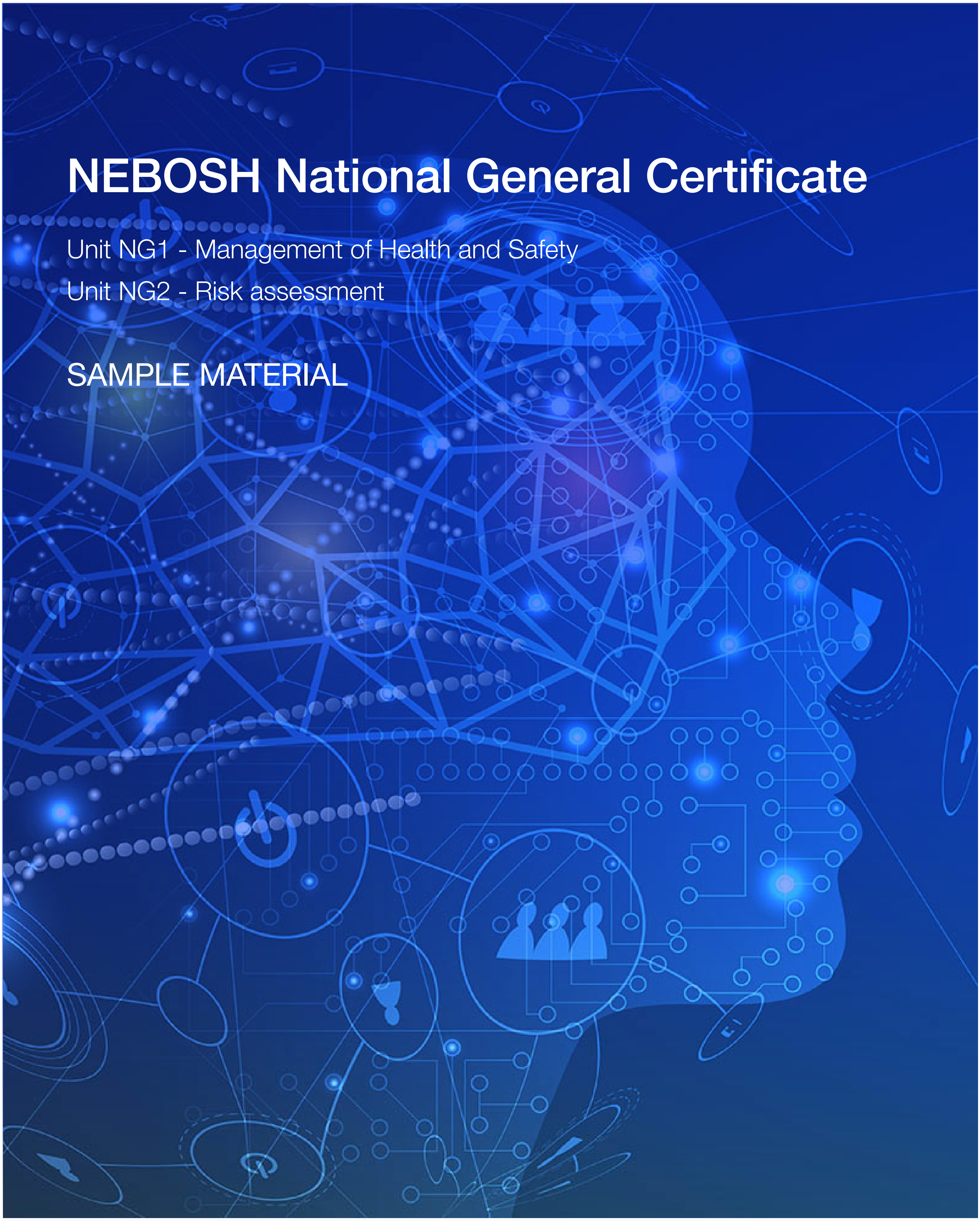
NEBOSH National General Certificate

Unit NG1 - Management of Health and Safety

Unit NG2 - Risk assessment

SAMPLE MATERIAL



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1.1 Morals and money

GENERAL ARGUMENT

The main reasons why organisations should manage workplace health and safety are:

1) ***Moral***
   Work-related injuries and ill-health result in a great deal of pain and suffering for those affected. Clearly, we must all do everything that we can to avoid this.

2) ***Financial***
   Accidents/incidents at work cost a great deal of money, particularly when the costs of fines and compensation are considered. There are also many other less obvious costs that can be very significant, including the costs relating to interruption to production, harm to the quality of our products or damage to the environment. Costs can be enormous – and perhaps already are many times larger than most individuals consider.

3) ***Legal***
   It is a legal requirement to protect the health and safety of employees and others that might be affected by the organisation's work activities.

The moral and financial reasons provide a strong motivation to promote good health and safety standards and are discussed further in this section. ***The legal reasons are covered in more detail in section 1.2.***

CASE STUDY

Effect of a serious accident/incident at work

A 32 year-old engineer fell 5 metres from a ladder while doing maintenance work on a building. He suffered major injuries to his head, arm and back when he hit the ground. He was taken to hospital where he remained unconscious for 24 hours and had surgery to repair the fractures he had suffered. He spent many days in hospital receiving treatment for his injuries.
The engineer's manager had to tell his family that he had been injured and was in hospital as a result of the fall at work. His manager said "It was really difficult to tell his family knowing that he was one of my workers. I knew his family well and felt that I had let them down by letting him get injured. It was hard to tell his wife and although his three young children did not understand I could see they were very upset to know he was in hospital."
His wife spent all her available time at the hospital with him. She shared the pain and emotional stress of his injuries. His condition affected everyone in the family. His wife said "One of his sons did not recognise him because of his injuries. I think it was very hard for them to see him like that."
The engineer used to bicycle to work every day. Although he had received treatment for his injuries and a long programme of exercises to improve his mobility the damage to his spine meant that he had difficulty in walking. He could no longer use a bicycle and would not be able to walk without a walking stick. This meant he could not return to his previous job.
The engineer said "I was once fit and healthy, now look at me, all because I didn't have the right equipment to work at height safely."

CONSIDER

Consider the case study above and identify three human effects or consequences that came from the incident.

MORAL EXPECTATIONS OF GOOD STANDARDS OF HEALTH AND SAFETY

Summary

Workplace injuries and ill-health can result in a great deal of pain and suffering for those affected. A worker should not have to expect that, by coming to work, their life is at risk. They should also not expect to be affected by hazardous substances that could shorten their life or cause long-term harm. Nor should others be adversely affected by work activates. Ensuring good health and safety standards at work may therefore be seen as the right way for organisations to conduct themselves and harming people through work activities as the wrong way.

Taking care not to harm people through work activities is a widely accepted custom of conduct and the right thing to do. This is reflected in many of the world's religions and cultures. This moral reason to prevent harm is usually further reinforced by societal expectations of behaviour, which requires the consideration of others that may be affected by interaction with them. In particular this includes work activities and how they may harm those involved or affected by the activity. This

A GENERAL APPROACH TO RISK ASSESSMENT (5-STEPS)

Identifying hazards

Sources and forms of harm

The first step in the risk assessment process is to identify the work tasks and associated hazards.

Sources of hazard may be related to:

- People - they may carry infections or be violent.
- Equipment - which may have mechanical or electrical hazards associated with it.
- Materials - which may be sharp, heavy or toxic.
- Environment - which could have characteristics like height or slipperiness.
- Systems/situations - the way work is carried out may put undue pressure on a worker.

Forms of hazards can be grouped under two main headings: health hazards and safety hazards.

The health hazard categories are:

Categories	Examples
Chemical	Paint, solvents, transport exhaust fumes
Biological	Bacteria, pathogens
Physical	Noise, vibration
Psychological	Occupational stress
Ergonomic	Repetitive strain injuries, manual handling

Safety hazard categories include:

Machinery.
Flying or falling objects.
Moving vehicle.
Struck against something fixed or stationary.
Mechanical handling, lifting or carrying.
Slips, trips and falls on the same level.
Working from a height.
Pressure equipment.
Dangerous substance.
Fire.
Confined space.
Electricity.
Animals.
Workplace violence.

The identification of hazards can be done in many ways. For complex activities it may be necessary to break the activity down into its component parts by using task analysis, for example. ***Task analysis*** identifies hazards before work starts. This is achieved by breaking the task down into its component steps and identifying the hazards associated with each step. Having established the hazards, safe and healthy working methods can be established that deal with them. For a large machine, task analysis could mean looking at:

- Installation.
- Normal operation.
- Breakdown.
- Cleaning.
- Adjustment.
- Dismantling.

The hazards associated with each part of the job or task could then be identified more easily and thoroughly. It is necessary to identify contingent hazards that could arise from failures of a system, component, or checking and maintenance, as well as continuing hazards, i.e. those that are present continuously. Examples may include:

- Mechanical hazards.
- Electrical hazards.
- Thermal hazards.
- Noise and vibration.
- Radiation.
- Toxic materials.
- Ergonomic design.

Once the area/activity has been selected, the method(s) of hazard identification can be chosen. If a hazard is defined as being something with the potential to cause harm, then hazard identification can be carried out by observing the activity and noting the hazards as they occur in the actual work setting, for example by using task analysis. This has advantages over carrying out hazard identification as a desktop exercise using the health and safety manual, because the manual may not reflect how work is actually done and workers may have developed their own method of working, contrary to instructions and training.

In more complex organisations, it may be appropriate to use other, more advanced, hazard identification techniques:

- Hazard and operability studies (HAZOP), which are much used by the chemical industry at the design stage of processes and equipment.
- Reliability analysis and failure mode and effect analysis (FMEA), which are inductive techniques.
- Fault tree analysis (FTA) and event tree analysis (ETA), which are deductive techniques.

damage-only incidents can contribute greatly to the risk assessment process, indicating potential for major -financial and human loss.

Near-miss

The term 'near-miss' refers to an event (incident) which did not result in personal injury, equipment damage or some other loss, but under slightly different circumstances could have done (for example, a building block falling off a scaffold and landing on the floor). The difference between a near-miss and a fatal accident in terms of time and distance can be very small. Apart from being unpleasant and perhaps very costly, every incident constitutes an opportunity to correct some problem. For this purpose, a near-miss is just as valuable as an incident that results in serious injury/damage, in fact even more valuable in its role of providing preventative analysis as no one has been injured in learning that there is a problem.

The investigation of 'near-miss' incidents and the identification of their underlying causes might allow preventive action to be taken before something more serious occurs. It also gives the right message that all failures are taken seriously by the employer and not just those that lead to injury.

Figure 4-5 demonstrates the difference between an accident, near-miss and unsafe conditions.

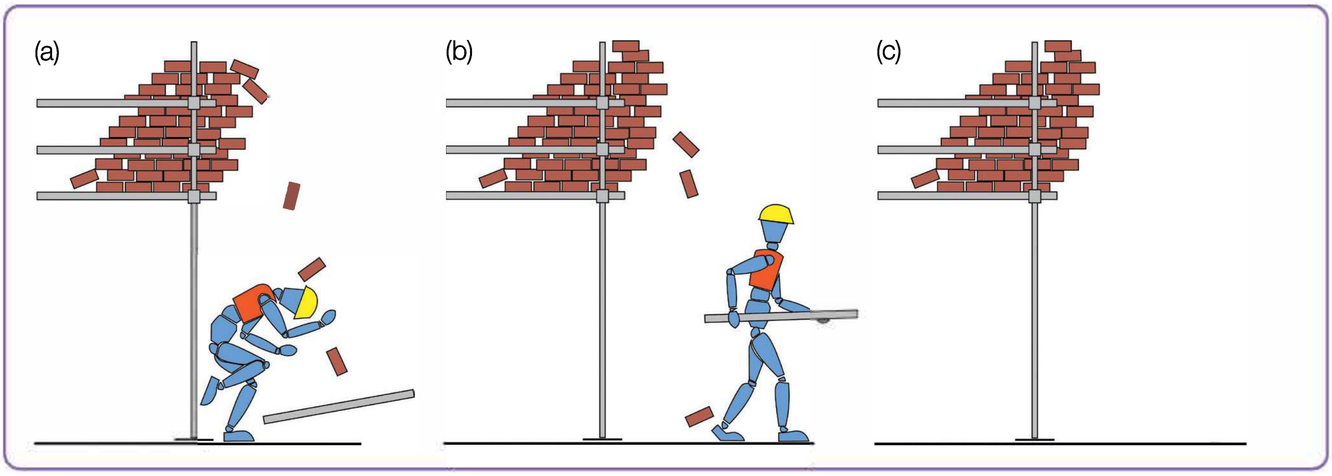

Figure 4-5: (a) Accident (b) Near-miss (c) Unsafe condition. Source: HSE, HSG45.

Reactive monitoring methods

These methods are deemed to be after the incident and are therefore reactive monitoring measures:

- Identification.
- Reporting.
- Investigation.
- Collation of data and statistics, on the adverse events.

These reactive monitoring methods are nearly always limited to measurement of the extent of failure of health and safety management arrangements and procedures (if we ignore unforeseeable events which may affect the business, for example, severe weather, flooding, fire spread from a third party). For example, historical records to show:

- Accidents/incidents, for example, resulting in lost time, physical injury.
- Dangerous occurrences, for example, significant damage to plant, equipment or facilities.
- Near-misses, for example, accidents/incidents with no measurable loss.
- Ill-health, for example, resulting from exposure to substances or repetitive actions.
- Complaints by workforce, or contractors, for example, headaches, acne, blanched fingers.
- Worker absence statistics.
- Worker accident/incident and injury statistics compared with national averages for the same sector of employment
- The extent of lost profits arising from damaged goods, lost production time and reduced output following a health and safety failure.
- Enforcement action, for example, issue of verbal instructions or written notices by an enforcement agency.

It is important to identify, in each case, why performance was substandard. Trends and common features may be identified, such as when, where and how these events occur. This provides an opportunity to learn and put into place improvements to the overall management system and to specific risk controls.

Incident statistics

Many organisations spend considerable time developing data on their health and safety performance based on a variety of incidents, including accidents, dangerous occurrences, near-misses and ill-health information. Whilst there is value in doing so it has the limitation of

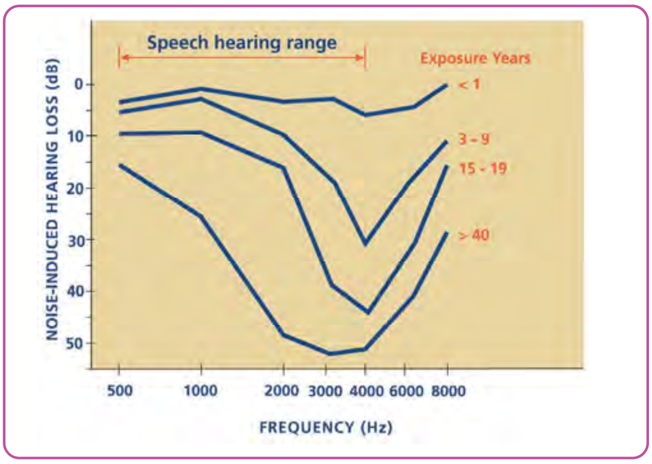

Figure 5-3: Effects of high levels of noise
Source: Australia, SafeWork SA.

Psychological effects of noise

Noise is often linked with adverse psychological effects such as stress, sleep disturbance or aggressive behaviour. It is frequently cited as the cause of conflict between workers, particularly in a noisy office environment where some individuals may need to concentrate on complex issues, but they find this difficult or impossible because of background noise levels.

In addition, the loss of hearing in the speech hearing range leads to a feeling of isolation as the person affected cannot contribute so easily to conversations, and pastimes may become affected, for example, listening to music, radio and television.

REVIEW

What are the possible effects on hearing from exposure to noise?
What are the causes of noise-induced hearing loss?

THE MEANING OF COMMONLY USED TERMS

Sound power and pressure

For noise to occur power must be available. It is the sound power of a source (measured in watts) that causes the sound pressure (measured in pascals, Pa) to occur at a specific point.

Intensity and frequency

The ***amplitude*** of a sound wave represents the ***intensity*** of the sound pressure. When measuring the ***amplitude*** of sound there are two main parameters of interest ***(as shown in Figure 5-4)***. One is related to the energy in the sound pressure wave and is known as the 'root mean square' (rms) value, and the other is the 'peak' level.

We use the 'rms' sound pressure for the majority of noise measurements, apart from some impulsive types of noise when the peak value is also measured.

A sound can have a ***'frequency'*** or ***'pitch',*** which is measured in cycles per second (Hz). Frequency in this context represents the number of times in a given time period that the sound wave repeats itself.

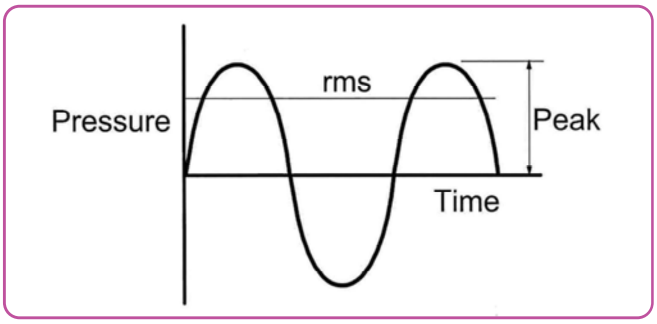

Figure 5-4: Rms and peak levels of a sound wave.
Source: RMS.

The decibel scale

Sound intensity or pressure is measured in a unit known as a pascal (Pa). The ear can detect pressures over a very wide range, from 20 μPa - 20 Pa. To measure in pascals therefore requires a very large range to exist and this is often inconvenient. A more helpful way of measuring sound is to use the decibel range. A decibel (dB) is a unit of sound pressure (intensity) measured on a logarithmic scale from a base level taken to be the threshold of hearing (0 dB). Typical noise levels are listed in ***Figure 5-5***.

Source	DB
CHAINSAW	120
SMOKE DETECTOR AT 1 METRE	105
MACHINE SHOP	90
RADIO IN AVERAGE ROOM	70
LIBRARY	30
THRESHOLD OF HEARING	0

Some typical noise levels for equipment used on construction sites are:

DISC CUTTER	99-115 db
HAMMER DRILL	102-111 db
BREAKERS	103-113 db
EARTHMOVER	87-94 db

Some typical manufacturing noise levels:

CONVEYOR	115 db
LATHE	96 db
PACKING MACHINE	106 db

Figure 5-5: Typical noise levels.
Source: RMS.

Figure 7-2: Mould - Aspergillus.
Source: National Geographic.

Figure 7-2 shows Aspergillus with its characteristic chains of spores emerging from the head. Moulds from the same family can cause ringworm and athlete's foot.

Bacteria

Bacteria are single-cell organisms. Most bacteria are harmless to humans and many are beneficial. The bacteria that can cause disease are called pathogens. Examples of harmful bacteria are leptospira (causing Weil's disease), bacillus anthracis (causing anthrax), and legionella pneumophila (causing Legionnaires' disease).

Figure 7-3: Bacteria - legionella pneumophila.
Source: European Hospital.

Viruses

Viruses are the smallest known type of infectious agent. They invade the cells of other organisms, which they take over and where they make copies of themselves, and while not all cause disease many of them do. Examples of viruses are hepatitis, which can cause liver damage, and the human immunodeficiency virus (HIV), which causes acquired immune deficiency syndrome (AIDS).

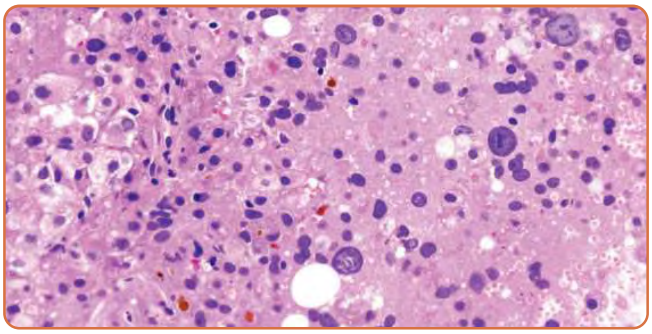

Figure 7-4: Virus - hepatitis C.
Source: National Public Radio.

DIFFERENCE BETWEEN ACUTE AND CHRONIC HEALTH EFFECTS

The effect of a substance on the body depends not only on the substance, but also on the dose and the susceptibility of the individual. No substance can be considered non-toxic; there are only differences in degree of effect.

Acute effect

An acute effect is an immediate or rapidly produced adverse effect following a single or short-term exposure to an offending agent, which is usually reversible (the obvious exception being death). Examples of acute effects are those from exposure to solvents, which affects the central nervous system, causing dizziness and lack of coordination, or carbon monoxide, which affects the level of oxygen in the blood, causing fainting.

Chronic effect

A chronic effect is an adverse health effect produced as a result of prolonged or repeated exposure to an agent. The gradual or latent effect develops over time and is often irreversible. The effect may go unrecognised for a number of years. Examples of chronic effects are lead or mercury poisoning, cancer and asthma.

Other common terms used in the context of occupational health are:

Toxicology

The study of the body's responses to substances. In order to interpret toxicological data and information, the meaning of the following terms should be understood.

Toxicity

The ability of a chemical substance to produce injury once it reaches a susceptible site in or on the body. A poisonous substance (for example, organic lead) causes harm to biological systems and interferes with the normal functions of the body. The effects may be acute or chronic, local or systemic.

Dose

The level of environmental contamination multiplied by the length of time (duration) of exposure to the contaminant.

Local effect

Usually confined to the initial point of contact. Possible sites affected include the skin, mucous membranes or the eyes, nose or throat. Examples are burns to the skin by corrosive substances (acids and alkalis), or dermatitis caused by solvents.

Systemic effect

Occurs in parts of the body other than at the point of initial contact. Frequently the circulatory system provides a means to distribute the substance round the body to a target organ/system.