Changing Lives

Making a difference through research

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30th anniversary edition

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Welcome

In our 30-year history, the BLF has invested more than £26m in life-saving research. In this, our aims have always been clear: to benefit the 12 million people affected by lung disease in the UK. We want to find ways to prevent, treat and cure lung disease and also help people living with a lung condition control their symptoms and enjoy the best possible quality of life.

In these pages you'll meet a number of our researchers. Some describe current projects, why they are needed and what they hope to achieve. Others report on recently completed projects, what they have achieved and how they aim to build on their findings to benefit patients. We look, too, at studies that have influenced clinical guidelines and also hear from patients whose lives and hopes depend on the vital research we fund.

We have always supported researchers early in their career. The BLF grant I received in 1986, as I was just starting out on my research career, without any doubt helped shape my own path. So I know first-hand how this can encourage researchers to stay in the respiratory field and help assure the future of UK lung research to benefit countless lives.

None of our achievements would have been possible without the generosity of our supporters. I hope you'll be inspired by the commitment of our researchers and the stories of those living with lung conditions to support our future work. Together, we can make the breakthroughs that will save and transform lives.

Professor Stephen Holgate CBE, FMedSci
Chair,
British Lung Foundation's Scientific Committee

Why we fund research

In 1985, Professor Sir Malcolm Green and a number of colleagues founded the BLF because respiratory research was underfunded and underappreciated, and lung diseases little understood. Since then, we have spent £26m on vital research, because lung disease affects more than 12 million people in the UK and is the third most common cause of death. **Today, just as then, we need your support to change lives.**

Priority disease areas

- Chronic obstructive pulmonary disease (COPD)
- Lung cancer
- Mesothelioma
- Interstitial lung disease (ILD), including idiopathic pulmonary fibrosis (IPF)
- Paediatric (children's) lung disease

Each year, we offer several funding streams, open to any research scientist working in the field of lung conditions. Our grants facilitate better understanding of what causes these diseases and how they develop. Our aim is to increase survival rates, improve diagnosis, treatment and care.

Our grants include student and fellowship awards to early-career researchers. This support for young lung scientists encourages them to stay in the respiratory field, to go on to receive further funding from organisations such as the Wellcome Trust and the Medical Research Council, and even become world-renowned respiratory research leaders. We have also awarded more than 400 travel fellowships to allow early-career researchers to attend and present at international conferences. This invaluable experience helps develop the next generation of breakthrough lung researchers in the UK.

"BLF travel fellowships enabled me to present my work at European Respiratory Society and American Thoracic Society conferences. When your research has been assessed and judged to be of value, it is a tremendous boost."

Dr John Hurst, Reader in Respiratory Medicine, University College London

"I have severe COPD, and a lung function of about 15%.

Breathlessness has a permanent, long term effect on us and our loved ones.

Dreams have to be ditched." **Chris**

A compelling proposition

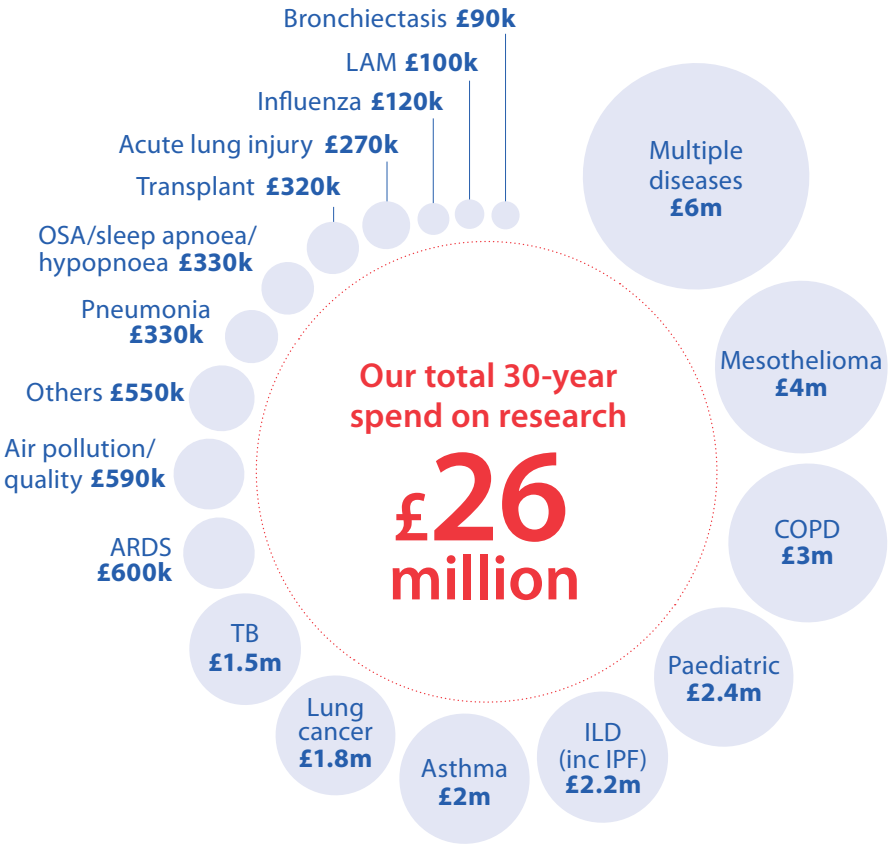
Our research strategy looks to fund research that tackles the most important questions in our priority disease areas.

Our research advisory boards consist of clinicians, researchers and people with lung conditions. They come up with a list of priority questions and topics that, once tackled, will lead to more successful care.

Our Scientific Committee assesses all funding applications to find the most promising. We call on experts from the international research community to peer review applications.

Urgent need

We've achieved a great deal since 1984 yet respiratory research remains generally underfunded and undervalued. The need for funding is as urgent today as it was 30 years ago.



Research awards 2014–15

In 2014–15, we invested **£694,000** in world-class research projects: 10 BLF projects totalling £594,000 plus one BLF Richard Mintz Fellowship of £100,000.

Q&A

WITH **PROFESSOR STEPHEN HOLGATE**

Professor Stephen Holgate was starting out in respiratory research when he received his first BLF grant. Looking back, he describes how it helped shape his career and why it has mattered in so many ways.

What was your first BLF grant?
In 1986 while I was at the University of Southampton, the BLF awarded us £76,000. We followed 113 children with asthma, aged seven to nine, for just over a year, collecting secretions from their upper respiratory tract every time they had a flare-up.

With help from Dr David Tyrell at the Medical Research Council (MRC) Common Cold Unit in Salisbury, we established a new test for detecting viruses in nasal secretions. We showed definitively that viruses were the major cause of the asthma flare-ups. And the common cold virus was causing much of the problem.

What did that study lead to?
First, it led to a whole series of MRC-funded studies. We showed that when people with asthma get infected with a virus, it passes from the nose down into the lower airways and infects the lining cells of the airways.

Normally, when someone gets a common cold, a protective mechanism in the lining cells is switched on to eliminate the virus. But in people with asthma, that mechanism is faulty because the lining cells do not have enough of a protein called 'interferon beta'.

That led us to set up a company in 2003 to develop interferon beta inhalation therapy for acute flare-ups of asthma. After a clinical trial, we showed the therapy offered protection against these viruses in asthma. AstraZeneca went on to license the treatment.

Second, over time, more researchers were drawn to the University of Southampton, making it one of the leading centres for asthma research in the world.

42 established Professors have been through my laboratory and are now world leaders in their fields.

Why did you initially approach the BLF for funding?
The BLF had put out a call for funding applications for research into children with respiratory disease. That fitted very well with what we were proposing. We couldn't have gone to the MRC, because we didn't have any preliminary data. That's precisely what the BLF grant made possible.

What further research grants did you get from the BLF?

In 1991, I received £62,000 to study aerosols to see whether we could make them more effective by increasing how much they deposit in the lung.

The technology we later developed, to deliver interferon beta to people with asthma to protect against flare-ups, was similar to what we were working on at this time.

How did BLF funding affect your subsequent work and career?

The initial BLF funding came a year before I got my MRC professorship in 1987, which has supported my salary ever since. So, that BLF grant was the foundation of my career, and many other good things have stemmed from it.

Why is the BLF important?

First, it gives young researchers relatively small amounts of money to run pilot projects to gather initial data, which they can then use to apply for further funding from much larger organisations.

Second, BLF travel fellowships, which allow young researchers to travel to international conferences to present their work, are a superb way of helping them to network, learn more about their chosen field and advance their careers.

How has research changed from when you started out?

Back then, you could work alone, or with a few colleagues, and make quite a bit of progress. Now you can't do that. With applications of new technology, the science has become quite complicated.

I'm currently chair of the MRC's Translational Research Group, which looks at all the basic science and finds ways for it to benefit patients. An important part of that work is getting together teams of scientists with the right skills.

Because it also supports patients, the BLF is in a unique position to help those teams attempting the next big breakthroughs in complicated respiratory diseases – and we're making real progress.

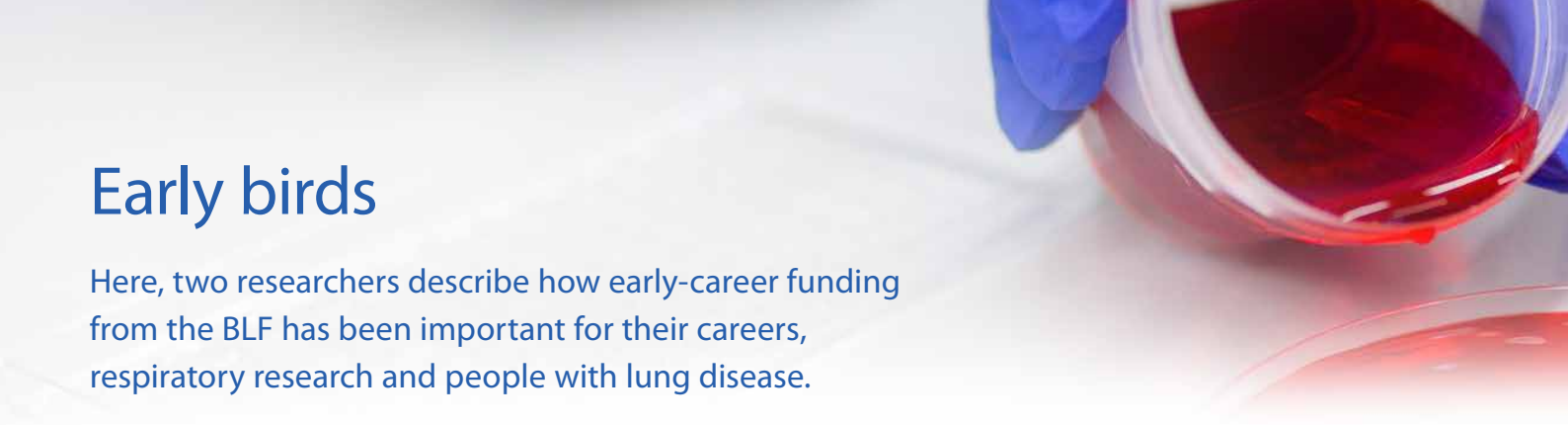
The BLF and other lung charities have played an important role in helping to form such teams in the areas of COPD and asthma.

What does the BLF mean to you personally?

My published paper on the 1986 study has helped me become the second highest-cited researcher in Europe for the last 10 years. Professor Peter Barnes (see page 13) was number one. Between the two of us, we've managed to have the most cited publications in the whole of Europe.

I'm now a BLF trustee and chair its Scientific Committee, which allows me to give back to the BLF and nicely completes the circle.

Professor Holgate is MRC Clinical Professor of Immunopharmacology, Faculty of Medicine, University of Southampton at Southampton General Hospital



Early birds

Here, two researchers describe how early-career funding from the BLF has been important for their careers, respiratory research and people with lung disease.

Dr Chris Scotton

Senior Lecturer in Lung Pathobiology, University of Exeter Medical School, October 2013 to present

In 2002, I obtained my PhD for work on ovarian cancer. However, an exciting post-doctoral opportunity at the Centre for Respiratory Research, University College London, turned my attention to the lung, and that's been my focus ever since.

In 2008, I was awarded a BLF Research Fellowship to investigate how blood-clotting proteins in the lung contribute to inflammation and scarring in lung disease. For me, this award made a difference on two levels.

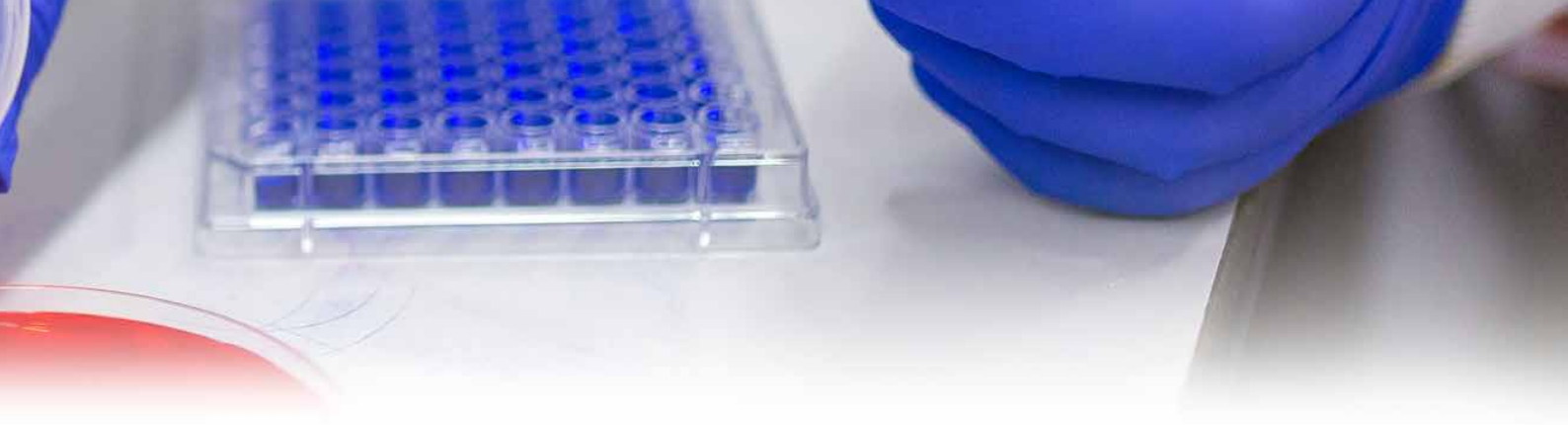
First, the project improved our understanding of how fibrotic lung disease, particularly idiopathic pulmonary fibrosis (IPF), develops and how it might be treated more effectively.

Second, the award, my first big grant as a Principal Investigator, was a major stepping stone on the path to an independent career in respiratory research. It allowed me to dictate the direction of my research. As a direct result, I have received further funding for respiratory research from the Medical Research Council and the Biotechnology and Biological Sciences Research Council.

Respiratory research is fascinating and intellectually stimulating, with increasing opportunities to collaborate with academia and industry. Building a collaborative regional research network, in fact, has been an important part of the work I've been doing in Exeter.

As the global burden of lung disease increases, our need for new treatments, preventions and cures gets ever greater.

Being involved with the BLF, and understanding what the organisation is all about, reminds me why, ultimately, I do respiratory research – to make a difference to people living with a lung disease.



Dr Elizabeth Sage

Academic Clinical Lecturer in Respiratory Medicine, University College London, 2008 to present

Early in my consultant training in respiratory medicine in 2010, I received BLF funding for three years to study whether it was possible to treat malignant mesothelioma cells with stem cells. It was my first piece of proper scientific research.

On a personal level, that funding was a very important first step as an independent respiratory researcher. More importantly, it supported work that has enormous potential for treating not only mesothelioma, but also lung, colon, prostate and other types of cancer.

When that work finished in 2013 (see page 18 for a more detailed description of the project and its findings), it had increased our experience of using modified stem cells to treat cancer. My aim now, working with another researcher, is to proceed to clinical trial in humans with mesothelioma to test the stem cell therapy in combination with chemotherapy drugs.

At present, we have pretty good therapies for colon and prostate cancer, and survival rates are much better than for lung cancer or mesothelioma, for example. I find this research exciting because it means we are now looking at potential treatments for those patients who currently have none.

As a clinician, you never want to see patients and have to say, 'Sorry, we have no options'.

For me, research is all about being able to take work that I've done in the lab and bring it out there into the world to make a real difference to patients.

But with options on the horizon, you really start to feel much more positive that, one day, you will have treatments to offer. That's what really matters.

How we make a difference

One measure of how we have made a real difference to the lives of people with lung disease is when the results of BLF-funded studies find their way into clinical guidelines. Here, we look at three research projects that have helped shape the treatment of pneumonia in children, asthma and bronchiectasis.

1 Treating children at home

In 2002, we awarded Professor Terence Stephenson, of the University of Nottingham, a two-year grant to compare injected antibiotics (intravenous/IV) and oral antibiotics (tablets or syrup) in the treatment of chest infections in children.

At that time, IV antibiotics, given in hospital, had long been the established treatment, and there were no guidelines on the use of oral antibiotics.

In the study, 246 children with pneumonia, aged between six months and 18 years, were divided into two groups: one to receive oral antibiotics and the other to receive IV antibiotics.

The results showed the two treatments were equally effective. There are a number of additional benefits to oral antibiotic treatment for pneumonia: children can be safely and effectively treated at home, so they don't have to spend time in hospital or endure painful injections and family life is less disrupted. It also frees up beds for other patients and costs the health service less.

From these findings, it was concluded that oral antibiotics were an effective treatment for children admitted to hospital with pneumonia.

In the guidelines

The study's results are in the British Thoracic Society's Guidelines for the management of acquired pneumonia in children update 2011.

"Antibiotics administered orally are safe and effective for children presenting with even severe CAP [community-acquired pneumonia] and are recommended."

2 Easier diagnosis of asthma

Many different cells in the lungs produce the gas nitric oxide (NO). NO can be detected in the breath of healthy people, some coming from the nose and some from the lungs. The amount increases when the lungs become inflamed in asthma.

In 1995, the BLF funded Professor Peter Barnes, at Imperial College London, for a two-year study to see if measurements of NO in the breath might be used to measure the amount of airway inflammation in asthma, and the anti-inflammatory effects of inhaled steroids.

Using a technique that involved closing the nasal passages, Professor Barnes was able to measure accurately amounts of NO present in the nose and amounts exhaled from the lungs. He found that exhaled NO in the mouth was identical to the NO measured directly from the lower airways, confirming that it came from the lungs.

With this non-invasive technique, he showed that the amount of NO was increased in patients with asthma who were experiencing flare-ups.

He also found that NO measurement can also be used to monitor the effects of steroid treatment in patients with asthma.

Measurement of exhaled NO is now an established non-invasive test.

In the guidelines

National Institute for Health and Care Excellence (NICE) guidance published in April 2014 recommends exhaled NO testing to help diagnose asthma in adults and children when diagnosis is unclear, and to help manage asthma in people who have symptoms despite using inhaled corticosteroids.

3 Improved bronchiectasis treatment

In bronchiectasis, our airways become widened and cannot clear themselves properly. Mucus builds up and airways can become infected and damaged permanently.

People with bronchiectasis produce thick, sticky sputum, which affects all aspects of their lives.

In 2002, research physiotherapist Fiona Kellett, at Wythenshawe Hospital, Manchester, received BLF funding for an 18-month study. It aimed to compare the effects in people with bronchiectasis of a nebulised hypertonic saline (HS) solution – a fine salt-water mist treatment with a higher salt concentration than normal body cells – with a normal-concentration salt mist.

Previously, Fiona had shown that the HS solution was a safe and effective treatment for patients with bronchiectasis, reducing sputum thickness, helping people cough it up more easily and improving lung function. The new study was designed to see how effective it was long term.

The results led to Fiona and her colleagues treating local patients daily with the HS solution, with significant improvements in their lung function and quality of life, and reduced use of antibiotics for infection.

In the guidelines

This work is now quoted in British Thoracic Society's Guideline for non-CF bronchiectasis.

"The use of nebulised hypertonic saline prior to airway clearance could be considered to increase sputum yield, reduce sputum viscosity and improve ease of expectoration."

Recently completed projects

We fund a range of research projects that produce exciting results every year. In the following section, we look at some recently completed projects that have furthered our understanding of COPD and mesothelioma.

Treating malignant mesothelioma with stem cells

Dr Elizabeth Sage

University College London

£50,000

36 months

Mesothelioma

Why did we need this study?

We already knew that cells found in the bone marrow of adults – mesenchymal stem cells (MSCs) – can travel to sites of cancer and form part of its structure. We knew that these cells can be altered to carry a treatment called TRAIL (a protein produced naturally by most normal tissue cells), which kills cancer cells without harming healthy cells.

The aim of this project was to see whether this treatment (MSCTRAIL) could kill mesothelioma cells and reduce tumour growth in mice with mesothelioma.

What was involved?

I put human adult MSCs in a dish with human mesothelioma cells, and added an antibiotic to some of the MSCs to 'switch on' TRAIL. I left the mesothelioma cells exposed to the MSCTRAIL treatment for 48 hours and found 15-60% of mesothelioma cells were dead or dying.

I then divided mice with mesothelioma into three treatment groups: salt water; MSCs not altered to carry TRAIL; and MSCTRAIL. Tumours in the mice receiving MSCTRAIL reduced significantly over 21 days.

I then found that combining MSCTRAIL with new chemotherapy drugs could reduce tumours further.

What did it achieve?

This work increased our experience of using modified stem cells to treat cancer. We want to proceed to a clinical trial in humans, to see which chemotherapy drugs work best with MSCTRAIL.

> "We have been awarded funding from the Medical Research Council to set up the first clinical trial testing MSCTRAIL in patients with advanced lung cancer. I will continue the work started in this project, aiming to find the best chemotherapy to use in combination with MSCTRAIL."
>
> **Dr Elizabeth Sage**

Overcoming resistance to drugs used to treat mesothelioma

Professor David Waugh

Queen's University, Belfast

£188,020

30 months

Mesothelioma

Why did we need this study?

Mesothelioma is highly resistant to treatment, because, to a large extent, inflammation associated with the disease protects the mesothelioma cells from chemotherapy. This protective effect depends very much on a family of molecules called 'inhibitor of apoptosis proteins' (IAPs). Without the IAPs, other molecules in the surrounding tissue cause the mesothelioma cells to switch off and, effectively, die.

IAP antagonists are a new class of drug. We wanted to use them to turn the inflammation – which normally protects the mesothelioma cells against the disease – to kill the cancer cells, not healthy cells.

What was involved?

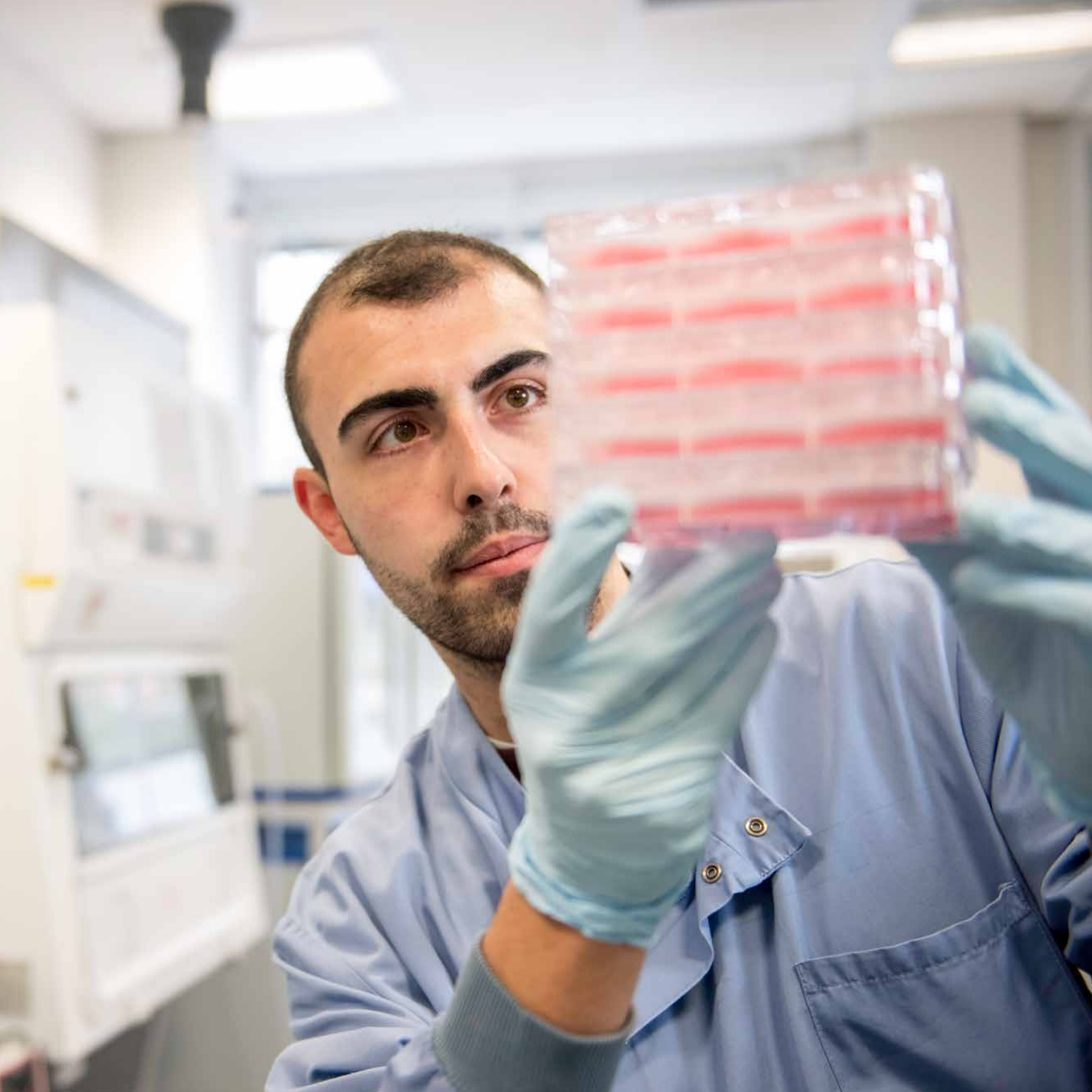
We grew mesothelioma cells in sterile conditions and exposed them to various established and experimental anti-cancer drugs. We also created conditions similar to the inflammation that protects mesothelioma cells against treatment. We then used different techniques to see whether the cells were living, dying or dead.

What did it achieve?

Initially, we found that the IAP antagonist drugs were not as effective as we had expected. Investigating further, we identified another protein that was causing the resistance. We then tried a combination of IAP antagonists and other anti-cancer drugs, HDAC inhibitors. This proved to be highly effective at killing the diseased cells.

We now want a clinical trial with mesothelioma patients who fail the first-line treatment of chemotherapy.

> "Our research has identified new approaches and new classes of anti-cancer drugs that may significantly improve outcomes for mesothelioma patients. We are now excited to take these research breakthroughs from the lab into innovative clinical trials."
>
> **Professor David Waugh**



Low oxygen levels and white blood cell damage to lung tissue in COPD

Dr Alison Condliffe

University of Cambridge

£117,115

36 months

COPD

Why did we need this study?

White blood cells called neutrophils digest bacteria using stored proteins called proteases. Ideally, this happens safely inside the neutrophils. But, if the proteases are released outside the neutrophils, they can damage delicate lung tissues.

We know that low oxygen levels make neutrophils less able to kill bacteria. Yet, most research on neutrophils is carried out in atmospheric oxygen, unlike the low-oxygen conditions in the body.

We wanted to see whether low oxygen levels in the airways of patients with lung disease make neutrophils more likely to release their damaging proteases.

What was involved?

Using blood samples, we separated the neutrophils from other blood cells, and divided them into two equal groups. We kept one in a chamber with low oxygen (similar to human airways), and the other in normal oxygen levels.

In each group, we studied the release of toxic proteins and how they damaged cells, such as those lining the airways, and protective proteins in the bloodstream. We also studied whether cigarette smoke affected these processes and tried to see which chemical signals in the neutrophils might cause them to release more damaging proteins.

What did it achieve?

We found that low oxygen levels affect neutrophils, causing them to release four to six times as many of a wide range of damaging proteases.

These proteases all contribute to lung damage in COPD. Cigarette smoke had no effect on this process. We also found out which chemical signals inside the neutrophils lead to this increased protease release.

> "We hope our findings can, in time, lead to new ways of treating this lung damage or stop it happening."
>
> **Dr Alison Condliffe**

Recently awarded grants

Every year we award research grants to scientific studies aiming to tackle a range of lung diseases. With the focus on our priority disease areas, this section summarises some recently funded projects, with related case studies describing the experiences of patients and health care professionals.

Helping immune cells kill cancer cells in mesothelioma

Dr Zsuzsanna Tabi

School of Medicine, Cardiff University

£148,587

36 months

Mesothelioma

Why do we need this study?

In most solid cancers, including mesothelioma, the 'right' immune cells in the tumour tissue can recognise the cancer cells as abnormal and destroy them. This is the basis for cancer immunotherapy – boosting the body's natural defences to fight the cancer.

Somehow, however, the tumour tissue in mesothelioma protects the cancer cells from attack by both immune cells and chemotherapy. We want to find out how it does that, so that we can develop effective new immunotherapy treatment and identify those patients most likely to benefit from it.

What is involved?

The mesothelioma tumour in patients is made up of a mixture of different types of cells that protect the cancer cells. To study it, we intend to create in the laboratory a complex 3D model consisting of cancer cells, stromal cells (connective tissue cells that support organ structure and function) and blood vessel cells. We will use this 3D model to test potential new treatments and look for markers to help predict how individuals might respond to treatment.

What do we hope to achieve?

The next step could be clinical trials to test new immunotherapy treatments, which could lead to individually tailored treatments for people with mesothelioma.

> "Previous studies have shown that unless you have a properly functioning immune system, simply irradiating a tumour doesn't work. That's where our complex 3D model comes in, allowing us to test combinations of drug and immune cell or radiation treatment, and speeding up pre-clinical trial testing time."
>
> **Dr Zsuzsanna Tabi**

"Treatment options are very limited and there are many unanswered questions"

As a mesothelioma clinical nurse specialist, I care for, support and give information about research and treatments to people affected.

My first experience of mesothelioma was as a student nurse. I cared for a woman who had been exposed to asbestos dust washing her husband's overalls. I was shocked so little was known and that there was neither treatment nor cure.

Twenty years on, treatment options for people diagnosed with mesothelioma are very limited and many questions go unanswered.

Several important trials are under way. Researchers are investigating the most effective treatments, and the best ways to diagnose mesothelioma and care for patients. In recent years, research has also helped shape how we care for people with this disease.

The issue of surgery here is controversial and needs further research. One trial is looking at combined chemotherapy and lung-sparing surgery, compared to chemotherapy alone. Its aim is to see whether this will help people live longer and improve their quality of life.

We now understand much more about how cancers grow and the factors they need to survive. This means researchers can look to develop treatments to target these mechanisms directly. They are also looking for ways to use the patient's own immune system to fight cancers.

I'm keen that patients know about suitable clinical trials and can take part if they choose to. I hope there will be many trials, so we can make real progress.

Further research is vital to improve survival rates and quality of life.

Leah is a mesothelioma clinical nurse specialist funded by the Mick Knighton Mesothelioma Research Fund, part of the BLF

Improving lung defence to reduce infection

Dr Alison Condliffe

University of Cambridge

£58,824

12 months

Lung infections

Why do we need this study?

Cells coated with cilia (tiny hairs like eyelashes) line the larger airways in the lungs, including the windpipe. They help clear mucus and bacteria from the lungs, protecting against infections.

Primary ciliary dyskinesia (PCD) is a genetic disease that stops the cilia from functioning normally, causing severe and recurring lung, ear and sinus infections. Adults with common lung diseases such as COPD and bronchiectasis often suffer long term infection, and their cilia may not function correctly.

In lung cells from people with a long term lung infection, reducing the activity of a protein called PI3-kinase restores normal function to the cilia. However, PI3-kinase has four family members, and each cell may contain one or more of these. We need to know which ones are found in airway cells and which ones control how the cilia function.

What is involved?

We will grow airway cells in the laboratory, infect them with bacteria, film the cilia in slow motion and analyse how they work. We will use drugs to target individual members of the PI3-kinase family to see if any restore the normal ciliary function. These drugs are currently being tested in clinical trials to treat cancer and inflammatory diseases.

What do we hope to achieve?

Based on our findings, this study could lead to inhaled medications and other treatments for recurrent airway infections, commonly found in people with COPD and bronchiectasis and also in PCD.

> "The project is progressing really well. We have shown which PI3-kinase proteins are in airway cells and are testing the impact of the drugs on them. We are getting amazing images of beating cilia. By putting tiny fluorescent beads or live bacteria on the cilia, we can measure how fast they move and how effective they are at clearing infection."
>
> **Dr Alison Condliffe**

"We need research so that children's lung conditions are diagnosed really early"

When my sons were tiny, my GP thought their runny noses and coughs were normal. But when they were six and four, we found out they both had primary ciliary dyskinesia (PCD). It's quite a rare condition affecting one in 15,000 people. More than a decade after their diagnosis, there is still very little research into the condition.

When they were diagnosed, we discovered our eldest son had lost one-third of his lung capacity by the age of six. Since then they have had excellent care from specialist doctors and are doing really well – doing all the things that 'normal' kids do.

They still need physiotherapy twice a day – every day – to clear the mucus from their lungs. Now that they're older, they can do some breathing exercises themselves. This is 'normal' for them and will be for the rest of their lives.

I don't want other families to be told their children have a long-term lung disease. We need research so that children's lung conditions are diagnosed really early, because that's their best chance for a normal life. It's also important to develop treatments and drugs designed for children.

Fiona, Chair PCD family support group

Preventing and treating vascular diseases in people with COPD

Dr Jennifer Quint

Imperial College London

£78,570

36 months

COPD

Why do we need this study?

People with COPD are more likely to have vascular diseases such as heart attacks, strokes or problems with the blood supply in their legs than people without COPD. They are also more likely to die as a result of these problems.

Yet, there is some evidence that people with COPD are less likely than the general population to be prescribed aspirin, statins and blood pressure medications to prevent these conditions developing or recurring.

So we need to understand how people with COPD are treated for vascular conditions, so that we can find ways to improve treatment and outcomes.

What is involved?

Using millions of anonymous health care records from GPs, we will identify people with COPD. We will compare their risk of vascular problems, and the treatments prescribed, to the records of people without COPD.

We will be able to find out if people with COPD are undertreated, for example because the risk scores that GPs currently use to identify people at risk of vascular disease and help decide treatment, are less accurate in people with COPD.

What do we hope to achieve?

This research has real potential to change the way that doctors work and improve health outcomes for the high numbers of people with COPD who have vascular disease.

> "We hope this study will lead to a change in the way health care professionals manage people with COPD. In the medium term, that could include starting treatment earlier, at lower thresholds for blood pressure results. Longer term, it's potentially about changing health care scoring systems and risk models."
>
> **Dr Jennifer Quint**

"Doctors don't know what to do because my condition's so rare"

I now live with emphysema (also called COPD) because I was born prematurely. When I was little, I was in and out of hospital with chest infections and pneumonia. Now in my 30s, I've had to stop working. Some days are better than others, but it's never easy for me to do everyday things like climbing stairs. I use ambulatory oxygen if I go out of the house.

Doctors don't know what to do because my condition's so rare. It's a neglected area of research and medicine, despite affecting so many people. Other diseases such as heart problems and cancers get a lot more attention.

I want research to find better drugs and treatments for me and everyone else. I'm very excited to have been offered some new drugs a couple of days ago. Next year, I hope to have a new type of lung volume reduction surgery. My consultant tells me I'm the youngest patient he will have treated this way.

My life would be easier if I didn't have to carry oxygen cylinders on my back, which isn't a great idea for people who struggle to breathe. Even though I have the NHS's lightest backpack, further innovation here would really help.

Looking ahead, a lung transplant is my only real option. The very thought of that is a huge psychological hurdle to get over. I'd like research to find alternatives. If scientists could find a way to grow new lungs from my stem cells, that would be so much better.

Jenna, who has emphysema, also called COPD

Can exercise help people with advanced lung cancer before and during chemotherapy?

Professor Mike Grocott

University of Southampton

£49,548

24 months

Lung cancer

Why do we need this study?

Patients with advanced lung cancer can experience symptoms and side effects from the cancer and its treatment (chemotherapy), such as tiredness and lack of energy or appetite.

We want to find out why chemotherapy affects physical fitness, and see if exercise training during chemotherapy can stop this happening.

What is involved?

This study compares people who take supervised exercise before and during chemotherapy in a hospital for 9–12 weeks with people who don't.

We will use cardiopulmonary exercise tests (CPETs) to decide how intense the exercise should be for each person. We will conduct the tests before and during chemotherapy to compare fitness levels between the two groups.

To understand why exercise can have physical benefits for people affected by chemotherapy, we will also take muscle tissue and urine and blood samples from each person. We are interested in mitochondria – structures in our body cells that play an important part in producing energy.

What do we hope to achieve?

If this study proves that exercise improves physical fitness and quality of life in people with advanced lung cancer affected by chemotherapy, we would hope to see it become a standard part of lung cancer treatment.

> "One of the benefits of exercise for people with cancer may be better wellbeing and improved appetite. Our ambition is to be able to refine the effectiveness of an exercise regimen for people with cancer by matching it to the right diet."
>
> **Professor Mike Grocott**

"Current cancer treatments can be effective, but they're very demanding for patients"

I learned I had lung cancer by accident. I'd had leg pains and found out I had a benign pelvic tumour the size of a grapefruit. Then, a spot on my lung was found and a tumour removed. It turned out to be lung cancer. At the age of 30, I had the bottom of my left lung removed. It was a shock, as there's no history of lung cancer in my family, and my parents and I have never smoked.

Research into lung cancer is important to me, because clearly it's not just a smoker's disease. We need to catch it early, before it has the chance to grow or spread to other organs. Early detection, effective treatment and rehabilitation give us all a better chance of survival. Young or old, you need a chance at life after diagnosis.

Current cancer treatments can be effective, but they're very demanding for patients, so we need new treatments. We need more research too into the root causes of lung cancer, to identify genetic, environmental, dietary and other triggers. We could then identify people at higher risk and take steps to prevent cancer in the first place.

I'm lucky to have been helped by advances in imaging and detection. Improved surgical procedures gave me a much better chance of living my life without long-term effects.

I hope research can find new types of early treatment. But wouldn't it be great if we could find ways to treat and cure lung cancer completely at any stage?

Chris, in remission from lung cancer since May 2014

"Current treatments for pre-school wheezers treat inflammation only, without knowing whether it is present, which can mean unwanted side effects."

Dr Sejal Saglani

Taking the guesswork out of treating pre-school children with wheezing

Dr Sejal Saglani

Imperial College London

£50,736

18 months

Children's lung disease

Why do we need this study?

Up to one-third of children under five develop breathlessness and wheezing, with at least one-third of those developing asthma. Currently, we guess at treatment from the pattern of symptoms.

We want to measure the pattern of infection or inflammation in the airways to decide the right treatment, rather than using guesswork.

Allergies cause inflamed airways, while bacteria and viruses cause infections. Current treatments (steroids) for pre-school wheezers treat inflammation only, without knowing whether it is present, which can mean unwanted side effects. It is not current practice to assess for the presence of bacteria or prescribe antibiotics.

What is involved?

We will use phlegm samples to look for infection and inflammation, and a sample of nostril fluid to look for inflammation. In the few children with very severe wheezing, we will use a camera passed into the airway under general anaesthetic and compare the results with the phlegm and nostril fluid samples.

What do we hope to achieve?

We aim to sort pre-school wheezers into two treatment groups: inhaled steroids for those with mainly inflammation, given the risks of infection and reduced growth; and antibiotics for those with bacterial infection.

We will also do long-term follow-up of children from the study, to see who develops asthma, and identify 'asthma-prone' factors, to see if the condition can be prevented.

> "With the results from this study, we hope to make the case for funding for a larger study. We would follow the children for five years to see if this approach to treatment has an effect on whether they develop asthma."
>
> **Dr Sejal Saglani**

Changing the structure of the extra-cellular matrix to treat IPF

Professor Simon Johnson

University of Nottingham

£49,781

12 months

IPF

Why do we need this study?

There is no cure for idiopathic pulmonary fibrosis (IPF). Current treatments can slow its progression to some extent, but we urgently need more effective treatments.

Pulmonary fibrosis occurs when particular cells in the lungs produce too much extra-cellular matrix (ECM), a kind of scaffold that supports cell growth.

Normal ECM has many useful functions, and is continually produced and removed naturally by the body, so the total amount stays constant. In IPF, there is too much ECM and the amount continually increases. This makes the lungs smaller and stiffer, reducing the amount of oxygen patients can use.

We think that the ECM involved in IPF is physically different from normal ECM, which is why it isn't removed in the usual way.

What is involved?

We will attempt to change the structure of the ECM in IPF, to remove it completely or stop it building up. To do this, we will target specific proteins that help produce chemical changes in the body in IPF, using drugs that have already been used in people with other diseases.

What do we hope to achieve?

If our initial findings are positive, we hope to proceed to clinical trials to see if this is a safe and effective treatment for IPF.

"A lot of our work is trying to understand how the abnormal ECM in pulmonary fibrosis keeps the disease active. What we find is that the ECM produced from cells in patients with IPF causes the cells sitting on the ECM to grow more rapidly than normal. Once the disease starts, even more ECM gets deposited allowing more cells to grow faster, creating a vicious circle of more matrix and more cells."

Professor Simon Johnson

"I was amazed how little was known"

I first learned I was living with idiopathic pulmonary fibrosis (IPF) in 2008. For a few years, I was in denial. I felt OK – IPF didn't seem to limit what I could do. Five years later, I started to notice its impact. I found it increasingly difficult to walk up slopes without resting. Last winter, my chest was so congested that walking just 50 metres on the flat was difficult. I became concerned about the future.

When I was first diagnosed, I searched the internet to learn about the disease. I was amazed how little was known. Research into IPF and other interstitial lung diseases is expanding, but basic understanding of the disease and its treatment are still in their infancy. The BLF has a key role to play in commissioning new research.

It also has an important part to play in listening to patients and learning from them. Patients are often well placed to provide pointers for new research, especially into how best to live with the disease. Pulmonary rehabilitation and drugs to relieve congestion have improved my life. I exercise for an hour every day, and can now walk on the flat and manage gentle slopes and stairs, if I take it slowly.

IPF matters to me because I have it. I am relatively lucky. I was diagnosed in 2008, yet I'm still alive and quite active. Unfortunately, I'm an exception. Most people die within four years of diagnosis. I want more and better research into IPF so that people with the disease can have hope and live longer.

Steve, who has been living with IPF since 2008

A better way to predict and treat IPF

Professor Donna Davies

University of Southampton

£119,975

24 months

IPF

Why do we need this study?

Idiopathic pulmonary fibrosis (IPF) occurs when abnormal scar tissue forms in the lungs, causing patients to become steadily more breathless. It is a progressive illness and one of the most difficult respiratory diseases to manage and treat effectively. And the course of the disease can vary greatly in different people.

This strongly suggests that, in different people, the disease has different drivers or mechanisms. It is also possible that in people with more aggressive IPF, the disease is already present in apparently normal lung tissue. But we have no way to detect this, and doctors have no way of predicting how IPF will progress in each patient.

What is involved?

We will use lung washings (a small amount of salt solution introduced into the lung, then suctioned out) obtained from people with IPF during diagnosis. We will look in washings from affected and normal regions of the lung for markers that tell us more about the different mechanisms in IPF, and try to identify people who already have the disease in normal parts of their lungs.

What do we hope to achieve?

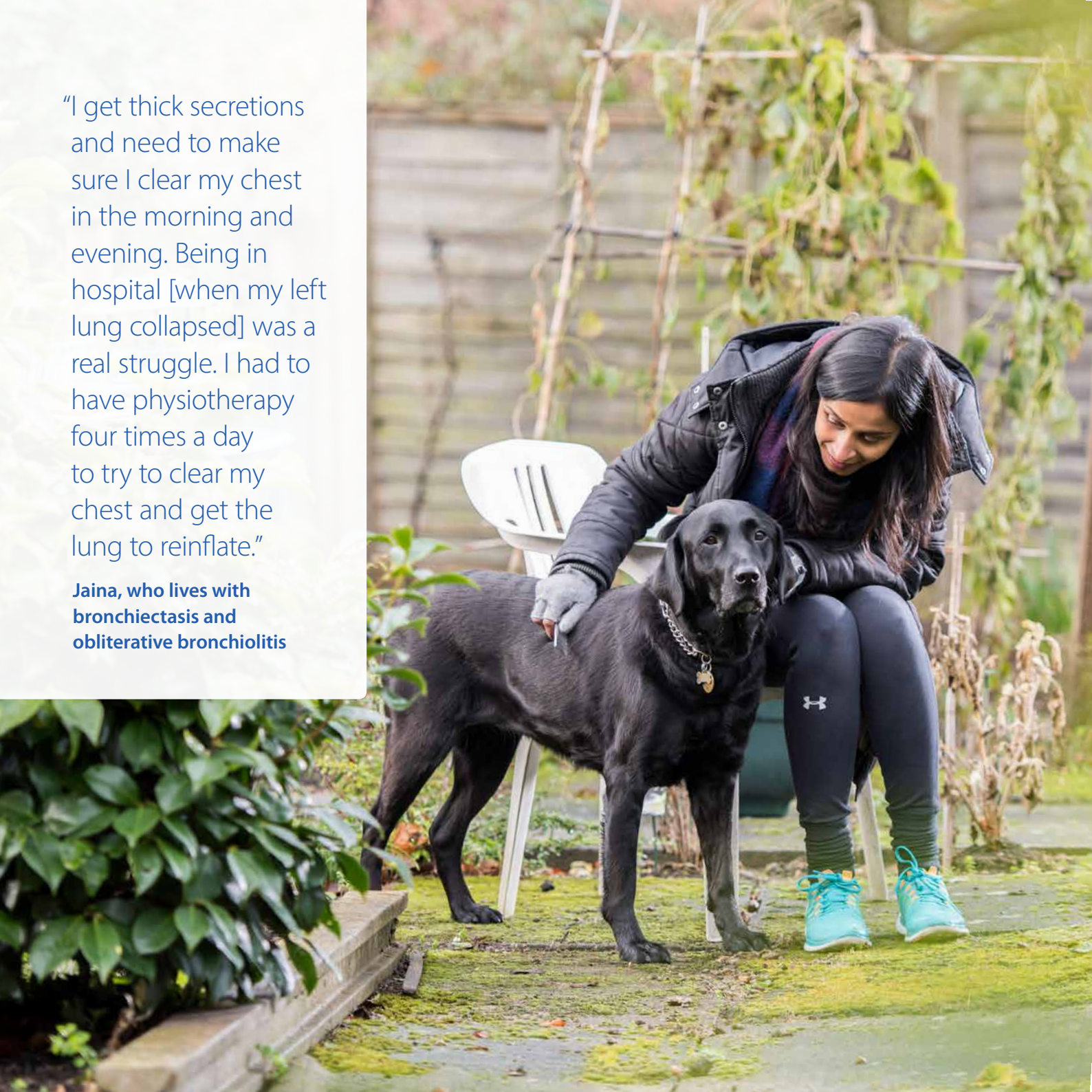
This study aims to help doctors conducting clinical trials select patients most likely to respond to a particular drug, and to assess whether the drug is having its expected effects in the lung.

Finding specific markers that respond positively to particular drugs could lead to drugs being evaluated more quickly as a possible treatments for IPF, and help doctors decide which treatment is best for each patient.

> "Because IPF is is idiopathic – literally, we don't know the cause – it is difficult to investigate the disease, because we have no starting point for it. So, we often work backwards. We look at somebody with IPF and try to understand features of the disease, in an attempt, eventually, to understand what causes it."
>
> **Professor Donna Davies**

"I get thick secretions and need to make sure I clear my chest in the morning and evening. Being in hospital [when my left lung collapsed] was a real struggle. I had to have physiotherapy four times a day to try to clear my chest and get the lung to reinflate."

Jaina, who lives with bronchiectasis and obliterative bronchiolitis



Support our life-saving research

The research we fund is vital.

We back researchers to explore new approaches, in the hope of discovering amazing things to help so many people living with a lung disease. We've done it before and we're determined to do it again.

Now is a great time to harness new scientific technologies to understand complex lung diseases.

You have an opportunity to make a real difference to the lives of people with a lung condition.

If you want to save, extend and improve many more lives now and for future generations, get involved in our research.

To find out more, visit **blf.org.uk/research** or call **03000 030 555**.

Shaking things up

Thirty years ago, Professor Sir Malcolm Green and other respiratory specialists set up the BLF. Its aims were to challenge the lack of awareness of lung disease and the under-resourcing of respiratory research.

We have achieved a lot since then. But there's more to do to improve the lives of people living with a lung condition today. We must also prevent respiratory disease in future generations. Our scientific research is vital to deliver this change and offer hope for the future.

Research into lung conditions is still drastically underfunded. Cardiovascular disease and neurological conditions have a similar impact on the UK's health, yet they receive vastly more funding. So our support for world-class research is needed more than ever.

That's why we intend to shake things up, by investing in as much high quality research as we can. We're committed to making sure our research brings about real – and speedy – improvements in lung health. In the coming year, we will deliver an exciting research programme totalling £1m.

"Our vision is that one day everyone will breathe clean air with healthy lungs. By supporting our research, together we can make that happen."

Thirty years on, we remain committed to the nation's lung health and to research that will achieve real breakthroughs in the fight against lung disease. We are the only UK charity with a mission to look after the nation's lungs.

Our vision is that one day everyone will breathe clean air with healthy lungs. By supporting our research, together we can make that happen.

Dr Penny Woods
Chief Executive

Thanks

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Aviva Insurance

The Benham Charitable Settlement

The British Paediatric Respiratory Society

Clare King Charitable Trust

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The Douglas Heath Eves Charitable Trust

The Flow Foundation

Garfield Weston Foundation

The George and Esme Pollitzer Charitable Settlement

Glaxosmithkline

Greendale Foundation

The Henry Lumley Charitable Trust

The Hospital Saturday Fund

The Inman Charity

Janssen

The Dr Joseph Footitt Breath of Life Fund

Kauri Trust

The Kirby Laing Foundation

Make My Day Better Limited

Mesothelioma UK Charitable Trust

Mick Knighton Mesothelioma Research Fund

Miss WE Lawrence 1973 Charitable Settlement

NAPP Pharmaceuticals

NM Rothschild & Sons Limited

The Oakdale Trust

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The Peter Courtauld Charitable Trust

PF Charitable Trust

Richard and Philippa Mintz and the Family Foundations Trust

Scottish Government Chief Scientist Office

SILA: The Sarcoidosis Charity

TK Maxx Community Fund

Wessex Medical Research

Zurich Insurance Group

"About 10 years ago I was diagnosed with COPD. The words 'chronic' and 'disease' terrified me, so I stopped doing stuff in case I made it worse.

I was referred to pulmonary rehabilitation and my whole outlook changed.

I realised that exercise could improve my condition and I learnt how to manage it instead of letting it manage me.

Suddenly the future looked much brighter and I've never looked back."

Joan

BLF research means pulmonary rehabilitation is now recommended for people after a hospital stay due to a flare-up of COPD.

Get in touch with the British Lung Foundation to find out more.

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