



HEALTH AND SAFETY  
AUTHORITY



# **Guidelines On Occupational Asthma**



# **Table of Contents**

<b>Introduction</b>	<b>3</b>
<b>What is asthma?</b>	<b>3</b>
<b>What is work related asthma?</b>	<b>3</b>
<b>What is the natural history of occupational asthma?</b>	<b>4</b>
<b>What are respiratory sensitisers?</b>	<b>4</b>
<b>What are the types of respiratory sensitisers?</b>	<b>5</b>
<b>What is an employer required to do?</b>	<b>6</b>
<b>How is a Risk Assessment carried out?</b>	<b>7</b>
<b>How is exposure prevented and controlled?</b>	<b>7</b>
<b>What do employees need to know?</b>	<b>8</b>
<b>What is the role of health surveillance?</b>	<b>8</b>
<b>How is occupational asthma evaluated?</b>	<b>9</b>
<b>What should be included in an occupational respiratory questionnaire?</b>	<b>11</b>

## Introduction

The objective of these guidelines is to provide useful information to enable employers and employees manage the prevention of occupational asthma in workplaces. The guidelines describe occupational asthma, the different types, and the substances which cause it. They also give practical advice on complying with health and safety legislation including the carrying out of a Risk Assessment and health surveillance.

## What is asthma?

Asthma is an inflammatory disorder of the airways. When an asthma attack occurs, the muscles surrounding the airways become tight and the lining of the air passages swell. This reduces the amount of air that can pass by, and can lead to wheezing sounds. Most people with asthma have wheezing attacks separated by symptom free periods. Other symptoms include shortness of breath, cough and chest tightness. Asthma attacks can last minutes to days and can become dangerous if the airflow becomes severely restricted.

## What is work related asthma?

Work related asthma accounts for about 10% of all adult onset asthma. Asthma related to the workplace can be categorized into 2 distinct subsets:

- **Work aggravated asthma** and
- **Occupational asthma**

### **Work Aggravated Asthma**

Persons with work aggravated asthma usually have a history of pre existing asthma. This usually has been symptomatic and the person may have been on treatment but sometimes they have not. Some but not all of this latter group may give a history of childhood asthma, that they have “grown out” of. They may tell of recurrent asthmatic episodes that are triggered by cold temperatures, excessive exertion, or exposure to irritant aerosols including dusts, fumes, vapours, and gases. These people may get wheezy or have other symptoms at work. The problem can often be eliminated by improving the work environment or avoiding the irritant.

### **Occupational Asthma**

Occupational asthma is caused as a direct result of workplace exposure. There are 2 forms of occupational asthma:

**Irritant Induced Occupational Asthma** (previously called reactive airway dysfunction syndrome or RADS) and

**Allergic Occupational Asthma.** This is the cause of the **vast majority** of occupational asthma cases.

**Irritant Induced Occupational Asthma** usually develops after a **single, very high exposure** to an irritant chemical. It is a direct “burn” effect on the airways and is not related to the immune system. Examples of causal agents include ammonia, acids and smoke. The high levels of exposure required are usually the result of accidents or some major failure of controls, often in enclosed spaces. The patients nearly always manifest asthma symptoms **within 24 hours of the exposure**, that is, there is no latent period. Symptoms will tend to improve over time and may go away entirely but if symptoms persist beyond 6 months persistent problems are possible. Whether recurrent exposure to lower levels of respiratory irritants leads to irritant induced asthma is currently a matter of debate but the majority of experts believe it does not.

**Allergic Occupational Asthma** is caused by **sensitisation** or becoming allergic to a specific chemical agent in the workplace over a **period of time**. This is the mechanism for the vast majority (>90%) of cases of occupational asthma. The sensitisation process does not occur after one exposure but develops over time (i.e., **latency period**). Latency periods are variable and can be as short as several weeks or as long as 30 years. If exposure is consistent, the period of greatest risk is the first two years of exposure but the risk does not go away after that but may reduce somewhat.

## What is the natural history of occupational asthma?

If exposure to the causative agent ceases completely, the condition will nearly always improve. If this happens within the first two years of the development of the condition then complete recovery is usual. The longer the exposure continues however, not alone is there a tendency for the condition to get worse, but the less likely it is that there will be a complete recovery although a cessation of exposure is nearly always of benefit. For these reasons identifying a case of occupational asthma as early as possible is of paramount importance, and hence the reason for health surveillance.

## What are respiratory sensitisers?

A respiratory sensitiser is a substance which when breathed in, can trigger an allergic reaction in the respiratory system. Initial sensitisation does not usually take place immediately, it happens after a period of perhaps weeks or months inhaling the sensitiser. Respiratory sensitisers have the following risk phrase and number in chemical safety data sheets “**may cause sensitisation by inhalation (R42)**”.

Many are also identified by the “Sen” notation in the Code of Practice, 2007, Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001.

The risk of development of sensitisation is usually dose related, that is the higher the exposure the more likely the individual will become sensitised. This is true even if the high exposures are transient such as in cases of spillage or during maintenance of equipment particularly if this higher exposure is recurrent. It may also be more likely to lead to sensitisation if the substance is also an irritant. Smokers may also be more vulnerable. For most substances the chances of becoming sensitised are much lower, but not completely absent, if the chemical is controlled below the occupational exposure level (OEL).

Once the sensitisation reaction has taken place, further exposure to the substance, even to the smallest amounts will produce symptoms. That is, **the OEL does not protect the person already sensitised**. This is known as **elicitation**. Once sensitised, the symptoms can happen immediately after the worker starts working with the substance or soon afterwards. The symptoms can sometimes occur some hours after the work period. This latter delayed reaction is quite common with isocyanates, for example. The symptoms typically improve when the worker is away from the workplace on days off or holidays.

## What are the types of respiratory sensitisers?

Respiratory sensitisers are subdivided into 2 groups based on the molecular weight of the aetiological agent:

- high-molecular-weight (HMW) substances, often proteins or other biological substances and
- low-molecular-weight (LMW) substances, which are commonly defined as having a molecular weight less than 1 kilodalton.

This division is made because the mechanism of disease is better understood for the HMW substances than for the LMW substances. It is generally accepted that agents of both substance types cause occupational asthma by an immune mechanism. The mechanism for allergic occupational asthma caused by HMW substances is a type I, IgE mediated process similar to that seen in hay fever. For this group, blood tests and other allergy tests such as Prick tests can be helpful in identifying what is happening in an employee.

The mechanism caused by LMW substances is less well defined. IgE and IgG antibodies, as well as cell mediated hypersensitivity, may be involved. There are usually no specific blood tests.

These are general rules but there are exceptions such as Chlorinated Platinum salts which are technically LMW compounds but behave like HMW compounds.

Several hundred substances found in the workplace have been found to be respiratory sensitisers, and more are being identified.

Table 1 below gives a broad indication of the types of substances which are known respiratory sensitisers and their associated common work activities. This list is not intended to be exhaustive and many known sensitisers are not identified here, so care should be taken to consider other sources of information, for example chemical safety data sheets.

**Table 1: Substance Groups and Common Activities**

<b>Substance Groups</b>	<b>Common Activities</b>
Isocyanates	Vehicle spray painting, foam manufacture
Flour/grain/hay	Handling grain at docks, milling, malting, baking
Electronic soldering flux	Soldering, electronic assembly, computer manufacture
Latex rubber	Gloves in health care, laboratories
Laboratory animals	Laboratory animal work
Wood dusts	Saw milling, woodworking, furniture manufacture
Glues/resins	Curing glues and epoxy resins in joinery and construction
Gluteraldehyde	Health care
Hair dyes	Hairdressers
Penicillin's/cephalosporin's	Pharmaceutical
Chromium compounds	Welding stainless steel
Platinum salts	Catalyst manufacture
Cobalt	Hard metal production, diamond polishing
Nickel sulphate	Electroplating
Subtilisin/enzymes	Detergent manufacture

## What is an employer required to do?

The employer must ensure a safe working environment where exposure to substances which can cause asthma is prevented or controlled. The employer should have or provide the following:

- An up to date Safety Statement
- A Risk Assessment
- Adequate control measures
- Information to employees
- Health surveillance where appropriate

## How is a Risk Assessment carried out?

All employers are required to have a written Safety Statement which must be brought to the attention of employees. It is a further requirement to implement all health and safety measures identified in the Safety Statement. The Safety Statement will include a written Risk Assessment which will identify if respiratory sensitisers that can cause asthma are being used in the workplace. The Risk Assessment should be able to answer the following questions:

- Are you using a respiratory sensitiser e.g. one of the substances listed in Table 1?
- Does the risk phrase “may cause sensitisation by inhalation (R42)” appear on the safety data sheet of any substances in use?
- Are any of the substances used listed with the Sen notation in the Code of Practice, 2007, Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001?
- Is there a close chemical similarity with a known respiratory sensitiser?
- Is the sensitiser likely to become airborne in use?
- Who is likely to be exposed?
- To what concentrations?
- For how long?
- How often?
- Does the exposure exceed the daily occupational exposure level (OEL) specified in the Chemical Agents Regulations?

This may require the employer to have the **work air monitored or measured** to detect the amount of the airborne substance and whether the exposure of workers is likely to be above or below the allowed OEL specified in the Chemical Agents Regulations. Monitoring must be carried out by a competent occupational hygienist with the right equipment.

## How is exposure prevented and controlled?

If the Risk Assessment identifies that workers are being exposed to respiratory sensitisers the following control measures should be considered:

- Stop using the sensitiser by replacing with a safer alternative if available
- Otherwise, segregate the work so to minimise the amount of workers exposed
- Totally enclose the process
- If this is not possible, partially enclose the process and provide local exhaust ventilation
- If after carrying out the above control measures, there is still exposure, provide suitable personal respiratory protection to workers

- If there is dependence on personal protective equipment (PPE), this equipment must be suitable for the task and work effectively. Fit testing is usually necessary for example
- Where substitution is not possible and there is still a risk of exposure despite the implementation of control measures, health surveillance must be provided.

## What do employees need to know?

Employees are entitled to information about hazards in the workplace and that contained in the Risk Assessment. They are also entitled to information on the protective and preventive measures to be taken. Employees who are likely to work with and be exposed to respiratory sensitisers need information, instruction and supervision so that they know and understand the following;

- Label and safety data sheet for chemicals used in the workplace
- Substances which are respiratory sensitisers in workplace
- Results of the Risk Assessment
- Proper use of control measures including PPE if relied upon
- Need to report any failures in control measures
- Risks to health
- Symptoms of sensitisation
- Importance of reporting symptoms at an early stage
- Role of health surveillance

## What is the role of health surveillance?

Health surveillance is used to detect the early onset or symptoms of asthma. It is deemed to be secondary prevention, (by detecting adverse effects early rather than total prevention) and not as effective as the primary prevention measures outlined above. Health surveillance where used, has to be used in conjunction with these other control measures.

Health surveillance can take the form of a pre employment medical assessment, an annual respiratory questionnaire or lung function tests or both depending on the situation.

### *Pre Employment Medical*

A pre employment health questionnaire (see below) should be completed by all those going to work with respiratory sensitisers. Unless it is likely that any exposure will be slight, the pre employment medical should also include spirometry or lung function test (LFT) and probably a medical examination. A previous history of asthma, significant atopy (or allergy) or an obstructive pattern on LFT may increase that individuals risk to getting more severe asthma. Therefore limitations may be necessary in employing



a person who currently suffers from or is at high risk of developing asthma in a high risk environment e.g. asthmatic going to work in a flour mill. However at all times there must be a balance between the risk an individual might face if working and their rights not to be discriminated against because of a disability, in this case asthma. Nevertheless there will be times when the risk of allowing a particular person to work with a sensitiser will be unacceptable.

The basis of this decision will be the Risk Assessment. The dose of potential exposure to the chemical is a very important part of this Risk Assessment. Usually it is advised to get the opinion of a specialist occupational physician or respiratory physician before allowing a known asthmatic or someone identified as having an asthmatic tendency to work with significant quantities of a respiratory sensitiser.

## ***Routine Health Surveillance***

Again the decision whether to carry out health surveillance is based on the Risk Assessment. When the Risk Assessment suggests there is the potential for an employee to develop asthma because of workplace exposure, then usually health surveillance is required. This should be carried out by a competent health professional 3 months and 12 months after job commencement and annually thereafter. The respiratory questionnaire should be completed again and results compared to pre employment ones. Ideally abnormal results should be interpreted by a doctor qualified and experienced in occupational medicine or respiratory medicine.

If health surveillance indicates that an employee has become sensitised, the employer should remove the worker from working with the sensitiser and advise him/her to consult a doctor. This would also indicate that the existing control measures are inadequate and the Risk Assessment should be reviewed and any necessary changes made.

Routine health surveillance which detects abnormalities will require referral from nurse to doctor to specialist. A diagnosis of occupational asthma can only be made after a suitable history and supplementary objective tests (see below) are undertaken. These include both immunological tests and physical examination for evidence of symptoms. The doctor may have to decide on fitness to work and whether the worker should continue working or be removed from the work environment.

## **How is occupational asthma evaluated?**

The evaluation of a potential case of occupational asthma is usually best done by a specialist occupational physician or a specialist respiratory physician with an interest in occupational asthma or ideally both. It is beyond the scope of this document to describe evaluation in detail but general principles are described.

The first step in the evaluation of a potential case is confirmation of the diagnosis of asthma. This is based on the history and clinical examination but also on objective tests. These will include serial peak flow measurements, spirometry and Bronchial Challenge tests usually involving Metacholine or Histamine. Challenge tests must only be carried out in a specialist centre under the supervision of a respiratory physician. All these tests demonstrate the reversibility typical of asthma. Typical significant values will be a 12-15% change. To successfully confirm the diagnosis, it is usually necessary for the patient to be off all asthma treatments but again this should be done under the direction of an experienced physician.

Once asthma is confirmed, the next step is determination of its potential to work. A history of symptoms being related to work is suggestive but not conclusive. Many asthmatics may experience symptoms at work due to an irritant effect (work aggravated asthma).

Potential sensitisers in the workplace should be identified (R42 risk phrase, safety data sheet information or from other sources, for example literature search).

It is not enough for sensitisers just to be present but there also should be potential for exposure. Exposure assessments will involve examining work practices but also objective measurements in air. These are compared to the OELs in the Code of Practice, 2007, Safety, Health and Welfare at Work (Chemical Agents) 2001 and subsequent editions. While control of sensitisers below OELs makes sensitisation less likely, it does not completely eliminate the risk. This may be because of peaks in exposure which may be so short lasting that they do not affect the Time Weighted Average that is the OEL.

Serial peak flows can be carried out typically every two hours but at least 4 times per day. They should be continued for at least 4 weeks; provided it is safe to do so and at least two weeks of this should be off work. A decrease of the order of 12-15% in values during work is suggestive of a work related cause. They usually rely on conscientious and consistent maximal effort and honest recording. For this reason they could be abused by someone with other motives, such as in the presence of civil litigation. Again they are more difficult to interpret in someone on treatment for asthma.

In the case of HMW agents blood tests and/or Prick tests may be helpful.

A specific Bronchial Challenge test with the putative causative agent is usually considered to be the Gold Standard in the diagnosis of occupational asthma. Again this must be done in a specialist centre.

## What should be included in an occupational respiratory questionnaire?

The questionnaire about workers at risk of occupational asthma should include the following questions;

### *Self Administered Section*

Company identification including name, address and type of business

Employee identification including name, PPS, DOB, gender

Job title and description.

Substances exposed to and control measures in place

Self reporting of symptoms including irritation of eyes, nose or throat, wheezing, cough, shortness of breath, chest tightness

Details of sickness absence in last year.

### *Medically Administered Section*

Past medical history

Family history

Previous occupational history

Lifestyle to include smoking (active and passive)

Medication

Allergies

Current medical complaints

## Summary

Occupational asthma is preventable. The guidance has outlined the simple but effective measures that an employer who is using substances which can cause asthma in the workplace should be implementing to prevent and control worker exposure.

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