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**QUEEN’S UNIVERSITY BELFAST**

**GUIDELINES FOR WORK WITH ASTHMAGENS**

1. INTRODUCTION

Asthma is a condition in which inflammation of the lining of the small airways of the lung together with spasms of the muscles around the airways cause these airways to narrow and reduce airflow both into and out of the lungs. This produces wheezing, shortness of breath, chest tightness and coughing.

Occupation related asthma can be (1) new onset adult asthma caused by exposure to asthmagens (substances capable of causing asthma) in the workplace (2) worsening of pre-existing asthma due to exposure to irritants or other agents in the workplace.

New onset occupational asthma can be divided into two types:

(i) Immunologic type – in which there is a variable time delay (latent period) between exposure to a respiratory sensitiser and the development of symptoms.

(ii) Non-immunologic (irritant) type – in which the symptoms develop within a few hours of exposure to an irritant at a high concentration.

Occupational asthma accounts for 9-15% of all cases of asthma in adults of working age with almost 90% of those cases being attributable to an immunologic type response. It is the most commonly reported occupational respiratory disorder in westernised industrial countries.

The Health and Safety Executive estimate that between 1500-3000 people develop occupational asthma in the UK every year.

Generally occupational asthma has a good prognosis if it is identified quickly and the worker is removed from the asthmagenic agent. If there is a delay in diagnosis and removal, it is more likely to persist and deteriorate leaving workers with chronic persistent asthma and some being forced into early retirement or a career change.

Unlike pre-existing asthma, occupational asthma is preventable and curable depending upon effective control of exposure to respiratory sensitisers in the workplace and early diagnosis of the condition.

It has been estimated that 90% of the UK’s 1400 annual deaths from asthma (pre-existing and occupational) could be prevented.

1.1 Symptoms and Long-term Effects of Sensitisation

It must be noted that there are uncertainties regarding the toxicological mechanisms underlying the disease processes involved in asthma and a lack of clarity surrounding definitions used to describe this condition. However, from a regulatory perspective, a “cause” of occupational asthma is considered to be an agent (respiratory sensitiser/asthmagen) which both produces a hypersensitive state in the airways and triggers a subsequent reaction in those airways. The sensitisation process is considered to be:-

* substance specific; symptoms initially occur only in response to that substance.
* unpredictable; only some at risk will become sensitised, typically 5-25%.
* latent; most cases of sensitisation occur during the first 2 years of exposure – sometimes in the first few months – but sometimes they appear only after decades of exposure.
* irreversible; although initially symptoms disappear when exposure stops, they may reappear if exposure occurs again, even after several years.

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When a worker is sensitised, the symptoms of an immunological reaction may develop on any re-exposure. These symptoms develop at much lower airborne concentrations of the substance than those which first caused the sensitisation and well below levels which would cause other harmful effects.

Typical symptoms of respiratory sensitisation are:

***Rhinitis and conjunctivitis*** – runny or stuffy nose, sneezing, and watery or prickly eyes.

***Asthma*** – periodic attacks of wheezing, chest tightness and breathlessness.

These symptoms can occur immediately after the person is exposed to the respiratory sensitiser or several hours later. If the symptoms are delayed, they are often most severe in the evening or during the night and so the person involved may not immediately realise that the cause is work related.

An improvement in symptoms when away from work at the weekends and during holidays has been shown to be a good indicator that there is an occupational relationship between asthma and the work environment.

If exposure to the respiratory sensitiser continues unchecked, then the symptoms are likely to become increasingly severe:

* people with rhinitis, conjunctivitis (and sometimes dry coughs) may go on to develop asthma.
* asthma is likely to become more persistent.
* once asthma is established attacks may be then triggered by other agents such as tobacco smoke, cold air, exercise and stress.

However, if people are removed from exposure to the substance causing their asthma as soon as they start to develop symptoms, they are likely to make a full recovery.

1.2 Typical Asthmagens/Respiratory Sensitisers

There are many different kinds of substances (agents) that are “known” or “suspected” asthmagens/respiratory sensitisers. These include dyes, drugs, chemicals, metals and substances of animal or plant origin.

The most frequently reported agents are:

* isocyanates, found in vehicle spray paints and polyurethane foams
* flour and grain dusts
* wood dusts
* animals and their bedding, laboratory animal work
* glutaraldehyde, a chemical disinfectant in the healthcare, paper and agriculture sectors
* latex, natural rubber latex, disposable surgical gloves
* solder/colophony, mainly found in the electronics industry
* glues/resins, epoxy resins

1.3 Occupations and Asthma

Worker population studies show that workers in the following occupations are at greater risk of developing occupational asthma than others:

* Bakers and pastry makers
* Chemical workers
* Food processors

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* Laboratory animal technicians
* Nurses and healthcare workers
* Paint sprayers
* Solderers and welders
* Timber workers

It is important that everyone at risk understands the causes and symptoms of occupational asthma and the importance of early diagnosis and treatment.

2. RECOGNITION OF ASTHMAGENS

An asthmagen/respiratory sensitiser is any substance or preparation which when classified in accordance with the classification provided for by Regulation 4 of the Chemicals (Hazards Information and Packaging) Regs 2009 (Chip 4) would be in the category of danger “sensitising”, assigned the symbol ‘Xn’, the indication of danger “harmful” and the risk phrase R42 or R42/R43\* whether or not the substance or preparation would be required to be classified under those Regulations.

\* R42 May cause a sensitisation by inhalation

R42/43 May cause sensitisation by inhalation and skin contact

* In the EU the above risk phrases are assigned where the following criteria have been met:
* if there is evidence that the substance or preparation can induce specific respiratory hypersensitivity
* where there are positive results from appropriate animal tests
* or, if the substance is an isocyanate, unless there is evidence that the substance does not cause respiratory hypersensitivity.

Those substances and preparations which **currently** meet the criteria are listed in Section C of the HSE document “Asthmagens? Critical assessments of the evidence for reagents implicated in occupational asthma” and in the EC publication Table 3.2 of Part 3 of Annex VI of the CLP Regulations. For convenience, the lists are reproduced here in appendices 1 and 2 respectively.

3. ASSESSMENT OF WORK WITH ASTHMAGENS

Since asthmagens are substances hazardous to health, there is a requirement under Regulation 6 of the Control of Substances Hazardous to Health Regulations (NI) 2003 (COSHH) to conduct a “suitable and sufficient” risk assessment of the health risks posed by work with them.

Detailed guidance on COSHH risk assessment is available elsewhere, i.e. from the University Safety Service, its website at [www.qub.ac.uk/so/webpages/guidance.htm](http://www.qub.ac.uk/webpages/guidance.htm) and from Local/Departmental COSHH Supervisors.

However, in view of the debilitating nature of occupational asthma, especial care must be taken in conducting a risk assessment of work involving asthmagens.

In particular, the risk assessment must identify any substances – either used in the process, or generated by the process – with the potential to cause respiratory sensitisation. The priority is then to explore the practicability of preventing exposure to these substances by:

(i) substituting the asthmagens used with non-sensitising or less potent alternatives.

(ii) modifying the process to prevent the generation of asthmagens, or.

(iii) modifying the process to prevent any generated asthmagens from becoming

airborne.

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If it is not possible to prevent exposure, the risk assessment must set out clearly the control measures required to ensure that the exposure remains as low as reasonably practicable. (Section 4).

In addition, the risk assessment must address carefully:

* the identification of all people at risk. For example, all persons working with laboratory animals, or in areas where laboratory animals are housed, are at risk. These people would include research, technical, cleaning and maintenance staff.
* the arrangements for monitoring exposure and for health surveillance (see below).
* the arrangements for the provision of information, instruction, training and supervision for those in contact with asthmagens. For example, it is recommended that such people are provided with the HSE information card “Breathe Freely”.

3.1 Air Monitoring

Routine exposure monitoring may be appropriate in some instances, but it should not generally be necessary for most research projects provided that the reliability and suitability of chosen control measures are carefully considered and the control measures are properly used and maintained.

It should be noted that if any individual develops occupational asthma, subsequent attacks may be triggered by extremely low, even undetectable, levels of exposure to the asthmagen. In such instances air monitoring is of limited value.

Further information on air monitoring should be obtained from the University Safety Service.

3.2 Health Surveillance

Health surveillance is appropriate for all persons exposed to, or liable to be exposed to, a substance which may cause occupational asthma.

Therefore all such persons involved in a process or project using or generating asthmagens must be referred to the Occupational Health Physician (by their supervisor/line manager) for assessment **prior** to the work commencing. The Occupational Health Physician should also be provided with full details of the process/project and the relevant COSHH risk assessment in order that he/she can determine the extent and frequency of health surveillance. The Occupational Health Physician will also provide advice on how appropriate health records will be maintained by management (Appendix 3).

4. CONTROL OF EXPOSURE TO ASTHMAGENS

Under Reg 7(3) of COSHH, if it is not reasonably practicable to prevent exposure to asthmagens, then appropriate protection measures must be applied in the following order of priority:

(i) *Design the work process to contain, limit and control the formation of airborne contamination*. So far as is reasonably practicable, totally enclose the process i.e. use a glove box. Avoid grinding operations which generate dust. Avoid the use of blenders, sonicators, vigorous mixing or shaking. Use spill trays.

(ii) *Control exposure at source by the use of local exhaust ventilation supplemented with appropriate organisation measures*. For example, work in a fume cupboard. Limit the scale of the work to minimise the quantities of asthmagens used or generated. Minimise the number of persons who could be exposed to asthmagens by restricting access to the process area to authorised personnel only. Prohibit eating, drinking, smoking and the use of cosmetics in the process area and other areas that could become contaminated with

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asthmagens. Exclude personal items from the process area to prevent the spread of contamination outside that area. Provide and maintain adequate hygiene measures to prevent the spread of contamination. Carefully demarcate with appropriate signage those areas that could become contaminated with asthmagens.

(iii) *Provide suitable personal protective equipment (PPE)*. This should include respiratory protective equipment (RPE), gloves and protective clothing (labcoats/overalls). Advice on the choice, use of RPE and face-fit-testing for negative pressure masks should be obtained from the University Safety Service but would normally include full-face powered respirators and “P3” grade disposable face masks. Protective clothing must be worn over personal clothing in the process area to prevent it becoming contaminated. Similarly, protective clothing should be stored separately from any personal clothing to prevent cross contamination. All protective clothing should be laundered at regular intervals to prevent the build up of respiratory sensitisers on it.

The application and use of the above control measures for work with asthmagens should be incorporated into standard operating procedures or local rules. These procedures will give details of safe working practices. Ideally such procedures and local rules should be presented to the appropriate local safety committee for approval prior to commencement of the work.

5. MANAGEMENT OF WORK WITH ASTHMAGENS

It is the supervisor’s/line manager’s duty to ensure that his/her workers (research workers) receive adequate information, instruction and training **before** commencing work with asthmagens. The workers should be provided with information covering:

* the typical symptoms of asthma.
* the nature of any substance likely to cause occupational asthma to which they may be exposed.
* the likelihood that once sensitised occupational asthma could become permanent. The effect of future exposures to the sensitising agent.
* the procedures for reporting the symptoms of asthma.
* and the importance of reporting immediately any symptoms that may indicate that occupational asthma has occurred.
* Appropriate training should be given in respect of:
* the correct use and maintenance of RPE and other control measures.
* work practices which prevent or reduce the emission of asthmagens into the atmosphere of the process area and the outside environment.
* any emergency procedures.

The supervisor/line manager should set out procedures for responding to a confirmed new case of asthma, which may be occupationally related.

These procedures should include the measures to:

* protect the person(s) involved while the cause of the symptoms is investigated (ie halt the process or remove the person from the process).
* review the risk assessment and the control measures currently in use.

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* report the case to the Occupational Health Service and the University Safety Service.

In consultation with the Occupational Health Physician, it is the supervisor’s/line manager’s duty to ensure that his/her workers report on time for the appropriate health surveillance. It is also his/her duty (in consultation with the Occupational Health Physician) to ensure adequate procedures are in place for the maintenance of health records for each individual worker placed under health surveillance.

Finally, it is the supervisor’s/line manager’s duty to ensure that workers are following agreed procedures or working to agreed local rules.

6. REFERENCES

Approved Codes of Practice and Guidance : Control of Substances Hazardous to Health (5th Edition), HSC.

Medical Aspects of Occupational Asthma, Guidance Note MS25, HSE

Managing Asthma : Out of Breath and Out of Work, TUC

EH40/200X Workplace Exposure Limits and Supplement 200X, HSE

Preventing Asthma at Work, How to Control Respiratory Sensitisers, HSE

Occupational Asthma: A Guide for Employers, Workers and their Representatives, BOHRF.

Occupational Asthma: A Guide for Occupational Physicians and Occupational Health Practitioners,BOHRF.

Guidance Note EH76 : Control of Laboratory Animal Allergy,HSE.

Respiratory Protective Equipment: Face Fit Testing Policy.

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*Approved by: Chemical Agents Advisory Committee*

APPENDIX 1 ASTHMAGENS

Asthmagens? Critical assessments of the evidence for agents implicated in occupational asthma.

α - amylases

Azodicarbonamide

Bromelains

Carmine

Castor bean dust

Cephalosporins

Chloramine-T

Chloroplatinates and other halogenoplatinates

Chromium (VI) compounds

Cobalt (metal and compounds)

Cockroach material

Coffee bean dust

Cow epithelium/urine

Crustacean proteins

Diazonium salts

Egg proteins

Ethylenediamine

Fish proteins

Flour dust

Grain dust

Glutaraldehyde

Hardwood dusts

Henna

Ispaghula

Isocyanates

Laboratory animal excreta/secreta

Latex

Maleic anhydride

Methyltetrahydrophthalic anhydride

Nickel sulphate

Opiates

Papain

Penicillins

Persulphates

Phthalic anhydride

Piperazine

Psyllium

Reactive dyes

Rosin-based solder flux fume

Softwood dusts

Soybean dust

Spiramycin

Storage mites

Subtilisins

Tetrachlorophthalic anhydride

Trimellitic anhydride

APPENDIX 2 ASTHMAGENS

Table 3.2, Part 3, Annex VI, CLP Regs

**R42 May cause sensitisation by inhalation**

Cellobiohydrolase, exo-

Chymotrypsin

Cellulase

8,9-dinorborn-5-ene-2,3-dicarboxylic anhydride

Ficin

β-glucosidase

4-isocyanatosulphonyltoluene

Methyl 2- (isocyanatosulfonylmethyl) benzoate

(1S,4R,6R,7R)-(4-nitrophenylmethyl)3-methylene-1-oxo-7-phenylacetamido-cepham-4-carboxylate

(1S,3S,5R,6R)-(4-nitrophenylmethyl)-1-dioxo-6-phenylacetamido-penam-3-carboxylate

1,5-naphthylene diisocyanate

Pepsin A

Proteases

Proteinase, microbial neutral

Rennin

Tetrasodium 5’-(4,6-dichloro-5-cyanopyrimidin-2-ylamino)-4’hydroxy-2,3’-azonaphtalene-1,2’,5,7’-disulphonate

Trypsin

**R42/43 May cause sensitisation by inhalation and skin contact**

7-amino-3-((5-carboxymethyl-4-methyl-1,3-thiazol-2-ylthio) methyl)-8-oxo-5-thia-1-azabicyclo [4,2,0] oct-2-ene-2-carboxylic acid

Ammonium dichromate

Benzene-1,2,4,5-tetracarboxylic dianhydride

2,5-bis-isocyanomethyl-bicyclo[2.2.1]heptane

tButyl (5S,6R,7R)-3-bromoethyl-5,8-dioxo-7-(2-(2-phenylacetamido)-5-thia-1-azabicyclo [4.2.0]

oct-2-ene-2-carboxylate

Cyclohexane-1,2-dicarboxylic anhydride

Diamminediisocyanatozinc

Diammonium hexachloroplatinate

Diammonium tetrachloroplatinate

Dicyclohexylmethane-4-4’-diisocyanate

Diphenylmethane-4-4’-diisocyanate

Diphenylmethane-2-2’-diisocyanate

Diphenylmethane-2-4’-diisocyanate

Ethyl-2-(isocyanatosulphonyl)benzoate

Hexachloroplatinic acid

Hexahydromethylphthalic anhydride

Hexamethylene-diisocyanate

Hexamethylenetetramine

o-(p-isocyanatobenzyl) phenyl isocyanate

3-isocyanatomethyl-3,5,5-trimethylcyclohexyl isocyanate

4,4’-methylenedi (cyclohexyl isocyanate)

4,4’-methylenediphenyl diisocyanate

2.2’-methylenediphenyl diisocyanate

Maleicanhydride

Methylenediphenyl diisocyanate

Phenylethylisocyanate

Potassium Dichromate

2-(3-[prop-1-en-2-yl]phenyl)prop-2-yl-isocyanate

(ii)

APPENDIX 2 continued

Pyromellitic dianhydride

Sodium dichromate

Tetrachlorophthalic anhydride

1,2,3,6-tetrahydro-3,6-methanophthalic anhydride

(1α, 2α, 3β, 6β) -1,2,3,6-tetrahydro-3,6-methanophthalic anhydride

1,2,3,6-tetrahydro-4-methylphthalic anhydride

1,2,3,6-tetrahydro-3-methylphthalic anhydride

Tetrahydromethylphthalic anhydride

1,2,3,6-tetrahydromethylphthalic anhydride

Tetrahydro-4-methylphthalic anhydride

2,3,5,6-tetrahydro-2-methlphthalic anhydride

1,2,3,6-tetrahydrophthalic anhydride

Toluene-di-isocyanates

S-(3-trimethoxysilyl)propyl-19-isocyanato-11-(6-isocyanatohexyl)

-10,12-dioxo-2,9,11.13-tetrazanonadecanethionate

APPENDIX 3 HEALTH RECORD PARTICULARS

The following particulars, approved by the HSE, must be kept for each individual placed under health surveillance.

(a) Identifying details:

(i) surname and forenames

(ii) gender

(iii) date of birth

(iv) permanent address

(v) National Insurance number

(vi) date of when work with asthmagens commenced and history of exposure to

asthmagens.

(b) Health surveillance results

(i) dates when carried out

(ii) by whom

(iii) conclusions regarding fitness for work.

The health record must not contain clinical data. The records must be kept for at least 40 years.