Dear Colleague,

We have all faced another challenging year as the pandemic continues to evolve and affect so many people around the globe. At the same time, at National Jewish Health we have worked hard to meet the needs of not only those patients suffering from COVID, but also the many who have serious and chronic illnesses of every nature. Our experts have followed the science, worked as a team to advance care and continued to adapt to changing conditions. Teamwork in the intensive care unit, at our Center for Post-COVID Care and Recovery and within our diagnostic and research laboratories across the institution continues to be key, combining varied strengths into a powerful, unified effort. With COVID as with other illnesses, we have found that existing scientific and clinical evidence continues to serve as our guide to protect our patients and staff and as a springboard for helping people recover from illness.

As a hospital system focused on respiratory and related diseases, we have historically placed high value on working across disciplines and have built strong and unique programs in areas such as cardiac care. Our approach is straightforward. Patients who come to us receive extensive evaluation by expert pulmonologists in collaboration with cardiologists, gastroenterologists, allergists, oncologists, rheumatologists and others, all located within one facility to bring an integrated approach to patients. Evaluation, testing and consultation all occur in just a few days in most cases. We then draw from our extensive experience, developing effective care management plans for patients with both common and rare conditions. Finally, we help patients return home to work with their hometown physicians, while we remain a resource for both patients and physicians.

National Jewish Health has one of the largest pulmonary divisions in the country, with recognized international leaders in fields such as asthma, COPD, cystic fibrosis, interstitial lung diseases and many others. We continue to be named #1 or #2 on the U.S. News & World Report list for best hospitals in pulmonology. With this unrelenting focus on research and care for patients, we are prepared to meet the ongoing issues from the pandemic, as well as the many challenges faced by millions of patients across the globe who have respiratory and related diseases.

With teamwork, evidence and responsiveness, we are sure to find solutions for our patients and yours. We hope you will take a few moments to read and discover more about how National Jewish Health advances pulmonary medicine for so many.

Kevin K. Brown, MD
Chair, Department of Medicine
National Jewish Health

Irina Petrache, MD
Chief, Division of Pulmonary, Critical Care and Sleep Medicine
National Jewish Health
Fighting the Pandemic: Year Two

As the COVID-19 pandemic rolled into its second year, National Jewish Health continued to be at the forefront of providing care and research to battle the ongoing challenges. Researchers and clinicians approached the disease from every angle, continuing testing programs and developing new ones, providing care and expanding treatments, and responding to the need to provide vaccine throughout the community.

When the first vaccines were approved for emergency use, National Jewish Health leadership worked with state officials and others to create a multiphase distribution plan that was ready to launch when vaccines arrived. “We had a great, multidisciplinary team that was focused on preparing to administer the vaccine across our organization and beyond,” said Steve Frankel, MD, executive vice president of Clinical Affairs. “They worked on best practices with other hospitals and with the state to follow the guidelines. All efforts focused on getting the vaccine to people as quickly and safely as possible.”

From December 2020 through June 2021, National Jewish Health vaccinated more than 70,000 people at mass vaccination events held in parking lots on the medical campus and in partnership with the University of Denver, local churches and others to reach more people, including underserved populations. Staff conducted special events where needed, including an event for soldiers in a local U.S. Army Reserve Medical Operations Readiness Unit. “Many who wouldn’t have gotten vaccinated were thankful that we brought the vaccine to them,” said Kristi Melton, MSN, RN, vice president of Clinical Business Operations. “They arrived in the parking lot and stayed in their cars for the vaccine and observation period. It ran like clockwork.”

As soon as they were approved, National Jewish Health was among the first facilities to provide third dose boosters to qualified patients and first and second doses of the Pfizer vaccine to children ages 5-11. As variants became a major concern, the organization sought innovative ways to help identify variants, including the adaptation of a novel technology that uses both the genetic sequence and the molecular weight of target mutations to rapidly identify which mutations are present in a sample and distinguish among the variants that can cause coronavirus infections in individuals, including all of the “variants of concern” and “variants of interest.” This process is much faster and less expensive than genetic sequencing and can help reveal what is happening within a community or region in real time.

The National Jewish Health Advanced Diagnostic Laboratories leveraged the same technology to create some of the earliest tests that could detect coronavirus, influenza A and B, and respiratory syncytial virus A and B from a single nasal swab to help monitor populations such as schools, nursing homes and prisons.

“Staff, faculty and physicians across the institution have risen to the challenge of the pandemic with foresight, expertise and nose-to-the-grindstone grit to develop tests that have been crucial in our battle to defeat the pandemic,” said Dr. Frankel.

For patients who were already infected with COVID-19, National Jewish Health also opened its doors as an infusion site to provide monoclonal antibody treatments. The institution was well-positioned for the task, as it maintained a safe location with negative pressure and staff members experienced in providing infusion treatments for patients with other conditions.

During this time, National Jewish Health critical care physicians, who work at intensive care units throughout Denver, also stayed focused on the pandemic. Working with the National Institutes of Health, they were part of trials of several medications to help reduce inflammation in patients’ lungs that comes as a consequence of fighting the virus.

“Inflammation is a huge problem for people with vibrant immune systems, where the collateral damage can really harm the lungs, which are so sensitive,” said William Janssen, MD, section head of Critical Care Medicine. “We really need to have therapies that help limit inflammation, but yet enable the body to control the virus.”
Almost as soon as National Jewish Health physicians began seeing patients with COVID-19, they realized those patients would need ongoing care after the acute phase of their disease had passed. To address this need, the institution opened the multidisciplinary Center for Post-COVID Care and Recovery in the spring of 2021. The Center now serves more than 300 patients a month and has touched more than 3,000 patients from Colorado and around the nation.

The wide range of long-COVID symptoms people suffer has become a hallmark of the COVID pandemic. “This is not one disease, it is many,” said Nir Goldstein, MD, director of the Center for Post-COVID Care and Recovery and a pulmonologist. “We have pulled together a dedicated team of experts in pulmonology, cardiology, neurology, gastroenterology, rheumatology, infectious disease, allergy and immunology to understand the full constellation of symptoms that each patient suffers. We then deliver state-of-the-art care tailored to each individual.”

Some symptoms are well understood, often arising from severe pulmonary viral illnesses or following acute care in intensive care units. Those symptoms can range from ongoing lung inflammation to scarring of the lungs, trauma to the airways and inflammation of the heart, all of which have well-established treatments. Other symptoms, such as unexplained fatigue, rapid heart rate, “brain fog,” and an inability to exercise, are less easy to explain and treat. Medications may improve symptoms for some. For others, supportive care and rehabilitative therapy are the best treatments.

While adults account for the majority of COVID patients with lingering symptoms, children and adolescents also can suffer debilitating effects of long-COVID, which spurred National Jewish Health for Kids to develop the COVID Assessment Program for younger patients. Working as part of the Center for Post-COVID Care and Recovery and housed within the Pediatric Care Unit, patients and their parents come for several days of comprehensive evaluation by a dedicated team of pediatric specialists who then develop treatment plans.

“We see slightly different symptoms in children with long-COVID than in adults, often including new-onset asthma,” said Hara Levy, MD, head of the Division of Pediatric Pulmonary Medicine. “We work hard to develop treatment plans that will help those children.”

“By launching new programs for both adult and pediatric long-COVID early in the pandemic, we have gained experience and expertise in addressing the long-term consequences of COVID-19,” said Irina Petrache, MD, chief of Adult Pulmonary, Critical Care and Sleep Medicine. “But there is still so much we do not know.” Research continues, including initial research that has provided clues to some of the mysteries surrounding long-COVID.

“We need to continue to work to understand the causes and guide development of effective treatments for long-COVID,” said Dr. Goldstein.

Study Helps Understand Relationship of Exercise Fatigue and Long-COVID

One recent study out of the Center for Post-COVID Care and Recovery found that malfunctioning mitochondria may contribute to fatigue and exercise intolerance in patients with long-COVID.

A multidisciplinary team, including clinicians and scientists with expertise in evaluation of long-COVID patients and in exercise physiology, tested 50 patients with symptoms of the disease. Most patients had previously received clean bills of health from usual testing such as X-rays, echocardiograms and MRIs. However, where once they were able to compete in endurance races, like marathons and triathlons, they were now unable to exercise at all.

The team indirectly tested how patients’ mitochondria were functioning by looking at their lactate levels. The patients completed a cardiopulmonary exercise test on a cycle ergometer, which increased in difficulty until each patient was exhausted. Blood and breath samples were collected throughout exercise to measure lactate, carbon dioxide production and oxygen utilization. They found that in patients with long-COVID, lactate levels rose much sooner at a lower wattage of exercise than they should. These findings suggested that the mitochondria do not efficiently utilize fatty acids as fuel to produce energy to meet the demand of increasing exercise load.

The study provided possibly the first evidence that a better understanding of mitochondrial dysfunction could advance our understanding of how long-COVID develops in patients with otherwise healthy pulmonary and cardiac function.

“By knowing what the problem is, we can start identifying solutions for the problem,” said Irina Petrache, MD, chief of Adult Pulmonary, Critical Care and Sleep Medicine, a co-author of the studies. “There is still more work to do to identify eventual treatments, like drugs or exercise protocols, but we know now where to look and can assure patients that what they are experiencing is not all in their heads.”

Her team is now embarking on more in-depth investigations to learn more about this phenomenon.
Special Programs Advance Understanding of Diseases

National Jewish Health physicians bring their expertise to research and projects that impact the understanding of various diseases and the improvement of treatments and care modalities. Following are several areas where that impact has been felt.

Study Finds Corticosteroid Use OK in COVID-19 Pandemic
Patients with chronic pulmonary diseases, including asthma and COPD, who require treatment with either inhaled or systemic corticosteroids, should continue their use during the COVID-19 pandemic. That was the conclusion of National Jewish Health researchers who examined if the use of the corticosteroids affects the likelihood of developing COVID-19 infection. Their study was published in Respiratory Medicine in January 2021.

The team, led by Shu-Yi Liao, MD, ScD, a pulmonologist at National Jewish Health, used the institution's electronic medical record research database to identify a cohort. This consisted of 900 patients who were tested for suspected COVID-19 between March and June 2020, the majority of which had a history of chronic pulmonary diseases.

The team found that not only was there no significant association between inhaled corticosteroid use and testing positive for infection, but also that systemic corticosteroid use was associated with lower odds of testing positive.

Physicians Define Process to Diagnose Hypersensitivity Pneumonitis
The American College of Chest Physicians published new guidelines this year to better diagnose and evaluate hypersensitivity pneumonitis. Evans Fernández, MD, a pulmonologist at National Jewish Health, spearheaded the effort and was the lead author.

Fernández and his colleagues sifted through hundreds of scientific papers and consulted with additional experts to develop 14 major recommendations and a step-by-step algorithm that guides physicians through a process that builds evidence for or against the disease.

Their main recommendation is that physicians should start with the least invasive tests and progress to more invasive tests only if more evidence is needed, ideally in the setting of consensus multidisciplinary discussion, patient preferences, prognosis and nature of the treatment.

Expert Promotes Updated Lung Cancer Screening Guidelines
Debra Dyer, MD, chair of the National Jewish Health Department of Radiology and chair of the American College of Radiology Lung Cancer Screening Steering Committee, has been working at the national level to publicize and disseminate the updated U.S. Preventive Services Task Force (USPSTF) lung cancer screening recommendations released this year.

The USPSTF now suggests annual screening for lung cancer with low-dose computed tomography in adults ages 50 to 80 years who have at least a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. This recommendation is five years earlier than guidance set nearly a decade ago and the number of pack years was lowered from 30 to the equivalent of 20, either one pack a day for 20 years or two packs a day for 10 years.

These new recommendations will almost double the number of people eligible for lung cancer screening and will help address some of the racial and gender disparities identified with the previous criteria.

Institution Now a PCD Center
National Jewish Health is now an accredited Primary Ciliary Dyskinesia (PCD) Foundation Clinical Center site, led by Hilda Metjian, MD. There are fewer than 30 such sites in the country.

To achieve this status, sites must be able to provide access to high-quality diagnostic and treatment tools and have the expertise to give appropriate care to PCD patients such as screening machines or geneticists to counsel patients.

This collaboration provides more research opportunities for patients with PCD to help develop breakthroughs and new therapies. In addition, all of the centers connect regularly to discuss their cases and assist each other with research protocols.

Immediate Care Program Introduced for Urgent Needs
The Immediate Care program grew out of a need identified during the pandemic to provide same-day, non-emergent care. Throughout the COVID-19 pandemic, National Jewish Health adapted, innovated and evolved to meet the ever-changing needs of patients and the community. While COVID patients were treated in specialty clinics set-up just for them and focused on COVID, others with immediate needs could now be addressed in an alternate unique setting. Launched in the spring of 2021, the walk-in clinic continues to help patients with suspected infections of many varieties, as well as other illnesses and minor injuries such as broken bones and intestinal issues.
National Jewish Health provides comprehensive evaluations, diagnoses and treatment plans for people from around the nation and the world. 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. Areas of our clinical expertise are highlighted here.

Clinical Expertise

Interstitial Lung Disease
The National Jewish Health Interstitial Lung Disease Program is one of the largest interstitial lung disease (ILD) centers in the country. Joshua Solomon, MD, was named Program Director in 2021.

Detailed evaluations allow physicians to identify the specific type of ILD out of the wide range of possibilities such as ILD related to autoimmunity, exposures in the environment and medications, as well as idiopathic disease. During a multidisciplinary conference, our lung specialists meet weekly with rheumatologists, radiologists and pathologists to examine complex cases from every angle. Our team also partners with patients and their primary caregivers to develop customized, comprehensive care plans based on the latest research and treatment options, many of which have been discovered at National Jewish Health. We also have several ongoing clinical trials of promising new treatments for ILD.

Chronic Beryllium Disease
National Jewish Health has more experience with the diagnosis and treatment of chronic beryllium disease than any other health care organization in the world. We developed the first diagnostic blood test for beryllium sensitization, which is now the gold standard diagnostic tool. We emphasize early detection and intervention.

Behavioral Health
Teaching patients to understand and manage behavioral health issues that often accompany chronic respiratory diseases is an integral part of our whole-patient approach. Additional prevention and wellness programs offer help with tobacco cessation and vaping cessation for adults and young people.

Asthma
Thorough upper and lower airway evaluations in the multidisciplinary 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.

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.

Allergy and Immunology
Our nationally recognized allergy and immunology clinics use the latest testing and diagnostic partners. Our CLIA and CAP15189SM-certified laboratories have decades of experience developing immunology, complement, infectious disease and molecular genomic tests. In 2020, we launched novel tests for active COVID-19 infection and IgG and IgM antibodies to SARS-CoV-2.

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. In 2020, we launched novel tests for active COVID-19 infection and IgG and IgM antibodies to SARS-CoV-2.

Gastroenterology
We have special expertise in GI motility disorders, pulmonary-related 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.

Exercise and Breathing Performance
The Exercise & Performance Breathing Center at National Jewish Health evaluates exercise intolerance and treats exercise-related respiratory problems in a state-of-the-art exercise physiology lab. Innovative on-site therapists aid in treating specific problems and guide using exercise as a medicine.

Led by J. Tod Olin, MD, MSCS, the Center is one of the few in the world that can readily perform continuous laryngoscopy during exercise, a diagnostic procedure for exercise-induced laryngeal obstruction, which enables the visualization of the upper airway during intense exercise. The team is composed of pulmonologists, cardiologists, allergists, otolaryngologists, speech-language pathologists and behavioral health providers. Dr. Olin and his team are credited with the introduction of new therapies to treat this condition, including therapeutic laryngoscopy during exercise and the Olin Exercise-Induced Laryngeal Obstruction Biphasic Inspiration (EIOBI) breathing techniques.

In 2021, the team published a questionnaire to quantify the physical and psychological factors central to well-being in patients with exercise-induced laryngeal obstruction. The questionnaire could become a benchmark for how doctors care for their patients and measure the impact of interventions for clinical trials in the future.
Neurology
In 2021, Jinny Tavee, MD, joined National Jewish Health to lead the Division of Neurology & Behavioral Health. Dr. Tavee brings nearly 20 years of experience to this new role. She most recently served as the Medical Director of the Neuromuscular Division at Northwestern University Feinberg School of Medicine. With a focused and integrated approach, the Division’s aim is to diagnose and treat complex neuromuscular diseases and related metabolic and respiratory disorders, as well as neuropsychological disorders. The team sees patients with conditions such as amyotrophic lateral sclerosis, myasthenia gravis, neuropathy and sarcoidosis.

The Division also has been focused on the care of patients suffering from post-COVID conditions. The team tests for abnormalities that might otherwise be dismissed and works with specialists in cardiology, speech and cognitive therapy as needed to address symptoms.

Interventional Pulmonology
Our interventional pulmonologists offer a wide spectrum of minimally invasive diagnostic, therapeutic and palliative airway procedures for pulmonary nodules, lung cancer, airway obstruction and more. We also insert airway stents and perform bronchial thermoplasty for severe asthma. Our specialists 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 diseased tuberculosis (TB) patients more than 123 years ago, and we continue to provide consultations and manage nontuberculous mycobacterial (NTM) infections today. 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 multidisciplinary evaluations, education and management plans for children with pulmonary and atopic diseases.

Pulmonary Hypertension
Cardiologists, pulmonologists, rheumatologists, physical therapists and other specialists on our pulmonary hypertension team collaborate to provide comprehensive and sophisticated outpatient and inpatient services. Detailed diagnostic procedures, such as right-heart catheterization with cardiopulmonary exercise testing, allow precise phenotyping and treatment of complex patients.

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 pulmonary physiology 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 tests to evaluate exercise-induced respiratory distress.

Radiology
National Jewish Health is recognized around the world for thoracic imaging expertise. 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 Disease
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 is a designated 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. The Foundation for Sarcoidosis Research named our Sarcoidosis Program a Center of Excellence.

Scleroderma
The Scleroderma Program at National Jewish Health is designated a Scleroderma Foundation Research Treatment Center. Our multidisciplinary team of specialists in rheumatology, interstitial lung disease, pulmonary hypertension, cardiology, gastroenterology and nephrology ensures that our patients receive comprehensive care. Services include advanced diagnostic and treatment options, access to scleroderma clinical trials, nutritional counseling and specialized pulmonary and physical rehabilitation programs.

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

Pulmonary Vascular Biology
National Jewish Health has added a Pulmonary Vascular Biology (PVB) program within its Division of Pulmonary, Critical Care and Sleep Medicine. The program includes a focus on the full spectrum of research in this area, from basic to clinical, providing key information for many of the diseases that National Jewish Health physician scientists treat or study. Tim Lahm, MD, is the program Director.

Primary areas of research interest include investigation of pulmonary vascular and right heart function in chronic lung disease, nutritional and exercise interventions in pulmonary hypertension, and gender differences in lung disease. Faculty and staff within this area have capacity to perform deep phenotyping by collecting lung, heart and skeletal muscle tissues and using new, cutting edge approaches, such as genomics and proteomics, to study pulmonary vascular and right heart function in great detail.
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 leaders and research institutions across the country through numerous research networks and consortiums. Highlights of our clinical research results from 2021 are provided below.

New Monoclonal Antibody Shows Promise for Severe Asthma
Michael Wechsler, MD, and colleagues found that tezepelumab is a safe and effective treatment for patients suffering from moderate-to-severe asthma in a phase 2 trial. The novel monoclonal antibody is designed to target interleukin-33, and the team found it led to a lower incidence of events indicating a loss of asthma control than placebo and improved lung function. *N Engl J Med.* 2021 Oct 28; 385(18):1656-1668

Monoclonal Antibody Shows Promise for Adults and Adolescents with Uncontrolled Asthma
Michael Wechsler, MD, and colleagues reported a successful trial of the anti-TSLP monoclonal antibody tezepelumab as a promising new treatment for severe, uncontrolled asthma. Patients with severe, uncontrolled asthma who received tezepelumab had fewer exacerbations and better lung function, asthma control and health-related quality of life. *N Engl J Med.* 2021 May 13;384(19):1800-1809

Asthma Toolkit Bootcamp Improves Rural Pediatric Asthma Care
Bruce Bender, PhD, reported successful results from the Asthma Toolkit Bootcamp program, a hands-on program that trains rural physicians how to diagnose and manage pediatric asthma. The program improved physician adherence to current asthma guidelines, leading to fewer hospitalizations, emergency room visits and decreased use of oral corticosteroids among the patients in participating practices. *J Allergy Clin Immunol Pract.* 2021 Aug;9(8):3091-3097.e1

Hand Hygiene Impact on Health Care Workers with Atopic Dermatitis
Jessica Hui, MD; Donald Y.M. Leung, MD; and Elena Goleva, PhD; evaluated the impact of increased hand hygiene practices as a result of the COVID-19 pandemic on health care workers and patients with atopic dermatitis. They found that health care workers have chronic use of hand sanitizer and a higher incidence of irritant contact dermatitis, which may explain a significantly higher transepidermal water loss area under the curve after the use of hand sanitizer because they have an already compromised skin barrier. *Ann Allergy Asthma Immunol.* 2021 Aug;127(2):188-196

Replacement with Non-Allergenic Joints Can Provide Relief
Karina Pacheco, MD; Annyce Mayer, MD; and their colleagues reported positive patient outcomes in their program to identify allergies in people with artificial joints that have failed. The majority of patients referred to the MetALLs Allergy program for evaluation of artificial joint failures not caused by infections or mechanical issues did have allergies to metals in the joints or the bone cement used to secure them. Patients who received new joints with non-allergenic metals and no bone cement reported reduced swelling, pain, itching and loose joints. Nickel was the most common allergenic metal in the joints. *J Allergy Clin Immunol Pract.* 2021 Aug;9(8):3109-3117.e1

A Human Skin Commensal Microbe for Bacteriotherapy of Atopic Dermatitis
Donald Y.M. Leung, MD, and research colleagues at National Jewish Health and the University of California San Diego School of Medicine, identified a universal strain of bacteria derived from healthy human skin, *Staphylococcus hominis A9 (ShA9)*, as a safe and effective topical therapy for atopic dermatitis that avoids the side effects of steroids and other medications that target the immune system. *Nat Med.* 2021 Apr;27(4):700-709

Ozone Climate Penalty and Health Equity Along the Colorado Front Range
James L Crooks, PhD, and colleagues at the Union of Concerned Scientists showed that climate change has increased ground-level ozone in the Denver Metro area. This has delayed the region’s ability to meet national ozone standards and imposes additional public health burdens on residents, especially those living in Latinx neighborhoods with high rates of asthma and diabetes. *J Expo Sci Environ Epidemiol.* 2021 Sep 10

Jessica Hui, MD, tests the impact of increased hand hygiene practices during the COVID-19 pandemic.
Below are brief descriptions of some of our active clinical trials.

**Alpha-1 Antitrypsin Deficiency**

Potential New Treatment for Alpha-1 Antitrypsin Deficiency
Principal Investigator: Robert Sandhaus, MD
Researchers want to see if a new drug, alvelestat, improves the symptoms of lung disease caused by COPD due to alpha-1 antitrypsin deficiency (AATD), as well as symptoms of AATD.

**Asthma**

PrecISE Severe Asthma Interventions
Principal Investigator: Michael Wechsler, MD
The purpose of this study is to understand how these changes occur in the immune system and how they regulate the skin barrier. Studies indicate that those with atopic dermatitis and psoriasis may be more susceptible to bacterial infections. Our researchers will use samples from patients with atopic dermatitis, psoriasis and healthy people to examine the differences in their genes. Researchers also will be trying to determine if inflammation affects the function of skin cells.

**Cystic Fibrosis**

Impact of Triple Combination Therapy for People with CF with Sinusitis
Principal Investigator: Jennifer Taylor-Cousar, MD
This observational study will assess the impact of a new triple-combination CFTR modulator therapy (ivacaftor/tezacaftor/elixacaftor) on chronic sinusitis in adults with cystic fibrosis. In previous studies, this therapy has been shown to improve lung function and sweat chloride. Researchers are trying to determine if this triple combination therapy can also improve computed tomography sinus CT scan findings, sense of smell and quality of life for people with CF with chronic sinusitis.

**Eczema**

Atopic Dermatitis & Skin Infections
Principal Investigator: Donald Leung, MD, PhD
The purpose of this study is to understand what causes the skin reactions as a side effect. By understanding these changes, our goal is to define the best treatment for the skin reactions, or possibly prevent the reactions.

**COVID-19**

Response to COVID-19 Vaccines in People with Chronic Conditions
Principal Investigators: Barry Make, MD, and Michael Wechsler, MD
Researchers are working to understand the antibody response to COVID-19 vaccines in people with chronic diseases. Researchers are focused on the short-term and long-term antibody response by people with chronic respiratory diseases, as well as other chronic diseases.

**Hypersensitivity Pneumonitis**

Predicting Fibrosis in Hypersensitivity Pneumonitis
Principal Investigator: Evans Fernández, MD
Researchers believe they will be able to predict which patients with chronic hypersensitivity pneumonitis (HP) will develop fibrosis by looking at their genes and biomarkers in their blood. For this observational study, researchers will collect samples and data from participants with rapidly progressing HP to look for patterns that can help predict the development of ILD and form specialized treatment plans.

**ILD & Early Rheumatoid Arthritis**

New Trial Medication for Pulmonary Arterial Hypertension
Principal Investigator: Marjorie Patricia George, MD
The purpose of this study is to determine if giving low-dose sirolimus earlier in the disease course safely and effectively prevents further lung damage from LAAM.

**Lymphangioleiomyomatosis**

Investigational Medication Sirolimus for Lymphangioleiomyomatosis (LAM)
Principal Investigator: Gregory Downey, MD
The purpose of this study is to see if a drug called sirolimus slows development of lymphangioleiomyomatosis (LAM), a lung disease in which abnormal cells growing inside the lungs prevent them from working properly. Sirolimus is approved by the United States Food and Drug Administration (FDA) for the treatment of LAM. A recent trial showed that sirolimus stabilized lung function in patients with moderate and severe disease. Our researchers want to find out if giving low-dose sirolimus earlier in the course of treatment safely and effectively prevents further lung damage from LAM.

**Sarcoidosis**

Lymphocytes & Sarcoidosis Inflammation
Principal Investigator: Lisa Maier, MD
Researchers want to learn how lymphocytes control inflammation in sarcoidosis patients, and if lymphocytes are the reason why each patient experiences a different outcome of the disease. The goal is to better understand lymphocytes to be able to identify different states of the disease and to identify new treatment options.

The purpose of this study is to learn how interstitial lung disease develops and progresses over time in people with early RA.

**Insomnia & OSA**

Treat Insomnia & OSA with Cognitive Behavioral Therapy
Principal Investigator: Jack D. Edinger, PhD
The purpose of this study is to determine if using a web-based program called Sleepio™ helps treat insomnia in patients with obstructive sleep apnea (OSA). The Sleepio™ program provides insomnia sufferers with cognitive behavioral therapy (CBT), a structured type of treatment that aims to identify and change inaccurate or negative thinking patterns, resulting in more constructive responses to challenging situations.

Visit [www.njhealth.org/clinicaltrials](http://www.njhealth.org/clinicaltrials) to learn more about clinical trials.
Lambda Variant of SARS-CoV-2 Has Better Chance than Delta Variant to Escape Vaccines

Haolin Liu, PhD; Katja Aviszus, PhD; John Yang, PhD; Lyndon Reynoso, MSHA, RPh; Gregory P. Downey, MD; Stephen Frankel, MD; John Kappler, PhD; Philippa Marrack, PhD; Gongyi Zhang, PhD; and their colleagues discovered that sera from different populations, including uninfected individuals and patients who were seropositive to SAR-CoV-2, effectively neutralized Lambda over Delta. Moreover, the Lambda variant could be neutralized at titers 10-fold lower than those of Delta, suggesting that the Lambda variant has a competitive advantage over Delta.

Chest CT Diagnosis, Clinical Management of Drug-related Pneumonitis in Patients Receiving Molecular Targeting Agents and Immune Checkpoint Inhibitors

Kevin Brown, MD; and David Lynch, MD; and colleagues provide simplified diagnostic criteria, a CT pattern approach and management recommendation of drug-related pneumonitis (DRP) in the emerging era of molecular targeting agents and cancer immunotherapy by using a multidisciplinary approach. The diagnosis of DRP is usually achieved by excluding other potential known causes. Awareness of the incidence and risk factors for DRP is becoming increasingly important. Imaging features of DRP should be assessed in consideration of the distribution of lung parenchymal abnormalities (radiologic pattern approach). The CT patterns reflect acute (diffuse alveolar damage) interstitial pneumonia and transient (simple pulmonary eosinophilia) lung abnormality, subacute interstitial disease (organizing pneumonia and hypersensitivity pneumonitis) and chronic interstitial disease (nonspecific interstitial pneumonia). Radiology. 2021 Mar;298(3):560-566
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% 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 internal medicine and family medicine at locations across our system.

**National and International Visiting Fellows**

National Jewish Health hosts visiting fellows from pulmonary and critical care training programs throughout the country and around the world for rotations in various subspecialty areas of pulmonary medicine and exercise physiology.

To learn more or request enrollment in DOM Grand Rounds, please email johnsona@njhealth.org.

**EDUCATION — CONTINUING MEDICAL EDUCATION**

Building on expertise of the world-renowned faculty at National Jewish Health, our 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. National Jewish Health is accredited by the Accreditation Council for Continuing Medical Education, Accreditation Council for Pharmacy Education and the California Board of Registered Nursing.

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.

With the ongoing pandemic, online education remains the primary format for delivering medical education. Along with virtual meetings and online educational activities, we looked to new formats for education and launched a series of National Jewish Health Twitter-based continuing medical education activities. Four respiratory-focused journal clubs in COPD, interstitial lung disease, pulmonary hypertension and non-tuberculous mycobacteria were developed using Zoom-based webinars and live Twitter chats to summarize, share and educate on important respiratory journal articles.

**Online Courses Include:**

- Evidence and the Evolving Treatment Landscape for COVID-19 with Virus Neutralizing Antibodies
- Enhancing Access to COVID-19 Breakthrough Therapy with Virus Neutralizing Antibodies: Strategies for Equitable Care Clinical Decision Points in the Diagnosis and Treatment of Non-Eosinophilic Asthma
- Where Are the New Targets in Severe Asthma? Looking Upstream in the Inflammatory Cascade
- Primary Care Decision Points in COPD: Why Preventing Exacerbations Remains a Challenge Case in COPD
- A Multidisciplinary Approach to the Management of New and Emerging Therapies for Moderate-to-Severe Atopic Dermatitis
- Hyper Eosinophilic Syndrome Roadmap: A Guided Workflow for Improved Diagnosis and Treatment in HES
- New Treatments in Chronic Rhinosinusitis with Nasal Polyps: Expert Insights into the Evidence
- Are You Prepared for the Difficult Virtual Visit? How to Be Successful with Challenging Adult Telemedicine Encounters

To view all of our online courses and learn more about the National Jewish Health Office of Professional Education, visit njhealth.org/CME
call 800.844.2305 or email proed@njhealth.org.

**Department of Medicine Grand Rounds**

Throughout the pandemic, the Department of Medicine (DOM) Grand Rounds at National Jewish Health continued to offer weekly presentations covering the latest in research, clinical care and other pertinent topics. Under the administrative leadership of Amen Sergew, MD, sessions were moved to an online format for safety. Each seminar is presented by either an expert from the institution or from around the world and has featured speakers from the National Institutes of Health (NIH) and scientists from Germany and New Zealand.

DOM Grand Rounds is open to researchers, clinicians, advanced practice providers, nurses, alumnae, all other health care workers, non-clinical staff members at National Jewish Health and its affiliates, and interested community members. Continuing medical education credits are offered to health care professionals.

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RESPIRATORY INSTITUTES ELEVATE CARE AND RESEARCH

Through our unique Respiratory Institute® model, National Jewish Health collaborates with hospitals around the country. The Respiratory Institutes combine the strengths of the collaborating institutions while bringing our multidisciplinary, team-based model of care to patients as well as providing a common platform for expanded research. National Jewish Health also collaborates with, and is an academic partner with, the University of Colorado School of Medicine and UCHC, in Denver.

Mount Sinai — National Jewish Health Respiratory Institute

The Mount Sinai – National Jewish Health Respiratory Institute provides state-of-the-art, multidisciplinary, outcomes-driven care in a network dedicated to elevating respiratory care and research. The Institute achieves this goal with clinical expertise, personalized medicine, patient-focused protocols and integration of the latest research advances in respiratory care.

Physicians at National Jewish Health and Mount Sinai have jointly developed protocols for the treatment of patients with respiratory diseases and have established regular conferences to discuss complex cases. The two institutions are also collaborating on protocols for care of post-COVID-19 patients and have developed protocols for joint research.

Jane and Leonard Korman Respiratory Institute — Jefferson Health and National Jewish Health

Together, Jefferson Health and National Jewish Health bring extraordinary care to address complex illnesses. The collaboration leverages the strengths of each organization, defining best practices for treatment and research of related diseases, including COVID-19, COPD, asthma, interstitial lung diseases and sarcoidosis.

Collaboration with Saint Joseph Hospital

Our collaboration with Denver-based Saint Joseph Hospital, a part of the SCL Health System, has grown from its inception in 2014 to expanding to now include an inpatient Respiratory Institute that includes a dedicated 36-bed unit and expanded research opportunities between the institutions.

Collaborations with University of Colorado School of Medicine and UCHC

National Jewish Health has a long-standing key relationship with the University of Colorado that encompasses opportunities for joint research, collaborative care programs and training for medical students. The organizations offer regular interaction through Grand Rounds and other medical and research programs.

SELECTED 2021 PUBLICATIONS

In 2021, National Jewish Health faculty published more than 120 articles in peer-reviewed scientific and medical journals. Included below is a selection of noteworthy articles.

COVID-19/SARS-COV-2

Longitudinal analysis of SARS-CoV-2 spike and RNA-dependent RNA polymerase sequence reveals the emergence and geographic distribution of diverse mutations. (Shenwa WM, Leach SM, Koutrakis K, Strong M. Infect Genet Evol. 2021 Nov 16;101:105153.)


Can digital communication technology reduce health system personnel time? An evaluation of personnel requirements and costs in a randomized controlled trial. (Wagner NM, Ritzvolz DP, Baehrel MA, Goodrich CK, Civitana PJ, King DK, Sjoberg JS, Sjoberg BG. Transl Behav Med. 2021 Apr;11(2):802-809.)


ASTHMA


CHRONIC OBSTRUCTIVE PULMONARY DISEASE

PFT study protocol: rationale and methodology of a 3-year longitudinal observational study to phenotype patients with COPD. 


A 28-day clinical trial of aerosolized hyaluronan in alpha-1 antitrypsin deficiency demonstrating a surrogate marker for drug efficacy. 


Soluble receptor for advanced glycation end products (sRAGE) as a biomarker of COPD. 


Racial Segregation and Respiratory Outcomes Among Urban Black Residents with and at Risk of Chronic Obstructive Pulmonary Disease. 


Plasma Metabolomic Signatures of Chronic Obstructive Pulmonary Disease and the Impact of Genetic Variants on Phenotype-Driven Therapeutics. 


Impact of a Medical Diagnosis on Decision to Stop Smoking and Successful Smoking Cessation. 


Hoemoglobin as a biomarker for clinical outcomes in chronic obstructive pulmonary disease. 


Multi-omics subtyping pipeline for chronic obstructive pulmonary disease. 


Pilot RCT of a telehealth intervention to reduce symptoms of depression and anxiety in adults with COPD. 


Subjects with moderate levels of childhood and adult comorbidities at increased risk of asthma. 


Development and validation of the exercise-Laryngeal Obstruction Dyspnea Index (ELOD). 


Asthma, in quest of optimizing care. 

Ottmanhier JF. Leuk. Allergy. 2021 Jan;123.517.131.
Ceramide and sphingosine-1 phosphate in COPD lungs.


Downregulation of epithelial sodium channel (ENaC) activity in human airway epithelium after low temperature induction.


Can Etosinophil Prevent Lung Injury? Ask PHIL.


Altered Macrophage Function Associated with Crystalline Lipid Inflammation in Sphingomyelinase Deficiency.


Blood Transcriptomics Predicts Progression of Pulmonary Fibrosis and Associated Natural Killer Cells.


Kildin for the Fire: Targeting Proline Synthesis to Extinguish Matrix Production in Pulmonary Fibrosis.


How Do We Know What We Are Missing? Loss of Signaling through CD141 Drives Fibroblast Activation in Pulmonary Fibrosis.


Prognostic accuracy of a peripheral blood transcriptome signature in chronic hypersensitivity pneumonitis.


Inflammation in Pulmonary Hypertension in Adults: A Position Paper from the Fleischer Society.


Impact of Pulmonary Hypertension in adults: a position paper from the Fleischer Society.


Comparison of CT Lung Density Measurements between Standard CT and Radiomics for Progression of Emphysema.


Radiomics: Machine learning evaluates improvements in罪犯computed tomography classification with EFR modulator therapy.


Radiotherapy machine learning improves evaluation in sinus computed tomography classification with EFR modulator therapy.


Radiotherapy machine learning improves evaluation in sinus computed tomography classification with EFR modulator therapy.


The Role of Surgical Lung Biopsy in the Diagnosis of Fibrotic Interstitial Lung Disease.


Role of Particulate Matter from Afghanistan and Iraq in Deployment-Related Lung Disease.


Comparison of CT Lung Density Measurements between Standard CT and Radiomics for Progression of Emphysema.


Radiomics: Machine learning evaluates improvements in罪犯computed tomography classification with EFR modulator therapy.


Radiotherapy machine learning improves evaluation in sinus computed tomography classification with EFR modulator therapy.


The Role of Surgical Lung Biopsy in the Diagnosis of Fibrotic Interstitial Lung Disease.

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.

For the 25th consecutive year, National Jewish Health was named a top respiratory hospital in the nation by U.S. News & World Report in its 2021-22 ranking of best hospitals in the nation. National Jewish Health has held the #1 or #2 position in the magazine’s pulmonology rankings in all 25 years that U.S. News has evaluated pulmonology care.

National Jewish Health is in the top 6% 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.

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

CLINICAL AND RESEARCH EXPERTISE, EXPERIENCE, COLLABORATION

With a 123-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, neurology and radiology to understand the whole person and find solutions for our patients.