Introduction

This technical bulletin provides general guidance on occupational asthmagens in the workplace. It lists common occupational asthmagens which may be found in the workplace, considers their health effects and suggests Respiratory Protective Equipment which might be considered to reduce exposure to them.

1. Occupational Asthma

Occupational asthma is an allergic reaction that can affect some people who are exposed to asthmagens at work. Exposure to an occupational asthmagen can cause a hypersensitive state in the airways which means that even low levels of exposure to that substance can cause an asthma attack, but not everyone who becomes sensitised goes on to develop asthma.

When someone suffers an asthma attack the muscles around the walls of their airways tighten so that the airways become narrower and linings of the airways becomes inflamed and starts to swell. Sometimes mucus also builds up which further narrows the airways. These reactions cause symptoms such as, wheezing, coughing, chest tightness and shortness of breath.

Occupational asthma can sometimes be reversed, but continued exposure to the same asthmagen once asthma has developed can lead to increasingly severe symptoms and permanent asthma.

2. Common Occupational Asthmagens

Occupational asthmagens are substances, found in the workplace, which can cause occupational asthma in some people. The main occupational asthmagens are detailed in the Health and Safety Executive’s Asthmagen Compendium and substances that “may cause sensitisation by inhalation” or “may cause sensitisation by inhalation or skin contact” will bear the risk phrase R42 or R42/43 respectively on either the product label or the safety datasheet. A total of 60 substances are listed in the HSE’s Asthmagen Compendium, but some of the more common asthmagens are listed in Table 1.

<table>
<thead>
<tr>
<th>Chromium (VI) compounds</th>
<th>Isocyanates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crustacean proteins</td>
<td>Laboratory animal excreta/secreta</td>
</tr>
<tr>
<td>Egg proteins</td>
<td>Latex</td>
</tr>
<tr>
<td>Fish proteins</td>
<td>Rosin-based solder flux fume</td>
</tr>
<tr>
<td>Flour dust</td>
<td>Some hardwood dusts</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>Some softwood dusts</td>
</tr>
</tbody>
</table>

Table 1: Some common occupational asthmagens

3. Legislation and Guidance

The Control of Substances Hazardous to Health Regulations (COSHH) require employers to control exposure to occupational asthmagens to as low as is reasonably practicable. Amongst other duties, employers must assess the risk of exposure and consider the substitution of hazardous substances for less harmful ones and use appropriate controls where required. Any controls that have been put in place must be kept in good order including; Local Exhaust Ventilation (LEV), Personal Protective Equipment (PPE) and administrative controls. Where there are occupational asthmagens employers are also required to monitor the health of individual employees through health surveillance. This allows for early detection of ill health caused by work and can highlight the need for improved control measures.

In addition, the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) requires employers to report cases of occupational asthma to a central point.

4. Control Measures

If occupational asthmagens have been identified in the workplace it may be necessary to implement one or more control measures to eliminate exposure or reduce it to as far as is reasonably practicable. The following sections describe the hierarchy of control which should always be followed:
4.1 Elimination or substitution
Careful consideration should be given to whether exposure to the occupational asthmagen can be eliminated completely by altering the process used or if the substance can be substituted for one which is less harmful. If this is not possible, or if the risk is not sufficiently reduced (i.e. in the case of substituting for a less harmful source) engineering controls, the next step in the hierarchy of control, should be considered.

4.2 Engineering controls
Engineering controls help to reduce exposure to a hazard. They are the second step in the hierarchy of control and can help to protect a group of people and not just an individual. An example of an engineering control often used to control occupational asthmagens is Local Exhaust Ventilation (LEV).

4.3 Administrative Controls
Administrative controls aim to limit the number of people entering a hazardous area and the time spent working in it. This is often achieved by rotating workers, restricting access to certain areas and by supervising employees to ensure that these controls are adhered to.

4.4 Personal Protective Equipment (PPE)
If it is still not possible to control exposure to a safe level after following the upper levels of the hierarchy of control, PPE should be used as a last resort. PPE may also be used as an interim measure whilst other controls are being implemented. In the case of occupational asthmagens, it is probable that PPE will be needed to ensure that exposure is reduced to as low as is reasonably practicable. PPE required may include protective clothing, safety eyewear and Respiratory Protective Equipment (RPE).

5. Respiratory Protective Equipment (RPE)
The RPE required depends upon the substance to be controlled, the wearer and the environment. In all cases the employer will need to conduct a risk assessment to determine who is at risk and how, but the following four steps provide a simple framework for selection and may be of help when selecting a suitable product.

5.1 Identify the hazard
Occupational asthmagens can be identified by consulting the list in the HSE’s Asthmagen Compendium or information supplied with a product. Substances that “may cause sensitisation by inhalation” or “may cause sensitisation by inhalation or skin contact” will bear the risk phrase R42 or R42/43 respectively on either the product label or the safety datasheet. This system of risk phrases is due to change in 2015 and some products may already bear the new phrase, H334 – “May cause allergy or asthma symptoms or breathing difficulties if inhaled.”

For the purposes of selecting RPE whether the substance is a particle or a gas/vapour is important. Particles can include solids but also liquid droplets. Gases are substances that are in the gas phase at room temperature, whilst vapours are emitted by substances that are generally liquid at room temperature. Petrol is a good example of a liquid which releases vapours.

5.2 Assess the risk
Once the hazard has been identified it is important to assess who might be exposed to it, how much they might be exposed to and for how long the exposure might last. This will probably require some measurement data to determine the concentration of the asthmagen in the air, which can be used to calculate an employee’s average exposure and compared with the Workplace Exposure Limit (WEL) as shown in Example 1.

Example 1

<table>
<thead>
<tr>
<th>Substance: Softwood Dust</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEL*: 5 mgm³ (8hr TWA**)</td>
</tr>
<tr>
<td>Exposure Time: 4 hours</td>
</tr>
<tr>
<td>Average Concentration in the air measured over 4 hours: 20 mgm³</td>
</tr>
<tr>
<td>Exposure Averaged over 8 hrs: 10 mgm³</td>
</tr>
<tr>
<td>Exposure must be reduced to at least half</td>
</tr>
</tbody>
</table>

*WEL = Workplace Exposure Limit. **TWA = Time Weighted Average

The WEL is the maximum amount of a substance to which an employee can legally be exposed, however in the case of the example above, because an occupational asthmagen is involved, exposure should be reduced to as low as is reasonably practicable.

This method is commonly used, but there are other methods available which do not require measurement data. For instance, the RPE Selector described in the HSE’s “Respiratory Protective Equipment at Work, A Practical Guide” (HSG 53) uses a “banding” method to select RPE. A similar process is also used by the COSHH Essentials Selector, http://www.hse.gov.uk/coshh/essentials/index.htm. Alternatively, manufacturers of substances or RPE may be able to offer guidance.

5.3 Select suitable and adequate RPE
RPE must be both suitable for the environment, the task and the wearer and adequate to control exposure, both should be considered when selecting products.

5.3.1 Adequate RPE
Table 2 shows some of the RPE that may be adequate to control exposure to particles. The level of protection offered by a particulate respirator is measured by the Assigned Protection Factor (APF) which indicates the number of times by which
exposure is reduced when wearing the respirator. The APF for each “class” of product is driven by workplace studies and published by the HSE.

Disposable respirators are not able to offer protection against gases and vapours (aside from at nuisance level), but reusable half masks, full face masks, powered respirators and supplied air respirators can all be considered. Supplied air respirators do not require filters as they use a breathable quality compressed air source to supply air to the wearer’s breathing zone, but for half face, full face and powered respirators the correct filters must be selected. Table 3 illustrates the main types of gas and vapour filters and 3M also has an online filter selection tool that can help determine the correct filter, [www.3M.co.uk/selectrespirator](http://www.3M.co.uk/selectrespirator).

For some work with occupational asthmagens, such as spraying isocyanates based paints, guidance from the HSE requires that supplied air respirators are used.

### 5.3.2 Suitable RPE

It is important to not only choose PPE which is able to offer an adequate level of protection but to choose equipment which is also suitable for the wearer, the task and the environment. Some of the factors to consider are as follows:

<table>
<thead>
<tr>
<th>Assigned Protection Factor (APF)</th>
<th>Disposable Respirator</th>
<th>Reusable half mask*</th>
<th>Reusable full face mask*</th>
<th>Powered Air*</th>
<th>Supplied Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>FFP1</td>
<td>P1</td>
<td>P1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>10</td>
<td>FFP2</td>
<td>P2</td>
<td>P2</td>
<td>TH1</td>
<td>–</td>
</tr>
<tr>
<td>20</td>
<td>FFP3</td>
<td>P3</td>
<td>–</td>
<td>TH2</td>
<td>CL2</td>
</tr>
<tr>
<td>40</td>
<td>–</td>
<td>–</td>
<td>P3</td>
<td>TH3</td>
<td>CL3</td>
</tr>
</tbody>
</table>

* Fitted with particulate filters

### The type of work

For instance, a long duration, frequent task will probably require more comfortable, more robust RPE than a quick one off job or for jobs where contamination is a concern disposable respirators may be preferred. If the job is quite physical RPE which offers very low breathing resistance, such as powered or supplied air respirators, may need to be considered.

### Comfort

Discomfort can discourage people from wearing their RPE properly for the full duration of the task. There is often a balance between comfort and protection, but manufacturers like 3M do put a lot of thought into wearer comfort when designing products.

### Compatibility

It is often necessary to wear multiple items of PPE at one time and it is important that these items are compatible and do not impede on one another or the wearer. Compatibility is generally a very personal thing as everyone’s face is different so it may be necessary to assess the fit of RPE on each wearer individually. A range of models may be needed to achieve a good fit on everybody.

### Wearer characteristics

It is important that RPE is suited to the wearer and that it fits them well. For tight fitting respiratory protective equipment such as disposable respirators a face fit test must be carried out to ensure that the product selected is able to offer an adequate seal to the wearer’s face.

### 5.4 Train on its use

Once suitable and adequate RPE has been selected it is essential that wearers are trained in its use. Good training should include; the need for protection, fitting and the importance of a good fit, limitations of use, maintenance and storage.

Table 3: The main types of gas and vapour filters

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Organic (&gt; 65°C)</td>
</tr>
<tr>
<td>B</td>
<td>Inorganic</td>
</tr>
<tr>
<td>E</td>
<td>Acid Gas</td>
</tr>
<tr>
<td>K</td>
<td>Ammonia</td>
</tr>
</tbody>
</table>
6. **3M Respiratory Protective Equipment**

3M have a wide range of RPE including disposable, reusable, powered and supplied air respirators examples of which are pictured. For more information please visit www.3M.co.uk/ohes or call 0870 60 800 60 (UK) or 1 800 320 500 (Ireland).

7. **3M Safety Services**

3M is able to offer a range of services to help you meet your PPE needs. These include:

- Care & Maintenance Packs
- Noise Level Check Service
- Hearing Conservation Programme
- Respiratory Service Life Software
- Fit Testing (Quantitative and Qualitative)
- Fit Testing Workshops
- EarFit Validation System (Hearing Protective Equipment)
- Air Quality Testing
- Product Selection Tools

8. **More information from 3M**

For more information on 3M products or services please visit the 3M Occupational Health & Environmental Safety website, www.3M.co.uk/ohes or call our helpline on 0870 60 800 60 (UK) or 1 800 320 500 (Ireland).

9. **Further reading**

- HSE: www.hse.gov.uk/asthma
- Asthma UK: www.asthma.org.uk
- Control of Substances Hazardous to Health Regulations, Regulation 7, Para. 7, c, ii.
- Control of Substances Hazardous to Health Regulations, Appendix 3
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations