

# Respiratory Investigations

Information for patients

Please read this leaflet  
carefully





This leaflet will describe the different tests performed by the respiratory physiology team at Leeds Teaching Hospitals, Cardio-Respiratory department.

Please refer to the relevant section for the test you are due to have.

**The tests described in this booklet include:**

<b>Spirometry Test</b>	<b>page 5</b>
<b>Full Pulmonary Function Test</b>	<b>page 6</b>
<b>Walk Tests</b>	<b>page 7</b>
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**For all tests, please read this page carefully before coming to your appointment.**

In order for each test to be performed it is important to carefully read the following pre-test instructions and act accordingly.

### **Before you leave for your appointment:**

Check your appointment letter carefully for the date, time and location of your test.

For the tests to be carried out successfully, it is important that you **do not**:

- Drink alcohol for four hours before.
- Exercise for 30 minutes before.
- Smoke for at least one hour before the test including e-cigs.
- Wear any tight clothing that may restrict your breathing.

Please contact the department if you have recently experienced any of the following:

- Attended A&E within the last one week.
- Chest infection / coughing up blood / burst ear drum within the last two weeks.
- Heart attack, stroke, blood clot, broken ribs or collapsed lung within the last six weeks.
- Any surgery or procedures within the last 12 weeks.
- Chest pain on the day of your appointment.

**If prescribed, please bring your GTN spray and blue inhaler or it may not be possible to perform your test.**

## Contact Information

If you have any questions about the tests or attending your appointment please contact the department on **0113 206 4759** or **0113 206 4425** (Mon-Fri 08:30-16:30).



## Spirometry

You may be sat on a chair in a glass box or it can be performed in any chair with arms/wheelchair as required.

Spirometry measures how much air you can breathe out in one forced breath and how fast. For this test we will ask you to breathe normally before taking in a big breath as full as you can, then blow out as hard and as fast as you can until your lungs are empty.

**Please allow 15 minutes for this test.**

## Full Pulmonary Function Test

A Full Pulmonary Function Tests is made up of three smaller tests. All of which are done on the same piece of equipment, sat inside a glass box. You will be seated for the whole test breathing through a mouthpiece. You will also be asked to wear some nose clips. Each test will be repeated a few times.

- **Spirometry** - As described above.
- **Gas Transfer** - How well the lungs transfer gases from the air into the blood stream. We will ask you to blow out gently until your lungs are empty then take a big breath in as full as you can and hold your breath for 10 seconds before blowing out gently again.
- **Static Lung Volumes** - The total size of your lungs. For this test the door will need to be closed, only for a few minutes. We will ask you do some normal breathing, then some panting manoeuvres against a shutter before blowing out for as long as you can and then taking in a breath as full as you can.

**Please allow 45 minutes for these tests.**

### Do I need to stop any medications for Spirometry or Full Pulmonary Function Testing?

Please try to avoid taking the following relievers for four hours prior to your test:

- Salbutamol (Easyhaler® Salbutamol, Salamol®, Ventolin®, Airomir®) (blue).
- Terbutaline (Bricanyl®) (white with blue twisty bottom).

**If you can't manage without your inhaler, please use it and make a note of the time.**

**Please continue to take all other prescribed medications as normal and bring a list of these with you.**

**If prescribed, please bring your GTN spray and blue inhaler (reliever) or it may not be possible to perform your test.**

## Walk Tests

The walking tests performed in our department are either a **Six Minute Walk Test**, or an **Incremental Shuttle Walk Test**. Both of these tests involve walking in a corridor between two cones whilst wearing an oxygen saturation probe on your finger.

### In order to prepare for these tests please:

- Wear comfortable clothing and appropriate shoes for walking.
- Bring any usual walking aids (cane, walker, etc.).
- Avoid vigorous exercise within two hours of the test.
- Continue taking all normal medications.

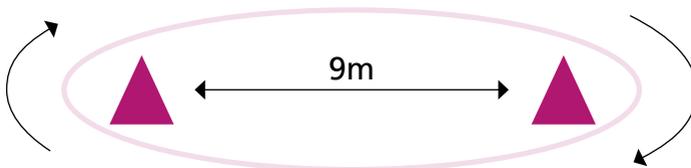
### Six Minute Walk Test

We will ask you to walk as far as you can, between the two cones, in six minutes. You can walk at your choice of pace and are able to slow down, stop or sit down at any point. However, the aim is to cover as much distance as possible.

### Incremental Shuttle Walk Test

We will ask you to walk between two cones, at a speed indicated by a CD player. The aim is to pace yourself so you are turning around a cone when the CD player makes a beep. It starts very slowly, although every minute will get slightly faster. You should keep walking as long as you are able, or can no longer keep up with the beeps.

### Figure 1. Walk test layout



Please allow 30 minutes for these tests.

## Respiratory Muscle Assessments

These tests include: mouth and sniff pressure and sitting and supine vital capacity.

**Mouth and Sniff Pressures** are three separate tests, performed together, which measure how much pressure you can generate when blowing out, breathing in and sniffing in, as hard as you can.

### 1. Sniff Nasal Inspiratory Pressure

You will be asked to sit upright in a chair and perform a vigorous sniff through a small bung, placed inside a nostril. This is repeated several times.

### 2. Maximal Inspiratory Pressure

Sat upright in a chair, you will be asked to breathe in as powerfully as you can through a mouthpiece.

### 3. Maximal Expiratory Pressure

Again sat in an upright position, you will be asked to breathe out as forcefully as you can onto a mouthpiece. The technician may place their hands on your cheeks so a seal is maintained on the mouthpiece.

### Sitting & Supine Vital Capacity

You will be asked to sit in a chair and breathe through a mouthpiece, with a clip on your nose. We will ask you to breathe in fully and then blow out steadily, as long as possible, until your lungs are empty. You will have to repeat this test a few times.

If you are able to, we will then ask you to lie down on a couch, completely flat on your back. This is only for a very short period of time. You will then be asked to perform the breathing test in this position.

**Please allow 40 minutes for these tests.**

## Capillary blood gas

A capillary blood gas test measures the amount of oxygen and carbon dioxide in your blood. We will take the blood sample from your ear lobe.

First, we will put a cream on your earlobe to warm it. **Please let the technician know if you have an allergy to aspirin, ibuprofen or plasters.**

After about 10 minutes we will take a small sample of blood from the earlobe. You should not find this painful. At the end of the test we will make sure that your earlobe has stopped bleeding and apply a small plaster.

**Please allow 30 minutes for this test.**

## Hypoxic Challenge Test

A hypoxic challenge test creates conditions similar to an aircraft at altitude, where there is slightly less oxygen available. It will help your consultant to decide whether you need extra oxygen during a flight.

At high altitudes blood oxygen levels fall in everyone and some people may feel a little breathless. In most people this has no health effect. But if you already have low blood oxygen levels because of your lung condition, then the extra dip that happens while you are in the plane could cause breathlessness and discomfort for you.

You will be sat down on a chair and asked to breathe a gas mixture through a mask which creates the oxygen level of an aeroplane, for up to 20 minutes. During this test we will monitor your pulse rate and oxygen levels. Occasionally people feel dizzy or faint during these tests. If this happens, please tell the technician.

We will perform a capillary blood gas (as described above) before you breathe the 15% gas mixture, we will take another capillary blood gas sample at the end of the test.

**Please allow 60 minutes for this test.**

**For Reversibility and Mannitol Challenge Tests, it is very important to follow the instructions about stopping certain medications prior to your appointment.**

**Please read these sections very carefully to avoid a wasted appointment, as we will not be able to perform the tests if you have taken the named medications within the stated time periods.**

## **Reversibility**

A reversibility test measures how your airways respond to salbutamol.

You will be asked to perform Spirometry first. Then if appropriate, we will administer 4 puffs of salbutamol to you through a disposable 'spacer'. We will then wait 20 minutes and repeat the Spirometry test.

**Please allow 60 minutes for this test.**



***Figure 2. Disposable spacer with inhaler***

If you regularly use inhalers or nebulisers then please try and avoid taking the following medications for the time period indicated:

**Table 1. Required medication withholding for reversibility**

(Common examples of inhaler listed, see appendix for further examples)

Medication	How long to stop before reversibility test?
<b>Short acting beta-2 agonists (SABA)</b> e.g. Salbutamol (Easyhaler® Salbutamol, Salamol®), Ventolin®.	4 hours
<b>Short-acting muscarinic antagonists (SAMA)</b> e.g. Ipratropium (Atrovent®).	12 hours
<b>Long-acting beta-2 agonists (LABA)</b> e.g. Salmeterol (Serevent®) Formoterol (Easyhaler®).	24 hours
<b>Twice Daily Inhaled Corticosteroids (ICS) + LABA</b> e.g. Fostair®, Symbicort®, Fobumix®, Seretide®, DuoResp®.	24 hours
<b>Once Daily ICS + LABA</b> Relvar®, Ateectura®.	36 hours
<b>Long-acting muscarinic antagonists (LAMA)</b> e.g. Incruse®, Spiriva®, Seebri®, Eklira®.	48 hours
<b>LABA + LAMA</b> e.g. Anoro®, Duaklir®, Ultibro®, Spiolto®, Bevespi®.	48 hours
<b>ICS + LABA + LAMA</b> e.g. Trimbow®, Trelegy®, Trixeo®, Enerzair®.	48 hours

If you have taken an inhaler above within the time period before your test, please get in touch with the department.

## Mannitol Challenge Test

Mannitol is a naturally occurring sugar alcohol found in most vegetables. We use a dry powdered form of mannitol, used widely as a sweetener. A mannitol challenge test looks to see whether you have sensitive airways which can be irritated. We will firstly ask you to perform spirometry. Then if the spirometry is acceptable, we will ask you to breathe in an increasing amount of mannitol through an inhaler (see figure 2).

Spirometry will then be repeated to see the effect that the mannitol has on your airways. There are potentially nine levels of inhaling mannitol. Each level has an increasing amount of mannitol. The test ends if there is a significant change in the amount of air you can blow out, or after nine levels.

At the end of the test we will give you some Salbutamol to relieve any symptoms you may have experienced. After 20 minutes, we will repeat spirometry. We will ensure that your breathing is back to normal before you leave.

Mannitol may cause you to cough and have a dry mouth; water will be provided. Occasionally people feel a bit tired after mannitol challenge tests. You will be offered the option to wait in the department if you wish. It should be safe for you to drive afterwards.

**Please allow 60 minutes for this test.**



**Figure 3. Mannitol challenge kit**

If you regularly use inhalers or nebulisers then please try and avoid taking the following medications for the time period indicated:

**Table 2. Required medication withholding for mannitol challenge**

(Common examples of inhaler listed, see appendix for further examples)

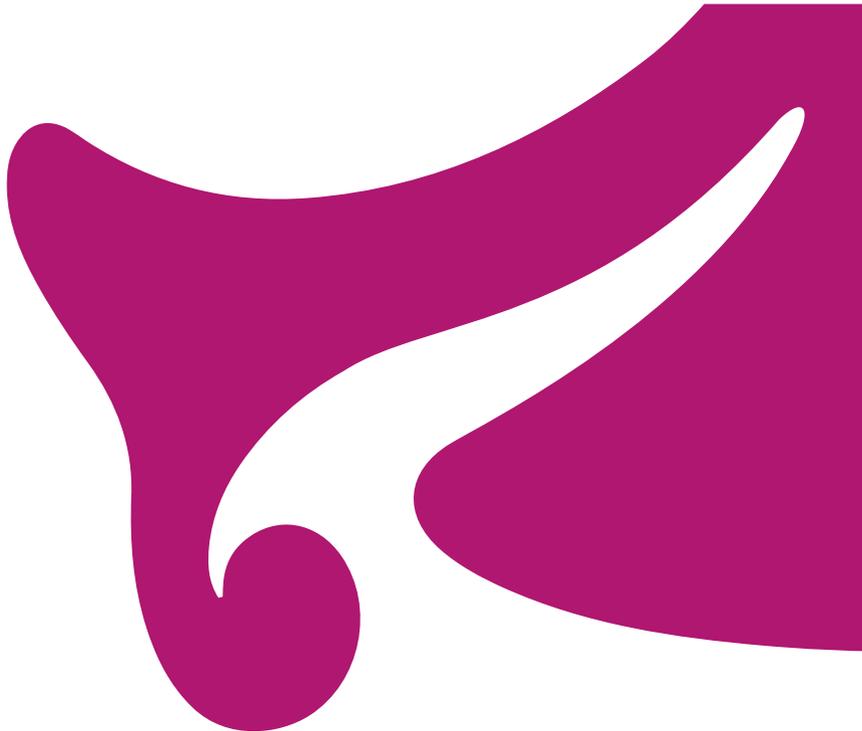
Medication	How long to stop before mannitol challenge test?
<b>Short acting beta-2 agonists (SABA)</b> e.g. Salbutamol (Easyhaler® Salbutamol, Salamol®), Ventolin®.	8 hours
<b>Inhaled corticosteroids (ICS)</b> e.g. Beclomethasone (Qvar®, Clenil Modulite®, Soprobe®), Budesonide (Easyhaler®, Pulmicort®).	12 hours
<b>Short-acting muscarinic antagonists (SAMA)</b> e.g. Ipratropium (Atrovent®).	12 hours
<b>Long-acting beta-2 agonists (LABA)</b> e.g. Salmeterol (Serevent®). Formoterol (Easyhaler®)	24 hours
<b>Theophylline</b> (e.g. Uniphyllin®)	24 hours
<b>Inhaled Corticosteroids (ICS) + LABA</b> e.g. Fostair®, Symbicort®, Fobumix®, Seretide®, DuoResp®.	24 hours
<b>Once Daily ICS + LABA</b> Relvar®, Ateectura®.	36 hours
<b>Long-acting muscarinic antagonists (LAMA)</b> e.g. Spiriva®,	3 days
<b>LABA + LAMA</b> e.g. Anoro®, Duaklir®, Ultibro®, Spiolto®, Bevespi®.	3 days
<b>ICS + LABA + LAMA</b> e.g. Trimbrow®, Trelegy®, Trixeo®, Enerzair®.	3 days
<b>Antihistamines</b>	3 days
<b>Montelukast</b>	4 days

## Appendix: Types of Inhalers

These lists will help you identify which type of inhaler you use, to help you know how long to withhold prior to your breathing tests (as described in Tables 1 and 2).

Brand Name	Drug Name
<b>Short-Acting Beta-2 Agonist (SABA)</b>	
Easyhaler Salbutamol, Salamol, Airomir, Ventolin	Salbutamol
Bricanyl	Terbutaline
<b>Short-Acting Muscarinic Antagonist (SAMA)</b>	
Atrovent, Ipravent	Ipratropium
<b>Long-Acting Beta-2 Agonist (LABA)</b>	
Easyhaler Formoterol, Oxis, Atimos, Foradil	Formoterol
Serevent, Neotent, Sotel	Salmeterol
Onbrez	Indacaterol
Striverdi	Olodaterol
<b>Long-Acting Muscarinic Antagonist (LAMA)</b>	
Eklira	Aclidinium
Seebri	Glycopyrronium
Spiriva, Braltus, Tiogiva, Acopair	Tiotropium
Incruse	Umeclidinium
<b>Inhaled Corticosteroid (ICS)</b>	
Clenil Modulite, Soprobeq, Easyhaler beclometasone, Qvar, Kelhale	Beclometasone
Easyhaler Budesonide, Pulmicort, Budelin	Budesonide
Alveso	Ciclesonide

Flixotide	Fluticasone propionate
Asmanex	Mometasone
<b>glycopyrroniumLong-Acting Beta-2 Agonist + Long-Acting Muscarinic Antagonist (LABA/LAMA)</b>	
Anoro	vilanterol/umeclidinium
Bevespi	formoterol/glycopyrroinum
Duaklir	formoterol/aclidinium
Spiolto	olodaterol/tiotropium
Ultibro	indacaterol/glycopyrronium
<b>Inhaled Corticosteroid + Long-Acting Beta-2 Agonist (ICS/LABA)</b>	
Fostair, Luforbec	beclometasone / formoterol,
DuoResp, Fobumix, Symbicort, Wockair	budesonide / formoterol
Relvar	luticasone fuorate / vilanterol
Flutiform	fluticasone propionate / formeterol
AirFluSal, Aloflute, Avenor, Combisal, Fixkoh, Fusacomb, Seffalair, Sereflo, Seretide, Sirdupla, Stalpex	fluticasone propionate / salmeterol
Atectura	mometasone / indacaterol
<b>Inhaled Corticosteroid + Long-Acting Beta-2 Agonist + Long-Acting Muscarinic Antagonist (ICS/LABA/LAMA)</b>	
Enerzair	mometasone / indacaterol / glycopyrronium
Trelegy	fluticasone fuorate / vilanterol / umeclidinium
Trimbow	beclometasone / formoterol / glycopyrronium
Trixeo	budesonide / formoterol / glycopyrroniumLong



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