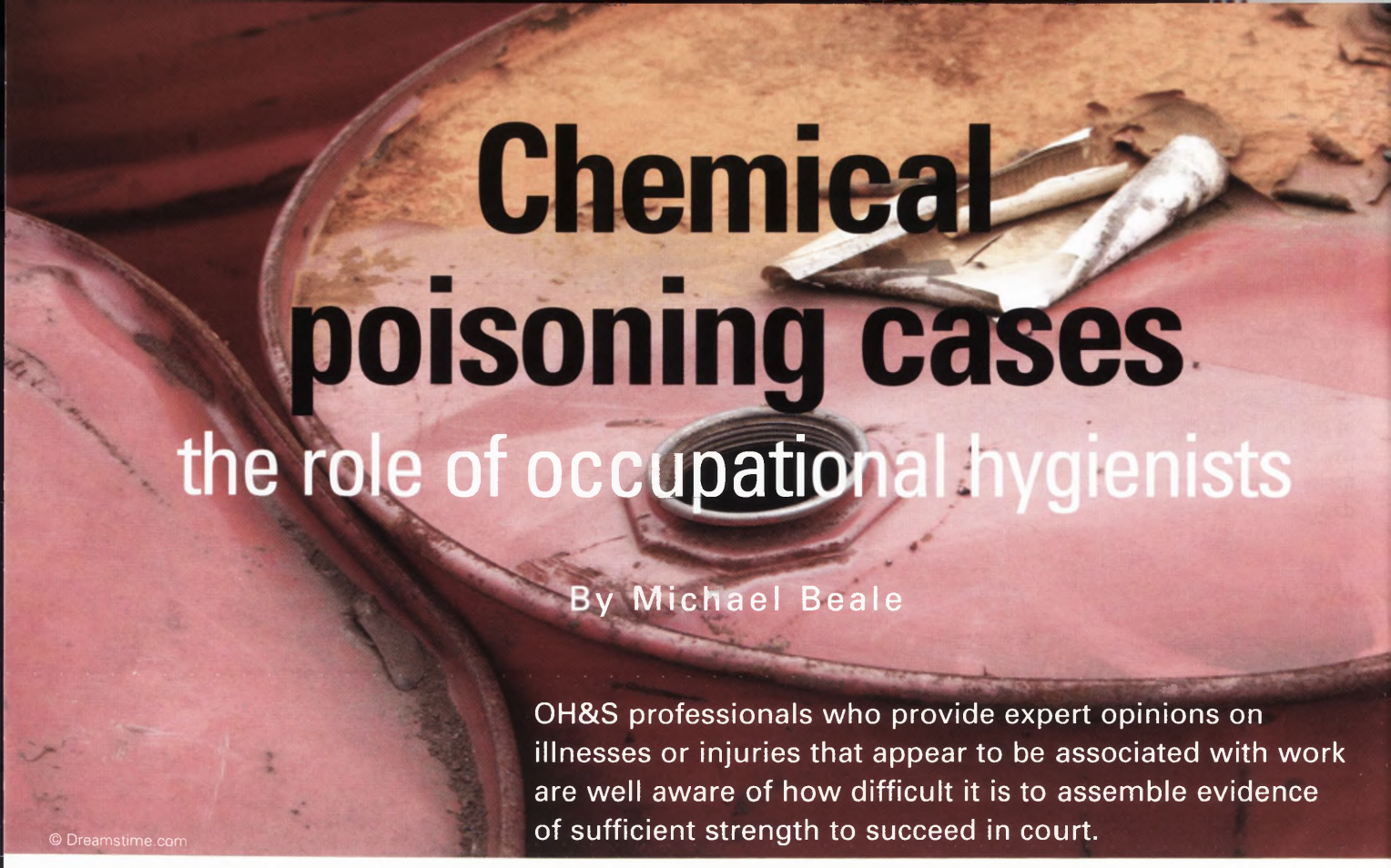

Chemical poisoning cases

the role of occupational hygienists

By Michael Beale

OH&S professionals who provide expert opinions on illnesses or injuries that appear to be associated with work are well aware of how difficult it is to assemble evidence of sufficient strength to succeed in court.

The problems in pursuing cases involving cigarettes and asbestos claims exemplify the difficulties facing toxic substances claims. Large numbers of people were exposed, making hundreds of thousands of person-years experience of exposure to these toxic substances available. Yet despite the large number of people exposed to these toxins, it took decades to assemble the necessary data to irrefutably establish a link between exposure and health problems.

CHEMICALS AND HAZARDOUS SUBSTANCES

In Victoria in 1999 the Occupational Health and Safety (Hazardous Substances) Regulations were introduced. What are hazardous substances? Are they chemicals? There is a tendency to confuse the two. For chemists, the word 'chemical' denotes a pure substance. For example, water is known as H_2O, a pure chemical. Normal tap water will have trace minerals and so is impure. Some minerals will have a beneficial health effect while others may cause health problems. It is the very minor constituents that may affect their health. For example, trace amounts of insecticides from spraying of crops may contaminate tank rain-water in cropping areas.

A hazardous substance can be an individual chemical (pure substance), or a mixture of chemicals. Most commonly they are mixtures of two or more chemicals. Petrol, for example, is a mixture of hundreds of different chemical entities and itself is produced from crude oil which contains thousands of chemical entities. Often more than one hazardous substance is used in a workplace and, as a result, mixtures of many pure substances (tens, hundreds or even thousands) typically occur in workplaces.

TOXICOLOGY

Toxicology – the study of the health effects of poisons – focuses on pure chemicals because it is important to identify and understand how health problems are related to exposure to a particular chemical. Impurities make it more difficult to identify the actual cause of a health effect if, for example, tests are conducted only on rats, mice, or other mammals as a warning of possible consequences to humans.

WORKPLACE EXPOSURE

Workplace exposure to chemicals typically affects only a small number of people, and many different chemicals are often present within the work environment. The combined effects of a mixture of different chemicals make it difficult to determine which, if any particular chemical, or mix of chemicals, has damaged the health of an individual worker. It is highly likely that any identified health problem will be restricted to one worker and it is also possible that this is a chance occurrence.

Furthermore, individual health consequences resulting from toxic exposures can differ. People exhibit different responses to chemicals; not everyone exposed to a toxic chemical will suffer health problems to the same extent at the same level of exposure.

The state of health of an individual worker depends upon three key factors: genetics and genetic predispositions to particular problems; lifestyle (diet, exercise, hobbies); and exposure at work to chemicals and physical hazards.

All chemicals can be poisonous. They are not in workplaces to promote workers' health. They are there because they are considered to be necessary for production. It is the dose that makes the poison. The more people are

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exposed, the more they are at risk of toxic effects. Even table salt, if used in sufficient quantities, can cause health problems such as kidney damage.

SYNERGISTIC EFFECTS AND POTENTIATION

Mixtures of pure substances can have a different toxicity from that of the individual chemicals. A synergy between chemicals inside the body can result in an increased toxicity ('synergistic effects'). Doctors have long recommended that asbestos-exposed people give up smoking to dramatically reduce their risk of lung cancer because, while cigarette smoke and asbestos can cause lung cancer, the combined effects are much greater than a simply cumulative effect. Studies of workers in the footwear industry in Florence, Italy, show that N-hexane, a carbon-based chemical used as a solvent, causes peripheral nerve damage. Exposure to a mixture of two other carbon-based solvents, MEK and MIBK, is known to have the same toxic effect when the toxicity of each of these chemicals would not indicate this problem ('potentiation'). The presence of both chemicals is necessary for the aggressive toxic effects to occur.

MSDSS

Under the occupational health and safety laws in Victoria and other states, employers are legally required to obtain current information on hazardous substances used in the workplace so that work can safely be carried out. This information is in the form of suppliers' Material Safety Data Sheets (MSDSs). MSDSs are based not on research of the particular hazardous substance, but on knowledge of the toxic effects of the ingredients. Often they are a compilation of data. Unless knowledge about synergistic or potentiation effects is already available, it will not be included in the MSDS.

MSDSs should provide warnings as to the toxic consequences of exposure to the substance through inhalation, skin contact, or ingestion. They should also indicate means of managing that exposure through ventilation, personal protective equipment and local enclosure to prevent contact. Because toxicity information changes as knowledge of toxicity increases, MSDSs become obsolete. By law, manufacturers and suppliers of hazardous substances must update their MSDSs regularly. A five-year-old MSDS is deemed inapplicable by the Hazardous Substances Regulations. Unfortunately, obsolete MSDSs often remain in workplaces, and continue to be supplied by suppliers. Particularly irresponsible are some areas of the cosmetic and hairdressing industries, where evidence suggests that some suppliers do not understand their responsibilities.

As employers are legally required to supply current MSDSs for every product used in the workplace, and to ensure that work practices are consistent with any measures required by the MSDS, any hazardous substances for which current MSDSs are not available should not be used.

EXPERT WITNESSES

Where a workplace 'chemical injury' case is to be taken to court, several expert witnesses are relevant. Occupational physicians are able to give evidence on clinical diagnosis and links to workplace chemicals. While they are strong on toxicology, epidemiology and clinical assessment, many have limited knowledge of environmental monitoring as part of assessing a toxic exposure. Toxicologists can provide opinions in relation to toxicity tests on particular chemicals. Epidemiologists can interpret or criticise population studies.

Occupational hygienists are in a unique position to straddle the boundary between toxicity testing and clinical diagnosis. They can provide evidence on likely exposure levels, and the controls that should be implemented in the workplace to ensure that exposure conforms to relevant standards. >>

What is an occupational hygienist? They are scientists and engineers involved in the science behind both the risk assessments carried out on chemical and physical hazards in the workplace, and in developing measures to control that risk. Most have one or more degrees in engineering or science, followed by post-graduate studies. They are not medical doctors, but they have studied toxicology as part of their post-graduate training, and they apply their knowledge about specific chemicals to measure workers' exposure against standards that establish acceptable risks. These standards can vary.

An important reference is the set of exposure standards published by Worksafe Australia in 1995. A proposed update of these standards is available for public comment and is likely to be formally released at the end of 2005. Knowledge steadily increases with time, so benchmarks can become obsolete. Benchmarks from other organisations may be relevant. One such organisation is the American Conference of Government Industrial Hygienists (ACGIH), which annually publishes exposure standards and reviews standards on an ongoing basis. Another is the Health and Safety Executive in the UK.

An occupational hygienist armed with a clinical diagnosis from medical experts can advise on the chemicals that may potentially have been involved in contributing to, or causing, the diagnosed health problem. Determining the way that people were exposed in the workplace to the chemical/s, and the methods that could have been employed to prevent that exposure, are their areas of expertise.

DOCUMENTATIONS REQUIRED FOR CHEMICAL INJURY CASES

- Medical reports providing clear diagnosis of toxic injury/illness;
- Statement from client/s detailing chemicals in the workplace and how they were exposed to them;
- Statement/s from other witnesses from the workplace that corroborate the exposure situation;
- Statement/s from other witnesses who may have experienced similar symptoms;
- Details of all hazardous substances (chemical) used in the workplace;
- Material safety data sheets for hazardous substances current at the time of the exposure to the substance, and updated MSDSs (should they be available); and
- Air contaminant monitoring, should this have been performed as part of an OH&S management program.

Because only some of these documents are typically available when preparing cases, additional research is often required to fill the gaps.

One way of obtaining a complete picture is to tour the workplace; a 'view'. However, the workplace is often 'cleaned up' to give the best impression of how risks are managed on site. It is necessary to get behind the spin, and essential to get a comprehensive description of all the work performed from the injured worker. A 'view' will involve legal representatives for the employer and/or insurance company, whose role is to manage the disclosure of information from staff still on site that would assist any case against the employer. Often some of the locations where the person worked will be not included in the view unless explicitly negotiated beforehand.

Changes may well have been introduced to the workplace, especially if the case relates to an exposure more than a year ago, so that the actual chemicals being used, the way they are used, the ventilation provided, the training of staff, and the provision of personal protective equipment will all be different. Cases can then devolve around the word of the injured worker against people remaining on site who need to keep their jobs, or who may have been negligent in ensuring appropriate chemical safety measures in the first place. If a view is held, the worker must attend to explain all locations. Where workers feel unable to attend a view, a detailed interview by the hygienist is needed to ensure that all necessary questions are addressed.

CONCLUSION

Environmental monitoring within workplaces is being increasingly performed as a result of the Hazardous Substances Regulations. Environmental monitoring reports in workplaces prepared by occupational hygienists working for employers should be critically assessed, as it is not simply about sampling air quality in the workplace. Monitoring requires careful planning to ensure that it is performed under

conditions typical of those within the workplace. Do you sample at a fixed location, or do you actually monitor people and, if so, who do you monitor?

Some questions to consider when reading a monitoring report are:

- Were the products that cause the toxic emissions actually operating?
- Was production less than or more than a typical production rate?
- Were doors open or closed?
- Were the ventilation systems operating, and is this typical of the way work is performed?

Workplaces are dynamic, with work rates and work methods constantly changing. The amount of exposure to hazardous substances can vary greatly as a result. Environmental monitoring provides a snapshot of what is actually a movie of activity and associated exposure when looking at what happens over a year, much less a decade.

Occupational hygienists can play a key role in assembling the evidence necessary to pursue chemical injury cases. By filtering out the more speculative cases, they can also play a useful role in assisting lawyers to focus on cases for which the evidence is such that a successful outcome at court is more likely. ■

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CASE STUDY 1

A worker employed to clean floors using an electric floor polishing machine presented to a doctor who diagnosed an unusual medical condition, scleroderma. This is a rare, progressive disease that leads to hardening and tightening of the skin and connective tissues and dramatically affects the sufferer's quality and length of life. The polishing machine, which used a reservoir of chemicals, was used on vinyl flooring at a major department store in the city. During its operation and maintenance, the worker had to make adjustments to the machine that resulted in extensive skin contact with the liquid in the reservoir, physically damaging to the skin. Gloves were not worn and, from the description of the work, had they been worn they would quickly have been damaged. The absence of training, lack of control in the mixing of substances used in the floor polishing machine, and the shared use of the machine by a number of workers meant that it was not possible to determine whether the substances were mixed according to the instructions from the supplier. Actual levels of active ingredients could have been higher than anticipated.

The worker was on sickness benefits and the author was asked to provide an opinion as to whether the work situation may have caused or contributed to the health problem. Scleroderma had previously been identified as a health problem experienced by women who have had silicone breast implants. An investigation into the mixture of substances used in the floor-cleaning machine involved looking at the MSDSs for the concentrates, which were diluted with water. Among the ingredients listed was an anti-foaming agent containing silicone material, which contained a siloxane material of the same molecular weight as that used in the silicone gel for breast implants. Essentially the same material was present in the solution as in breast implants. The material was not volatile and so had not entered the body of the worker by inhalation. Literature research of the penetration of the skin by siloxanes suggested that this was the way the worker would have been exposed. The corrosive nature of the mixture of chemicals used in the floor cleaner would have damaged the skin on his hands and increased his exposure to the chemical. It was accepted that the siloxane exposure may have caused the health problem, and the worker was entitled to go on to WorkCover payments.

CASE STUDY 2

A worker involved in the preparation of formulated solvent mixtures at a large solvent supplier's facility suffered a number of symptoms that were diagnosed by some medical experts as multiple chemical sensitivity. Air quality monitoring indicated detectable levels of organic vapour fumes, but not at levels exceeding exposure standards. Solvent exposure should not have been an issue.

By the time of the view, three years had elapsed since exposure. The worker was not prepared to go on site to assist the view. A preparatory meeting was held with the worker immediately prior to the view, which generated some useful understanding of geography and processes. During the view, it became clear that some of the locations mentioned by the worker were not included. Interesting negotiations to widen the scope of the view ensued. While the areas originally included in the view were well set out, without any odours from the solvents being dispensed into the formulations being produced, the area not originally included in the view was a mezzanine floor on the other side of a wall from the formulating area. Here there were large storage vessels supplying solvents for the dispensing hoses. This area reeked of solvent fumes, was poorly ventilated, and the worker had to spend time there checking levels in the tanks during a filling process. Because of the flammability of the solvents, no electronic communication devices were allowed; once a tank was almost filled, the worker had to leave the building to switch off the feeder valve from another storage vessel. Workers had to look into the tank to measure the level with a rod to determine when to run and turn off the valve. They had to be very attentive and put themselves at risk of significant solvent fume exposure. Not including this information as part of the assessment would have greatly weakened the worker's case, as changes to the dispensing area had reduced solvent fume issues.