Chapter 11

Hazardous chemicals

What's the hazard?

Most chemicals used at work have not been fully tested for their effects on human health. The majority of new chemicals introduced into the market go through some sort of assessment by a Federal Government agency – called NICNAS. However, when NICNAS legislation was introduced in the early 1990s some 40,000 chemicals were "grandfathered". Since then only 5,000 have been assessed for their safety.

Exposures to chemicals can have a variety of outcomes – most of which are not well recognised by doctors or the workers' compensation system, e.g. work-related asthma, work related skin rashes, cancer, effects on unborn babies etc. See other sections on cancer, asthma, welding etc.

The Regulations

The Regulation of chemicals in Australia is complex and we have not adopted laws that ensure a reduction in the overall exposures to hazardous chemicals on our bodies or the environment (overseas this is called toxics use reduction). The contamination of land and water by firefighting foams is one recent example of where our regulatory systems have failed.

Only those chemicals, designated by the manufacturer and supplier as hazardous are regulated under health and safety laws. Because of this, if workers are concerned about a chemical, it's important to investigate their complaints.

This is an outline only of the Hazardous Chemicals Regulations.

1. **Hazardous Chemicals must be labelled** – This includes the requirement to label containers and pipework.

   All hazardous chemicals manufactured or imported after January 1, 2017 are required to use what is called the GHS system. Suppliers can supply workplaces with existing stock that was manufactured or imported before January 1, 2017, but anything imported or manufactured after that date must be labelled according to the GHS.

   This international system requires the labels to list the safety and risk phrases for the substance and include a symbol to indicate the type of safety or risk:
   - Name, address and telephone number
   - Product identifier
   - Signal word
   - Hazard statements
   - Precautionary statements
   - Pictograms.

2. **Our job is to make sure that more PCBU/employers use the controls of elimination, substitution and isolation/engineering controls more often.** If the Safety Data Sheet or label carries the following symbols, then elimination and substitution need to be a high priority:

Flammable

Oxidising

Corrosive

Health hazard including cancer

Acute toxicity

Environmental

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3. Safety Data Sheets – All hazardous chemicals must be accompanied by Safety Data Sheets (SDS). SDSs contain information on:
   - Chemicals in the product
   - How to use the product safely
   - Health and safety effects
   - What risk control measures
   - What safety gear to use
   - What to do in an emergency, fire or chemical spill.
4. Hazardous Chemical Register – the PCBU/employer must keep a Register of hazardous chemicals and it must be readily available to workers and emergency services.
5. Risks associated with the use of hazardous chemicals must be controlled – by applying the hierarchy of control:
   - Eliminate: do the job without chemicals
   - Substitute: use less dangerous chemicals
   - Engineering controls: keep the chemicals away from the workers, e.g. in closed systems, use extraction ventilation to remove the fumes, flame proof lighting
   - Change to safer work practices: use glove bags, use brushes not sprays, use chemicals in smaller quantities, keep the lids on, keep out flame sources
   - Train workers in the health hazards and safe work practices
6. All control measures must be reviewed and maintained
7. Safety signs and arrangements for fire or explosions etc.
8. Emergency plans
9. Storage and handling systems
10. Health monitoring – there is a list of chemicals for which health monitoring may be necessary, e.g. isocyantes
11. There is a short list of substances which must not be used
12. Short list of cancer-causing substances that can only be used in certain circumstances

Useful resources

"whenever stricter controls are proposed, industry representatives or their hired guns appear, challenging the science and predicting an economic catastrophe"
Sharan Burrow, International Trade Union Congress, April 2015

The best way to remove a chemical hazard is not to use it – by either changing the process or using a safer chemical.

Dangerous solvents – there are many other options: As solvents enter the body via the lungs and skin a very effective method of substitution is using chemicals that are less volatile (see above). It is estimated that a worker could inhale 5.5 litres of volatile solvent with a flash point below 21 degrees Celsius over a working day. Vegetable based solvents or those with a high boiling point can virtually eliminate the volume of fumes inhaled.

When it comes to chemicals, cleaning agents, lubricants etc. there is often a reluctance to move to safer and greener alternatives. Here are some points to consider when choosing substitutes:

- **Phase out and get rid of any substance** that can cause cancer, is an endocrine disrupter, affects human genes (mutagen) or affects unborn babies (teratogen)
- **Exposure to any substance that causes asthma or dermatitis** needs to be prevented as much as possible (not so far as reasonably practicable). There are alternatives for these substances and over time there needs to be a phasing out process
- Effectiveness. Will the product meet the technical requirements (e.g., solubility, drying time) for the job or process?
- Compatibility. The substitute must not interfere or react with the process, the other products, or the equipment
- Existing Control Measures. Existing control methods may not adequately control the substitute (e.g., a less toxic substitute may evaporate more rapidly, and the existing ventilation system may not adequately capture the vapours)
- Waste Disposal. Will the current waste disposal system meet technical and regulatory requirements when dealing with any new waste created by using the substitute?
- Hazard Assessment should be done to decide whether to substitute a chemical or product with a different one. For example:
  - Short term health effects. It is important to remember that adverse health effects caused by short-term exposures to high concentrations of a chemical may not be the same as those resulting from low level, long-term exposures. For example, benzene and toluene, have similar acute effects but only benzene causes cancer following long-term exposure
  - Long-term health effects such as chronic lung disease may be more significant than short term health effects
  - Skin toxicity. Both the potential for direct irritation and allergic sensitisation must be examined. Besides breathing in chemicals, some solvents (and some solvent vapours) can also be absorbed through intact skin
  - Sensitization of the lungs etc. Repeated exposure to the chemical by inhalation can cause hypersensitive reactions, like an asthma attack. Special exposure control methods and workplace practices should be set up and maintained
  - Cancer-causing potential and reproductive effects
  - Physical hazards. Fire and explosion are sometimes the greatest hazards from a product. Properties that must be examined include vapour pressure, autoignition temperature, flash point, flammability limits, and reactivity
  - Vapour pressure. Vapour pressure is an indicator of how easily a chemical evaporates into the air. If a solvent is not very volatile (does not evaporate easily), the potential for exposure by inhalation may be very low.

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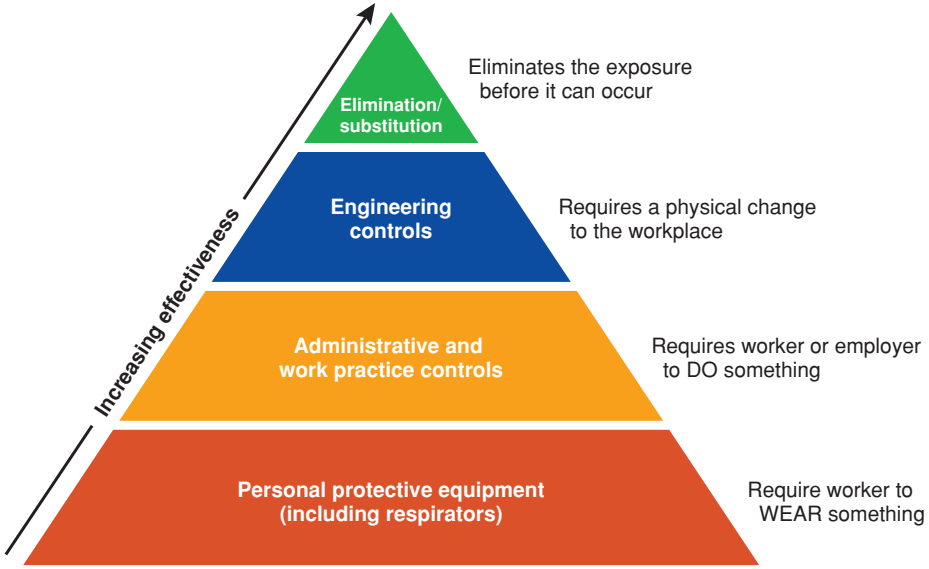
Overseas advice

Australia lags many other countries on the phasing out of dangerous chemicals – excellent advice can be found on the HSE website (UK) – called CSOHH essentials – it has lots of advice for workplaces looking to remove unnecessary and dangerous chemicals. http://www.hse.gov.uk/coshh/essentials/index.htm

The printing industry guides are particularly practical: http://www.hse.gov.uk/coshh/essentials/direct-advice/printing.htm



Here is a quick checklist on chemical safety to get you started:

	Yes	No
Are all hazardous substances and materials properly labelled?		
Are Safety Data Sheets (SDS) located in the areas where substances are stored or used?		
Is there a Manifest for all dangerous goods on site and a Register for all hazardous chemicals on site?		
Is there a minimum of 1.5 metres between incompatible Dangerous Goods, e.g. class 8 and class 5.1?		
Are all Dangerous Goods stored away from ignition sources e.g. welding?		
Is all the lighting in Dangerous Goods areas flame proof?		
Are all flammable liquids stored properly?		
Is work organised to eliminate or minimise the handling of hazardous substances?		
Where direct handling is unavoidable, are workers provided with suitable clothing, respirators and gloves?		
Are there emergency procedures and facilities for spillages and other accidents?		
Are all workers given information, instruction and training on the hazards of the substances?		
Have safer materials and substances been substituted where possible?		
Are dusts or fume producing machines enclosed or isolated?		
Are the sources of hazardous gases or fumes completely enclosed or sealed?		
Does the local exhaust ventilation remove the fume/vapour from workers breathing zones?		
Is the exhaust system regularly maintained?		
Have you checked to see if any of the chemicals include any of those on the lists below?		

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A checklist for printing workplaces

A YES indicates that your workplace is using chemicals that are unnecessarily hazardous.

	Yes	No
Are there any chemicals with a flashpoint of less than 55°C?		
Do roller or blanket washing cleaning solutions have a flashpoint of less than 21°C?		
Do any of the blanket revivers or ink stripping products contain n-hexane?		
Do any of the blanket revivers or ink stripping products contain hydrocarbons containing chlorides, fluorides or bromides?		
Do any of the blanket revivers or ink stripping products contain terpenes?		
Do any of the blanket revivers or ink stripping products contain amines or amides?		
Do any of the solvents have benzene content greater than 0.1%?		
Do any of the solvents have a toluene or xylene content of greater than 10%?		
Is the percentage of isopropyl alcohol (IPA) in font solvents greater than 10%?		
Are the appropriate SDSs not located in the areas in which the hazardous substances and materials are stored or used?		

A quick check list for general manufacturing:

A YES indicates that your workplace is using chemicals that are unnecessarily hazardous.

	Yes	No
Do any chemicals have a flashpoint of less than 55°C?		
Do any solvents have a flashpoint of less than 21°C?		
Do any solvents/cleaning agents products contain trichloroethylene, trichloroethane or methylene chloride?		
Do any solvents/cleaning agents products contain formaldehyde or epoxy resins?		
Do any solvents/cleaning agents products contain chlorides, fluorides or bromides?		
Do any solvents/cleaning agents products contain hydrofluoric acid?		
Do any solvents/cleaning agents products contain amines or amides?		
Do any solvents/cleaning agents products contain heavy metals?		
Do any solvents have benzene content greater than 0.1%?		
Do any solvents have a toluene or xylene content of greater than 10%?		
Do any paints contain isocyanates e.g. TDI or MDI?		
Do any paints contain Chromium (IV) i.e. Hexavalent Chromium?		
Do any coolants/cutting oils contain carcinogens, fungicides or bactericides?		

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Some chemical hazards for pregnant women

Hazard	Occupational exposure	Additional effect on woman or foetus
Beryllium	Electronics workers, jewellery makers, laboratory workers, nuclear technologists	Pregnancy may make symptoms of beryllium poisoning worse and cause death to the women
Carbon disulfide	Degreasers, glue makers, paint removers,	Menstrual irregularities, decreased fertility, miscarriages
Carbon monoxide	Wherever combustion is inadequately ventilated: forklifts, parking garages, foundries, second hand smoke	High levels toxic to foetus due to interference with ability of blood to carry oxygen may result in decreased birth weight, brain damage.
Hormones (including androgens, estrogens, progesterone and synthetic products such as DES)	Workers manufacturing synthetic hormones or extracts (e.g. birth control pills), including pharmaceutical workers, laboratory workers	Menstrual irregularities, ovarian cysts, breast lumps, cancer of the uterus; birth defects such as abnormalities of the skeletal system, heart, windpipe and sexual abnormalities, such as enlarged breasts, genital and sperm abnormalities in male offspring, DES can cause cancer in female offspring
Lead	Auto manufacturers and recyclers, battery manufacturers and recyclers, bridge re painters, electronics workers (soldering), farmers, pesticide makers, paint makers and users, plumbers, radiator repairers, smelter workers, welders	Development disorders such as intellectual disabilities, infertility, low birth weight, menstrual disorders, chromosome aberrations, miscarriages and stillbirths; contaminates breast milk
Mercury	Battery manufacturers, makers of fluorescent lamps and recyclers, scientific instrument makers	Miscarriages, stillbirths, reduced fertility, foetal exposure, can result in severe brain damage and intellectual disabilities
Pesticides	Pesticide manufacturers	Chromosomal abnormalities, miscarriages, birth defects
Vinyl chloride	Workers making vinyl chloride, polyvinyl chloride, and related products	Genetic damage to egg; miscarriages, stillbirths, birth defects; cancer in offspring from exposure during pregnancy
Benzene	Laboratory workers, refinery workers; service station workers (benzene is found in gasoline and other solvents)	Abnormal menstrual bleeding, bleeding during pregnancy, miscarriage; congenital malformation
Chlorinated solvents e.g. carbon tetrachloride, chloroform, methylene chloride, trichloroethylene, perchloroethylene	Degreasing, dry cleaning, adhesives, coating, foam plants	Carbon tetrachloride can pass through the placenta and cause liver damage in the foetus; chloroform can hinder foetal development
Glycol ethers (2-methoxyethanol and 2-ethoxyethanol)	Workers making or using solvents, paints, adhesives, cleaning products, thinners, etc. containing glycol ethers; electronic and semi-conductor workers	Miscarriages; animal studies suggest that glycol ethers may cause birth defects of exposure occurs during pregnancy
Other solvents	Workers making or using solvents for degreasing, cleaning, extraction, or in paints, adhesives, thinners, etc.	Various solvents have been linked to adverse reproductive effects in human or animal studies; but it is difficult to isolate the individual substance responsible as many solvents are mixtures. Caution is advised when handling solvents. Many solvents may contaminate breast milk.