## A CAN OF WORMS
## From a microbiological and common sense viewpoint

The term, can of worms, relates to “A situation that presents difficulty, uncertainty, or perplexity”

Today hotels are faced with a vast range of situations that can and do impact on their business. Knowing and understanding the impact of these risks especially when these risks relate to things that can and do cause illness in guests, and in the worst scenarios death, can result in enormous damage to hotel reputations.

In a society where everyone is well informed and information is so readily available over the internet no business can afford to be complacent or take the chance that they won’t be exposed to litigation by an oversight or careless action in not exorcising due diligence. So much has been said and written over the past few years that for any business not to take adequate precautions especially where everything receives instant coverage is fraught with danger.

Hotels at their best are fun places to go with a lot of amenities specifically targeted to enhance the enjoyment of singles, couples and families. The last thing anyone wants at this time is to be stricken down with an illness even a mild dose of something is enough to spoil the occasion. Worse is an illness that is life threatening? Swimming pools, Jacuzzis’, cooling towers, drinking water, food and ice and the quality of indoor air can all potentially be of concern to all guests that have a predisposition to certain risk factors.

**Swimming Pools and Jacuzzi’s**

Inadequate disinfection of swimming pools and Jacuzzis’ offers ample opportunity for exposure to a number of bacterium, viruses and parasites not to mention the individuals that can have an adverse reaction to chlorine itself.

Good management of public swimming pools and public spa pools is essential for the health of everyone that uses them. Swimming pools and spas (Jacuzzis) that contain insufficient or reduced levels of disinfectant have the potential for rapid growth of microorganisms.

All swimming pools and spas should be equipped with an effective water circulation system with proper filtration and a continuous disinfectant dosing control system.

- A continuous dosing system is one that uses a metering device to feed the chemical/s at a controlled rate or can manufacture or generate chlorine to maintain a satisfactory residual to disinfect the water.
- Disease causing organisms that affect bathers may be introduced into a pool or spa on the bather’s skin, in their saliva, urine or faeces.
- Bird droppings, dust, water make-up, dirt and soil on the feet of bathers can also contribute and cause contamination.
- If pool water is not properly treated and maintained disease causing organisms are not killed and may actually grow and proliferate.
- The fast and effective kill of all disease causing organisms is essential for proper control.

Spa pools should be drained at least once per month to enable cleaning procedures to be undertaken. There can be a build-up of acid in the spa pool and this requires an exchange of water to reduce the level. Thorough cleaning includes removal of lint and foreign matter, and soaking overnight in 10ppm chlorine or similar disinfectant. Where spa pools are heated, the temperature must never exceed $40^{O}$C and exposures at greater than body temperature should not exceed 20 minutes for a healthy adult.

Signs should be displayed around spa pools restricting bathing to 20 minutes. The temperature of the spa should be regularly checked. Temperature has an adverse effect on the killing power of disinfectants, such as chlorine, in that the disinfectant dissipates rapidly. Warmer temperatures favour bacterial growth, such as *Legionella* in filter media, which may be transmitted by aerosols in spa pools. *Pseudomonas aeruginosa* survival and growth is enhanced at temperatures exceeding $26^{O}$C.

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To help prevent the contamination of pool and spa waters by bathers, they should all be encouraged to perform toileting prior to bathing by locating such areas within dressing and change rooms close to the pool entry. Urine is the most polluting material to enter a pool or spa.
Adequate numbers of showers should also be located in the dressing/change room areas and patrons should be encouraged to pre-shower before swimming. Signage should be erected to help encourage showering and soap provided.
Where persons are detected with wounds, sores and rashes, infected eyes, or wearing bandages it should be requested that they not swim in the pool. Pool contamination through nose blowing, spitting and sprouting of water should be actively discouraged.

**Waterborne Pathogens - A List of Infectious Agents That Could Be Swimming With You**

| | |
|---|---|
| ▪ ***Aeromonas*** | ▪ Isospora belli |
| ▪ ***Arcobacter*** | ▪ Microsporidia |
| ▪ ***Campylobacter*** | ▪ Toxoplasma gondii |
| ▪ **Enterovirulent *Escherichia coli*** | ▪ Adenoviruses |
| ▪ ***Helicobacter pylori*** | ▪ Astroviruses |
| ▪ ***Legionella*** | ▪ Caliciviruses |
| ▪ ***Mycobacterium avium* complex** | ▪ Coxsackieviruses |
| ▪ ***Salmonella*** | ▪ Hepatitis E virus |
| ▪ ***Vibrio*** | ▪ Norwalk-like viruses |
| ▪ ***Yersinia enterocolitica*** | ▪ Non-Group A Rotaviruses |
| ▪ ***Acanthamoeba*** | ▪ Cryptosporidium & Giardia |
| ▪ **Cyclospora** | ▪ Isospora belli |

Source: Infection Control Today www.awwarf.com/newprojects/factshts.html

It is important to understand the consequences of inadequate disinfection and how that impacts on your pool water, or more importantly, your guests. Most authorities recommend regular and routine testing plans to establish proper measurement and controls. Chemical levels should be performed at least at the start of pool openings and midway throughout the day. Microbiological testing should be performed by a recognised accredited laboratory at least monthly for standard indicator organisms. Swimming pools and spas should control these to minimise risk. It should also be realised that the results of a single sample do not necessarily give an indication of overall pool management therefore it is best that samples be collected over a long period of time such as 1 year to enable adequate assessment. Because there is a delay of some days before the results of a bacteriological analysis is known, the chemical quality of the swimming pool water will provide a measure of its “on the spot” ability to combat infection as it is introduced into a pool or spa.

| Type of Organism | Maximum Count Allowable |
|---|---|
| Total Plate Count | 100 Colony Forming Units (CFU) per mL |
| Thermotolerant coliforms (Faecal Coliforms) | Nil per 100 mL |
| Pseudomonas aeruginosa | Nil per 100 mL |

**Cooling Towers**
Cooling Towers are another area of risk with their potential to proliferate and harbour Legionella Bacterium. The three potential problems associated with cooling water are, corrosion, scale/deposits, and Microbiological activity.
Corrosion will shorten the life of the equipment, Scale/deposits will decrease heat transfer and increase energy usage and unchecked microbiological activity will cause system blockages, increased operating & running costs, and potential health hazards.
Further, a poorly maintained cooling water system will contribute to the growth of Legionella which as everyone knows has the potential to infect and kill. And, if a cooling tower isn’t fitted with an eliminator restricting the exhausting of tower water to atmosphere added risk is applied when these water droplets

are spread throughout the surrounding area up to a distance of 2 kilometres where infection can reach a broader community and potentially create a greater risk to the public.
Proper water management is crucial along with good maintenance practices to ensure that the risks to public health are minimised and the cooling system operates effectively. Best practice includes an independent and regular, routine sampling and testing programme for Legionella and Total Bacteria Counts to do two things, ensure the quality of the water treatment programme to manage bacterial levels and, to monitor these systems for Legionella so that there is minimal risk to hotel guests.


**Food and hygiene**
Food and hygiene is another very important area of concern, here the potential for harm is high as is risk to the establishment's reputation critical.
The manufacture and or sale of food, prepared or stored in a microbiologically hostile environment may result in any or all of the following

- Food poisoning or illness
- Food contaminated with foreign matter
- Food contaminated with animals or insects
- Food spoilage
- Unhygienic or unclean premises
- Unhygienic or unsafe food handling practices
- Unhygienic or unsafe food storage practices

is mainly attributable to a lack of appropriate standards and controls. Foodborne illness is a significant and increasing public health problem. The causative agents are mostly harmful micro-organisms. Most foodborne illness results from inappropriate food hygiene and food handling practices, which could have been avoided. Other factors influencing the increase in foodborne illness worldwide include: the emergence of new and virulent strains of pathogens; the increased consumption of, and consumer preference for, fresh, minimally processed food, takeaway and ready-to-heat meals; changes in animal husbandry; and the increase in the proportion of elderly and other at-risk groups (Gerba et al. 1996, ANZFA 1999). Every hotel should be aware of and incorporate proper HACCP applications and guidelines to prevent the potential for food safety problems. HACCP is a system that identifies and monitors specific foodborne hazards - - biological, chemical, or physical properties -- that can adversely affect the safety of the food product. Hotels have a responsibility to their guests to ensure that all kitchen and similar activities undergo proper monitoring programs to ensure that hygiene, handling, preparation and storage strictly meet criteria designed to minimize risk. Even areas often taken for granted need to receive serious attention, such as ice machines and the handling of ice for food and drink, if manufactured off site you need to be assured that the quality of water is tested for the same microbiological parameters as drinking water, that staff are correctly handling it and bottled water provided to guests needs verification that it also has been measured and certified to ensure that there isn't any contamination. The delivery of product should be made in such a way as to assure its quality and integrity, and that adequate checks are made before it is accepted on arrival. Every procedure and practice should be reviewed, checked, and evaluated so that there are substantiated control standards enforced to minimize any risk.

**Indoor Air Quality**

The importance of a safe indoor environment is crucial to the health of staff, guests, contractors and the general public. In many instances, the quality of the air is overlooked for more visible problems such as broken windows, slip hazards, and overhangs. In actual fact, the air quality is the single most significant aspect of an indoor environment. The World Health Organisation (WHO) estimates that more than 30percent of all commercial buildings have significant Indoor Air Quality problems, a figure that most people are oblivious to.

The indoor environment in any building is a result of interaction between the site, climate, building system, (original design and later modification in the structure, and mechanical systems), construction techniques, contaminant sources (building materials and furnishings, moisture, processes, and activities within the building, and outdoor sources), and building occupants. Indoor air should be free from harmful atmospheric pollutants such as gases, fumes, dust or vapours.

The following four elements are involved in the development of indoor air quality problems:

Sources: there is a source of contamination or discomfort indoors, outdoors, or within the mechanical systems of the building,

HVAC: the HVAC system is not able to control existing air contaminants and ensure thermal comfort (temperature and humidity conditions that are comfortable for most occupants),

Pathways: one or more pollutant pathways connect the pollutant source to the occupants and a driving force exists to move pollutants along the pathway(s),

Occupants: building occupants are present.

It is important to understand the role that each of these factors may play in order to prevent, investigate, and resolve indoor air quality problems.

**Sick Building Syndrome (SBS)**

The term sick building syndrome (SBS) is sometimes used to describe cases in which building occupants experience acute health and comfort effects that are apparently linked to the time that they spend in the building, but in which no specific illness or cause can be identified. The complaints may be localized in a particular room or zone or may be widespread throughout the building. Many different symptoms have been associated with SBS, including respiratory complaints, irritation, and fatigue. Analysis of air samples often fail to detect high concentrations of specific contaminants. The problem may be caused by:

The combined effects of multiple pollutants at low concentrations (e.g. VOCs, carbon monoxide, formaldehyde)

Other environmental stressors (overheating, poor lighting, noise)

Ergonomic stressors

Job-related psychosocial stressors (overcrowding, labour management problems)

Unknown factors

**Building Related Illness (BRI)**

Building-related symptoms are common and are generally nonspecific discomfort problems affecting the eyes, nose and throat. There are no definitive clinical tests available to establish the diagnosis of sick building syndrome rather, building associated symptoms are recognized by identification of indoor air quality (IAQ) environmental problems or higher combined symptom rates among a group of building occupants.

In contrast, building-related illnesses are uncommon and by definition, are more serious in prognosis than mere discomfort. Physician diagnosis by clinical investigation of symptoms is the usual means of recognizing building-related illnesses. Building-related illnesses can have a long latent (or asymptomatic) period after exposure begins before symptoms are experienced, such as occurs with lung cancer after indoor radon exposure. Other categories of building-related illnesses, however, are associated with an immediate appearance of symptoms after exposure

**Recognizing Building-Related Illnesses**
Toxic illness; for example: carbon monoxide poisoning

Infectious disease; for example: Legionnaires' disease
Allergic disease; for example: asthma, hay fever, or hypersensitivity pneumonitis
Building-related illnesses generally require a prolonged recovery time or may become a chronic problem for the patient, even after removal or remediation of the building exposure that caused the illness in the beginning.

**Assessment Objective**
The objective of an IAQ assessment and monitoring is to evaluate and assess that the condition of indoor air quality of a building or office premises is in compliance with acceptable limits.
A typical Indoor Air Quality Assessment objective is to perform an analysis of the Indoor Air Quality as it is at the time of the assessment and identify any areas where concentration of levels is high and may cause concern to the occupants. Measurement of thermal comfort which incorporates air temperature and relative humidity within the occupied areas. These are compared with established acceptable levels.

Carbon dioxide levels within the working environment which would give an indication as to whether the fresh air rate supplied is in sufficient quantity to remove unpleasant odours and other internally generated pollutants.

Noxious gases such as carbon monoxide, carbon dioxide and formaldehyde and (where required) ozone.

Measurement of airborne particulate levels within the workplace. Comparison with acceptable levels and between various locations within the same building.

Airborne bacteria, and fungal contamination levels within the office areas. These are compared to various guidelines or best knowledge of our microbiologists. The data also helps to locate the source of the problem.
A 'spot check' assessment, longer term or indoor air quality monitoring programmes can be used to confirm that the ventilation plant is being maintained at an acceptable hygienic and mechanical standard as well as ensuring that the building complies with current acceptable limits.

**What Causes Indoor Air Problems?**
Indoor pollution sources that release gases or particles into the air are the primary cause of indoor air quality problems. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the building. High temperature and humidity levels can also increase concentrations of some pollutants.

**Pollutant Sources**
There are many sources of indoor air pollution. These include combustion sources such as oil, gas, kerosene, coal, wood, dust, pollen and tobacco products; building materials and furnishings as diverse as deteriorated, asbestos-containing insulation, wet or damp carpet, and cabinetry or furniture made of certain pressed wood products; products for cleaning and maintenance, or personal care, central heating and cooling systems and humidification devices; and other sources such as radon, pesticides, and outdoor air pollution.
The relative importance of any single source depends on how much of a given pollutant it emits and how hazardous those emissions are. In some cases, factors such as how old the source is and whether it is properly maintained are significant.
Some sources, such as building materials, furnishings, and cleaning products like air fresheners, release pollutants more or less continuously. Other sources, related to activities carried out in a building, release pollutants intermittently. These include smoking, the use of solvents in cleaning, the use of paint strippers in redecorating activities, and the use of cleaning products and pesticides in house-keeping. High pollutant concentrations can remain in the air for long periods after some of these activities.

**Amount of Ventilation**
If too little outdoor air enters a building, pollutants can accumulate to levels that can pose health and comfort problems. Unless they are built with special mechanical means of ventilation, buildings that are designed and constructed to minimize the amount of outdoor air that can "leak" into and out of the building may have higher pollutant levels than other buildings.

**Indoor Air Pollution and Health**
Health effects from indoor air pollutants may be experienced soon after exposure or, possibly, years later.

**Immediate effects**
Immediate effects may show up after a single exposure or repeated exposures. These include irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue. Such immediate effects are usually short-term and treatable. Sometimes the treatment is simply eliminating the person's exposure to the source of the pollution, if it can be identified. Symptoms of some diseases, including asthma, hypersensitivity pneumonitis, and humidifier fever, may also show up soon after exposure to some indoor air pollutants.
The likelihood of immediate reactions to indoor air pollutants depends on several factors. Age and pre-existing medical conditions are two important influences. In other cases, whether a person reacts to a pollutant depends on individual sensitivity, which varies tremendously from person to person. Some people can become sensitized to biological and chemical pollutants after repeated exposures.
Certain immediate effects are similar to those from colds or other viral diseases, so it is often difficult to determine if the symptoms are a result of exposure to indoor air pollution. For this reason, it is important to pay attention to the time and place symptoms occur. If the symptoms fade or go away when a person is away from work, for example, an effort should be made to identify indoor air sources that may be possible causes. Some effects may be made worse by an inadequate supply of outdoor air or from the heating, cooling, or humidity conditions prevalent in the building.

**Long-term effects**
Other health effects may show up either years after exposure has occurred or only after long or repeated periods of exposure. These effects, which include some respiratory diseases, heart disease, and cancer, can be severely debilitating or fatal. It is prudent to try to improve the indoor air quality in a building even if symptoms are not noticeable.
While pollutants commonly found in indoor air are responsible for many harmful effects, there is considerable uncertainty about what concentrations or periods of exposure are necessary to produce specific health problems. People also react very differently to exposure to indoor air pollutants. Further research is needed to better understand which health effects occur after exposure to the average pollutant concentrations found in buildings and which occurs from the higher concentrations that occur for short periods of time.
***Documentation of all complaints*** *concerning the quality perceived or other of the Indoor Air Quality inside your building or property should be well documented and recorded including situations where the system has faulted or some known occurrence has impacted on the quality of the air.*

**Improving Indoor Air Quality - There are three basic strategies to improve indoor air quality**

**Source Control**
Usually the most effective way to improve indoor air quality is to eliminate individual sources of pollution or to reduce their emissions. Some sources, like those that contain asbestos, can be sealed or enclosed; others, like gas stoves, can be adjusted to decrease the amount of emissions. In many cases, source control is also a more cost-efficient approach to protecting indoor air quality than increasing ventilation because increasing ventilation will increase energy costs.

**For most indoor air quality problems in a building, source control is the most effective solution.**

**Ventilation Improvements**

Another approach to lowering the concentrations of indoor air pollutants in a building is to increase the amount of outdoor air coming indoors. Most building heating and cooling systems mechanically bring fresh air into the building at a controlled rate depending on the percentage and exchange rate of air can dramatically affect the pollutant levels. The minimum recommended fresh air rate is 10 Litres per second (L/s) per person or 10 L/s per 10 m2 for mechanical ventilation systems with optimum air movement of 0.1-0.5 m/s (naturally ventilated), 0.1-0.2 m/s (air-conditioned).

**Air Cleaners**

There are many types and sizes of air cleaners on the market some air cleaners are highly effective at particle removal, while others are much less so. Air cleaners are generally not designed to remove gaseous pollutants.

The effectiveness of an air cleaner depends on how well it collects pollutants from indoor air (expressed as a percentage efficiency rate) and how much air it draws through the cleaning or filtering element (expressed in cubic feet per minute). A very efficient collector with a low air-circulation rate will not be effective, nor will a cleaner with a high air-circulation rate but with a less efficient collector. The long-term performance of any air cleaner depends on maintaining it according to the manufacturer's directions.

Another important factor in determining the effectiveness of an air cleaner is the strength of the pollutant source. People with sensitivity to particular sources may find that air cleaners are helpful only in conjunction with concerted efforts to remove the source.

Over the past few years, there has been some publicity around indoor houseplants and these should not be over-watered because overly damp soil may promote the growth of microorganisms which can affect allergic individuals and in the case of some plants spores can be collected and distributed through the air system to contribute significant allergy and contamination problems.

Consultants in indoor air quality would state, "Dilution is the solution to indoor air pollution!" Today although we focus on controlling the source of contaminant, dilution makes a terrific second line of defence and can reduce or eliminate many IAQ concerns in commercial buildings.