Allergy Best Practice Guide

MRC will provide a safe environment and employ best practice to ensure health, safety and welfare within the workplace. This document sets the expected best practice guidance for employees and visitors to avoid work related allergies.

Directors' summary

This document gives a brief background to the causes of allergies. The incidence of allergic reactions is on the increase and the potential impact of developing an allergy on the health and career of an individual can be potentially serious. Loss of an individual from a team may also lead to serious disruption of the research programme.

Within the workplace four main groups of allergens have been identified which are:

- Laboratory animals and insects
- Latex products
- Certain antibiotics
- Specific chemicals

Directors and team leaders should take note of this guidance and in particular,

- Raise staff awareness to the risks of exposure to allergens and potential sensitising substances
- Identify those individuals who may be exposed to known allergens
- Ensure that all air handling systems used to control exposure to airborne allergens are regularly serviced and maintained to a high standard
- Ensure that appropriate health surveillance programmes are in place
- Encourage a disciplined approach to good hygiene practices when handling known allergens and potential sensitising substances

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**Guidance notes**

**General guidance on allergy**

Healthy individuals develop immunity to many infectious diseases by producing antibodies. The body produces antibodies in response to a substance known as an antigen (a protein belonging to the invading agent). The antibody combines with the antigen forming an inert compound thus inactivating the infectious agent. The body has then been immunised against that specific infective agent.

Allergy is thus the body's defence mechanism acting in times of no danger. Von Pirquet (1905) first described allergy as an abnormal reaction to foreign proteins. This is not the whole picture as the antigens of allergy include drugs and other chemicals, and even chemical elements. These simpler substances are thought to combine with a protein in the body to form a new "foreign" protein, which triggers the production of antibodies.

The principle antibody that participates in allergic reactions is immunoglobulin E, or IgE. This antibody signals cells such as basophils, mast cells and other cell types to release chemicals, one example of which is histamine. It is the release of these chemicals that cause the familiar allergic reactions.

There is no adverse reaction to the first encounter with an allergen, except that the body produces antibodies and becomes "sensitised". Subsequent exposure to the same allergen will cause the antibodies to react with it and symptoms to be exhibited.

As the antibodies of allergy tend to link themselves to particular tissues the symptoms of the allergenic response depends on the tissue involved, e.g. if antigens meet corresponding antibodies in the skin they may cause urticaria or eczema.

It is estimated that one third of the population will become sensitive to common environmental respiratory sensitisers. The most common allergy is the condition termed rhinitis and conjunctivitis which normally results in itchy prickly eyes and a running nose and is known by most of us as "hay fever". The agents responsible for this reaction can be grass pollens or house dust mites. Individuals who develop this type of allergy are referred to as being "atopic". Fortunately for most of us it is only a minor inconvenience. Others are less fortunate and develop severe reactions to certain substances which can make their lives miserable. Severe reactions can result in asthmatic attacks and in certain instances can be life threatening. The foreign agent which causes the body's immune system to respond in such a manner is termed the allergen and the allergic response as sensitisation. The two thirds of the population who are fortunate not to develop allergenic reactions are referred to as being "non-atopic" individuals.

**Types of allergy**
Although the range of allergenic diseases is large they are all symptoms of the same fundamental effect. Allergies are classified by the symptoms observed in the individual. Six classes or type of allergy have been recognised.

**Type I Hypersensitivity (atopic or anaphylactic)**

**Type II Hypersensitivity (cytotoxic)**

**Type III Hypersensitivity (immune complex initiated hypersensitivity, immune complex hypersensitivity, immune complex reaction)**

**Type IV Hypersensitivity (delayed or cell-mediated)**

**Type V Hypersensitivity (stimulating antibody)**

**Type VI Hypersensitivity (antibody dependant cell mediated cytotoxicity (ADCC))**

**Type I Immediate hypersensitivity**

Examples include Allergic Rhinitis, Intrinsic Asthma and Anaphylactic shock

In Type I the symptoms are almost certainly due to the production of histamine. The end result of the release of histamine is blood vessel dilation and a narrowing of the airways. Included are urticaria, hay fever, laboratory animal allergy, some cases of asthma and some digestive disturbances. Symptoms take typically fifteen minutes to become really obvious.

**Type II Hypersensitivity**

This hypersensitivity reaction destroys cells because the antibody-antigen reaction itself leads to the release of toxic substances.

An example is Goodpasture’s syndrome. This is an autoimmune disorder resulting in a decrease in both the function of the kidneys and lungs due to the accumulation of antibodies in small capillaries.

**Type III Hypersensitivity**

Here large numbers of antibody-antigen complexes accumulate resulting in inflammation that damages tissues.

An example is Systemic lupus erythematosus. Lupus can affect many parts of the body leading to painful and swollen joints, extreme fatigue, skin rashes and kidney problems.

**Type IV Hypersensitivity**
This is characterised by delayed or cell-mediated reactions. There are three recognised reactions in this group.

1. **Contact hypersensitivity**

   This is characterised by a reaction at the site of contact with the allergen. It is an epidermal response often elicited by small molecules called “haptens”; The reaction normally decreases 48-72 hrs following exposure. A variety of cytokines are involved in this reaction.

2. **Tuberculin hypersensitivity**

   The skin test for tuberculosis is of this nature. It occurs when soluble antigens for example of mycobacteria are introduced subcutaneously. The reaction is induced by cellular migrations and activations involving macrophages and T-cells and other cellular mechanisms including the expression of specific antibodies by lymphocytes and macrophages.

3. **Granulomatous hypersensitivity**

   This is characterised by lesions and macrophage migration. Some particulate matter such as talc or silica is responsible for initiating this reaction.

**Type V Hypersensitivity**

In type V reactions IgG antibodies react with specific tissue receptors for example in Graves’s disease. Here the immune system leads to an over stimulation of the thyroid.

**Type VI Antibody dependant cell mediated cytotoxicity (ADCC)**

In this reaction target cells coated with antibody are recognised and destroyed by specialised killer cells. which bear the Fc portion of the coating antibody.

**Anaphylaxis**

Anaphylaxis is the term used for serious and rapid Type I allergic reactions usually involving more than one part of the body which, if severe enough, can be life threatening.

Some products or organisms responsible for allergens known to cause anaphylaxis are:

- Latex, in surgical gloves, catheters and other medical products. Sufferers may also become allergic to certain fruit and vegetables such as bananas, avocados, kiwi fruit, figs and even tomatoes and potatoes.
- Laboratory animals/insects.
- Drugs, especially penicillins, some anaesthetics, and beta-blockers.
- Foods, especially nuts.

**Note that in cases of anaphylactic shock physical contact with the allergen may not be required. The presence of the allergen as molecules or dust in the air may be sufficient to trigger the immune response.**

**Food Sources**

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Peanut and tree nuts are the most common allergy-causing foods. However, food sources for laboratory held stocks such as fish, flies and frogs may also lead to an allergic reaction, particularly in atopic individuals.

The following food sources are known to be or suspected as allergens and care must be taken if these are in use.

1. **Fish** – the chironomid larvae (bloodworm/or red midge larvae) are used as fish food and are recognised as sensitisers.
2. **Flies** – yeast is often a food source for drosophila and yeast, in particular, candida yeast are known sensitisers.
3. **Frogs** – although relatively rare, contact dermatitis can occur when handling frogs without adequate hand/arm protection.

The following notes provide guidance on the control of risks to occupational exposure to allergens.
Animal/Insect Allergy

Introduction

Individuals who by nature of their work come into contact with animals or insects stand a greater risk than members of the general public do to becoming sensitised to animal allergens such as blood serum proteins, urine proteins, dander and bedding, and also some insects’ excretory products. Symptoms to allergies developed from exposure to laboratory animals or insects vary according to the individual affected. Many are similar to those associated with "hay fever ". However, other individuals may suffer from skin disorders (rashes or weals). A minority of individuals may develop extreme reactions to animal/insect allergens developing asthma or in rare instances anaphylactic shock.

A major concern is that it is impossible to measure safe limits for animal/insect allergens. Thus, for these allergens, work exposure limits (WELs) (these determine maximum airborne concentrations of substances to which an individual can be exposed without harmful effects) cannot be given. This criterion therefore, cannot be used either to predict the outcome of exposure to animal/insect allergens nor used to exclude individuals from employment where animal/insect contact may occur. It is also important to stress that both atopic and non-atopic individuals can become sensitised many years after their first exposure.

Design of Vivariums

The construction and engineering controls of the air handling, the ventilation and the filtration of air within animal facilities and vivaria is the primary mechanism in controlling hazards. The effectiveness of the engineering controls will have a major impact on air quality and hence the degree of risk of exposure to personnel. Animal facility managers should ensure that engineering controls are regularly inspected for visible signs of damage and that compliance testing of local exhaust ventilation systems is carried out regularly, at least every 14 months. Ventilation should be engineered to ensure that contaminated air is directed away from the user and extracted to the outside (preferably through a filter). Whenever possible rooms containing animals should be at a slight negative pressure. Cage cleaning facilities may be particularly hazardous due to the potential for dust production. For this reason local exhaust ventilation (LEV) systems must be in place, as far as it is reasonably practicable, to remove contaminated air from these areas. Wherever possible wet cleaning methods must be used. In facilities where LEV is not installed then procedures should ensure that dust is kept to a minimum. Where mini-isolators are in use then care should be taken when the filter is removed.
Local Rules of Practice

The manager of the Bio Services unit together with the safety co-ordinator must draw up local rules for users. These rules will make it clear who is authorised to enter the facility. These rules should also contain instructions for visitors and maintenance workers. They must be clearly displayed and each user and visitor must read them and sign that they understand and will follow the recommended procedures. The local rules should contain information on all of the following points.

- the managerial structure
- the training procedure for new users
- the working practices adopted within the facility
- the working practices adopted for maintenance workers and visitors
- risk assessments to ensure safe systems of work
- waste disposal procedures
- personal protective equipment, its use and maintenance.
- personal hygiene
- arrangements for health monitoring
- emergency procedures

Risk Assessments

A risk assessment for all projects must be completed before work commences. It should consider the following points.

- The task being carried out
- Animal species being used e.g. large or small
- Anaesthetic usage
- Danger from zoonoses
- Danger from infection through bites
- Occupational Health issues including relevant vaccinations

Transfer of Animals

The transfer of live animals within and between departments should be kept to a minimum. Animals should always be transported within filter-top boxes. When transfer is necessary animals should not be left in corridors, but be moved directly from one room to another.
Personal Protective Equipment

Personal protective equipment (PPE) is normally considered to be one of the last measures to be adopted in the control of risks. It is advisable that PPE is always worn when working with animals or when entering the animal housing. The local rules should state this fact and it would be good practice to ensure that PPE was available for visitors. The type of PPE worn will depend very much on the task. Please note that personal protective equipment is personal and must not be shared.

For PPE the following is recommended:

- **Animal facilities staff** - outside clothing should not be worn when entering the animal housing. Overalls, over-gowns, over-shoes, hats and where applicable, gloves should be worn. The PPE should be disposable or washable. If practicable laundry facilities should be available on the premises.

- **Laboratory staff** - those whose research brings them into frequent contact with animals should follow the guidelines for the animal facilities staff.

- **Infrequent visitors** - disposable gowns, shoes and hats should be available. In the case of regular maintenance workers overalls should be available specifically for use within the facility. Again they should be washable.

Respiratory protection

When coming into contact with animals it is important to wear a face mask. The type of face mask will depend very much upon personal circumstances, the tasks being carried out, and the efficiency of the engineering controls in regulating air quality. Care must be taken to ensure that the mask is of the correct design and comfortable. Where the risk assessment determines that a disposable face mask is required, then a quantitative face fit test must be done to ensure the wearer is protected. Remember that disposable respirators and half mask respirators with disposable filters do not offer full protection and give particular difficulties to people with small faces. These types of mask are also not suitable for staff with beards or facial hair in the region of the seal and alternatives should be sought. Other respirators, such as the Pureflo design (BS 2092) allow filtered air to pass down the face visor affording better protection to the user. Respirators must be made available for individuals who request them or require them on health grounds. These are, however, bulkier and may inhibit certain activities such as close proximity work.

Standard EN or BS masks must be used. For information on what is available contact your corporate safety adviser.
**Personal Hygiene**

This is applicable to all users.

- Changing facilities should be available separate from animal housings
- Facilities should be free of contaminated protective clothing
- Always remove outside clothing before entering animal housings
- Always wear protective PPE (as described above) in animal housings
- Always wash your hands after the removal of PPE and when exiting the animal housing
- Never eat, drink or smoke within animal housings. The only exception to this is where a dedicated staff room is provided for food and beverage consumption.

**Insectaria**

The insectarium should be designed so that the control of exposure to possible allergens follows the hierarchy of controls:

1. Engineering controls
2. Administrative controls
3. Personal Protective Equipment

**Engineering controls**

Allergen control will rely on an effective air handling system to prevent the accumulation of allergens in the air; 15-18 air changes per hour should be the standard using filtered air extracts to prevent the release of flies into the environment. Wherever possible, vented, filtered work cabinets should be used when handling insects; for instance, when turning or screening flies. Such measures will reduce exposure to airborne allergens. Insectocutors must be installed inside the exit/entrance door.
Administrative controls

Access - only to those working with the insect.
Doors - must be kept closed at all times.
Waste - autoclave prior to disposal.

Housekeeping
- avoid unnecessary storage such as books, files, bottle stocks etc.
- ensure that a clean working regime is in place and practised.
- use HEPA filtered vacuum cleaners to control dust levels.
- minimise mite infestation by having a recognised programme in place.

Competence - a recorded training programme must be in place to ensure competence of personnel. Included must be an understanding of the hazards associated with insect work.

Personal Protective Equipment (PPE)

The risk assessment will determine the need for and correct type of PPE that may be required. As a minimum the following must be in place when working in the Insectarium:

- Dedicated laboratory coat distinctly coloured.
- Disposable gloves and a disposable mask (face-fit tested) must be worn when directly handling the insects/cleaning fly trays etc.
- Clogs or overshoes must be worn in the insect room.

Health Surveillance

Although the local rules will contain information regarding health surveillance this section deals specifically with this subject.

Health Surveillance

All individuals before working with laboratory animals or insects must be seen by an Occupational Health physician/nurse and complete a health questionnaire in line with the MRC Health Promotion policy. The Occupational Health physician will advise whether a person is fit for work with animals or insects. This includes existing staff that are transferring to a project which includes animal or insect work. Staff fit to work will be enrolled onto a health surveillance programme. Health checks will normally be on an annual basis but it may be desirable to carry out checks every six months for the first two years of working with animals or insects. Detrimental changes found by these health checks or the appearance of symptoms suggestive of an allergenic response, however slight, (e.g. itchy eyes, irritable skin, dry ticklish throat etc.) during the period between health checks requires an immediate cessation of animal or insect work. The line manager or supervisor must be informed and in this case an additional Occupational Health check should be arranged. Work should not proceed until the cause of the response has been identified, and removed or controlled.
Visitors to Animal/Insect Facilities

It is advisable that other personnel who visit the animal or insect facility on an infrequent basis, for example, other laboratory staff, maintenance engineers or sales people are made aware of the possible hazards associated with potential allergens. This should be clearly laid out in the local rules and brought to the attention of these individuals. Precautionary measures should always be adopted. Visits should be kept to the minimum required.
Latex Allergy

Latex is the sap from the Brazilian rubber tree (*Hevea brasiliensis*). It is the proteins present in the sap that are the allergens. The molecular sizes of allergen proteins fall within the range of 5,000-80,000 Daltons, with the protein of molecular size of 14,600 thought to be the major allergen.

Natural rubber products have been used for many years. Allergies to some of these products have only been recognised recently. The first report was in 1979 but since this time the number of reported incidents has risen dramatically with some studies suggesting that up to 17% of individuals in employment, which brings them into contact with latex products, (laboratory workers, dental and health professionals) may be at risk. In the UK some estimates put those at risk from latex allergy around the 1.5 million mark.

Latex Products

A surprising number of products within the work place contain latex. These include:

- rubber gloves
- surgical gloves
- surgical masks
- adhesive tape
- band aid
- elastic bandages
- certain types of syringe
- bulb syringes

Symptoms of Latex Allergy

Three different types of reaction can occur:

- **Irritation** - Non allergic conditions which disappear when contact with latex ceases. The skin (contact area) is dry and crusty.

- **Delayed hypersensitivity** - Chemical allergy, the skin becomes dry and crusty eventually breaking out in sores and blisters. The response time can be up to 48h after contact. Repeated exposure results in an increase in the area affected.
• Immediate hypersensitivity - Response of the immune system can include hives at the site of contact but may also include all or some of the following:
  o itching eyes
  o swelling of the lips and tongue
  o nausea
  o abdominal pain
  o dizziness and shock.

Guidance to Managers
The sudden increase in the demand for latex products has meant that new manufacturers have come into the market offering products differing both in price and quality. Latex allergy is an issue which as a manager you should be aware of. It is not possible to determine how an individual will react to latex proteins. However it is important to respond positively and quickly to any staff under your supervision who indicate a work related problem that may be attributable to latex products:
  • Identify (if possible) what is responsible for causing the symptoms.
  • Remove the cause. If hands are affected then the probable cause will be the gloves.
  • Get the staff member to the attention of a first aid person.
  • Ensure that the incident is recorded in the accident/incident book.
  • Contact your Occupational Health provider via administration.

Control Measures
Providing the cause has been identified then further contact must be avoided. If the gloves caused the reaction then using latex free gloves or non-powdered latex gloves may be the answer. If the cause is not immediately identifiable then all procedures which the staff member is doing should be carefully examined. Remember that the reaction may arise from activities or procedures carried out by someone else. For example, the presence of latex dust in the atmosphere may be the cause.

Testing Staff for Latex Allergy
Staff can be tested for latex allergy. Normally a skin test will tell whether a person is sensitised to the latex proteins. Other more sophisticated tests are available. The Occupational Health provider can arrange these and other tests. The Unit administrator or Unit Safety Co-ordinator will advise you on how they can be contacted.
Antibiotics

Antibiotics are used in laboratories for a number of purposes. In genetic modification experiments they are used as tools to select bacteria transformed with one or more plasmids carrying specific antibiotic genes. In tissue culture some media preparations contain antibiotics against both bacteria and fungi. There are reported cases of researchers becoming sensitised to certain antibiotics. Conditions such as "hypersensitivity syndrome reaction" (HSR) and "serum sickness like reaction" (SSLR) are well documented. These allergies occur particularly with the tetracyclines and the ampicillins.

This note is simply to draw awareness to the risk that may arise from using antibiotics.

Problems Which May Arise

Most individuals weigh out the powder form of the antibiotic and this is where contact is most likely. Inhalation of the antibiotic powder as a fine particulate dust can lead to sensitisation of the airways by the processes discussed earlier. This can then lead to major health problems for the individual.

Control Measures

The message here is simple. Avoid inhaling the antibiotic powder.

1. Open and weigh the antibiotic within a fume cupboard or cabinet that is removing air away from the individual eg microbiological safety cabinet Class I or II, not on the open bench.

2. Always wear gloves, a laboratory coat and when necessary, respirator,

3. Prepare and store concentrated solutions. Aliquot into smaller volumes and store in the freezer thus reducing unnecessary exposure to the powder.

Symptoms

Symptoms of antibiotic allergy are rhinitis, conjunctivitis, runny eyes and wheezing.

Persons experiencing these symptoms after working with antibiotics must:

• Cease working with antibiotics immediately

• Report their symptoms to their supervisor or line manager

• Record the incident in the accident/incident book

Seek advice from the Occupational Health provider (see the unit administrator).
Guidance Note 4

Chemicals

Introduction

A large number of substances have been identified as causative agents of contact dermatitis. Contact dermatitis can result from contact with chemicals or chemical elements that either directly irritate the skin or have the potential to cause an allergic reaction.

The first group causes the condition 'irritant contact dermatitis'. These chemicals cause cell damage if in contact with the skin in sufficient concentration for a sufficient time. The second group cause the condition known as 'allergic contact dermatitis' and these are known as 'sensitisers'.

Examples of 'sensitisers':

- Metals such as nickel, chromium or salts of chromium
- Epoxy resins and methacrylate adhesives
- Aldehydes such as formaldehyde and gluteraldehyde.

The relationship between irritant potential, concentration and skin contact time is important in the development of dermatitis. Only small amounts of some sensitising agents may be required to induce allergy but once the allergic condition is induced minute amounts of the same substance may be all that is required to activate the dermatitis.

Once sensitisation has occurred allergic dermatitis may occur in any area of the skin and not necessarily in the area where sensitisation first occurred. Sensitisation may occur after a single exposure to a certain chemical or after many exposures over many years. It is impossible to predict the initiation of sensitisation but we do know that the higher the concentration of exposure and/or the longer the chemical is in contact with the skin the more likely it is that sensitisation will occur.

Prevention

Before using any chemical a risk assessment should be performed. This should not be an onerous task and takes only a few minutes. The label on the chemical container should identify whether it is an 'irritant' and/or a 'sensitiser'.

- If it is an 'irritant' or 'sensitiser' then the following questions need to be asked in the risk assessment.
- Can I substitute for something less hazardous?
- Can I reduce the amount used?
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- Can I enclose the work so exposure can be avoided?
- What engineering controls can I use, e.g. fume cupboards, to prevent exposure?
- If none of the above provide adequate protection, what personal protective equipment should I use?

When using chemicals it is important to use the right protective gloves for the job. Latex gloves offer little protection against solvents and many organic chemicals. PVA gloves are impenetrable to most organic solvents but dissolve in water. Always seek advice from the glove supplier to the glove's suitability for the task.

There is also no substitute to good laboratory hygiene for reducing the risk of contact dermatitis and allergy.

**Monitoring**

It is essential when working with chemicals classed as irritants that you inspect your skin regularly, especially your hands and face, for signs of dermatitis.

The symptoms vary from very dry patches through urticaria to a severe, debilitating inflammation.

If you suspect that you have contact dermatitis inform your supervisor immediately and request, through the unit administrator, a consultation with the Occupational Health provider. The Occupational Health physician will be able to advise on how to treat the condition and how to prevent recurrences. The Occupational Health provider will also liaise with your GP.
Guidance Note 5

Reporting Procedures for Allergenic Sensitisation

It is important to ensure that the correct reporting procedure is followed with any suspected allergenic reaction. The reason is that the extent of the allergy may not be immediately apparent either to the person affected or to medical personnel dealing with the case. What initially may appear to be relatively trivial may develop into a serious medical condition.

Therefore it is important to:

• refer the individual to the Occupational Health provider
• record a detailed description of the case
• record the agents involved, the type/make of personal protective equipment used
• record details of any engineering controls in place at the time and their maintenance status
• record the name and position of the reporting officer.

It is important for this information to be accurately collated since any deterioration in the condition that results in future absences from work for some time may require notification to the Health and Safety Executive.

This data may also be used to determine the correct medical treatment and provide evidence in any civil action that may arise.