HEALTH AND SAFETY AUTHORITY

Medical Guidance Notes on Occupational Asthma

Lung Disorders

Occupational Lung Disorders can result from the inhalation of substances which cause asthma, airway irritation and pulmonary oedema, fibrosis, bronchitis, emphysema, pleural disease, infection or even cancer.

Occupational Asthma

Occupational asthma is reversible airways obstruction due to inhalation of a Respiratory Sensitising Agent present in the workplace. First it must be prevented by the assessment and control of Respiratory Sensitisors at work.

If unrecognised or inappropriately treated it can lead to serious morbidity but detection and intervention when early signs or symptoms are present may prevent further functional impairment.

Occupational asthma should not be confused with other Occupational Respiratory disorders such as Bronchospasm and Inflammation due to respiratory irritants, occupational bronchitis or Extrinsic Allergic Alveolitis (Farmer's Lung).

Sensitisation

Sensitisation is an Immunological Mechanism whereby initial exposure to an agent causes changes in the immune system so that future exposure, to minute amounts below those that are associated with irritation can cause further episodes of asthma. Sensitisation may occur a few months or even years after first exposure. The mechanism is ill defined and in some cases no antibodies are detected in serum.

The initial risk of development of sensitisation may be increased if:-

a Transient high concentrations of the sensitiser are present such as in cases of spillage or during maintenance of equipment.

b If the substance is also an irritant.

Atopic individuals may be more susceptible to the effects of higher molecular weight compounds (>5000 daltons) that produce specific IgE antibodies but equally may be less susceptible to asthma induced by low molecular weight compounds that don't induce specific IgE antibodies e.g. isocyanates.

The response patterns of sensitised individuals are of three kinds:-

1 Immediate reaction occurring within minutes and resolving after one hour.

2 Late Phase reactions beginning four hours after exposure and lasting 12 to 24 hrs. Such a reaction is often associated with non-specific bronchial hyper-reactivity.

3 Mixed reaction - a combination of the above.

Appendix I contains a list of recognised sensitisers and includes high molecular weight proteins and low molecular weight proteins and low molecular weight chemicals. Chemicals which may cause sensitisation by inhalation are given EU risk phrase R42, at present this is not an extensive list but is constantly being updated, the fact that a chemical does not have an R42 classification does not mean it will not result in Occupational Asthma if inhaled.

Respiratory Irritants

Respiratory Irritants (eg sulphur dioxide, chlorine) will cause bronchospasm and airway inflammation without relying on immunological mechanisms. If an acute exposure to a severe irritant is of sufficient concentration or duration then pulmonary oedema may develop and result in a tragic outcome if not referred and treated immediately. Bronchial hyper-responsiveness may occur after a single exposure to a high concentration of a respiratory irritant, so called Reactive Airways Dysfunction Syndrome (RADS). It is often difficult in practice to distinguish between respiratory irritants and sensitisers since they both result in bronchospasm and inflammation. Referral to a specialist for skin tests, serum IgE, specific antibody measurements, bronchial provocation tests or tests of bronchial hyperreactivity may be indicated.

Exposure to respiratory sensitisers only causes sensitisation in a certain percentage of those exposed whereas exposure to respiratory irritants will cause symptoms in 100 percent of those exposed to a sufficiently high concentration. The concentration of an irritant that causes symptoms is usually at or above the Occupational Exposure Limit (OEL) so that health surveillance should not be necessary for irritants if good occupational hygiene measures (eg Local Exhaust Ventilation) are used to reduce the concentration of the irritant in the atmosphere to below the Occupational Exposure Limit.

Health Surveillance

Pre-Employment

Workers exposed to Respiratory Sensitisers should be informed of the risks associated with such work and should have health surveillance provided by the employer if the risk is significant. If the risk of exposure is reduced by means of effective local exhaust ventilation then health surveillance by means of annual respiratory questionnaire is adequate, where the control measures however rely mainly on personal respiratory protection (or other voluntary means) then health surveillance by means of lung function tests is necessary. Those who currently suffer from asthma and are on treatment should should not work with respiratory sensitisers but a history of Atopy should only be used in selection criteria in situations in which Atopy has been demonstrated to be a significant risk factor for that particular sensitiser. In those who already have asthma, dusts, smoke, solvents, and other agents may trigger an asthmatic attack, this is usually an immediate response without a late phase response as would be the case for a Respiratory Sensitiser.

A suitable questionnaire should be completed, (Appendix II), and clinical examination including base line spirometry performed prior to exposure. The parameters measured by spirometry should include Forced Expiratory Volume in one second (FEVI), Forced Vital Capacity (FVC) and the Forced Expiratory Ratio (FER=FEVI/FVC).

Routine Follow Up

This should be planned and implemented in consultation with suitably qualified health professionals and should include the criteria for referral from nurse to doctor and doctor to specialist when indicated. It should be carried out 3 months and 12 months after the job commencement and annually thereafter. The results and their significance should be explained to individual employees. The respiratory-based questionnaire should be performed and compared to the pre-employment values.

Abnormalities on routine health surveillance which require further assessment include any of the following: -

1 Positive response to the Respiratory based questionnaire.

2 Fifteen percent decrease in FEVI over a one year period.

3 Forced expiratory ratio (FEVI/FVC) less than 70 percent may be unusually low.

Further assessment may include serial peak flow diary measurements (4 hourly); pre and post shift FEVI recordings or direct referral to a Respiratory Physician. Specific bronchial challenge testing is potentially dangerous and should only be performed by suitably qualified physicians when investigating a possible new

sensitising agent but is not justified in subjects exposed to well known sensitisers.

A diagnosis of occupational asthma should only be made after a suitable history and supplementary objective tests are undertaken. Immunological tests are available in cases of exposure to platinum salts, acid anhydrides, laboratory animals/insects that will confirm sensitisation. The doctor should decide at the first consultation if the subject should continue working whilst the question of occupational asthma is being assessed (peak flow diary), a rapidly developing course of symptoms should prompt immediate removal as fatalities from occupational asthma do occur. Physical examination for evidence of rhinitis or sinusitis and rhonchi or hyperinflation of the lungs should be carried out.

The FEVI measurement is a better measure of small airway diameter, less subject to the individuals effort and is therefore preferable to an isolated peak flow measurement. The subject should slacken any tight clothing and remove loose dentures. Strong verbal encouragement should be given during the actual test, where multiple subjects are being tested and no one objects, allowing subjects to observe previous testing is a good idea. Submaximal effort, for whatever reason, by the subject will affect FEVI and FVC readings but experienced pulmonary Function Technicians should be able to recognise this.

Clues that they look for include: -

- Failure to inspire to total lung capacity
- Failure to give reproducible results
- Lack of change in facial expression or colour during expiratory manoeuvres
- Failure to exhale to residual volume or
- Simply lack of forceful effort

The Key To Prevention

The secondary prevention which medical surveillance provides is not as good as the primary prevention which good occupational hygiene practices ensure and therefore health surveillance on its own is not an acceptable control means.

Appendix I

Substances Causally Associated with Occupational asthma

List of Sensitisers

Isocyanates* R42
Flour/grain*
Colophony based soldering flux* R42
Laboratory animals*
Other animals
Wood dusts*
Phthalic, Maleic, Trimellitic Anhydrides*R42
Fungi-mushrooms
Antibiotics
Crustaceans and fish
Ethylene diamine R42
Azodicarbonamide R42
Proteolytic enzymes*
Platinum salts* R42
Cobalt and its salts R42
Nickel and its salts R42
Coffee and soya beans
Persulphate salts R42
Reactive dyes e.g. Triazine R42
Glues and epoxy resins
Tetrsodium dichloro cyano pyrimidinyl amino hydroxy R42
Diammine diisocyanotozinc R42
Diepoxy butane R42
Glycidol R42
Glutaraldehyde R42
Propyl isocyanato isocyanatohexyl R42
Methenamine (hexamethylenetetramine) R42
Dicarboxylic anhydride R42

*Occupational Prescribed Disease by the department of Socilal Welfare.

Appendix II

Occupational Respiratory Questionnaire

Any questionnaire on subjects at risk of occupational asthma should include questions on the following.

Self-Administered Section

1 Company/organisation identification details, including names of occupational health staff.

2 Employees identification details, including D.O.B., height, sex, GP, RSI number, ethnic group.

3 Job title, job description, substances potentially exposed to, extent of exposure – (high, medium, low) as determined by frequency of use and process description. The use of personal protective equipment, local exhaust ventilation and any concentration measurements of substances present should be noted.

4 Systems review to include:-
- Irritation of eyes, nose or throat
- Wheezing
- Cough
- Shortness of breath
- Chest tightness
- Chills or fever
- Headache
- Muscle or joint pains
- Skin rash
- Sleep disturbance

If yes to above, when are symptoms most noticeable?

How long do symptoms last for? Are the symptoms improving, worsening or staying the same?

5 Details of sickness absence in last year

Medically Administered Section

6 Past medical history to include history of asthma, Allergic rhinitis, Sinusitis, Nasal polyposis, Eczema, Bronchitis, details of previous pulmonary function tests.

7 Family history.

8 Previous occupational history: - previous employers, job description, substances exposed to, has ill health ever forced a job change.

9 Social History: - smoking, current or prior, with details of number/day and duration. Passive smoking at home or work. Hobbies and pets.

10 Medication to include intermittent Aspirin or Beta blockers.

11 Allergies, drug and environmental.

12 Current medical complaints.

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