Sleep Medicine National Jewish Health Kevin K. Brown, MD

Chair, Department of Medicine National Jewish Health

CLINICAL EXPERTISE

National Jewish Health provides people from around the nation and the world with comprehensive evaluations, diagnoses and treatment plans. Our pulmonary specialists and their colleagues in cardiology, gastroenterology, oncology, immunology, rheumatology and radiology lead the way in providing our unique, comprehensive approach to care. Our clinical expertise include:

Advanced Diagnostic Laboratories

We provide unparalleled expertise in immune and respiratory disease to our clinical, biotech, pharmaceutical, public health and diagnostic partners. Our CLIA and CAP15189SM-certified laboratories have decades of experience developing immunology, complement, infectious disease and molecular genomic tests.

Allergy and Immunology

Our nationally recognized experts use the latest testing and treatments to diagnose and manage allergies and other immune disorders, which can impact respiratory health.

Our patients have access to the latest allergy and immunology clinical trials.

Asthma

Thorough upper and lower airway evaluations in our multi-day adult and pediatric asthma programs help us phenotype patients and understand complicating factors, from aspiration to allergies, vocal cord dysfunction and inhaler technique. Our faculty members lead numerous National Institutes of Health (NIH) studies and industry-sponsored clinical trials.



Behavioral Health

Teaching patients to understand and manage behavioral health issues that often accompany chronic respiratory diseases is an integral part of our wholepatient approach. In addition, our prevention and wellness programs offer help with tobacco cessation and vaping cessation for adults and young people.

Cardiology

Our cardiologists are experts in the heart-lung interface. They work closely with pulmonologists to diagnose and treat the cardiac causes and consequences of lung disease, including pulmonary hypertension, cardiac sarcoidosis and other rare diseases.

Chronic Beryllium Disease

National Jewish Health has more experience with the diagnosis and treatment of chronic beryllium disease than any other group in the world. We emphasize early detection and intervention.

Chronic Obstructive Pulmonary Disease

We are advancing pulmonary medicine with COPDGene™ and other studies to diagnose and phenotype COPD, striving to individualize therapies for chronic bronchitis, bronchiolitis, emphysema and bronchiectasis. In addition, we are a leading center for the diagnosis and management of alpha-1 antitrypsin deficiency and offer clinical trials for those with this condition.

CLINICAL EXPERTISE

Cystic Fibrosis

We have the largest and most experienced adult cystic fibrosis program in the nation. Our team of pulmonary specialists, nurse coordinators, respiratory therapists, registered dietitians, psychologists and social workers provides treatment for more than 400 adults annually. We have more than two dozen ongoing clinical trials to evaluate new cystic fibrosis therapies.

Environmental Health

We define, diagnose and treat patients with a broad range of occupational, environmental and granulomatous lung diseases, including chronic beryllium disease, bronchiolitis obliterans and respiratory disease among war fighters returning from deployment in the Middle East.

Gastroenterology

We have special expertise in GI motility disorders, pulmonaryrelated GI conditions, GI cancer screening and treatment of GI malignancies. We diagnose and treat the entire range of GI



illnesses, including liver disease, biliary disorders, inflammatory bowel disease, GERD and esophageal disorders, pancreatic disease, and functional disorders of the gut.

Interstitial Lung Disease

We have vast experience with interstitial lung disease (ILD). Through detailed evaluations, we diagnose the wide range of ILDs of idiopathic, exposure and autoimmune origins. Care plans are based on the most current information, much of which has been discovered at National Jewish Health. We have several ongoing clinical trials of approved and experimental ILD therapies.

Interventional Pulmonology

We provide minimally invasive diagnostic, therapeutic and palliative procedures for pulmonary nodules, lung cancer, airway obstruction, tracheomalacia, pleural effusions, airway stents, and bronchial thermoplasty for severe asthma. Our interventional pulmonologists work closely with thoracic surgeons to individualize therapeutic options for those with severe emphysema, including bronchoscopic lung volume reduction and intra-bronchial valve placement.

Mycobacterial Infections: TB and NTM

National Jewish Health began as a hospital for destitute tuberculosis (TB) patients more than 121 years ago, and we continue to provide consultations and manage nontuberculous mycobacterial (NTM) infections today.



CLINICAL EXPERTISE

Our unprecedented experience with thousands of complex mycobacterial infections gives us a deep knowledge of personalized antibiotic regimens and surgical options.

Oncology

Our expert pulmonologists, thoracic radiologists, gastroenterologists and surgeons help us diagnose and treat cancers of the lungs, head and neck and digestive system. Lung cancer screening and our tumor registry help us screen and monitor patients at high risk for lung cancer.

Pediatrics

National Jewish Health for Kids physicians are nationally recognized leaders in the diagnosis and treatment of asthma, vocal cord dysfunction and other pediatric pulmonary diseases.

Our Severe Asthma Clinic and Pediatric Day Program offer multi-day evaluations, education, and management plans for children with pulmonary and atopic diseases.

Pulmonary Hypertension

Our pulmonologists and cardiologists collaborate to provide comprehensive and sophisticated outpatient and inpatient services for pulmonary hypertension. These include detailed diagnostic procedures, such as right-heart catheterization with cardiopulmonary exercise testing, which allow for precise phenotyping and treatment of complex patients.



We are recognized around the world for our expertise in thoracic imaging.

Pulmonary Palliative Care

We improve the quality of life for individuals suffering from diverse respiratory conditions and help manage symptoms by integrating interventions with existing clinical care plans.

Pulmonary Pathology

Our vast pathology experience examining lung tissue and recognizing respiratory diseases contributes to our unparalleled diagnostic capabilities, which generate consultation requests from around the country.

Pulmonary Physiological Services

Our state-of-the-art laboratory offers many unique tests, including cardiopulmonary exercise tests with full metabolic testing, arterial line, lactate levels and cardiac data; and continuous laryngoscopy with exercise tolerance to evaluate exercise-induced respiratory distress.

Radiology

We are recognized around the world for our expertise in thoracic imaging. Our highly experienced team of radiologists and technicians performs imaging studies on more lungs than any other facility. Our experts provide interpretations of imaging test results and consultations to help doctors nationwide make accurate and timely diagnoses.

Rare Lung Diseases

As a national pulmonary referral center, we have extensive experience diagnosing and managing a variety of rare lung

diseases, including pulmonary alveolar proteinosis (PAP), lymphangioleiomyomatosis (LAM) and eosinophilic syndromes that most pulmonologists rarely see.

Rheumatology

Our rheumatologists work to diagnose, manage and research a variety of rheumatologic disorders, with special expertise in interstitial lung diseases caused by systemic autoimmune diseases. The Rheumatology Division has been designated as a Scleroderma Foundation Research and Treatment Center.

Sarcoidosis

Our experience with thousands of sarcoidosis patients has helped us better define and address the multi-organ nature of the disease and gain insight into its causes.

Sleep

Our comprehensive Sleep Center has a full complement of pulmonologists, sleep medicine specialists, psychologists, respiratory therapists and polysomnographic technologists.

DEPARTMENT OF MEDICINE CHAIR

Renowned Pulmonologist Kevin K. Brown, MD, To Lead the Department of Medicine

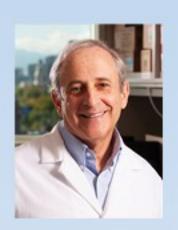


In December, internationally renowned pulmonologist Kevin K. Brown, MD, was named the new Chair of the Department of Medicine at National Jewish Health. Dr. Brown is a leading clinician and investigator with expertise in pulmonary fibrosis, inflammatory lung disease, interstitial lung disease and other serious conditions of the lung. His research interests include the mechanisms responsible for the initiation and progression of lung fibrosis, as well as autoimmune disorders such as rheumatoid arthritis and scleroderma.

"I am humbled and honored to lead the outstanding faculty at National Jewish Health as we advance the care of patients with complex, lifealtering diseases; train the next generation of clinicians and scientists; and expand our clinical, translational, and basic science knowledge in order to, one day, cure and prevent them," said Dr. Brown.

Dr. Brown succeeds Richard J. Martin, MD, who stepped down as department Chair in July 2019. Dr. Brown has been the Interim Chair since July and has served as Vice Chair for the Department of Medicine since 2006. He has authored more than 250 peer-reviewed publications, including highimpact publications such as The New England Journal of Medicine, American Journal of Respiratory Critical Care Medicine and others. In addition, he is credited with more than 50 book chapters and reviews and more than 350 invited podium presentations.

Dr. Brown received his medical degree from the University of Minnesota Medical School and was Chief Medical Resident at Providence Medical Center, He completed fellowships at Maine Medical Center and at National Jewish Health, Dr. Brown has been on the America's Top Doctors list for more than 15 years. He is a Professor of Medicine in the Division of Pulmonary Sciences and Critical Care Medicine at the University of Colorado School of Medicine, and at the Icahn School of Medicine at Mount Sinai in New York. He is board certified in Internal Medicine and Pulmonary Medicine.



Richard J. Martin, MD, Retires After Leading Decades of Growth

After nearly 40 years at
National Jewish Health,
including 15 years as Chair of
the Department of Medicine,
Richard J. Martin, MD, has
stepped down. Dr. Martin led
the Department of Medicine
through its greatest growth
in the 121-year history of
National Jewish Health.

Under his leadership, the Department more than tripled in size, growing from 51 faculty in three divisions to 178 faculty in 11 divisions. Dr. Martin played a crucial role in extending our model of care through the formation of Respiratory Institutes at Mount Sinai in New York, Jefferson Health in Philadelphia and Saint Joseph Hospital in Denver.

CLINICAL RESEARCH — SELECTED RESULTS

National Jewish Health has a robust clinical research program with more than 300 active clinical trials. We collaborate on clinical research with the National Institutes of Health, industry, and leading research institutions across the country through numerous research networks and consortiums. Some highlights of our clinical research from 2019 are listed here:

African American Children Respond Differently to Asthma Medications

Although African Americans suffer asthma more often and more severely than Caucasian patients, clinical trials that have shaped treatment guidelines have included few African Americans. Michael Wechsler, MD; Ronina Covar, MD; Tod Olin, MD; and their NHLBI AsthmaNet colleagues evaluated the response of African American children and adults to various step-up therapies for asthma inadequately controlled with low-dose inhaled corticosteroids.

More adult African Americans responded better to adding long-acting beta agonists (49 percent) than higher doses of inhaled steroids alone (28 percent). Caucasians have shown a similar response in previous trials. However, even numbers of African American children responded better to increasing the dose of inhaled corticosteroids alone (46 percent) and adding long-acting beta agonists (46 percent).

These results indicate that asthma treatment guidelines do not necessarily apply to African American children and that physicians should consider alternatives.

(N Engl J Med. 2019 Sep 26)

New Diagnostic Criteria for Chronic Obstructive Pulmonary Disease

Researchers at National Jewish Health and their colleagues around the nation have proposed new criteria for diagnosing chronic obstructive pulmonary disease (COPD), the fourth leading cause of death in the United States. The proposal expands diagnostic criteria from a single measure of lung function to include additional criteria of environmental exposure (smoking); symptoms (shortness of breath, chronic cough and phlegm); and structural abnormalities on CT scans (emphysema, gas-trapping and airway wall thickness). If used, the new diagnostic criteria could increase the number of patients diagnosed with COPD by 15 percent to 36 percent, or about 2 to 5 million people.

The researchers evaluated 8,784 smokers and former smokers enrolled in the COPDGene™ study. At enrollment, the researchers documented all four of the proposed diagnostic criteria for the patients. Many of the patients were not diagnosed with COPD when measuring only lung function. When researchers correlated those measures with mortality and loss of lung function five years later, they

found that all patients with at least two qualifying criteria had increased risks of losing significant lung function or dying in five years.

(Chronic Obstr Pulm Dis. 2019 Nov)

Triple Combination Therapy Effective in Cystic Fibrosis

In recent years, several new medications have come to market that directly impact the faulty CFTR ion channel that causes cystic fibrosis (CF). A combination of tezacaftor or lumacaftor and ivacaftor is standard therapy for people with CF homozygous for the most common mutation Phe508del. However, CF patients with only one copy of Phe508del do not benefit from that combination therapy.

Jennifer Taylor-Cousar, MD, and her colleagues reported results of a phase two clinical trial of a triple combination therapy (elexacaftor-tezacaftor-ivacaftor) among patients heterozygous for the Phe508del mutation and a different minimal-function mutation. Patients taking the triple combination therapy showed increased pulmonary function and quality of life, while having fewer exacerbations. The triple combination therapy could benefit approximately 90 percent of CF patients who have one or two copies of the Phe508del

CLINICAL RESEARCH — SELECTED RESULTS

mutation. The triple combination therapy has been approved by the FDA.

(N Engl J Med., 2019 Nov 7)

Lung Scarring Responds to Medication

Kevin K. Brown, MD, and his colleagues reported that nintedanib, a medication approved for the treatment of idiopathic pulmonary fibrosis, slows the decline in lung function among patients with a broad range of scarring lung diseases. The findings suggest that many more people may benefit from nintedanib than are currently approved for treatment.

The findings also suggest that the dozens of different forms of fibrosing interstitial lung disease may share similar scarring mechanisms and respond to the same treatments in spite of different causes and patterns. The findings could help accelerate the search for new, more effective therapies in the future by significantly expanding the pool of patients eligible for clinical trials of antifibrotic therapies.

(N Engl J Med., 2019 Oct 31)

Severe Silicosis Discovered in Stonecutters

Engineered stone, made of ground quartz and resin, has become a popular material for kitchen countertops. Cecile Rose, MD, MPH, and her colleagues in Texas, California and Washington reported that workers who form, cut and polish the material risk developing severe silicosis at a relatively young age.

Engineered stone contains up to 90 percent silica, compared to less than 45 percent in granite. After seeing several silicosis patients, Dr. Rose reviewed patient files and discovered seven recent cases of silicosis among engineered stone workers in her practice. Public health officials in the other states identified 11 more cases.

"There may be thousands of silicosis cases among workers in the engineered-stone industry. We urgently need to identify workers at risk and reduce their exposure to silica dust," said Dr. Rose.

(MMWR Morb Mortal Wkly Rep. 2019 Sep 27)

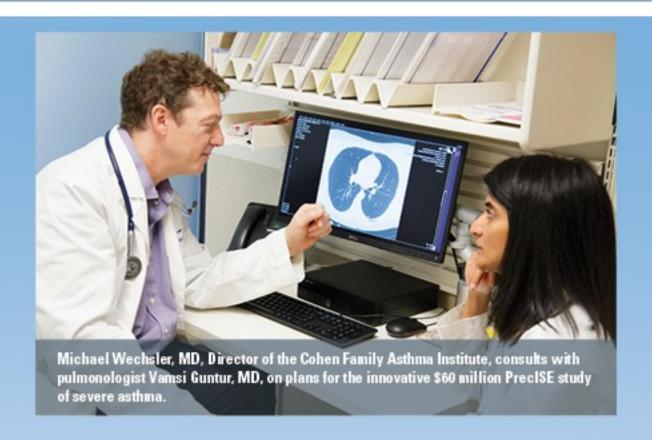






Our robust clinical research program includes more than 300 active clinical trials. And, this year alone we've published and collaborated on more than 500 peer-reviewed scientific journal articles.

CLINICAL RESEARCH — ASTHMA INSTITUTE



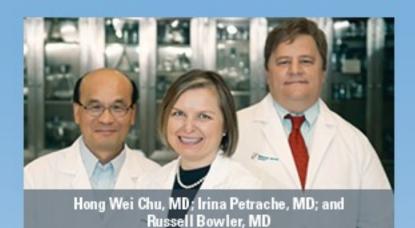
ASTHMA RESEARCH ADVANCES PERSONALIZED MEDICINE

National Jewish Health is at the forefront of precision medicine for asthma — delivering the right medication to the right person at the right time. Four new medications aimed at specific subsets of patients have dramatically reduced hospitalizations and emergency room visits for severe asthma patients. Basic and translational research at National Jewish Health helped reveal the disease mechanisms targeted by these medications. Pivotal clinical trials of all the medications were conducted at National Jewish Health.

An innovative, \$60 million study just beginning at National Jewish Health and other centers around the world will use

an adaptive design to evaluate several medications, many of them not previously used for asthma. The Precision Interventions for Severe and/or Exacerbation-Prone Asthma Network (PrecISE) study will identify subsets of asthma patients based on biological characteristics of their disease. The researchers will then provide a medication to each patient that appears most likely to address their unique biology. Several weeks into the intervention, researchers will evaluate success of the treatment. If the first medication is not working well, the researchers will shift the patient to another medication and another if that does not work, until they find the right medication for the right patient.

RESEARCH — PUBLIC HEALTH CRISIS



ADDRESSING THE NATION'S VAPING EPIDEMIC

Researching Impacts and Helping Teens Quit

Well before thousands of e-cigarette users came down with severe and sometimes deadly lung disease, National Jewish Health had begun researching the biological and behavioral impacts of vaping and developing programs to help teens and young adults quit.

In 2019, more than 34 percent of high school students and 18 percent of middle school students reported currently vaping. It's estimated that more than 4 million high school students are using e-cigarettes.

In 2017, Russell Bowler, MD, PhD, reported that adult tobacco smokers often begin using e-cigarettes in hopes of reducing their tobacco use. He reported, however, that more often than not, they fail to do so.

Hong Wei Chu, MD, reported that e-cigarette vapor reduces the ability of lung cells to fight off viral infections. He has continued this line of research, which shows that even nicotine-free e-cigarette vapor increases inflammation and mucus production in human lung tissue. Dr. Chu and Irina Petrache, MD, recently earned a four-year grant to further evaluate the effects of e-cigarette vapor on the immune system.

Today, we are using a machine to draw vapor from an e-cigarette and pass it over live human lung cells. "We are finding that there is damage to the cells from both the heated vape juice and the vehicle used for delivering the juice, which may cause further harm when cooling to body temperature. We found that these chemicals can decrease the normal defense of the lung," Petrache said. "This injury may become irreversible over time, an issue we are studying now."

We also have been working to help teens and young adults quit vaping. In 2019, our tobacco cessation experts in Health Initiatives at National Jewish Health launched My Life, My Quit™. Developed with input from teen addiction specialists and teens via focus groups, it is the first program in the country to offer a comprehensive quitline — including text, online, and phone coaching — to help young people quit vaping and using other tobacco products.



RESEARCH — SELECTED OPEN CLINICALTRIALS

National Jewish Health has a robust clinical trials program with more than 300 active clinical trials in progress. Below are brief descriptions of some of our active clinical trials:

ASTHMA MANDALA Asthma Study

Principal Investigator: Michael Wechsler, MD

Safety and efficacy of BDA MDI is compared with albuterol MDI to relieve symptoms in children ages four and older and adults with moderate to severe asthma. Two doses of budesonide and albuterol inhalation suspension (BDA MDI) is compared to an albuterol metered dose inhaler (albuterol MDI).

Understanding the Genetics of Asthma

Principal Investigator: Brian Modena, MD

By studying the genes involved with asthma, researchers hope to understand what causes the disease and how to better treat it. For this study, researchers are examining participants' nasal cells and blood samples for patterns and signatures in their genetic codes. Researchers are particularly interested in gathering more information on Aspirin Exacerbated Respiratory Disease (AERD).

COPD

Investigational Medication for COPD Lung Damage

Principal Investigator:

Barry Make, MD

Our researchers are investigating if Losartan helps people with chronic obstructive pulmonary disease (COPD) with emphysema. Although some COPD medications reduce symptoms and prevent flare-ups, few have been shown to reduce damage to the lungs in people with COPD. Losartan, a medicine used to treat high blood pressure, has been shown to slow lung damage caused by COPD in animals.

CYSTIC FIBROSIS The PROMISE Study: An

Observational Study of Triple Combination Therapy for Cystic Fibrosis

Principal Investigator:

Jennifer Taylor-Cousar, MD, MSCS

This is an observational study to evaluate the biological and clinical effects of triple combination therapy, elexacaftor/tezacaftor/ivacaftor, in people with cystic fibrosis (CF) before and after starting this therapy. Researchers will follow their progress and evaluate the effects of triple-combination therapy in order to understand short and long-term changes to the body and disease caused by the medication.

Impact of Combination Therapy on Cystic Fibrosis (TEACH Study)

Principal Investigator:

Jerry Nick, MD

The purpose of this study is to determine how azithromycin and inhaled tobramycin work when taken together to treat cystic fibrosis (CF) patients with chronic pseudomonas aeruginosa (PA) lung infections. Some data suggest that azithromycin and inhaled tobramycin do not work well when used together. Our researchers want to determine if taking azithromycin with inhaled tobramycin has a negative impact on how well people with CF breathe, They also want to determine if the combination of medications improves or worsens the health of people with CF.

INTERSTITIAL LUNG DISEASE & EARLY RHEUMATOID ARTHRITIS

Principal Investigator: Joshua Solomon, MD

The purpose of this study is to learn how interstitial lung disease (ILD) develops and progresses over time in people with early rheumatoid arthritis (RA). There is evidence that RA starts in the lungs in a subset of patients, and through this study researchers will be looking at the relationship between RA and the lungs.

RESEARCH — SELECTED OPEN CLINICALTRIALS

LUNG CANCER New Medication for EarlyStage Non-small Cell Lung

Principal Investigator: Laurie Carr. MD

Researchers are testing atezolizumab and its effects on early-stage non-small cell lung cancer (NSCLC). Atezolizumab is an experimental immunotherapy medicine, which is a manmade antibody. Atezolizumab is approved to treat advanced cancer of the bladder and lung. Researchers believe it may help people who have early-stage NSCLC.

PULMONARY FIBROSIS Src Family Kinase Inhibitor Saracatinib for Pulmonary Fibrosis

Principal Investigator: Gregory P. Downey, MD

Dr. Downey and his colleagues at Yale and Mount Sinai have been awarded \$4.7 million by the National Center for Advancing Translational Sciences to conduct phase 1b/2a clinical trials of the experimental medication saracatinib for idiopathic pulmonary fibrosis (IPF). Saracatinib inhibits the activity of Src kinases, many of which participate in cellular signaling associated with fibrosis. Saracatinib was originally developed for the treatment of

cancer. It was selected for the IPF trial after genetic studies demonstrated an overlap in the genes and signaling pathways relevant in idiopathic pulmonary fibrosis and in those affected by saracatinib.

Pulmonary Fibrosis & Genetic Factors

Principal Investigator: Kevin K. Brown, MD

This study is investigating genetic factors in people with two or more family members who have been diagnosed with idiopathic pulmonary fibrosis (IPF). Finding the genes that play a role in pulmonary fibrosis is the first step toward developing better methods for early diagnosis and improved treatment of pulmonary fibrosis.

GERD in Idiopathic Pulmonary Fibrosis

Principal Investigator: Jeffrey Swigris, DO, MS

The purpose of this study is to measure and accurately identify the presence and severity of gastroesophageal reflux disease (GERD) in idiopathic pulmonary fibrosis (IPF) patients using the supraglottic index. The study also will determine if stomach reflux or abnormal swallowing are associated with the progression of IPF.

PULMONARY HYPERTENSION Investigational PAH Medication CXA-10

Principal Investigator: Marjorie Patricia George, MD

This study is to learn whether a new study drug, called CXA-10, can help lower the pressure in the blood vessels from the heart to the lungs and improve heart health.

RARE DISEASES Investigational Medication for Lymphangioleiomyomatosis

Principal Investigator:

Gregory P. Downey, MD

A recent trial showed that sirolimus stabilizes lung function in patients with moderate and severe lymphangioleiomyomatosis (LAM). This study is investigating people with LAM to find out if giving low-dose sirolimus earlier in the course of treatment safely and effectively prevents further lung damage from LAM.

Immune Pathways & Development of Sarcoidosis

Principal Investigator: Lisa Maier, MD

This study in patients with biopsy-proven sarcoidosis who are not on immunosuppressive therapy seeks to define different types of sarcoidosis and what may predict how the disease develops over time.

To learn more about clinical trials visit www.njhealth.org/clinicaltrials.

FRONTIERS OF PULMONARY SCIENCE

National Jewish Health researchers conduct basic, translational, and clinical research that advances the frontiers of science and medicine. This year alone, we published more than 500 peer-reviewed scientific journal articles. Here is some of the groundbreaking research being conducted at National Jewish Health:

SELECTED 2019 RESEARCH REPORTS

Reducing Inflammation in COPD

Fabienne Gally, PhD, and her colleagues report that a protein known as FABP5 may be a key to reducing inflammation associated with respiratory infections in COPD patients. FABP5 levels normally increase during infections, but instead of increasing inflammation, FABP5 helps resolve and reduce inflammation as the immune response winds down.

The researchers showed that FABP5 levels are low in COPD patients' lungs and that cigarette smoke reduces the cells' ability to produce FABP5 when it is needed. Animals lacking FABP5 suffer greater inflammation during respiratory infections.

Restoring cells' ability to produce FABP5 reduced inflammation associated with bacterial infection. FABP5 may be an important target for reducing inflammation, symptoms and lung damage caused by respiratory infections in COPD patients.

(Clin Transl Med. 2019 Mar 15)

Potential Therapy for Emphysema

Irina Petrache, MD, and her colleagues showed that release of the cytokine EMAPII caused by cigarette smoke promotes lung inflammation and cell injury, including apoptosis and autophagy. Neutralizing antibodies to EMAPII showed therapeutic and even curative potential in two strains of mice when administered via nebulizer or subcutaneous injection during or following cigarette smokeinduced emphysema.

(Am J Physiol Lung Cell Mol Physiol. 2019 Mar 1)

Trigger of Type 1 Diabetes

Researchers led by John Kappler, PhD, and Shaodong Dai, PhD, have identified an elusive trigger of type 1 diabetes. The research solves a long-standing mystery about the specific molecule that triggers many cases of type 1 diabetes. The researchers showed that a fragment of the insulin protein, known as B:14-22, activates pathogenic T cells to attack and destroy insulin producing beta cells in the pancreas.

"The recycling process inside beta cells produces many protein fragments that can activate pathogenic T cells," said Dr. Kappler. "We have finally identified the precise target for T cells that cause type 1 diabetes and have identified a process that can produce those disease triggers."

(Sci Immunol. 2019 Apr 5)

Differential Infectivity of Nontuberculous Mycobacteria

Nontuberculous mycobacteria (NTM) are ubiquitous in the environment, yet they infect relatively few people. Knowing relative infectivity of different species could aid prognostic accuracy and enhance personalized treatment.

Jennifer Honda, PhD; Ed Chan, MD; and their colleagues evaluated differences in NTM isolates' ability to infect macrophages. They discovered that different species of NTM, even different isolates of the same species, more successfully infected macrophages in culture. They also found that infectivity is associated with the mycobacteria's ability to evade the antibacterial peptide LL-37.

NTM phospholipids, especially those with phosphatidylinositol or cardiolipin backbones, are strongly implicated as antagonists of LL-37, and thus mediators of NTM infectivity and virulence.

(Am J Respir Cell Mol Biol. 2019 Sep 23)

RESEARCH — 2019 SELECTED REPORTS

Puerto Rican Infant Metagenomic and Epidemiologic Study of Respiratory Outcomes (PRIMERO)

Max Seibold, PhD, and his colleagues are studying the impact of patient genetics and viral infections on the development of asthma in a five-year birth cohort study of 3,000 children in Puerto Rico, where asthma prevalence and deaths are among the highest in the world.

COPDGene[™] — Genetic Epidemiology of COPD

Led by James Crapo, MD, the COPDGene™ Study aims to find inherited or genetic factors that increase risk for COPD and to better classify COPD subtypes that may respond to precision medicine interventions. Now entering its 13th year, the study has 10,000 enrolled individuals.

Mechanisms and Treatment of Deployment-Related Lung Injury

Gregory P. Downey, MD, and Cecile Rose, MD, MPH, are working with a unique cohort of more than 100 previously deployed veterans with lung disease to understand why war fighters deployed to Southwest Asia suffer increased rates of respiratory disease and to test potential treatments.

Immunosuppressive Injurious Effects of E-Cigarettes on Human Lung Parenchyma

Irina Petrache, MD, and Hong Wei Chu, MD, are testing their hypothesis that e-cigarettes impair antiviral immunity, causing increased neutrophilic inflammation and injury to distal lung structure.

Reducing Fibroblast Persistence in Pulmonary Fibrosis as a Mechanism of Resolution

Elizabeth Redente, PhD, is studying whether runaway fibrosis in the lungs can be stopped by inducing scar-forming fibroblasts to die. Dr. Redente will block the action of the protein Bcl-2, which prevents cells from undergoing a programmed cell death.



AIR POLLUTION AND ASTHMA THROUGH THE GENERATIONS

Mothers Exposed to Air Pollution Pass Asthma Susceptibility to Their Offspring

Women who live in areas of high air pollution are more likely to have children with asthma.
Magdalena Gorska, MD, PhD, is researching how prenatal exposure to air pollution might cause asthma. Her research has found that polycyclic aromatic hydrocarbons (PAHs) in diesel exhaust cross the placenta. The PAHs then bind to aryl hydrocarbon receptors (AhRs) on fetal natural killer cells. The AhR causes the natural killer cells to release cytokines, including IL-1βand IL17-A, which interact with other cells to increase inflammation and airway resistance — the hallmarks of asthma.

Dr. Gorska continues to research how a mother's inhaling diesel exhaust may lead to her child's susceptibility to asthma.

EDUCATION — ACADEMIC TRAINING

Our physicians and scientists are thought leaders in their fields who elevate the standard of patient care while teaching the next generation of health care professionals through fellowships, training and continuing medical education. National Jewish Health is an accredited teaching affiliate of the University of Colorado School of Medicine, where our physicians and scientists have faculty appointments.

Clinical Fellowships

Based at National Jewish Health:

- Adult Sleep Medicine
- Pediatric Allergy and Immunology
- Adult Allergy and Immunology
- Mycobacterial Disease

Based at University of Colorado School of Medicine with rotations at National Jewish Health:

- Adult Pulmonary and Critical Care Medicine
- Interventional Pulmonology
- Infectious Disease
- Pediatric Pulmonary Medicine
- Rheumatology
- Cardiothoracic Radiology

In collaboration with the Colorado School of Public Health, National Jewish Health also offers fellowships in:

- Occupational and Environmental Medicine
- Pediatric Sleep Medicine





Postdoctoral Fellowships

Numerous opportunities exist for postdoctoral training in laboratories in the Department of Biomedical Research, the Division of Cell Biology and the Basic Science Section of the Department of Medicine.

National Jewish Health has a robust discovery and translation research enterprise, placing it in the top 6 percent of institutions funded by the National Institutes of Health.

Graduate Education

Students enrolled in one of the PhD programs offered by the Graduate School of the University of Colorado School of Medicine have the opportunity to perform their thesis research in the laboratories of the faculty at National Jewish Health.

Residents and Medical Students

Residents and medical students at the University of Colorado School of Medicine have rotations at National Jewish Health in a variety of specialties, including pulmonary medicine, cardiology, allergy and gastroenterology. In addition, our faculty train residents in family medicine at National Jewish Health | Saint Joseph Hospital.



EDUCATION — CONTINUING MEDICAL EDUCATION

Building on the expertise of world-renowned faculty at National Jewish Health, the Office of Professional Education creates innovative educational activities for physicians, pharmacists, nurses and other health care providers to develop and enhance their knowledge and competency related to the diseases National Jewish Health treats and researches.

Through robust educational offerings, with the ultimate goal of improved patient outcomes, we work to deliver on our mission to educate as a preeminent health care institution.

Live and Online Program Provides Road Map for Navigating Severe Asthma

Our live continuing medical education (CME) program, "Navigating Asthma Control: A Severe Asthma Road Map for Improved Diagnosis and Personalized Treatment," has continued into 2020 as an online CME activity. It covers the diagnosis, treatment and management of patients with severe and difficult-to-treat asthma. It is a follow-up to our severe asthma course offered in 2018 and uses a test-and-teach simulation-based structure that follows the workflow of a Severe Asthma Road Map Infographic.



The case-based, interactive, enduring multimedia activity and the downloadable infographic can be accessed by visiting njhealth.org/CME. Pulmonologists **Michael Wechsler**, **MD**, of National Jewish Health, and Linda Rogers, MD, of the Icahn School of Medicine at Mount Sinai, served as the faculty for this education collaboration with the Mount Sinai – National Jewish Health Respiratory Institute.

National Outreach in Person and Online

Each year, the Office of Professional Education manages CME activities in cities coast to coast. In 2019, this included three satellite symposia at the CHEST Annual Meeting in New Orleans on nontuberculous mycobacteria, systemic sclerosis interstitial lung disease and eosinophilic granulomatosis with polyangiitis. More than 600 physicians came to learn from our experts at these symposia.

These initiatives offer free, online CME-certified activities, making the same great education accessible to health care professionals around the world.

To see all of our courses and learn more about the Office of Professional Education, please visit njhealth.org/CME or call 800.844.2305 or email proed@njhealth.org.

COLLABORATIONS

Collaborations with leading health care organizations are a key component of our growth. From Denver to New York, Philadelphia and across the western United States, these relationships extend our unique model of care, elevate respiratory care for patients, and create opportunities for research and training of health professionals.



MILESTONES REACHED WITH SAINT JOSEPH HOSPITAL

When National Jewish Health and Saint Joseph Hospital, a part of the SCL Health System, signed a joint operating agreement in 2014, the primary goals were to deliver patientcentered, innovative health care, medical education and training, and to advance medical science through research.

The past year has seen success in all of these areas. A new extracorporeal membrane oxygenation (ECMO) program for the sickest pulmonary and cardiovascular patients was launched. The lung cancer program was named a Center of Excellence by the GO2 Foundation for Lung Cancer. Glenn A. Hirsch, MD, began his tenure as Chief of Cardiology and Director of the Cardiovascular Service Line for both organizations.

The thoracic surgery team began performing robotic surgery that is less invasive and has shorter recovery time than traditional surgery. Saint Joseph Hospital became the second hospital in Colorado recognized for reducing sepsis mortality with certification by The Joint Commission.

Both organizations were recognized for success and performance by respected organizations such as U.S. News & World Report. National Jewish Health was ranked the #1 pulmonary hospital in the nation for the 18th year. Saint Joseph Hospital was named one of the top five hospitals in Colorado and Denver and was recognized as High Performing for abdominal aortic aneurysm repair, aortic valve surgery, heart bypass surgery, hip replacement, knee replacement and lung cancer surgery.

RESPIRATORY INSTITUTES DELIVER UNPARALLELED CARE

National Jewish Health collaborates with Mount Sinai in New York and Jefferson Health in Philadelphia to advance and expand our Respiratory Institutes in those cities.

Through our Respiratory Institutes we bring our multidisciplinary, team-based model of care to respiratory patients in New York, Philadelphia and throughout the northeastern United States. The Respiratory Institutes also focus on research, bringing together investigators from all three organizations to advance care for complex respiratory diseases.



Led by Charles Powell, MD, the Mount Sinai —
National Jewish Health Respiratory Institute
continues to grow in the number of patients
served, the range of conditions treated and
collaborative research. The opening of a second
location in Union Square in New York City
significantly increased our capacity to serve more
patients with our comprehensive and collaborative
model of care.

The Respiratory Institute in New York also increased its capacity and expertise to help patients with nontuberculous mycobacterial infections and bronchiectasis with the addition of **Sebastian Kurz, MD**, a nationally recognized expert in the research and treatment of those conditions.

In the past year, Respiratory Institute faculty have published research findings on COPD, asthma and management of idiopathic pulmonary fibrosis. Mount Sinai and National Jewish Health faculty continue to collaborate on research in those diseases.

In Philadelphia, the Jane and Leonard Korman Respiratory Institute Jefferson Health — National Jewish Health added faculty and staff, moved into a new space and established programs in several disciplines as operations continue to grow. Under the leadership of Jesse Roman, MD, nine



new faculty, specializing in pulmonary medicine, allergy and immunology, and critical care, joined the Respiratory Institute. We also added a clinical research coordinator, seven medical assistants, two nurses, two nurse practitioners and an administrator. The Respiratory Institute's training program expanded to include 15 postgraduate fellows for a three-year accredited program.

New programs were established in Critical Care Medicine, Lung Cancer, Interventional Pulmonology, Hypertension, Asthma/Allergy, Interstitial Lung Disease and COPD.

TELE-ICU SERVES BANNER HEALTH PATIENTS ACROSS THE WEST

Acutely ill patients in intensive care units (ICUs) at 25 Banner Health hospitals across the western United States benefit from the expertise and care of National Jewish Health intensivists via the Tele-ICU program. From an office in Denver, our intensivists use electronic resources to remotely monitor seriously ill patients and provide guidance on their care. Banner Health has found Tele-ICU technology improves care, saves lives and shortens ICU stays for patients.

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Pamela L. Zeitlin, MD, PhD



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* denotes Professor Emeritus



William J. Janssen, MD



Glenn A. Hirsch, MD, MHS, FACC



Jeffrey B. King, MD

National Jewish Health faculty published more than 500 articles in 2019 in peer-reviewed scientific and medical journals. Included is a selection of noteworthy articles:

ASTHMA

Asthma Biologics: Comparing Trial Designs, Patient Cohorts and Study Results.

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Step-Up Therapy in Black Children and Adults with Poorly Controlled Asthma.

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New insights to improve treatment adherence in asthma and COPD.

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Exacerbation-prone asthma in the context of race and ancestry in Asthma Clinical Research Network trials.

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Is there a role for type 2 CD8+ T cells in patients with steroid-resistant asthma?

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Mometasone or Tiotropium in Mild Asthma with a Low Sputum Eosinophil Level.

The effect of BPIFA1/SPLUNC1 genetic variation on its expression and function in asthmatic airway epithelium.

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Treatment Adherence in Young Children with Asthma.

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Functional genomics of CDHR3 confirms its role in HRV-C infection and childhood asthma exacerbations.

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Exercise-Induced Laryngeal Obstruction: When Pediatric Exertional Dyspnea Does not Respond to Bronchodilators.

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Cardiopulmonary Effects of Fine Particulate Matter Exposure among Older Adults, during Wildfire and Non-Wildfire Periods, in the United States 2008-2010.

DeFlorio-Barker SIErooks J達bvbp连IEappold AGŒnviron Health Perspect점 - . 63 J ^命/4等894-- 36

The Best of 2018 in the Annals of Allergy, Asthma, and Immunology: The Editors' Choices.

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Asthma over the Adult Life Course: Gender and Hormonal Influences. VBRBD@Abkpl kBB @Weohsler ME@Ain Chest Mea@-. 631 ^c8-152 16*, 3, 49

Polysomnographic characteristics of adolescents with asthma and low risk for sleep-disordered breathing.

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Hypoxia enhances CD8+ TC2 cell-dependent airway hyperresponsiveness and inflammation through hypoxia-inducible factor 1.

Ning FjTakeda KjSchedel MjDomenico JjDoetham Ajgelfand EW@ Allargy Clin Immunolik -, 또한rk8 10%장 -/3º/-0464집

Genetic associations of the response to inhaled corticosteroids in asthma: a systematic review.

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Report from the National Institute of Allergy and Infectious Diseases workshop on "Atopic dermatitis and the atopic march: Mechanisms and interventions."

Colorado Asthma Toolkit Implementation Improves Some Process Measures of Asthma Care.

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Adapting clinical trial design to maintain meaningful outcomes during a multicenter asthma trial in the precision medicine era.

Impact of a digital health intervention on asthma resource utilization. J bo'e^k@ipve&dp'gBender BGptr dftl pt^oobqp > pth ke^if*@ptrvb6js^kpf hbb Appфj nb@i-dWorld Allergy Organ JGI - 50kb*686 . %875@

Clinical Issues in Severe Asthma: Debates and Discussions About Personalizing Patient Management.

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Benralizumab does not impair antibody response to seasonal influenza vaccination in adolescent and young adult patients with moderate to severe asthma: results from the Phase IIIb ALIZE trial.

A rare case report of polyangiitis overlap syndrome: granulomatosis with polyangiitis and eosinophilic granulomatosis with polyangiitis.

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A Transcriptomic Method to Determine Airway Immune Dysfunction in T2-High and T2-Low Asthma.

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The asthma Symptom Free Days Questionnaire: how reliable are patient responses?

Gene Coexpression Networks in Whole Blood Implicate Multiple Interrelated Molecular Pathways in Obesity in People with Asthma.

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Phenotypes of Recurrent Wheezing in Preschool Children: Identification by Latent Class Analysis and Utility in Prediction of Future Exacerbation.

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Predictors of inhaled corticosteroid taper failure in adults with asthma.
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J Allergy Clin Immunol Pract®-. 68 m@%& 002*. 004&063

Rhinitis in children and adolescents with asthma: Ubiquitous, difficult to control, and associated with asthma outcomes.

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A genome-wide association and admixture mapping study of bronchodilator drug response in African Americans with asthma.

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An admixture mapping meta-analysis implicates genetic variation at 18g21 with asthma susceptibility in Latinos.

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Effects of Reslizumab on Asthma Outcomes in a Subgroup of Eosinophilic Asthma Patients with Self-Reported Chronic Rhinosinusitis with Nasal Polyps.

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Expression of corticosteroid-regulated genes by PBMCs in children with asthma.

Building Bridges for Asthma Care: Reducing school absence for innercity children with health disparities.

Susceptibility to exacerbations in Black adults with asthma.

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Consistently very poorly controlled asthma is associated with greater activity and school impairment in children with severe or difficult-to-treat asthma.

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COPD

COPD: A New Diagnostic Paradigm.

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Pulmonary Subtypes Exhibit Differential Global Initiative for Chronic Obstructive Lung Disease Spirometry Stage Progression: The COPDGene™ Study.

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Subtypes of COPD Have Unique Distributions and Differential Risk of Mortality.

COPDGene™ 2019: Redefining the Diagnosis of Chronic Obstructive Pulmonary Disease.

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Fifty Years of the Division of Lung Diseases and the Evolution of Pulmonary Research and Medicine.

Crapo JD-8Chronic Obstr Pulm Dista- . 601." (\$102%80)

Metoprolol for the Prevention of Acute Exacerbations of COPD.

New insights to improve treatment adherence in asthma and COPD.

George Millender 8+Patient Prefer Adherence (8-, 615r (0, 8 07 07 27, 001-0)

Radiographic lung volumes predict progression to COPD in smokers with preserved spirometry in SPIROMICS.

Serum amino acid concentrations and clinical outcomes in smokers: SPIROMICS.

Diffusing Capacity of Carbon Monoxide in Assessment of COPD.

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Physiologic Insights from the COPD Genetic Epidemiology Study.

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Identifying Smoking-Related Disease on Lung Cancer Screening CT Scans: Increasing the Value.

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Subtyping COPD by Using Visual and Quantitative CT Imaging Features.

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Turning subtypes into disease axes to improve prediction of COPD progression.

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Clinical Epidemiology of COPD: Insights From 10 Years of the COPDGene™ Study.

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Introducing the New COPD Pocket Consultant Guide App: Can A Digital Approach Improve Care? A Statement of the COPD Foundation.

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The St. George's Respiratory Questionnaire Definition of Chronic Bronchitis May Be a Better Predictor of COPD Exacerbations Compared With the Classic Definition.

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Proline-Glycine-Proline Peptides Are Critical in the Development of Smoke-induced Emphysema.

Real-world use of rescue inhaler sensors, electronic symptom questionnaires and physical activity monitors in COPD.

Bowler RE lifeabd9 (Becobson S)9 tibe\$ (2) tibe\$ (2)**Pfedbd\$(5)* ^kq dd\$ (3) BMJ Open Respir Res@-, (22)_158***8b---02--43 Genetic Advances in Chronic Obstructive Pulmonary Disease. Insights from COPDGene™.

O^di^ka@ Q@bkt ^v@\$@Trop#J@BowlerRP@b`hbd\$@Elh^kplk@@ErepoJD@ @pofint\$@\$hJbl@Al@Ebope@\$@El___@@Al@^kdb@@ab^g@E@ppi@Eppfisboj^kl\$\$H@ Am J Respir Crit Care Med@-、@Pbr@28 - "\$\$\$44"36-@

Impact of fatty acid binding protein 5-deficiency on COPD exacerbations and cigarette smoke-induced inflammatory response to bacterial infection.

Reo DMIPhen DT)Ehoo MJ(Weaver MR)E_babv*Abbd*k@@Bowler RP)3 Gelly F626n Transi Med®-, 631 ^6328% 8441

Omics and the Search for Blood Biomarkers in Chronic Obstructive Pulmonary Disease. Insights from COPDGene™.

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Symptoms of anxiety and depression and use of anxiolytic-hypnotics and antidepressants in current and former smokers with and without COPD - A cross sectional analysis of the COPDGene™ cohort.

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Mortality and Exacerbations by Global Initiative for Chronic Obstructive Lung Disease Groups ABCD: 2011 Versus 2017 in the COPDGene™ Cohort

@fikbdDK可^_^hff T (Regan EA)D | ki\$J (P1 | bibD)D e^qP1ND roo^vD12E | h^kpl kiD GBD*fishqi ^kBH|DCrepo JD10Droqfd8| 19 ^qpkbvBG3Meke BJ)E ^kiD H(D ^qpkbvND5 8) @ MADbkb2 (Bksbpqfd^q qs/Chronic ObstrPolin Dista-, GB~kiD-8%-881*408)

Bioactive Sphingolipids in the Pathogenesis of Chronic Obstructive Pulmonary Disease.

Koike KiBerdyshev EVIBowler RPISoruggs AKIBeo DJSchweitzer KSISerben KAIII Petrache IdAnn Am Thorac Social-, 1986: 8 219r mmili 89/1619/2/63

Systemic Markers of Inflammation in Smokers With Symptoms Despite Preserved Spirometry in SPIROMICS.

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Airway wall thickening on CT: Relation to smoking status and severity of COPD.

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Safety and Tolerability of Comprehensive Research Bronchoscopy in Chronic Obstructive Pulmonary Disease. Results from the SPIROMICS Bronchoscopy Substudy.

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Elevated circulating MMP-9 is linked to increased COPD exacerbation risk in SPIROMICS and COPDGene™.

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Genomics and response to long-term oxygen therapy in chronic obstructive pulmonary disease.

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Imaging Advances in Chronic Obstructive Pulmonary Disease. Insights from the Genetic Epidemiology of Chronic Obstructive Pulmonary Disease (COPDGene™).

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CYSTIC FIBROSIS

Elexacaftor-Tezacaftor-Ivacaftor for Cystic Fibrosis with a Single Phe508del Allele.

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Efficacy and safety of the elexacaftor plus tezacaftor plus ivacaftor combination regimen in people with cystic fibrosis homozygous for the F508del mutation: a double-blind, randomized, phase 3 trial.

Ebilgagi ^k@EDJ 2011 Hikb@C Downey DG(25^k@r/56 of 5 hb/65(2011) to 167 J (25 ilipate) ^ilip > pi T bilgad@G(20) jebv@T 2011 Hbbl@gi 201 ^odd t a ^100 2011 phi t (p\$#J) 2011 ^ilipate) pk ^v@L0(20 Plj ^ac@g3 eint ^il/15_20k ^k@l0(25% ^kd5)@eylor-Couser JL(2011) @v@LP\$\$U. 4*112*. -000 b*© Dd rm@Lancer@l-. 60(11) @8-60

Identification of CFTR variants in Latino patients with cystic fibrosis from the Dominican Republic and Puerto Rico.

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Prevention of transmission of Mycobacterium abscessus among patients with cystic fibrosis.

Gross JEEB ^adkt^kl EPI ENick JA&Corr Opin Polm Mod@-, @X | s8 2*84813*320@

Clinical development of triple-combination CFTR modulators for cystic fibrosis patients with one or two F508del alleles.

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Prospective multicenter randomized patient recruitment and sample collection to enable future measurements of sputum biomarkers of inflammation in an observational study of cystic fibrosis.

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The combination of tezacaftor and ivacaftor in the treatment of patients with cystic fibrosis: clinical evidence and future prospects in cystic fibrosis therapy.

Lommatzsch ST@eylor-Couser JL@her Adv Respir Dis@-, @S^k* Ab` 8 07 4201333, @5111/1@

Comparative risks of chronic inhaled corticosteroids and macrolides for bronchiectasis.

Phenotyping ciliary dynamics and coordination in response to CFTRmodulators in Cystic Fibrosis respiratory epithelial cells.

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Update in Cystic Fibrosis 2018.

0^j ph/8T T (Bowney GP)3N pplije (Mm J Respir Crit Care Medili-, 63) ^v6. . 28 66%- 8: . 55*. . 61 60 Oral Azithromycin Use and the Recovery of Lung Function from Pulmonary Exacerbations Treated with Intravenous Tobramycin or Colistimethate in Adults with Cystic Fibrosis.

PI j ^v^g数f0rppbif00到 dbkt\$A201 pp\$(\$ pNick SE)Seevedre MT)Teylor-Couser JL(3) Nick JA21 f el (g\$AMAnn Am Thorac So* 45 - 665 i8 314至20153-65

Pseudomonas aeruginosa stimulates nuclear sphingosine-1-phosphate generation and epigenetic regulation of lung inflammatory injury.

Corticosteroid use and increased CXCR2 levels on leukocytes are associated with lumacaftor/ivacaftor discontinuation in cystic fibrosis patients homozygous for the F508del CFTR mutation.

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Antisense oligonucleotide eluforsen improves CFTR function in F508del cystic fibrosis.

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Nontuberculous Mycobacterial Infections in Cystic Fibrosis.

J ^cgkt^ki IP1 (Mick JA)Deley CL&Thorac Surg Clinit-. 605_8 6%852*. -563

Mycobacterium talmoniae, a Potential Pulmonary Pathogen Isolated from Multiple Patients with Bronchiectasis in the United States, Including the First Case of Clinical Disease in a Patient with Cystic Fibrosis.

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INTERSTITIAL LUNG DISEASE

Genome-Wide Association Study of Susceptibility to Idiopathic Pulmonary Fibrosis.

Current Perspectives On Emerging Biomarkers For Rheumatoid Arthritis-Associated Interstitial Lung Disease.

Amigues IID*) ^ar o*@ Bwigris JJ@pan Access Rheumatol@ -, 65 *@28 , 7 //6*/02@

Pamrevlumab, an anti-connective tissue growth factor therapy, for idiopathic pulmonary fibrosis (PRAISE): a phase 2, randomized, double-blind, placebo-controlled trial.

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Nintedanib in Progressive Fibrosing Interstitial Lung Diseases.

MUC5B variant is associated with visually and quantitatively detected preclinical pulmonary fibrosis.

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Acute exacerbations of fibrotic interstitial lung diseases.

Provints (Bill kalle@i@Brown KK)(Siehle@i@Bi^q/ih/@i@Dbrhrih/@i@Bij ro/@i@i/qpra/@i@ Mihlv/j/@i@Brhhr/o/@i@ikal@i@Brk/h/@i@k/penjilq@k@br/h/jilq@i@k/pbd/t/@i@i Respirology@-.66-rd@6@

Overlap of Genetic Risk Between Interstitial Lung Abnormalities and Idiopathic Pulmonary Fibrosis.

Progressive fibrosing interstitial lung diseases: current practice in diagnosis and management.

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Idiopathic pulmonary fibrosis: Educational needs of health-care providers, patients, and caregivers.

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Potential of nintedanib in treatment of progressive fibrosing interstitial lung diseases.

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Diagnostic Likelihood Thresholds That Define a Working Diagnosis of Idiopathic Pulmonary Fibrosis.

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Advancing Symptom Alleviation with Palliative Treatment (ADAPT) trial to improve quality of life: a study protocol for a randomized clinical trial. Groney BAIS (REID *00KB 500kbkd 186) _pD> 100 of pl 5060M abkid 186-ql kp0600 0*_602 > 100 of pl 5060M abkid 186-ql kp0600 0*_602 > 100 of pl 5060M abkid 186-ql kp0600 0*_602 > 100 of pl 5060M abkid 186-ql kp06000 0*_602 > 100 of pl 5060M abk

Rationale, design and objectives of two phase III, randomised, placebocontrolled studies of GLPG1690, a novel autotaxin inhibitor, in idiopathic pulmonary fibrosis (ISABELA 1 and 2).

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Impact of the pattern of interstitial lung disease on mortality in rheumatoid arthritis: A systematic literature review and meta-analysis. PkdeE [5^adebpbE@kd*ka9 0]Solomon JJ9 f e^ra@9 fripE0]Eb^MEPEH Hij mpd kBJ [9] of bfedB I (Samin Arthritis Rheum 6-. 69 ^4524)

Interstitial Pneumonia with Autoimmune Features and Undifferentiated Connective Tissue Disease.

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Comprehensive Supportive Care for Patients with Fibrosing Interstitial Lung Disease.

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Resequencing Study Confirms That Host Defense and Cell Senescence Gene Variants Contribute to the Risk of Idiopathic Pulmonary Fibrosis.

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Idiopathic Pulmonary Fibrosis: Epidemiology, Diagnosis and Outcomes.

T ^ht ^v^@Brown KK@a JMed Sci@-. 69 ^v@2492026*036@

Use of a molecular classifier to identify usual interstitial pneumonia in conventional transbronchial lung biopsy samples: a prospective validation study.

O^der@那个ebay@O@bababaBaRpneh DAR@i_v2SE vbq5HijGresheng SDE^qbkD ? Q现grkdEE ProbleD NP bkwhrbkP pgybb BNE pgskbdDGK ^q~kdPAR^G KPPP'j ^pr ^j v3 25 ^dj bvbdIpA^sp660PD^re^GR> (BARko^q&DE)H 1966 r*kdE@ T ^ipeBPJK bstibE Bli c'd BOD ^aqE.J (Bbkkbav26@Brown KK)D ^aqkbv8G&encet RespirMed® - (BBrks/86854*1638)

The clinical course of idiopathic pulmonary fibrosis and its association to quality of life over time: longitudinal data from the INSIGHTS-IPF registry.

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Lung function outcomes in the INPULSIS® trials of nintedanib in idiopathic pulmonary fibrosis.

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Interstitial lung disease associated with systemic sclerosis (SSc-ILD). @ aphts:Brown KK:(Respir Resid - . 48:4658 - 14:8:08

The epidemiology of idiopathic pulmonary fibrosis and interstitial lung diseases at risk of a progressive-fibrosing phenotype.

Olson AL(Billiot calls E) Sk ^pb3X) Fernández-Pérez ER(Bir a ^fb4Eur Respir Revill - , 50Ab* © / , 51452-86)

Patients' perceptions and patient-reported outcomes in progressivefibrosing interstitial lung diseases.

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Rheumatoid Arthritis-Interstitial Lung Disease in the United States: Prevalence, Incidence, and Healthcare Costs and Mortality.

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MUC5B Promoter Variant and Rheumatoid Arthritis with Interstitial Lung Disease.

Towards a refined definition of combined pulmonary fibrosis and emphysema.

Swignis JJ@Paspirology@-, @S^k# 1%86". - @

Minimal Important Difference for Physical Activity and Validity of the International Physical Activity Questionnaire in Interstitial Lung Disease.

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LUNG INJURY AND REPAIR

Mesenchymal Regulation of the Microvascular Niche in Chronic Lung Diseases.

Majka SM(2) grp3 (Petrache (E)) d kg@CECampr Physiol@-. 6(PbnE68%S) . 10. *. 11. 63

The effect of cysteine oxidation on DJ-1 cytoprotective function in human alveolar type II cells.

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Proteasome dysfunction in alveolar type 2 epithelial cells is associated with acute respiratory distress syndrome.

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Identification of an emphysema-associated genetic variant near TGFB2 with regulatory effects in lung fibroblasts.

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The role of DJ-1 in human primary alveolar type II cell injury induced by e-cigarette aerosol.

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Transitional human alveolar type II epithelial cells suppress extracellular matrix and growth factor gene expression in lung fibroblasts.

Correll KAJEdeen KEJZemens RLJBedente EFJSerban KAJEurran-Everett DJEdelman BLJB fiblip*Sida^45 (Mason RJ&Am J Physiol Lung Call Mol Physiolia - . 63 r dB . 30. 4% 81/50*1/6145

Protective role of B cells in sterile particulate-induced lung injury.

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Interleukin 1 Receptor-Like 1 (IL1RL1) Promotes Airway Bacterial and Viral Infection and Inflammation.

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Interleukin-6 is required for Neuregulin-1 induced HER2 signaling in lung epithelium.

Mishra R.Foster DG)Finigan JH)Kern JA@iocham Biophys Res Commun® -. 6@rk0 ... 2. 0%3614660

The effect of BPIFA1/SPLUNC1 genetic variation on its expression and function in asthmatic airway epithelium.

Proline-Glycine-Proline Peptides Are Critical in the Development of Smoke-induced Emphysema.

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Malondialdehyde-Acetaldehyde Adducts and Antibody Responses in Rheumatoid Arthritis-Associated Interstitial Lung Disease.

Single cell RNA sequencing identifies TGF as a key regenerative cue following LPS-induced lung injury.

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Impact of fatty acid binding protein 5-deficiency on COPD exacerbations and cigarette smoke-induced inflammatory response to bacterial infection.

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Bioactive Sphingolipids in the Pathogenesis of Chronic Obstructive Pulmonary Disease.

Koike Kilberdyshev EVjBowler RP/Scruggs AKICao D(Schweitzer KS)Serban KA): Petrache IdAnn Am Thorac Socia-, 50kb* 8 29r mm2 8P/16*P/2/ 63

Pseudomonas aeruginosa stimulates nuclear sphingosine-1-phosphate generation and epigenetic regulation of lung inflammatory injury.

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Single cell RNA sequencing identifies unique inflammatory airspace macrophage subsets.

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Impaired non-homologous end joining in human primary alveolar type II cells in emphysema.

Subcutaneous administration of neutralizing antibodies to endothelial monocyte-activating protein II attenuates cigarette smoke-induced lung injury in mice.

Koike KIBeatman EL|Schweitzer KS|Bustice MJIMikosz AMIMi KRE*r pd3 > III Petrache IdAm J Physiol Lung Call Mol Physiol 4 - 63 ^d3 0.3*98 225*1 233 8

MYCOBACTERIAL INFECTIONS

Efficacy and safety of tigecycline for Mycobacterium abscessus disease.

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Nontuberculous Mycobacteria Show Differential Infectivity and Use Phospholipids to Antagonize LL-37.

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Same meat, different gravy: ignore the new names of mycobacteria.

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Alpha-1-Antitrypsin Enhances Primary Human Macrophage Immunity Against Non-tuberculous Mycobacteria.

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Managing antibiotic resistance in nontuberculous mycobacterial pulmonary disease: challenges and new approaches.

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In Vitro Activity of Bedaquiline and Delamanid against Nontuberculous Mycobacteria, Including Macrolide-Resistant Clinical Isolates.

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GenoType NTM-DR Performance Evaluation for Identification of Mycobacterium avium Complex and Mycobacterium abscessus and Determination of Clarithromycin and Amikacin Resistance.

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Guidelines-based treatment associated with improved economic outcomes in nontuberculous mycobacterial lung disease.

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A paucity of knowledge regarding nontuberculous mycobacterial lipids compared to the tubercle bacillus.

Orkfift I ke'j G Githen ED/Honda JR ITuberoulosis (Edinb) E-. 63 *cl. 203*. -48

Species Distribution and Macrolide Susceptibility of Mycobacterium fortuitum Complex Clinical Isolates.

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Treatment with a macrolide-containing regimen for Mycobacterium kansasii pulmonary disease.

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Evaluation of a Novel MALDI Biotyper Algorithm to Distinguish Mycobacterium intracellulare From Mycobacterium chimaera.

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Treatment of Mycobacterium avium Complex Pulmonary Disease.

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A Closer Look at the Genomic Variation of Geographically
Diverse Mycobacterium abscessus Clones That Cause Human Infection
and Disease.

Devidson RM-@Front Microbiol @ -. 52Ab 12:67 656 @

Nontuberculous Mycobacterial Infections in Cystic Fibrosis. J ^cqk*kl IP1 | Nick JA| Daley CL&Thorse Surg Closs - 605, \$64.852*. -561

Nontuberculous Mycobacteria: Epidemiology and the Impact on Pulmonary and Cardiac Disease.

Drummond WKJKasperbauer SH+Thorac Surg Conti-. 60th_#6%826*3148

RADIOLOGY

Ethics of Artificial Intelligence in Radiology: Summary of the Joint European and North American Multisociety Statement.

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Radiographic lung volumes predict progression to COPD in smokers with preserved spirometry in SPIROMICS.

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Lung Hyperlucency: A Clinical-Radiologic Algorithmic Approach to Diagnosis.

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Identifying Smoking-Related Disease on Lung Cancer Screening CT Scans: Increasing the Value.

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Methods for the Watch the Spot Trial: A Pragmatic Trial of More vs. Less Intensive Strategies for Active Surveillance of Small Pulmonary Nodules

Subtyping COPD by Using Visual and Quantitative CT Imaging Features.

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Objectively Measured Chronic Lung Injury on Chest CT.

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Radiomic measures from chest high-resolution computed tomography associated with lung function in sarcoidosis.

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Machine learning approach for distinguishing malignant and benign lung nodules utilizing standardized perinodular parenchymal features from CT.

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Diffuse Idiopathic Skeletal Hyperostosis in Smokers and Restrictive Spirometry Pattern: An Analysis of the COPDGene™ Cohort.

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The Role of Computed Tomography Honeycombing in Profiling Disease Progression in Chronic Interstitial Lung Disease.

Fernández-Pérez ER (Ann Am Thorac Soo 間 - 、6日 小839年137215日

CT Phenotypes in Hypersensitivity Pneumonitis.

Lynch DA (Ches n2) - . 65 m6 22% 8822 323 (1)

Identification of Nonaggressive Pulmonary Nodules Using an Optimized Scoring System.

Stephens MJJRho BHJEurran-Everett DJEarr LJBowler RJBynch D#J Thorac Imaging@ /-. 673 ^481 198 4-*, 45@

Reprint of: Voxel-Wise Longitudinal Parametric Response Mapping Analysis of Chest Computed Tomography in Smokers.

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Advances in CT Diagnosis of UIP and IPF.

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Airway wall thickening on CT: Relation to smoking status and severity of COPD.

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Coronary Artery Calcium on Noncontrast Thoracic Computerized
Tomography Scans and All-Cause Mortality.

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New Spirometry Indices for Detecting Mild Airflow Obstruction. ?o^g\$N\$?o^hq*0.00Wilson CGE\$! nbdi\$? \$?^ghq*dsf \$\$\$! aarird\$?\$!! \$9\$3 8_bdbh\$? \$? | | | acros\$0\$?^fro_^\$\$\$\$pq*ia\$\$\$\$\$\$*k\$ #\$\$\$o*kp\$bia\$*\$\$\$\$\$\$\$\$\$\$\$\$Sci Rap\$

Relationship between current smoking, visual CT findings and emphysema index in cigarette smokers.

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Imaging Advances in Chronic Obstructive Pulmonary Disease. Insights from the Genetic Epidemiology of Chronic Obstructive Pulmonary Disease (COPDGene™) Study.

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Voxel-Wise Longitudinal Parametric Response Mapping Analysis of Chest Computed Tomography in Smokers.

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RECOGNITION

National Jewish Health is the leading respiratory hospital in the nation and the only health care organization to be focused on respiratory and related illnesses.

National Jewish Health has been named the #1 respiratory hospital in the nation by U.S. News and World Report in its 2019–2020 Best Hospitals rankings. National Jewish Health has ranked number one or number two all 23 years that U.S. News has ranked pulmonology on its Best Hospitals list. This is the 18th time we have ranked number one.



#1 in Respiratory Care

National Jewish Health has 53 doctors, nearly one-third of our faculty, named on various top doctor lists, including "America's Top Doctors" by Castle Connolly and "Top Docs" in 5280 Magazine's 2019 rankings of Denver-area physicians.

National Jewish Health is in the top 6 percent of institutions nationally funded by the National Institutes of Health (NIH), in terms of absolute dollars. This is a tremendous achievement for a specialty hospital.

BREAKTHROUGHS IN RESEARCH

National Jewish Health is responsible for many of the important scientific advances that have shaped the landscape of pulmonary science today, including:

IgE, the molecule responsible for allergic reactions. This discovery has become the basis for many new treatments for asthma and allergies.

The T cell receptor gene, which plays a crucial role in recognizing foreign invaders and orchestrating an immune response. Identifying this gene opened the door to understanding how bodies fight viruses, bacteria and cancer.

Superantigens, extremely powerful bacterial toxins associated with particularly virulent diseases, such as toxic shock syndrome and Legionnaires' disease.

Combined chemotherapy for tuberculosis. Our National Jewish Health physicians were among the nation's thought leaders in developing this crucial tool for fighting tuberculosis.

Mechanisms of apoptosis. Our pioneering efforts have helped doctors understand how the body effectively removes and recycles up to two billion cells a day and resolves inflammation in the lungs.

Allergies to artificial joints. National Jewish Health researchers have developed a blood test that can detect allergies to nickel used in artificial joints, a common cause of failure.



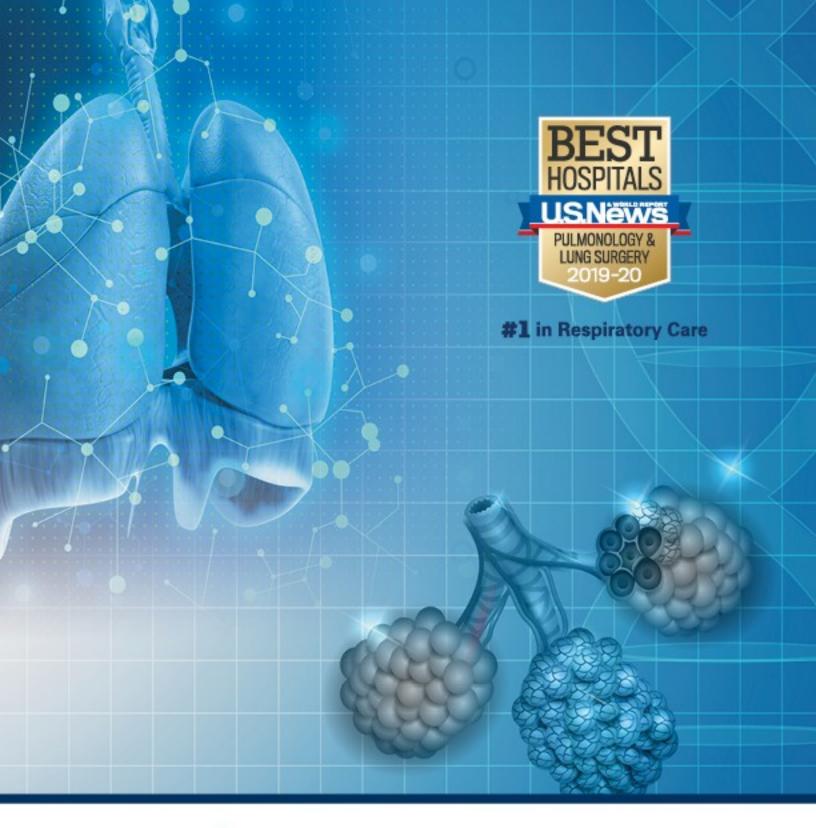


CLINICAL EXPERTISE, EXPERIENCE, COLLABORATION

With a 121-year history of transformative medicine, National Jewish Health is the only health care organization in the world dedicated exclusively to respiratory and related diseases. Today, we have unparalleled pulmonary expertise and internationally recognized physician-scientists who bring their extensive experience and knowledge to the most challenging respiratory cases from around the world.

Our pulmonologists work closely with their colleagues in cardiology, gastroenterology, allergy, immunology, oncology and radiology to understand the whole person and find solutions for our patients.

We welcome your referrals and consultation requests.
Call our Physician Line at 800.652.9555.
Learn more at njhealth.org/for-professionals.





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