Background information

Approximately one-third of people will suffer from an allergy at some time in their life. For example, about 15% of people are affected by hay fever at some time in their lives, and one in six children suffer from skin conditions associated with allergy, especially eczema. In the Western world, asthma is the most common chronic disease of children (13% of children in the USA and 11% of children in the UK have asthma). Food allergies, particularly to peanuts, are increasing at a dramatic rate, although they are still relatively uncommon, as is allergy to bee/wasp stings.

Allergies are generally a disease of prosperous countries. For example, the risk of children having asthma is affected by their race, and the climate, altitude and conditions they live in. Very few children suffer from asthma in regions such as India, Japan and rural Gambia. The rapid increase in incidence in the Western world is thought to be due to changes in the environment and lifestyle. An example of this process is seen in the rapid increase in allergic diseases being detected in Eastern European countries that are gradually assuming a Western European way of life. Modern-day pollution, in particular the high levels of nitrogen oxide emissions from diesel engines, may be an important factor in the increase in allergic disorders. Although this debate continues, there is no doubt that conditions such as hay fever and asthma are exacerbated on days of high pollution.

Indoor pollution is a major contributor to the epidemic of allergies seen today. In modern houses, fewer chimneys, careful insulation, double glazing and central heating all contribute to a general decrease in air flow throughout the rooms. As a result, humidity levels are high. In addition, soft furnishings and fitted carpets provide the ideal environment for house dust mites (the faeces of which are a common cause of allergy) and for the retention of allergens from pets, fumes from unventilated gas cookers, cigarette smoke, and fumes and vapours from household chemicals and sprays. This mixture of allergens and irritants in the unventilated home environment is likely to be a major cause of the rapid increase in allergic diseases seen today.

Allergies run in families. The allergic reaction begins early in life in people who are genetically predisposed. Exposure to allergens in a baby’s first year leads to the production of the allergy antibody, IgE. The amount of exposure at this time is crucial. For example, a child exposed to high levels of house dust mite in the first year of life is more likely to develop asthma in childhood. Similarly, children born in the pollen season are much more likely to suffer from hay fever.

Table 2 summarizes the symptoms of and available treatment for some common allergies.

Class discussion 1

Take a quick survey within the class about allergies, for example by a show of hands as to who is allergic to pollen, penicillin, elastoplast, sea food, chocolate, bee/wasp stings, dust, animals, etc. Record pupils’ responses on a blackboard or flipchart.

If possible, ask an asthma/eczema sufferer before the session whether they would explain their symptoms and treatments of their condition. What personal and social problems do they suffer from? Is their work affected? Are they irritable, lacking in self-confidence, self-conscious about their appearance? Do their symptoms restrict their social life? Are they in danger from their allergy?
This could lead into a more general discussion of other allergies (see Table 2).

(20 minutes)

**Group work**

Split the pupils into groups and instruct them to use pages 56–64 of the book to help them to complete the worksheet on ‘Allergy’.

(15 minutes)

**Class discussion 2**

Using the worksheet (and Table 2) as a basis, discuss the body’s immune reaction to an allergen in asthma. Discuss the various treatments that are available.

Consider the following questions:

(i) Drugs that actually prevent the allergic response are more effective than those that attack the symptoms. Such drugs are similar to glucocorticoid steroids, which are produced naturally in the human body (page 64). Explain why such drugs are not used regularly with children.

(Answer: These drugs stop immune cells making many of their powerful chemicals, but, most importantly, prevent them from invading the lungs. They are not normally used with children because of their serious side-effects, particularly on the immune system and growth.)

(ii) Immunotherapy involves exposing someone to the substance they are allergic to so that eventually they begin to tolerate it. Why is this treatment used so rarely?

(Answer: Immunotherapy is only used in very serious cases because it may provoke such a powerful allergic response that the patient’s life can be endangered.)

(15 minutes)

**Class discussion 3 (as a separate session)**

(i) Consider the impact of pollution and stress in modern cities on the incidence of allergies.

(ii) Discuss the pros and cons of traffic-free zones and/or car-sharing schemes.

(30 minutes)
<table>
<thead>
<tr>
<th>Allergy</th>
<th>Allergen</th>
<th>Allergic response</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAY FEVER</td>
<td>Pollen from trees and flowers.</td>
<td>Sneezing, runny nose, itchy and watery eyes; caused by widening of blood vessels and irritation of nerve endings.</td>
<td>Anti-histamines: stick tightly to histamine receptors thereby preventing histamine itself from working.</td>
</tr>
<tr>
<td>ASTHMA</td>
<td>Pollen and spores of fungi, faeces of house dust mite, feathers, animal fur, some foods (e.g. peanuts). Cigarette smoke, air pollution, cold air exercise and lung infections can all make asthma worse.</td>
<td>Wheezing and coughing due to spasms in the muscles of the tiny airways in the lungs and inflammation of the lining cells of the lungs (caused by eicosanoids).</td>
<td>Rapid relief provided by drugs that open tightened airways, mimicking adrenaline (natural hormone that makes heart beat faster and muscles of lung relax so that more air can enter), e.g. SALBUTAMOL, which is breathed in using an inhaler or a nebulizer. A drug which prevents asthma attacks rather than treating the symptoms is CROMOLYN (Intal), which stops mast cells from releasing dangerous chemicals. Other drugs, which resemble the hormones, glucocorticoids, stop defender cells getting into lungs and causing damage. These drugs can have serious side-effects, but are made safer by direct delivery to lungs using an inhaler.</td>
</tr>
<tr>
<td>FOOD ALLERGIES</td>
<td>Milk, eggs, fish, nuts (particularly peanuts).</td>
<td>Tingling and rapid swelling of the lips, swelling of the tongue (can cause suffocation). If food swallowed, violent vomiting. If food reaches bloodstream, widespread rash, wheezing, drop in blood pressure. Without treatment, can result in death.</td>
<td>Elimination of allergen from the diet. Treatment of mild symptoms of itching and swelling with anti-histamine. For severe reactions, treatment with adrenaline will cause constriction of the blood vessels in swollen areas, reverse asthma and raise blood pressure. Must be administered rapidly.</td>
</tr>
<tr>
<td>ITCHY SKIN RASHES</td>
<td>Variety, such as food, chemicals, animal hair. Some people affected by changes in air temperature and pressure, house dust mite.</td>
<td>Eczema is most common in children. It starts between 2 and 6 months when rash can spread all over body. In about 50% of cases, rash clears by 18 months. In remainder, it moves to skin folds, e.g. the insides of the elbows, backs of knees, neck, wrists and ankles. Less common in adults.</td>
<td>Use of emollients and avoidance of soaps. In more severe cases, corticosteroid ointments may be used.</td>
</tr>
<tr>
<td>WASP and BEE STINGS</td>
<td>Venom injected by wasp or bee.</td>
<td>Rash, asthma and falling blood pressure. Although stings are common, the allergic reaction occurs in only 10% of the population. Five to ten deaths per year in the UK.</td>
<td>Anti-histamine for local reactions. Widespread reactions require emergency treatment with adrenaline.</td>
</tr>
</tbody>
</table>