POSITION STATEMENT

Occupational carcinogens

It is probable that between 2 and 11% of cancers in Australia are attributable to past occupational exposure. State and federal government has a role in identifying occupational carcinogens and regulating worker exposure to them.

Key messages

- Historically, well-established causal links between some occupational exposures and cancer include asbestos exposure and mesothelioma, vinyl chloride manufacture and angiosarcoma of the liver, and between benzene and leukaemia. Some occupations, e.g. painting, involve increased risk without the identification of particular chemicals.
- Exposure levels within industry have decreased considerably over time. Most occupational cancers diagnosed now are the result of exposures in past decades.
- Describing a cancer as due to an occupational exposure can be complex for a number of reasons:
    - Generally, there is no way to differentiate between cancers in the same organ caused by different factors.
    - Some exposures, such as UV radiation and tobacco smoke, may occur in both work and non-work contexts.
- Estimating the extent of occupational cancer in Australia is complex and estimates vary according to the methods used. It is probable that between 2 and 11% of cancers in Australia are attributable to past occupational exposure.
- Data on the nature and extent of exposures within Australian industry are needed to inform prevention practices. Data collection requires continuing research into the carcinogenic (cancer causing) effects of exposure to the chemicals, physical agents and industrial processes found in industry today and in the future.
- Primary prevention – that is, ensuring that workplace exposure to carcinogenic agents does not occur – is the best way to reduce occupational cancer. Options range from replacing known carcinogens through to the use of enclosed systems and protective clothing. Surveys of workplace practices may be necessary to ensure that recommended preventive procedures and practices are being implemented.
- The term “cancer cluster” indicates reporting of an unexpectedly high incidence of cancer with reference to geography or time. Some cancer clusters may be suspected of being a result of occupational exposure because they are identified by workers in a particular location. The majority of observed cancer clusters, however, appear to be chance events. Occasionally, cancer cluster investigations may identify unrecognised modes of exposure to known carcinogens and/or the inadequacy of protective measures.
- State and federal government has a role in identifying occupational carcinogens and regulating worker exposure to them. This may include banning certain substances, identification of best practice control measures, the promotion of exposure compliance monitoring and the active enforcement of occupational exposure limits.

Recommendations

Cancer Council Australia recommends that government:

- facilitates consensus on national priorities for research, monitoring and surveillance in relation to occupational cancer;
- collaborates with industry-led bodies and trade unions to increase awareness about carcinogens in the workplace.
- encourages and supports the systematic collection of exposure surveillance data including regular surveys of carcinogenic hazards and exposures in workplaces.
- Promotes best-practice occupational cancer prevention strategies, including:
    - eliminating workplace exposures to tobacco smoke;
    - using sun protection methods to minimise exposure to UV radiation;
    - widespread adherence to asbestos removal procedures;
    - minimising the number of people exposed to a known carcinogen through safe work environments, policies and practices;
    - training employees about exposure reduction;
    - workplace monitoring of carcinogens where applicable;
    - the development of appropriate new regulations and updating old regulations and existing occupational exposure limits; and
    - active enforcement of existing regulations in occupational health particularly in the area of compliance with occupational exposure limits and compliance monitoring.

Background

An occupational cancer is one attributable to exposure in the workplace. Most people are aware that exposure to asbestos causes mesothelioma. Similarly, occupational exposure to vinyl chloride causes angiosarcoma of the liver, and working with benzene causes an increase in the risk of leukaemia.

Most information about which chemicals cause human cancer has been obtained in occupational settings where, in general, levels of exposure are greater than those encountered in an environmental context. For example, people employed as pesticide applicators may be presumed to be exposed to higher levels of pesticides than persons living near where pesticides have been used.

An occupational cause is often clearer if the cancer is a very unusual type, or if the number of cancers occurring in an occupation is markedly increased (eg asbestos exposure and mesothelioma). Generally, there is no definitive way to differentiate between cancers in the same organ caused by different factors. It may help to record occupational histories as part of the standard management of tumour types known to be associated with occupational exposures.

Differentiating between occupational or other 'lifestyle' risk factors for cancer (such as smoking, alcohol drinking and obesity) is difficult. Lung cancer risk multiplies in tobacco smokers who are exposed to further tobacco smoke at work or asbestos. Some exposures, such as UV radiation and tobacco smoke, may occur in both work and non-work contexts.

For many workplace or environmental carcinogens (such as tobacco smoke), the greater the level of exposure, the higher the risk of cancer.

Investigation of carcinogens is invariably complicated because cancers generally arise many years – sometimes many decades – after exposure occurs and individuals may be exposed to many, rather than a single, carcinogen.

Hazardous exposures

The National Industrial Chemical Notification and Assessment Scheme (NICNAS) undertakes both hazard identification and risk assessment concerning the use of chemicals in an industrial context in Australia. There are over 38,000 chemicals on the Australian Inventory of Chemical Substances (NICNAS 2006) and some of these are known to be carcinogenic.

Some physical agents are also known carcinogens, such as ionising radiation and sunlight. There are also a number of complex exposures, including industrial processes which give rise to possibly carcinogenic exposures eg rubber process fume, diesel exhaust. For some chemicals, physical agents and processes eg asbestos, x-rays , chromite ore processing, the evidence that cancer has been caused is unequivocal. The evidence of occupational human carcinogenicity is weaker for other substances and processes. Knowledge that certain categories of work eg painting, increase risk, may or may not involve identification of particular chemicals as mediating that risk.

The International Agency for Research on Cancer (IARC), a body sponsored by the World Health Organisation (WHO), provides a list of agents that have been evaluated according to specific criteria and have been identified as carcinogens. Agents can be classified as carcinogenic to humans, probably carcinogenic or possibly carcinogenic. For further information visit www.iarc.fr.

The American Conference of Governmental Industrial Hygienists (ACGIH) and several national bodies set occupational exposure limits, including limits for known carcinogens. The ACGIH categorise agents with respect to their carcinogenic potential. For further information visit www.acgih.org.

Extent of the burden

It is difficult to estimate the number of cancers resulting from occupational exposure, because of the long lag time between the exposure and cancer diagnosis, and the difficulty of proving causation. Evidence from most epidemiological studies of occupational cancer conducted overseas can be applied to Australia. Local work practices, climate and the makeup of particular workforces may also be relevant.

There are many uncertainties in the available data necessitating several assumptions, and the results should be interpreted cautiously. Recently, the proportion of all cancers due to occupation was estimated by applying Finnish exposure prevalence estimates to Australian cancer data (Fritschi and Driscoll 2006). Using this method, it was estimated that about 11% of incident cancers in males and 2% in females are caused by occupation. This is about 5,000 cancers a year.

An alternative measure is to estimate the number of workers exposed to carcinogens at work (including chemicals such as diesel exhaust and tobacco smoke), and radiation, such as sun exposure. An estimate from the European Union (Kogevinas et al. 1998) indicated that 23% of the workforce are occupationally exposed to carcinogens. If this overall proportion is applied to the workforce in Australia then about 1.5 million workers in Australia are occupationally exposed to carcinogens (Fritschi and Driscoll 2006).

Others have applied different assumptions and methodologies and come up with different and sometimes lower estimates of the proportion of cancers due to past occupational exposures. (Doll and Peto 1981) A study from South Australian estimated that 4% of cancers were of occupational origin and that of the risk of future cancers from Category 1 carcinogens (IARC) was estimated to be about 2.5% of the current number of cancers in males. (SA Health Commission, 1995). Other estimates include, the proportion of cancer deaths due to occupational exposures that could be avoided (Peto 2001).

Screening

Individual workers thought to be exposed to some carcinogens may benefit from some form of clinical screening. Screening can detect early signs of certain diseases or pre-clinical diseases in individual workers. This is only useful when it leads to cure or to increased survival time. This varies for different cancers. An example is urine dipstick testing for haematuria in workers exposed to aromatic amines. This exposure is known to increase risk of bladder cancer and early treatment can result in an improved outcome. Further advances in imaging techniques and lung cancer treatments may make screening for lung cancer in exposed workers practical in the future.

There is a special need for health surveillance of workers exposed to carcinogens, not only because of the serious outcome of many cancers, but because of the long latency period between exposure and disease onset. This means that most cancers are likely to develop long after workers have ceased employment at the workplace where exposure occurred. Therefore, the timing of screening programs is crucial, and employers or perhaps a government agency should maintain a roll of employees exposed to carcinogens and notify the individuals when their next test is due.

Cancer clusters

A cancer cluster can be defined as "(an) aggregation of relatively uncommon events or diseases in space and/or time in amounts that are believed or perceived to be greater than could be expected by chance" (Last 1995). However, many of the clusters which have been brought to the attention of the Australian community are "occupational" to the extent that persons identified in terms of their workplace (for example, ABC Toowong, the National Gallery, RMIT and Concord Hospital).

Current evidence indicates that most cancer clusters occur by chance, and as such cannot be prevented. The random nature of the distribution of any disease throughout the community means that groups of cancers will occur together without any specific underlying cause. When cancer clusters are reported there needs to be an appropriate investigation to identify any plausible exposures. There must also be adequate communication about this with those affected and the wider community. (Thun & Sinks, 2004; Westley-Wise et al, 1999; Stewart 2007)

Gaps in current knowledge

Prevention of occupational cancer in Australia requires more than just ensuring that workers are not exposed to known carcinogens. It depends on understanding the nature and extent of exposures within Australian industry. We need a systematic method of continuing to extend our knowledge of the carcinogenicity of chemicals and physical agents and processes found in industry today, and of those agents which may be introduced in the future.

To do this, the following are required:

- A list of carcinogens and carcinogenic processes.
- An estimate of the relative risk of each cancer type for each carcinogen.
- The number of people exposed to each carcinogen at work and the extent and duration of the exposure.
- The number of cancers in the country.

Except for the last point, obtaining these data is quite difficult because:

- There is no definitive list of confirmed occupational carcinogens and the process of defining a carcinogen is extremely difficult. Several international organizations do have programs of classifying cancers, the most authoritative of which is the program co-ordinated by the International Agency for Research in Cancer (IARC).
- There is poor evidence on the potency of even confirmed carcinogens.
- There is little information on prevalence of exposure to occupational chemicals in the Australian community.

Building the evidence base on occupational cancer risk would be facilitated by ensuring that data from cancer registries are available to epidemiologists conducting research into clusters and occupational exposures, and that data sets are linked where necessary.

Reducing exposure

Primary prevention – i.e., ensuring workplace exposure to hazardous agents does not occur in the first place – is the most reliable way to reduce occupational cancer. Examples include:

- Eliminating a cancer causing agent by banning its production, import, sale or use.
- Substituting the cancer causing agent with something non-carcinogenic or less hazardous.
- Introducing engineering controls such as ventilation, enclosure or partial enclosure to the workplace where the carcinogen is present.
- Isolating the cancer causing agent so that it is separated from workers by distance.
- Using robotics to undertake tasks involving high exposure.
- Implementing safe work procedures in the workplace such as limiting the times at which outdoor work is performed, or ensuring that dust containing the cancer causing substance is dampened down.
- Ensuring staff are educated and trained in the use of hazardous substances.
- Personal protective equipment (PPE).

If the carcinogen is not removed from the workplace, monitoring should be undertaken to ensure that these control measures are and continue to be, effective. Regular monitoring might include making measurements of the amount of the carcinogen in the worker's breathing zone, checks on ventilation flow rates and respirator fit tests.

Role of government

In Australia, regulation of exposure to a recognised carcinogen may be subject to both Commonwealth- and state-based legislation. Both national and state authorities may have a role in setting limits on exposure to carcinogens in the workplace and on monitoring the situation. These limits are published on the Australian Safety and Compensation Council (ASCC) website, www.ascc.gov.au.

Legislation enacted to protect the worker from known and suspected carcinogens must be implemented and enforced. Exposure surveillance would record and enumerate those who are exposed to such agents or processes. In particular, when agents (or work environments) are evaluated by authorities such as IARC, ACGIH, International Program on Chemical Safety or the US National Toxicology Program, such findings must be "translated" into Australian regulation as quickly as possible. In addition the government has a role in publicising the findings so that the social partners can take timely action to reduce exposure at work and in the general environment.

Cancer Council Australia, GPO Box 4708, Sydney NSW 2001
Ph: (02) 8063 4100 Fax: (02) 8063 4101 Website: www.cancer.org.au

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