Occupational poisonings

A wide variety of syndromes, discussed in Chapter 2, may be caused by occupational exposure to toxic substances. Again, the diagnosis rests largely on the occupational history and awareness that exposure to gases, fumes and chemicals may lead to disease. In the early 20th century such episodes were frequent in the UK and were easily recognized by physicians, but nowadays episodes occur sporadically, usually in small, poorly regulated workplaces and the diagnosis is often missed. They do, however, remain common in poor countries.

Case history 3.5

A 54-year-old man was employed by an industrial cleaning company. The company obtained a contract to assist the annual maintenance in a factory producing seeds. He was required to clean a hopper that had become encrusted with a rind of biological material, and spent 2 days working in this space with powered tools, coming out covered with dust. By midday on the second day he felt unwell, with a cough and tremulous hands. He became agitated and seemed confused, and the factory nurse sent him to see his general practitioner. No diagnosis was made, but an anxiolytic was prescribed. He continued with tremor, but his agitation improved over the next 2 weeks. Because he had previously been quite fit, his doctor referred him to a physician, who took a detailed history, found albuminuria and suspected acute heavy metal poisoning. Investigation through the Health and Safety Executive showed that the hopper was used for dressing the seeds with a mercurial powder. Fortunately the patient recovered without serious sequelae.

In general, toxic gases and fumes attack the lung, metals damage internal organs, solvents may cause damage to the skin, liver and nervous system, and a number of insecticides cause symptoms of parasympathetic overactivity. There are some investigations that are of value in establishing a diagnosis and monitoring exposure or response to treatment in some of these poisonings; the more important ones are summarized in Table 3.5.

In general, inorganic chemicals may be measured in either blood or urine and some (such as mercury and arsenic which accumulate in the tissues) in hair and nail parings. The metabolites of organic substances, which are rapidly biotransformed into water-soluble chemicals, may be measured in urine, while poorly biotransformed organics are measured in blood. Volatile organics (of which the best known example is ethyl alcohol) may be measured in alveolar air. In cases of suspected chronic poisoning by metals such as lead, mercury or cadmium, \textit{in-vivo} methods using neutron activation or X-ray fluorescence are being developed. There is further discussion of biological monitoring in Chapter 7.

Investigation of the workplace

Investigation of the workplace is the aspect of occupational medicine with which doctors are least familiar; almost no doctor thinks to visit a patient’s workplace and those few who do rarely know how to proceed once there.

Why should one wish to visit the workplace? Three reasons, related to the investigation of illness are:
• to seek a cause of the patient’s illness
• to see whether the cause can be eliminated
• to see whether others are affected.

In addition, regular workplace visits to assess hazards and to plan to reduce risks are part of the bread-and-butter work of an occupational physician acting in his or her preventive role.

There are, however, serious problems that make it difficult for the doctor to make a workplace visit:
• ethical issues
• unfamiliarity with the approach to management
• industrial relations problems
• lack of time
• ignorance of how to carry out the investigation.

Usually a combination of these factors results in no visit being made, and an opportunity to prevent disease in others is lost.

When should the workplace be visited?

Occupational physicians should see regular workplace visits as much a part of the job as clinical examinations, with a view to spotting hazards and reducing risks before injury occurs. But what about the doctor who happens to see a patient with a suspected occupational disease? When should the extra, time-consuming step to visit the workplace be taken?

The short answer is whenever possible (but the visit does not have to be made by the doctor who is looking after the patient – see below, page 60). Usually the reason for the visit is not to investigate the cause – this is only necessary when the cause is suspected but not known – but to help in rehabilitation of the patient and to prevent disease in others. Of course, there are many circumstances when a visit is neither practicable nor necessary; for example, in the case of diagnosis of a well-known disease such as coal worker’s pneumoconiosis when the industry concerned is already aware of and is addressing the problem, or in the case of an occupational cancer as a result of work many years previously. However, in many cases of obvious occupational disease, such as dermatitis or back injury, failure to make any contact with the workplace means that the chance to prevent the same problems in others is missed. Indeed, in such circumstances, the medical management of the problem in the individual patient is of little effect if the underlying cause is not corrected.

How to make contact with the workplace

Case history 3.6

In a lecture to 25 general practitioners, one of the authors discussed a local health problem: allergies in the fish-processing industry. During the discussion period, a member of the audience said that it was commonplace to see patients in his surgery with rhinitis and wheeze attributed to work in one of the prawn-processing factories. These cases rarely responded satisfactorily to treatment and the patients usually ended up leaving their jobs. The general practitioner appreciated the problem, but did not know how to do anything about it.
What would have been the appropriate action? This was the question that the lecturer put back to the class.

Two hands went up. The first doctor suggested a visit to the factory, but when asked how he would approach it, he was unsure. The other doctor suggested contacting a local specialist in occupational medicine. In the UK, a nationwide network of such specialists is maintained by the Health and Safety Executive. However, few members of the class were aware of this.

This event was one of the factors in the decision to write this book. In all other areas of medicine, if a doctor does not know how to handle a situation, the way out is clear – seek the advice of a colleague more expert in the area. But when it comes to occupational problems, this simple lesson is forgotten. In the UK, occupational medicine, because of its traditional separation from the mainstream of the National Health Service, is not looked upon as an accessible resource. And yet since the mid-1970s, there has been a UK-wide group of doctors and nurses trained in occupational health and specifically available for advice on such matters. In addition, there are now increasing numbers of specialist consultants employed within the NHS.

Sources of advice

The most important source of advice in Britain is the Employment Medical Advisory Service of the Health and Safety Executive (EMAS), described more fully in Chapter 5. A telephone call to the local branch of the Health and Safety Executive, asking for the Medical Inspector, is all that is necessary. In doing this, it is of course important to obtain the patient’s agreement to this confidential medical referral. The EMAS doctor may wish to see the patient and will take all necessary subsequent steps, including visiting the workplace, examining other workers at risk and, if necessary, arranging a visit by the Factory Inspector.

There are alternative approaches that a doctor might wish to take. If the workplace already has its own occupational health service, the doctor should approach the physician in charge, who could then make the investigation. That doctor, in turn, should advise his employer to make a report to EMAS if the condition is a reportable one under the RIDDOR regulations (see Chapter 4 and Appendix 1). Or the doctor might wish to consult a university department of occupational medicine, a National Health Service consultant in occupational medicine, or an independent consultant. Finally, the doctor may wish personally to visit the workplace.

In some parts of Europe, a workplace visit may result from a compulsory reporting of occupational disease. Thus every physician in Germany is required by law to report a suspected case of occupational disease, this being one of the few exceptions to the physician’s duty to protect the medical information of a patient. The report is sent to the ‘Berufsgenossenschaft’, a semi-governmental institution that is responsible for insuring companies against occupational accidents and diseases. The ‘Berufsgenossenschaft’ has a legal obligation to investigate every report, but the investigation may be carried out by technical people with limited knowledge in the health field.

Problems in arranging a workplace visit

Ethics (see also Chapter 11)

The relationship between a doctor and patient is confidential, and it is not acceptable to disclose information obtained from that relationship to a third party without the
patient’s permission. There may be particular dangers, perceived or real, to disclosure of clinical information to an agent of the employer, in that the worker may fear loss of job or some other form of discrimination. Even disclosure to another doctor, as to one in EMAS, may allow identification of individuals and their complaints by management. However, on the other side is the doctor’s duty to do everything reasonably practicable for the health of the patient and to prevent disease in others.

The solution to this conundrum lies in clear explanation of the care to be taken to preserve confidentiality and to protect the patient from possible discriminatory action prior to seeking permission for referral or agreement to make a visit. Two points can be made here – in almost all cases, if the patient desires confidentiality it can be maintained (and if it cannot, the patient will withhold agreement) and, in general, managers are anxious not to cause injury to their employees and will be extremely cooperative in acting to prevent further trouble. Furthermore, if they are not, their legal obligations such as those in the UK under the Health and Safety at Work, etc., Act (see Chapter 6) can be pointed out to them.

Ethical problems are avoided by clear explanation to the patient of the doctor’s desire to help by preventing further harm and of the confidential nature of communications between doctors. With the patient’s permission, it is then possible to refer the problem to a specialist, who will discuss with the patient further approaches to the workplace and to the management. Only if the patient’s permission is given can management be informed of the clinical problem, and then only in general terms. This should not of course hinder the doctor in the workplace from giving explicit advice to managers on preventive measures to protect workers.

The approach to management

If the company employs a doctor, the best approach is directly to him or her. If not, it is usual to speak to the most senior person on the site, normally the managing director or factory manager. The reasons for requesting a visit should be clearly explained, namely an anxiety that something in the workplace may be causing illness among the workers, and an eagerness to help in preventing future problems. It is both sensible and good medicine to stress this positive objective, because the management may have fears about an approach from outside – fears of litigation and trade union disputes, and fears of unrealistic demands on the budget in order to put things right. Responsibility for safety in a workplace is usually delegated by the managing director to a safety manager or safety officer. Such individuals should be trained in safety and the relevant legislation, but their knowledge varies considerably with regard to more strictly medical matters. Nevertheless, they have a detailed understanding of the workplace and its hazards and are the most useful people with whom to liaise over a visit.

Workers’ representatives

In general, and in contrast to their popular image, trade unionists are helpful and cooperative when it comes to dealing with possible health hazards in the workplace. There is, however, a risk that individuals may take the opportunity of fomenting industrial unrest if they suspect such a problem but have not been fully informed. For this reason, as also for ethical reasons, it is advisable that the workforce’s representatives should be made aware of the visit and be taken into the management’s confidence about the reasons, the arrangements, and the means of reporting the outcome. In most
workplaces, the employees will have appointed safety representatives, who sit on the factory safety committee with managers and the safety officer. This is often a useful forum for discussion of possible hazards to health, although again care has to be taken to preserve the confidentiality of individuals. Lay people are often ignorant of the ethical responsibilities of doctors, and may ask inappropriate questions.

**The visit**

**Arrangements**

The initial approach should lead to a meeting with appropriate managers to discuss the purpose of the visit and the anticipated outcome. The advisability of discussion with unions or workers’ representatives should be brought up and normally a joint meeting is arranged. This gives an opportunity to allay fears and suspicions and to make clear that the purpose of a medical visit is to help prevent possible health problems.

The initial meeting with the management should also be used to learn about the factory or workplace – in the case of the manufacturing industry, about the raw materials, the processes, the products and by-products, waste and pollutants and the workforce. A brief checklist is given in Table 3.6.

<table>
<thead>
<tr>
<th>Table 3.6 The workplace visit – important information</th>
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<tbody>
<tr>
<td><strong>What raw materials are used?</strong></td>
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<tr>
<td><strong>How are they processed?</strong></td>
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<tr>
<td><strong>What are the products?</strong></td>
</tr>
<tr>
<td><strong>What by-products are there?</strong></td>
</tr>
<tr>
<td><strong>How are waste and pollutants removed?</strong></td>
</tr>
<tr>
<td><strong>What happens during maintenance and shutdown?</strong></td>
</tr>
<tr>
<td><strong>How large is the workforce?</strong></td>
</tr>
<tr>
<td><strong>What is the shift pattern?</strong></td>
</tr>
<tr>
<td><strong>Which workers work in the different areas/processes?</strong></td>
</tr>
<tr>
<td><strong>Who comes into contact with hazards?</strong></td>
</tr>
<tr>
<td><strong>Who carries out repair/maintenance?</strong></td>
</tr>
<tr>
<td><strong>What use is made of contract workers, and how do their safety precautions differ from those of the regular workforce?</strong></td>
</tr>
<tr>
<td><strong>What evidence is there of compliance with health and safety law?</strong></td>
</tr>
</tbody>
</table>

In service industries, this matter is simplified as complex questions about processes are unnecessary and the emphasis is on environmental hazards, usually related to the building, and on methods of work organization.

In many industries, the process is complex and difficult for a non-specialist to understand. All such organizations have a flow diagram, often in the control room, which allows an outsider to obtain an overview of what goes on.

**Looking around**

Looking around, the vital part of the visit, is best undertaken in a structured way. It varies in complexity, from a short look at the particular process thought to be
responsible for trouble, to a detailed examination of a whole industry. The former is more usual for the clinical doctor, the latter for the epidemiologist and occupational physician. The visit should, of course, be made in the company of someone who understands the workplace and the processes. The factory general manager usually has overall knowledge, although the production manager will often have more detailed knowledge of processes. The safety manager or safety officer has a particular responsibility for health and safety matters and the personnel manager (to whom the safety officer commonly reports) is most knowledgeable about the workforce, sickness absence and welfare matters. In service industries, personnel and safety managers and, often, engineers and building officers are useful contacts.

The simplest method of making a visit, having learnt about the process, is to follow it through from the entry of raw materials to the dispatch of the final product. It is important to watch what people actually do and to ask what happens when the process breaks down or shuts down. Particular attention should be paid to the handling of materials and chemicals and to possible exposure to airborne hazards. Of course, the doctor making a visit will be influenced by the condition of the patient or patients that provoked the visit, and here special attention would be paid to the particular job in question. If the likely cause is found, an assessment should be made of whether other workers are at risk (and not necessarily only on the shift during which the visit took place).

Watching the patient, or a colleague of the patient, do the job is an extension of the occupational history (Fig. 3.6). Workers vary in the care they take, just as organizations

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Fig. 3.6. Washing a unit from the X-ray processor. Normally this is enclosed but has to be removed on a regular basis for cleaning, allowing exposure to chemical vapours. See also colour plate 3.6.
vary in their protective measures. In the investigation of dermatitis, for example, a very fastidious worker may be found to be at greater risk because of repeated washing of the hands, while some less hygienic people may become sensitized as a consequence of contaminating their cigarettes with allergenic chemicals. In some instances, quite unexpected procedures come to light on a workplace visit.

**Case history 3.7**

A doctor was asked to advise an organization about safety in its animal laboratories. A careful examination of the workplace showed a number of areas in which there was a risk of skin and lung sensitization to people working on rodents. Appropriate recommendations were made. Some months later, the same doctor was asked to investigate an outbreak of skin disease in a biochemical laboratory in the same organization. While the technicians were showing him the way they carried out their work, one of their colleagues brought a live rat into the laboratory and proceeded to anaesthetize it on the bench. At the time five other people in the laboratory were working in the small laboratory; all were therefore at risk of developing occupational asthma, even though only one actually worked with rats.

The doctor dealt with the dermatitis problem and went back, a chastened man, to rewrite the animal house codes of practice. He had assumed that all work with rodents took place in the designated part of the animal laboratory and had forgotten that human beings often put convenience before safety!

The investigation of workplaces may bring to light the use of substances, often chemicals, that are not known to the doctor. Frequently their identity is concealed by trade names or by their presence in complex mixtures. However, all chemicals used in industry should be subject to a data sheet provided by the maker or supplier, which gives appropriate physical, chemical and toxicological data, together with advice on any precautions to be taken and action when accidental exposure occurs. Furthermore, in the UK, regulations on the Control of Substances Hazardous to Health (COSHH, see Chapter 6) require employers to have made an assessment of risk from the use of any hazardous substances, and to have made a written record of the assessment. These documents should be available for inspection. If further information on such substances is required, a list of readily accessible sources is given in Appendix 3.

**The outcome of the visit**

The visit should lead to three outcomes:

- confirmation of the hazard and assessment of risk
- action to reduce risk
- identification of others affected or at risk.

Once a hazard has been identified, it may be necessary to study it in more detail prior to planning preventive measures. This requires the use of the techniques of occupational hygiene and ergonomics.

**Occupational hygiene** is a discipline that applies scientific methods to investigation and measurement of hazards in the workplace and to control of risks from those hazards.

**Ergonomics** is a discipline devoted to the study of people in relation to their work and workplace.
These disciplines are discussed further in Chapter 5. All occupational physicians learn something of them – essentially an occupational hygienist is concerned with chemical, noise and radiation hazards and with their measurement and control, while an ergonomist is concerned with workplace, machinery and system design so as to ensure that a person’s work is as well suited to his or her capabilities as possible. An occupational hygienist might be consulted, for example, for advice on control of airborne hazards from laboratory animals, an ergonomist for assistance in design of manual work so as to reduce risk of backache.

The measures taken to reduce risk and to manage individuals with occupational disease are discussed in Chapter 4. The workplace visit should allow these measures to be planned so that, ideally, the patient can return to the job and others will not be affected. In some cases, the visit may point to the need for a more extensive study of the workforce – this requires the epidemiological approach.

**Epidemiological investigation**

In a fascinating book, *The Rise and Fall of Modern Medicine*, Dr James le Fanu has argued, *inter alia* and tongue only half in cheek, that the public interest would be served by the abolition of all university departments of epidemiology. In doing this he takes what might be regarded as the popular view that epidemiology consists in demonstrating weak relationships between ill-health and environmental factors and thus adds spurious weight to campaigns for unrealistic changes to the environment. Many industrialists would endorse this view, and it has to be admitted that, particularly in North America, epidemiologists have sometimes confused their roles of objective scientist and of concerned citizen. On the other hand, it may be argued that epidemiology is the principal means of determining quantitative relationships between risk of disease in humans and environmental exposure, and that its achievements have been considerable. Led by the pioneering work, a century apart, of Snow on cholera and Doll and Hill on smoking and lung cancer, epidemiological studies have produced evidence that has led to the control of many occupational diseases – think, for example, of cancers in nickel refining; polyvinyl chloride (PVC) and ion exchange resin manufacture; those working with shale oil, polycyclic aromatic hydrocarbons, chrome and asbestos; and of silicosis, coal workers’ pneumoconiosis and occupational asthma. In view of popular misconceptions about epidemiology, it is worth explaining its practical applications in occupational medicine.

Epidemiology involves the study of groups of people in order to determine patterns of health and ill-health within these groups. Analysis of the data derived from such studies may show relationships between disease (or health) and the environment, and lead to action to modify these relationships in order to improve health. This important outcome is often not considered by many doctors, whose curiosity is satisfied when a probable causative relationship is demonstrated. As can be seen from the best known example of epidemiology – the demonstration of a relationship between smoking and lung cancer – this is because the action required to prevent disease is usually largely out of the hands of doctors and depends more on politicians and other policy makers.

The epidemiological process is in fact analogous to the clinical process, as shown in Fig. 3.7. The clinician studies a patient and makes an examination, the synthesis of which leads to a diagnosis. In turn, this should lead to decisions about treatment and