

The purpose of this leaflet

This leaflet will provide some useful information about the serious infection caused by *Aspergillus* and its prevention.

Nothing contained in this leaflet is intended to be any form of medical advice and must not be taken, or relied upon, as such. Individuals must seek all such advice personally in relation to their particular circumstances.

What is *Aspergillus*?

Aspergillus species are fungal organisms with a wide distribution in nature. The fungus is most common during autumn and winter in the Northern Hemisphere, frequently found in dust, decaying material (such as compost, soils), plants, building materials, airborne dusts (household, construction sites or building renovation sites), air conditioning or heating vents, insulating materials (walls, ceilings, water cylinders) and anything else that involves disturbing potentially mouldy material.

How do you get infections?

Transmission by air is the commonest route. *Aspergillus* fungus produces millions of tiny, invisible spores small enough to be inhaled and start to settle and grow inside the airspaces of the lungs. Some people with large areas of wounds or burns on the skin may acquire the infection by airborne contamination. Illnesses caused by *Aspergillus* infection are collectively called aspergillosis.

Who gets serious *Aspergillus* infection?

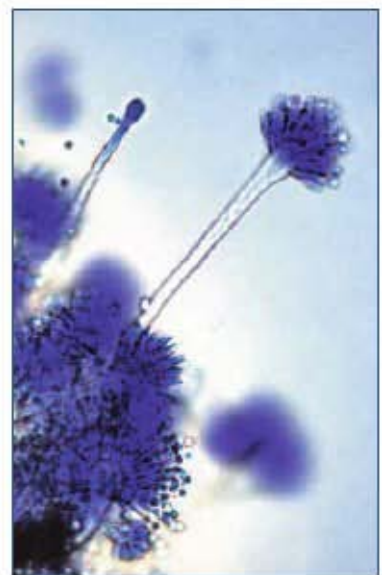
Although the fungus is always in the air around us, the majority of people do not develop illness because their immune system is very capable of protecting them from infections when the fungus enters the body. In the lungs there are also special immune defence systems which combat inhaled infections. Therefore individuals with weakened immune systems, or long-term lung diseases which prevent the local defences from working properly, are most susceptible to serious *Aspergillus* infections.

So what increases the risk of serious *Aspergillus* infection?

Illnesses which weaken your body's immune response

- ~ Immune suppressing diseases:
granulocytopenia, leukaemia, lymphoma, myeloma
- ~ Cancer patients on chemotherapy treatment
- ~ Long term medications which suppress the immune system (common ones include corticosteroids, cyclosporin, methotrexate). People who require these treatments include organ transplant recipients (particularly heart,

How can I reduce the risk of *Aspergillus* Infection?



Aspergillus fumigatus

lung), bone marrow transplant recipients, and those with illnesses caused by the immune system attacking their own body structures (auto-immune disease)

- ~ Poorly or uncontrolled HIV infection
- ~ Diabetes where there is poor blood sugar control

Lung diseases

- ~ Asthma in adults, tuberculosis (TB), sarcoidosis and cystic fibrosis. This list covers the more common risks, but the list is not extensive. Medical advice must be sought from your doctor and medical staff.

What serious illness does Aspergillus cause?

The types of diseases caused by Aspergillus are varied:

Invasive Aspergillosis (IA)

Serious and potentially life threatening Aspergillus infection, known as invasive aspergillosis, occurs once the fungus gains a foothold in the susceptible individual (usually in the lungs, sinuses, damaged skin). Usually confined to the lung (80+%) or sinuses (5-10%). The fungus may enter the circulating bloodstream and spread to other parts of the body. It can damage key organs (particularly kidneys, heart, brain and skin) and cause obstructions in blood vessels. Invasive aspergillosis is rare in normal, healthy people, but is serious and potentially life threatening in people with a weakened immune system.

Symptoms include cough, fever, tiredness, chest pain (usually worse on breathing). Some may cough up blood, lose weight, and experience shortness of breath. Note that symptoms are often variable, depending upon which organ is involved, and may even be absent, particularly during the early stage of the disease. Therefore all individuals at risk of serious Aspergillus infections should see their doctors promptly when feeling unwell. This allows special tests and appropriate treatments to be carried out as soon as possible.

Chronic Pulmonary Aspergillosis (CPA)

CPA is a catchall term for a number of different forms of pulmonary aspergillosis, including CCPA (chronic cavity), CNPA (chronic necrotising) and CFPA (chronic fibrosing), as defined by Denning et al in :

www.aspergillus.org.uk/secure/articles/pdfs/Aspergillosischroniccavitary.pdf

Other defined infections that could fall under CPA include semi-invasive aspergillosis, subacute invasive pulmonary aspergillosis, chronic invasive pulmonary aspergillosis, symptomatic pulmonary aspergilloma, and Aspergillus pseudotuberculosis.

The unifying features of CPA seem to be: limited invasiveness, poor detection by immune-based diagnostics, forms 'holes' in the lungs filled with fungus, and the patient is not usually immune-compromised.

'Fungal balls' of Aspergillus growing inside the lungs' air spaces (Aspergilloma)

This is the growth of Aspergillus into a ball in pre-existing lung cavities caused by diseases such as TB and bronchiectasis. Symptoms include cough, shortness of breath, chest pain, and bloody sputum (phlegm). It is not as life-threatening as invasive pulmonary aspergillosis (IPA) but in some it may lead to lung damage and serious blood loss by lung bleeding which requires prompt treatment in hospital. It has recently been realized that Aspergillus may also cause cavities in the lung, especially in patients who have had tuberculosis, and these cavities may sometimes have a fungal ball in them. Sarcoidosis may cause cavitation which is ripe for fungal colonisation (Chronic cavitary pulmonary aspergillosis). This tends to be a long-term problem.

Allergic Broncho-pulmonary Aspergillosis (ABPA)

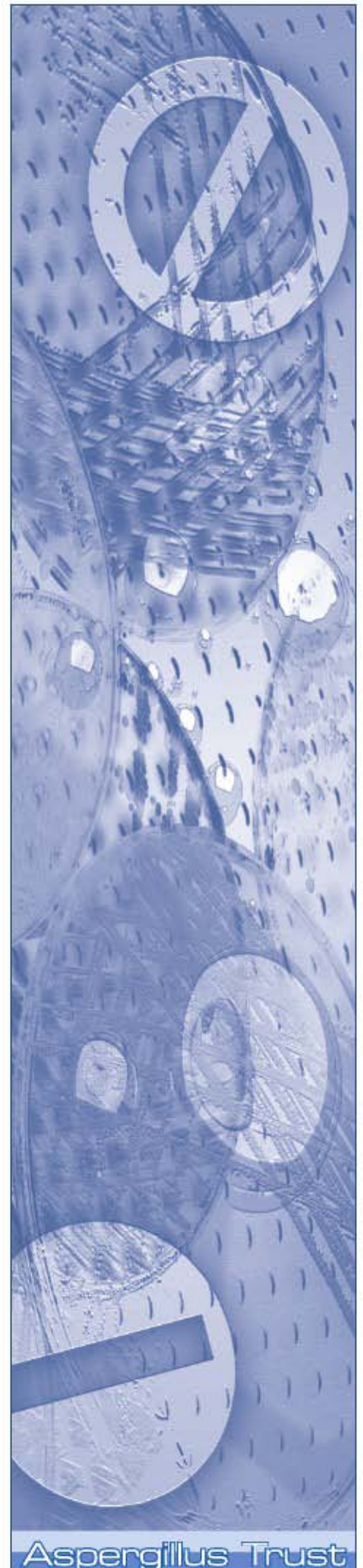
ABPA is not regarded as an infection; it is an allergic reaction to Aspergillus fungus and spores which invade the air spaces of the lungs. It is not life threatening. Sufferers will experience wheezing and cough. Asthmatics find they have a hard time controlling their asthma. Some may have fever, tiredness, and coughing up of brown-colored sputum (phlegm).

How can I prevent Aspergillus infection?

In hospitals individuals at high risk of acquiring Aspergillus infections may need to be nursed in special rooms with air dust filters and ventilation systems (using a high efficiency particulate air HEPA filter) which minimise the spores in the air. However, many of these individuals are now living outside the hospital and are encouraged to live a normal lifestyle so that continuous access to air filters is not possible.

Aspergillus cannot be completely avoided in the environment but the risk of infection can be reduced:

- ✓ Avoid places where Aspergillus spores are abundant – forests, gardens, compost heaps, damp bark or wood chippings, grain stores, rotting vegetation, dead leaves, and building construction or renovation areas.
- ✓ Remove any potted and ornamental plants in the household. The household environment and furniture surfaces should be kept clean, dust-free and dry to minimise the accumulation of fungus and moulds.
- ✓ Certain food items, such as spices and herbs, which are usually found to contain Aspergillus spores, should be avoided, unless already cooked by someone else.
- ✓ Avoid activities with a high risk of Aspergillus exposure, such as gardening, compost making, building construction, and house cleaning.
- ✓ Don't smoke marijuana, as it contains much Aspergillus.
- ✓ Wearing a mask that filters spores, if a high risk environment is unavoidable, could be helpful (particulate respirator BS EN 149).





- ✓ Avoid skin injuries. Any wounds should be cleaned with soapy water and covered with a clean dressing.
- ✓ Wash hands thoroughly with soap, particularly after touching any objects known to harbour *Aspergillus* spores. Also, maintain a good habit of washing hands before meals, before touching your eyes, lips, mouth, nose or any wounds on your skin.
- ✓ Change your pillow regularly (ie 3 monthly and before discharge from hospital after chemotherapy or transplantation), as research has indicated that pillows are harbourers of *Aspergillus*.
- ✓ Always ensure you take your medical prescriptions as instructed and attend your doctor's appointments. See your doctor promptly when you feel ill or develop symptoms suggestive of IPA.
- ✓ If on immunosuppressive drugs, you may be asked to attend for blood tests regularly e.g. after a transplant. It is good advice to faithfully attend every appointment, as any changes in your immune system's ability to fight off infection can be quickly spotted by blood tests (i.e. neutrophil count changes) and advice given to avoid infections before the infection is established.

In addition, good hygiene and a healthy lifestyle will help improve your body's immune defence against *Aspergillus* and other infections.

- ✓ Do not smoke as it can further weaken the immune defence system in your lungs and increases your risk of infections.
- ✓ Eat a balanced diet. The body and immune system needs optimum nutrition in order to function well. Try to eat fresh food, at least five portions of fruit and vegetables per day.
- ✓ Take regular exercise, get enough rest and sleep every day.
- ✓ There is some evidence that stress can further weaken our immunity and also reduce our well being. While many life stresses cannot be totally avoided, you can discover your own means of relaxation. Some complementary therapies such as massage and meditation can be very relaxing.

How is *Aspergillus* infection diagnosed?

Symptoms give clues to the diagnosis. The doctor may perform tests to check your lung functions and airflow regularly. Some special tests may also be performed to confirm suspected *Aspergillus* infection (especially IPA) and rule out other illnesses.

Tests may include:

- ~ Getting a sample of sputum (phlegm) to look for *Aspergillus* spores and fungus. Future diagnostic tests include PCR (PCR is a very sensitive blood test for the detection of infecting agents).
- ~ Blood tests for:
 - 1) Blood proteins (antibodies) that are developed to counteract *Aspergillus*.
 - 2) *Aspergillus* substances (antigens) that are produced by the fungus during infection.

- ~ X-ray and computerised tomography (CT) scan gives information about lung abnormalities.
 - ~ Skin prick tests against *Aspergillus* – these check for an allergic reaction to *Aspergillus* and many other fungi and pollens etc. They are not useful for invasive or chronic pulmonary aspergillosis.
 - ~ Bronchoscopy, where a telescope attached to a tube is inserted into your lungs via the nose to have a view of your lungs' air passages.
 - ~ A tissue sample of the lung (a biopsy) taken to check for invasive *Aspergillus*.
- Further information about these tests can be provided by your doctor.

What is the treatment for Aspergillosis?

- 1] Anti-fungal drugs [such as voriconazole (IV/oral), amphotericin B (IV only), itraconazole (IV/oral), caspofungin (IV only), or amphotericin B into the lung cavity] are the main treatments for IPA. They may also be used to treat CPA.
- 2] A single fungus ball in the sinuses or in a single lung cavity in one lung may need to be surgically removed. However, lung function in patients with such problems may preclude safe surgery and the main associated problem, namely haemoptysis (bleeding), can be dealt with via embolisation. Embolisation is probably now the method of choice for treating the haemoptysis in virtually all cases, but this should be done rapidly. Often the haemoptysis will recur due to new blood vessels developing but it is easy to repeat the procedure. Antifungal therapy is also required in some cases.
- 3] There is some evidence that anti-fungal medicine (prophylaxis) taken regularly may reduce the risk of establishing an infection for selected patients with suppressed immune systems. Information regarding prophylaxis is provided by your doctor. No vaccines are currently available.

What further help is available?

Many individuals at risk of developing serious *Aspergillus* infections often also have other long-term underlying health conditions which can have a negative impact on the quality of life. Therefore special help, information and advice may be necessary to give further support to the sufferers and their carers.



Information on the web



Informative websites on Aspergillus

- ~ www.aspergillus.org.uk
- ~ www.aspergillus.org.uk/newpatients
A site developed for patients.
- ~ uk.groups.yahoo.com/group/AspergillusSupport
An email discussion group for sufferers.
- ~ uk.groups.yahoo.com/group/AspergillusCentreAdvocates
This group replaces the Aspergillus Trust from 2009

Websites for organ transplant recipients

- ~ groups.msn.com/TransplantSupportLungHeartLungHeart
An online discussion group for heart & lung transplant recipients.
- ~ www.uktransplant.org.uk
Developed by the National Health Service to provide general information about organ transplants. Links to many organ transplant support organisations.

Other reliable and useful sources of general medical information

- ~ www.nhsdirect.nhs.uk
This site includes a health encyclopaedia, a self-help guide, local health information and an NHS A-Z. Updated daily. It complements a 24-hour call service available in England and Wales. The Scottish version (NHS 24) is in its pilot stages.
- ~ www.cancerhelp.org.uk/help/default.asp?page=118
Cancer research – information about your immune system.
- ~ www.elib.scot.nhs.uk/weblibrary.asp?cat=Patient_Information
NHS e-library – contains many sources of health information and a site for patients.

Medical knowledge and opinion varies according to the extent and availability of research and differing assessments of such research by different practitioners.

Whilst the information contained in this leaflet has been compiled by the Aspergillus Trust from sources believed to be reliable, the Trust cannot guarantee the accuracy or completeness of such information and cannot accept any responsibility for any use of such information.

Grateful thanks are given to Candice Chan, winner of the second Aspergillus Trust competition, for her help in compiling this leaflet.

Thanks also to our medical advisers and sponsors:

Fungal Research Trust
Newcastle Healthcare Charity
Hexham Trinity Methodist Church

This leaflet is dedicated to the memory of Kerry Marie Hope.

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Update 2009: The Aspergillus Trust is now the Patient Advocates Group, part of the Fungal Research Trust.
<http://uk.groups.yahoo.com/group/AspergillosisCentreAdvocates/>