ACT Population Health Bulletin

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Contents

Upcoming Events

- 18 March 2016 - Healthy Canberra Grants applications close - http://www.health.act.gov.au/healthy-living/health-promotion-grants-program
- 20 June 2016 - Health Promotion Innovation Fund appications close - http://www.health.act.gov.au/healthy-living/health-promotion-grants-program
- 8 April 2016 - National Youth Week - It's Your Move pop up cafe - HealthPromotion@act.gov.au
- April - Remember to get your Flu shot.

Editorial

In this Issue, a broad examination of environmental hazards affecting the ACT is provided. We are rightly proud of our safe and clean environment, and the first takeaway message from the various papers presented here is that this pride is justified. However, preserving that situation cannot be left to chance, and requires a commitment to prevention as well as risk-based regulation, sustained vigilance and an ability to act appropriately when hazards are detected.

An important underlying concept in public health is a superficially simple explanation of the way in which humans and other species interact with disease causing agents within varied ecological niches. This concept is known as the "epidemiological triad" of host, agent and environment and an examination of variations in one or more of these three components can provide useful and indeed quite sophisticated understandings and opportunities for public health action.

Predicting, preventing, monitoring and responding to environmental hazards requires a multidisciplinary approach. This includes but is not limited to such diverse disciplines as epidemiology, statistics, engineering, microbiology, environmental and forensic chemistry, toxicology, entomology, information technology (including signal detection and real-time reporting as well as data linkage), meteorology, plant science, ecology and clinical medicine (including emergency, infectious diseases and respirology). In a small jurisdiction like the ACT this creates a challenge, but one which we are able to meet through strong collaboration across the ACT Government, the academic sector and with inter-state colleagues. The link with clinical services data is crucial for establishing the cause and effect relationships but more importantly for predicting and preventing acute exacerbations of illness that can quickly overwhelm our emergency departments and GP surgeries. Whilst we cannot always control the hazard, we can mitigate the effects through timely, evidence-based public health alerts and actions.

As our environment continues to change and our city increases in size and complexity, many of the topics covered here will likely become more prominent public health issues. Urban development and water catchment management, the frequency and intensity of bushfires, choices of heating or cooling in our homes and commercial buildings, the introduction of different industries, decisions on public transport and urban expansion close to waterways and the opening of international travel options at our airport can all have consequences that impact positively on the health of the community. Conversely, they can have unintended consequences that may be associated with adverse health impacts. The authors of articles in this Issue, as well as many of their colleagues in the Health Protection Service, provide a crucial frontline service to consider and respond to emerging environmental health issues related to these developments.

I am particularly thankful for the contributions of external authors, Professor Simon Haberle and Associate Professor Martyn Kirk and his co-authors. Thanks also to Dr Vanessa Johnston who was guest editor and was ably assisted by the other members of the editorial committee.

Dr Paul Kelly
ACT Chief Health Officer
February 2016

Breaking News

ACT to introduce pharmacist vaccinations

Influenza, commonly known as the flu, is a highly contagious respiratory illness. Influenza is responsible for significant numbers of respiratory illness, usually in the winter months, each year in the ACT. Vaccination against influenza is an effective way to prevent infection with the influenza virus.

The Assistant Minister for Health, Meegan Fitzharris, MLA has announced that the ACT has changed the Medicines, Poisons and Therapeutic Goods Regulation 2008 to allow pharmacists to administer vaccinations to adult patients (over 18 years) without a prescription.Pharmacist vaccinations will complement already existing immunisation services that exist through visits to general practitioners, other primary health care providers and vaccination programs available in workplaces. Improving public access to vaccinations is an important public health initiative.

As part of this initiative, the Chief Health Officer has determined standards that ACT pharmacists will need to comply with to deliver influenza vaccination to adults. This includes training, appropriately outfitted premises, and administration and record keeping requirements. These standards are set in place to reassure the public that vaccines administered by pharmacists are safe.

This public health initiative will deliver a further option to adult patients in the ACT who are seeking vaccination against the influenza virus. Patients are encouraged to discuss their vaccination requirements with their health provider, including a medical practitioner or pharmacist, as appropriate.

For more information on Pharmacist vaccination in the ACT visit http://www.health.act.gov.au/public-information/businesses/pharmaceutical-services/pharmacist-vaccinations

Image: Immunisation. Blackstock, FreeDigitalPhotos.net

Safe Cycle

With only one in five ACT primary school students achieving the recommend 60 minutes of daily physical activity, riding and walking to school is a simple and fun way to increase that level and assist in establishing healthy habits into adulthood. The Ride or Walk to School program is now established in 52 schools across Canberra to work with students, teachers and the school community to increase the awareness of and participation in active travel. The program contributes to the ACT Government's Healthy Weight Initiative and is implemented in schools by the Physical Activity Foundation with support from ACT Health.

Image: Ride or Walk to School. ACT Health

In December 2015, ACT Chief Health Officer Dr Paul Kelly, joined a group of Canberra teachers who have been acting as program coordinators in their schools, implementing the various aspects of the program including student workshops, teacher training, road safety education, events and the curriculum-aligned practical cycling education program Safe Cycle for 5/6 students. The group heard about the experiences of both Farrer and Evatt Primary Schools who had just completed the first of their three years on the program. Both schools shared their challenges, learnings and successes from the first year and reported an increased enthusiasm and commitment to active travel from students and their school community.

In addition, analysis of the data collected from participating schools showed that 64 percent of Year 6 students reported the use of active travel to school which was up from 50 percent at the commencement of the program.

Ride or Walk to School Program Manager, Emma Tattam reported that in 2015, 531 bikes and 36 scooters were delivered to participating schools, 2,158 students participated in BMX skills workshops, 91 self-defence protective-behaviour workshops were conducted and 362 teachers were trained in bike riding workshops.

For more information on the program visit www.paf.org.au

The Evatt Primary School story can be viewed on YouTube at https://www.youtube.com/watch?v=LLqcKY4iuO0

Breaking News

Active Streets launches in four Belconnen schools

On 24 February 2016 the ACT Minister for Transport and Municipal Services and Assistant Minister for Health, Meegan Fitzharris MLA, launched the Active Streets pilot program at Latham Primary School. Minister Fitzharris was joined by ACT Minister for Education, Shane Rattenbury MLA and the Chief Health Officer, Dr Paul Kelly.

Image: Active Streets Launch. ACT Health

Active Streets is an extension of the ACT Government's Ride or Walk to School program and aims to create a supportive environment for students and school communities that are safer and more conducive to active travel. It is being trialled in four schools – Macquarie, Macgregor, Latham and Mount Rogers primary schools.

Road safety, walking and cycling improvements have been rolled out at the schools. These include dragon's teeth at Macgregor Primary School; dragon's teeth and footpath improvements at Macquarie Primary School; a 30 km/h speed limit, parking improvements and children's crossing at Mount Rogers Primary School; and a 30 km/h speed limit and parking improvements at Latham Primary School. Popular path networks from the four schools have been marked with Active Streets icons which identify how far and how long students have until they reach their school.

Active Streets is all about starting small. You don't have to ride or walk every day or the whole way, with part way drop off points identified for each school that provide direct routes which are not along busy stretches of road, have suitable active travel infrastructure and are within a walkable distance.

Cycling, walking, scootering or skating are simple ways for children to incorporate physical activity into their everyday lives. Their daily journey to and from school provides an ideal opportunity to put this into practice.

For more information about Active Streets email healthpromotion@act.gov.au, phone 6207 0725 or visit www.goodhabitsforlife.act.gov.au/active-streets.

Acronyms and Resources

Acronyms

ANU	Australian National University
AQI	Air Quality Index
APR	Air purifying respirators
ARP	Affected residential properties
ATS	Amphetamine type substances
BAM	Beta attenuation monitor
BFV	Barmah Forest Virus
CO	Carbon Monoxide
CFU/mL	Colony forming units per millilitre
DEET	Diethyltoluamide
ED	Emergency Department
ESA	Emergency Services Agency
HPS	Health Protection Service
KUNV	Kunjin Virus
MDMA	3,4-Methylenedioxymethylamphetamine
MVEV	Murray Valley Encephalitis Virus
NATA	National Association of Testing Authority
NEPM	National Environment Protection Measure
NO_2	Nitrogen dioxide
O_3	Ozone
PEP	Personal protective equipment
PM	Particulate matter
RRV	Ross River Virus
SCBA	Self contained breathing apparatus
TATP	Triacetonetriperoxide

Resources

- ACT Asbestos Health Study - act.asbestos.health.study@anu.edu.au
- Active Streets
- Air Quality Index data - **http://www.health.act.gov.au/public-information/public-health/act-air-quality-monitoring/air-quality-index-aqi**
- Asbestos Taskforce - http://www.act.gov.au/asbestos-response-taskforce
- Canberra Pollen - www.canberrapollen.com.au
- DustWatch - http://www.environment.nsw.gov.au/dustwatch/dwreports.htm
- Good Habits for Life - www.goodhabitsforlife
- Pharmacist Vaccination - http://www.health.act.gov.au/public-information/businesses/pharmaceutical-services/pharmacist-vaccinations
- Ride or Walk to School - www.paf.org.au
- *Salmonella anatum* - http://www.foodstandards.gov.au/industry/foodrecalls/recalls/Pages/Pre-packaged-salad-leaves.aspx
- Smart Traveller - http://smartraveller.gov.au/guide/all-travellers/health/
- Zika Virus - http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-zika.htm

Article

Asbestos in the ACT: what are the health risks?

Dr Andrew Pengilley & Kirsty Whybrow, Office of the Chief Health Officer, Population Health Division

Asbestos is a topic of interest in Canberra as the ACT Government and residents deal with the effects of 'Mr Fluffy', a loose fill asbestos product that was sold as insulation and installed in the roof space of more than 1000 houses in the ACT and surrounding region between 1968-1979.

This article discusses some of the health risks of asbestos.

Introduction

Australia has a long history of using asbestos. Subsequently, asbestos-related disease has been a significant public health issue, predominantly among workers in high exposure industries. Recent times have seen the ACT Government grapple with how to mitigate the risk of exposure to loose fill asbestos insulation in residential homes. While there is considerable and understandable public anxiety about the health effects of residential exposure, it is anticipated that at a population level, the impact is likely to be low but not zero. Local studies are currently underway to provide us with a greater understanding of the risks.

What is asbestos?

Asbestos is a group of natural mineral fibres which have been used extensively in many products due to its strength, insulating features and fire resistance. Amosite and crocidolite asbestos, known as brown and blue asbestos respectively (due to the natural colour of the fibres) were commonly used in building materials until the mid-1980s. By this time it was apparent that inhalation of airborne asbestos fibres could cause serious illness, most commonly in people exposed to high levels in industrial settings. This led to a gradual phasing out of asbestos use in Australia and its use has been prohibited since 2003.[1] The areas of Canberra that were built during the 1960s reflect the national usage of asbestos.[1] The use of loose fill asbestos insulation in more than 1000 Canberra homes has posed a unique potential route of exposure to inhaled asbestos since the late 1960s. Because of this there has been considerable recent interest in the potential effects of long-term exposure to asbestos on people's health.

Image: Loose fill asbestos. ACT Asbestos Response Taskforce

Health effects and exposure levels

Several health conditions are linked to asbestos exposure. The most common are benign pleural plaques, which typically cause no symptoms but appear 20-40 years after exposure to asbestos and may be visible on chest x-rays. A small proportion of people exposed to asbestos will develop mesothelioma, a malignancy of the pleura, which is fatal in most cases. The rate of mesothelioma reached 26 per 100,000 (calculated at the end of 1993) in residents exposed to dust and mine tailings in the West Australian mining town of Wittenoom[2] compared to 2-4 per 100,000 in Canberra.[3] Heavy exposure to asbestos can also scar the lungs causing a reduction in lung capacity and difficulty breathing called 'asbestosis'.

There is probably no absolutely safe level of exposure. This has led to the common belief that 'one fibre can kill,' which causes a great deal of community anxiety given the amount of asbestos in the built environment. Air in urban centres generally contains about 100 fibres in the volume of air a person breathes each hour, and so everyone inhales a large number of fibres over their lifetime, apart from other known asbestos exposures. The risk of asbestos related disease increases with lifetime exposure to asbestos and has mostly been limited to mining or industrial manufacturing workers. Home renovators, who may be exposed to large quantities of asbestos over a short period, are also at risk of asbestos-related disease. Most people exposed to asbestos, however, do not developed asbestos-related disease.

Asbestos Use in Australia

Historically, Australia has had one of the largest per-population usages of asbestos in the world. The mineral was mined in Australia for over a hundred years until 1983 when the chrysotile (white asbestos) mine in New South Wales closed. Crocidolite was mined in Wittenoom in Western Australia from 1937 to 1966.[4] In addition to domestic production, Australia imported asbestos and asbestos-containing products, such as cement articles, cord and fabric, and friction materials. Until the 1960s, 25 percent of all new Australian homes were clad in asbestos cement.[4] Most of the asbestos in buildings is bonded into materials like fibre-board or pipe lagging. This is present in a large proportion of Canberra homes built before 1985, particularly in kitchens, eaves and sheds. Unless this material is damaged, however, asbestos fibres are not released into the air in significant quantities and pose a low risk of being inhaled.

Between 1968 and 1979, loose fill asbestos, mainly amosite, but some crocidolite, was sold as insulation and installed in the roof space of some 1,100 houses in the ACT and surrounding region by D. Jansen & Co. Pty Ltd and its successor firms. Loose fill asbestos insulation is finely crushed asbestos, and up to two million fibres can be seen under the microscope on the sample size of a 50 cent piece. This asbestos fluff insulation has become commonly known as 'Mr Fluffy'. Unfortunately, this loose asbestos can easily become airborne and poses an ongoing risk of inhalation to people exposed to it.

Between 1989 and 1993, in recognition of the public health risks associated with loose-fill asbestos insulation, a joint Commonwealth and ACT Government program sought to remove visible and accessible asbestos from the roof spaces of most homes. The prevailing view at the time of that program, amongst at least some of the owners of affected homes, and notwithstanding disclaimers to the contrary on the program's completion certificates, was that all loose fill asbestos insulation was removed.[5]

In 2012-13, a house that had been missed in the original removal program recorded significant levels of contamination in the living areas. In February 2014, the ACT Government wrote to residents of affected homes reminding them of the continuing presence of asbestos fibres in the structure of their homes, and recommended they have an asbestos assessment undertaken. Findings of early assessments found loose fill asbestos in cupboards, heating and cooling ducts and vents, living rooms and bedrooms, sometimes in visible quantities.

ACT Asbestos Response Taskforce

The ACT Asbestos Response Taskforce was formed in June 2014 to provide a coordinated, comprehensive and compassionate response to this issue. It concluded that there was no effective, practical and affordable method to render houses containing loose fill asbestos insulation safe. Demolition of affected homes was considered the only enduring solution to the health risks posed by the presence of

Asbestos in the ACT: what are the health risks? *(continued)*

loose fill asbestos insulation in homes, and their attendant social, financial and practical consequences. The decision was made for the ACT Government to purchase and demolish each of the 1,022 houses eligible for the ACT Government buyback and demolition scheme. The taskforce stated the it may, in time, and for historical reference, add other known affected houses that were previously demolished or removed through natural disasters.[5]

What is the exact risk to health from residential exposure to loose fill asbestos?

Quantifying the exact risk to people who have lived in houses with residual 'Mr Fluffy' has been difficult, and is the subject of an ongoing epidemiological study funded by ACT Health (see article on page 6 of this Bulletin). The study team includes Bruce Armstrong, Emeritus Professor in the School of Public Health at the University of Sydney. Professor Armstrong is a leading public health expert with over 40 years' experience researching the causes and prevention of cancer and the performance of cancer services. In 2015 Professor Armstrong investigated the possible health effects on people living in a Mr Fluffy house for a presentation to the Canberra community. Professor Armstrong reviewed a 1980s study of 22 Canberra buildings, one of which appeared to have had Mr Fluffy insulation. Of the 59 samples from that building, the highest concentration was 0.022 fibres per millilitre of air, but most of the samples showed levels below 0.001. For context, ambient air in cities has a level of 0.0002 asbestos fibres per millilitre.[6] Professor Armstrong also used information from a 1988 report that found a concentration of less than 0.01 fibres per millilitre (the lowest detectable level in that study) in 16 Canberra Mr Fluffy houses. Data from testing in 2014/15 of 42 NSW Mr Fluffy homes showed concentrations of less than 0.01 fibres per millilitre in all but one property. The data doesn't take account of additional exposure through renovations or other activity which could stir up the asbestos fibres. Assuming an average asbestos concentration in the air in a Mr Fluffy house of 0.001 fibres per millilitre, Professor Armstrong estimated that the lifetime risk of death from mesothelioma or lung cancer due to a lifetime of living in a Mr Fluffy house is 16 per 100,000. It is widely accepted that the general population should not be exposed to hazards that confer a lifetime risk of cancer of less than 1 per 100,000. As such, according to these figure, living in a Mr Fluffy house presents an unacceptable risk to life and health. The impact at a population level is likely to be small, with an estimate of one, and perhaps up to three, people dying from mesothelioma as a consequence of living in a Mr Fluffy house.[7]

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6. Department of Health and Ageing. EnHealth: Management of asbestos in the non-occupational environment. Canberra: DoHA, 2005.

7. Armstrong, B. How dangerous is it to live in a Mr Fluffy house? http://nceph.anu.edu.au/files/Mr%20Fluffy%2020150804.pdf (accessed December 2015).

Asbestos Response Taskforce Update

On 26 February 2016, the Asbestos Response Taskforce released a revised indicative Demolition Schedule showing where a further 727 houses will be demolished across Canberra from now through to end of 2018.

The ACT Government demolition program is progressing well with 90 houses safely demolished across 30 suburbs and 10 principal contractors engaged to undertake demolition work over the coming years. With increased industry capacity and experience, efficiencies are being achieved that allow additional properties to be incorporated into existing work programs particularly where houses exist in close proximity. This further improves the efficiencies that can be achieved by the contractors and will minimise the number of times the Taskforce needs to be in a particular street or suburb, thereby reducing disruption to the community.

The Taskforce is committed to continued improvement drawing from lessons learned and innovation. As the program progresses the community may see changes in the practical approach to demolition activity for efficiency purposes and as understanding of these works broadens. Refinements to processes and practices have already been seen and it is important to note that all methods used in the demolition program are safe and are independently signed off by the regulator, WorkSafe ACT.

Whilst each house is different and the level of asbestos contamination found varies, it is clear from the demolitions undertaken to date that the considerable volumes of asbestos fibres have migrated into the wall cavities of these properties as can be seen by the images below.

Image: Loose fill asbestos. Asbestos Response Taskforce

The Taskforce continues to engage with and support homeowners, neighbours and the broader community around the surrender of affected properties, remaining in the properties with Asbestos Management Plans in place, the maintenance of vacant properties, demolition process and timing. In April 2016 the Eradication Scheme commences the next phase, resale of remediated blocks, and the Taskforce will continue to provide information and support to interested parties.

For more information please view the Taskforce website at www.act.gov.au/asbestostaskforce, send an email to asbestostaskforce@act.gov.au or call Access Canberra on 13 22 81.

Article

ACT Asbestos Health Study: investigating the health effects of living in Mr Fluffy homes

A/ Prof. Martyn Kirk, Susan Trevenar, Dr Rosemary Korda, National Centre for Epidemiology and Population Health, Australian National University

ACT Health commissioned the ACT Asbestos Health Study to investigate the health effects of living in a house with loose-fill asbestos insulation in the ACT. In 2014, the ACT Government made the decision to demolish more than 1000 homes that contained loose-fill asbestos. People who have ever lived in one of these affected residential properties may have been exposed to the asbestos fibres.

The study will provide information on mesothelioma in the ACT, domestic exposure to asbestos and health concerns of current and recent residents of affected residential properties. It will also estimate the risk of mesothelioma and other cancer associated with living in an affected residential property. There are four components to the study:

1. Descriptive analysis of mesothelioma cases diagnosed in the ACT since 1982.
2. Focus group discussions to determine the health-related and social concerns of current and recent residents of affected residential properties.
3. Cross sectional survey to assess health-related concerns and determine likely levels of exposure to asbestos insulation in current and recent residents of affected residential properties.
4. Data linkage study to estimate the relative rates of mesothelioma and other cancers in current and former residents of affected residential properties.

Asbestos and health

Asbestos is a naturally occurring silicate mineral that occurs in a variety of fibrous forms. The fibres have heat-resistant properties and have been used commercially in cements, insulation and other building materials. Inhalation of asbestos fibres can cause fibrosis (asbestosis), mesothelioma and other cancers. The main forms of asbestos include chrysotile or white asbestos, actinolite, amosite or brown asbestos, and crocodilite or blue asbestos, which vary in their propensity to cause disease in humans.

The health risks associated with exposure to asbestos is well understood for people exposed in an occupational setting.[1] However, the health impact of exposure to asbestos in domestic settings is less clear.[2] Asbestos-based insulation has been recognised as a potential health concern, but there is very little scientific data to examine potential health risks.[3] Non-occupational exposure has been suggested to explain up to 20 percent of mesotheliomas in developed countries. Australian researchers have raised concerns that it may be important to consider exposure to asbestos in the domestic setting as a cause of mesothelioma.[4] Exposure to asbestos in the domestic setting is likely to occur mainly through renovation work.[4,5]

Loose-fill asbestos insulation in the ACT

In the 1960s and 1970s, a contractor—commonly known as 'Mr Fluffy'—used loose-fill amosite (and sometimes crocidolite) asbestos in a ground raw form to insulate homes in the ACT and southern NSW. Between 1988 and 1993, approximately 65,000 houses in the ACT were visually checked for the presence of loose-fill asbestos insulation. More than 1000 houses were identified and an extensive remediation program was undertaken, in which the loose-fill asbestos was removed from the roof spaces of these houses and efforts made to prevent any residual asbestos spreading. In 2014, there were renewed concerns after asbestos fibres were identified in remediated houses.

In June 2014, the ACT government established the Asbestos Response Taskforce to respond to impacts of loose-fill asbestos insulation on residents and the ACT community. The Taskforce reports to the Minister for Workplace Safety and Industrial Relations and represents a single point of contact for ACT residents concerned about loose-fill asbestos insulation. The Taskforce has a mechanism for recording the contact details of current and former residents of affected houses as well as members of the wider community, such as tradespeople, who are concerned about their exposure to asbestos in affected houses.

Examining the health effects of residents of affected houses

In response to community concern about health risks of asbestos, ACT Health considered the potential physical and mental health effects of living in affected residential properties (ARPs), along with the risk of developing mesothelioma. ACT Health requested that the Australian National University (ANU) develop a staged multi-component research approach, over a two year period, to investigate these potential health impacts. The research was to address several key questions about the distribution of mesothelioma in the ACT, the health concerns of residents of an ARP, likely levels of exposure of residents to asbestos insulation, and the risk of developing mesothelioma in recent and former residents of an ARP. ACT Health contracted ANU to independently conduct the ACT Asbestos Health Study.

Current status of the Study

The ACT Asbestos Health Study has completed a descriptive analysis of the epidemiology of mesothelioma in the ACT from 1982 to 2014. The analysis compared trends in the ACT with the rest of Australia, but excluded data from Western Australia (WA), where rates are high due to its history of asbestos mining. There were a total of 140 mesothelioma cases reported to the Registry between 1982 and 2014. Most cases (81 percent) were male and around one-third of the cases were diagnosed in people aged 65–74 years, with less than 5 percent aged less than 45 years. There was one case of mesothelioma diagnosed in a person living in a Mr Fluffy house at the time of diagnosis. The Study team found rates of mesothelioma in the ACT increased over time, in-line with what has been observed nationally and internationally. In the latest period of compete data from 2009–2011, the rate of mesothelioma in the ACT was 2.95 cases per 100,000 population, a similar rate to that for rest of Australia (excluding WA).

For the second component of the ACT Asbestos Health Study, the Study team conducted two focus groups in July 2015 with people who had lived in ARPs. The discussions centred on residents' health and other concerns, their experiences of dealing with living in an affected home, and their perception of risk related to asbestos exposure. Participants raised concerns about the physical health risks of their exposure to asbestos and about their children's risk of contracting mesothelioma in the future. However, their most immediate health concerns centred on the psychological distress associated with navigating the process of leaving their homes and finding somewhere else to live.

The third component of the ACT Asbestos Health Study is a survey of past and recent residents of ARPs to review residents' potential exposure to asbestos and assess their health concerns. The survey is in the final stages of preparation and data will be collected during March and April 2016.

The fourth and final component is a study linking historical data from Medicare records on where people have lived, with the Australian Cancer Database. This study will estimate rates of mesothelioma and other cancers among people who have lived in an ARP and compare these to rates in residents of the ACT who had not lived in an affected residential property.

ACT Asbestos Health Study: what we currently know about the health risks of domestic asbestos exposure *(continued)*

The ANU-based study team has undertaken a range of other activities, including hosting a public forum by Emeritus Professor Bruce Armstrong, from the University of Sydney's School of Public Health and the Sax Institute, on the dangers of living in a Mr Fluffy house. Professor Armstrong is one of the co-investigators of the ACT Asbestos Health Study. The forum is available as an audio podcast on the ACT Asbestos Health Study website.

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Presentation:

How dangerous is it to live in a Mr Fluffy house?

Emeritus Professor Bruce Armstrong
Senior Adviser, The Sax Institute Sydney

http://nceph.anu.edu.au/research/projects/news-events-reports

Article

Air quality monitoring in the ACT

Dr Mark Stickley, Communicable Disease Control, Population Health Division

Air quality is continuously monitored at three sites in the Canberra metropolitan area, measuring particulate matter, ozone, carbon monoxide and nitrogen dioxide levels. The ACT Government reports levels of these pollutants on its website as an Air Quality Index. Air quality in Canberra is generally good. When significant pollution is detected, it is usually due to particulate matter associated with wood smoke or dust. Air pollution can cause significant health effects and cause deaths, especially in people with pre-existing heart and lung conditions.

Background

The National Environment Protection (Ambient Air Quality) Measure (NEPM) provides a framework and guidelines about standards for monitoring ambient air quality in a consistent way across state, territory and Commonwealth jurisdictions in Australia.

The ACT undertakes air quality monitoring at three sites in the Canberra metropolitan area for particulate matter, nitrogen dioxide (NO_2) carbon monoxide (CO) and ozone (O_3). These sites are at Civic, Monash and Florey (Figure 1).

The scientific literature on air pollution refers to particulate matter with an aerodynamic diameter of less than 10μm (PM_{10}) and with a diameter of less than 2.5μm ($PM_{2.5}$). The former are small enough to enter the human airways and the latter small enough to deposit in the alveolar spaces of the lung. Both PM_{10} and $PM_{2.5}$ are measured in the ACT.

Air quality data is continuously collected from the Monash and Florey monitoring stations for five pollutants and Civic monitors $PM_{2.5}$, PM_{10} and ozone. The periods over which the pollutant concentrations are averaged and reported align with national standards:

- Ozone (reported as averages over one hour and four hours)
- Nitrogen dioxide (reported as an average over one hour)
- Carbon monoxide (reported as an average over eight hours)
- PM_{10} (reported as an average over twenty-four hours)
- $PM_{2.5}$ (reported as an average over twenty-four hours)

Real-time results of monitoring are made publicly accessible on the ACT Government website, and are expressed as an Air Quality Index (AQI). The AQI for each pollutant is calculated using the following formula, and the reported site AQI is the highest pollutant-specific value.

$$\text{Air Quality Index (AQI)} = \frac{\text{Pollutant concentration} \times 100}{\text{Pollutant standard}}$$

The AQI provides an indicator of how clean the air is. The lower the index is, the better the quality of the air. Each category in the AQI corresponds to a different level of health risk (see Table 1, on page 9).[1]
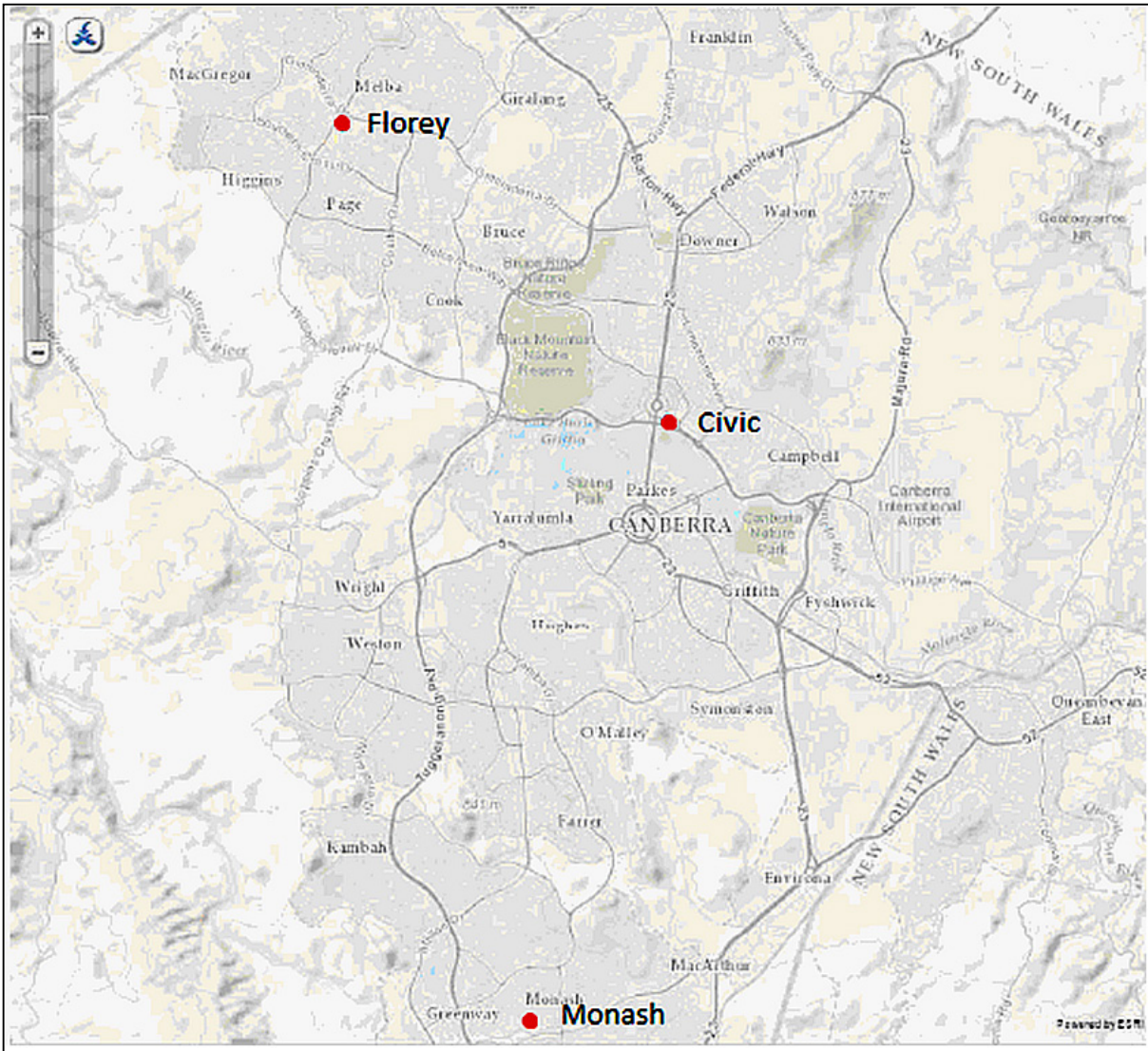

Figure 1: Air quality monitoring sites

Air quality monitoring in the ACT *(Continued)*

AQI Descrip-tor	Range of Values	Description of potential health risks
Very Good	0 – 33	Air quality is considered good, and air pollution poses little or no risk.
Good	34 – 66	Air quality is considered good, and air pollution poses little or no risk.
Fair	67 – 99	Air quality is acceptable. However, there may be a health concern for very sensitive people.
Poor	100 – 149	The air quality is unhealthy for sensitive groups, such as people with lung disease or heart disease. The general population is not likely to be affected.
Very Poor	150 – 200	Everyone may begin to experience health effects, especially those from sensitive groups.
Hazardous	> 200	Everyone may experience health effects. (In Canberra, the AQI only reaches this level during major bushfires or dust storms).

Table 1: Air Quality Index Categories. Source: adapted from http://www.health.act.gov.au/public-information/public-health/act-air-quality-monitoring/air-quality-index-aqi

The categories and descriptors used in the ACT are the same as those in used in New South Wales and Western Australia (AQI >200 is described as "Extreme" in Western Australia), and similar to those used in Queensland and Victoria (which do not have a "Hazardous" category, describing all AQI > 150 as "Very Poor"). When assessing the effect of bushfires on air quality, Victoria has seven categories (low to hazardous/extreme air quality) based on $PM_{2.5}$ monitoring results only.

In some other jurisdictions, sulphur dioxide is also routinely measured. This is not considered necessary in the ACT due to a lack of heavy industry that would contribute to high levels of this pollutant. Lead monitoring was discontinued nationally in 2002, as lead-containing petrol was being phased out and measured levels had been consistently low.[2]

Data from each of the monitoring stations is published on the ACT Government website. Having air quality data publicly accessible allows susceptible people to assess risks to their own health, in addition to providing data for the formulation of evidence-based policy and research.[3]

One seasonal factor that particularly influences air quality in the ACT is the atmospheric temperature inversion. This describes a phenomenon observed particularly on cold, clear, still nights, where a cool layer of air close to the earth's surface has a warmer layer of air above it preventing pollutants from dispersing.[4] This has specifically been identified as a determinant of air quality in the Tuggeranong Valley.[5]

Specific pollutants and their associated health risks

Particulate Matter ($PM_{2.5}$ and PM_{10})

In practice, the highest pollutant-specific AQI for any site in the ACT will usually be due to $PM_{2.5}$ or PM_{10}.

Particulate matter (PM) refers to a variety of liquid or solid substances that are suspended in the air. These vary greatly in their nature, sources and size. Particulate matter can be directly emitted into the air (called primary PM), or formed from chemical reactions between other pollutants (secondary PM).[3] Primary PM can be man-made, such as emissions from combustion engines, energy generation or industry; or naturally occurring, such as soil, dust and smoke from fires.[6] Secondary PM is usually formed through reactions involving oxides of nitrogen and sulphur mostly emitted by motor vehicles and industry.[6]

The effects of PM_{10} on short-term respiratory health are well documented, with exacerbations of respiratory disease such as asthma most common.[6] $PM_{2.5}$, especially with longer term exposure, is a greater predictor of mortality than the coarser PM_{10} particles. People with pre-existing cardiovascular and respiratory disease as well as children and the elderly are particularly vulnerable to the health effects of particulate matter.[6]

Seasonal variations occur in the composition of PM. For example, monitoring at Westmead in western Sydney in summer (February 2011) identified that 34 percent of $PM_{2.5}$ was sea salt, and 34 percent was organic matter. Similar observations in autumn (April and May 2012) showed much lower levels of sea salt (5 percent) and higher levels of organic matter (57 percent). Secondary inorganic aerosols accounted for 15 percent of $PM_{2.5}$ in both seasons.[7]

Since 2010 there has been only two days where the PM_{10} national standard has been exceeded in the ACT, reflecting the impact of government efforts to reduce the use of solid fuel burners in winter.

An analysis of national air quality for the period 1999 to 2008 found that during this period, the daily maximum PM_{10} levels in Monash (the sole Canberra monitoring site at that time) exceeded the PM_{10} national standard for an average of 5 days in nine out of 10 years.[8] The major contributors to PM_{10} in Canberra are bushfire smoke, dust storms and wood heaters.[8] The highest concentrations and greatest number of days where the standard was exceeded was in 2003, coinciding with major bushfires in Canberra.

Nitrogen Dioxide (NO_2)

Nitrogen Dioxide can be directly emitted from vehicle exhausts, but is usually formed from the oxidisation of nitrogen oxide by oxygen or ozone. It is mostly generated from fossil fuel combustion from motor vehicles and electricity generation.[3] The health effects of nitrogen dioxide are primarily respiratory, with short term exposures associated with increasing bronchial responsiveness in asthmatics, and longer term exposures linked to bronchitic symptoms and impaired lung function in asthmatic children.[9]

Air quality monitoring in the ACT *(Continued)*

The national standard for nitrogen dioxide was not exceeded in the last 15 years of monitoring in Canberra.[8]

Carbon Monoxide (CO)

Carbon monoxide is produced by incomplete combustion of carbon and hydrogen-containing fuels. Health effects are more related to indoor exposures such as poorly maintained cooking and heating appliances. Motor vehicles contribute significantly to outdoor carbon monoxide levels, but are less of a problem with modern vehicles. Higher outdoor concentrations are associated with temperature inversions in cold weather, peak traffic hours and proximity to major traffic routes.[3]

The national standard for carbon monoxide was not exceeded in the last 15 years of monitoring in Canberra.[8]

Ozone (O$_3$)

Ozone close to the earth's surface is produced by the effect of ultraviolet radiation on nitrogen oxides and volatile organic compounds. There is naturally occurring variability in atmospheric ozone concentrations due to variations in emission of precursors from manmade and natural causes, as well as the movement of ozone from high in the atmosphere, primarily in the stratosphere, down close to the ground in certain climactic conditions. It is possible for guideline values to be exceeded occasionally through natural causes.[9] There is both seasonal and diurnal (relating to time of day) variation, with ozone levels higher in spring and summer than in winter, and with concentrations usually highest in the afternoon.[3]

Weight of evidence reviews have concluded that there is no convincing evidence of increased cardiovascular morbidity or mortality associated with short[10] or long term[11] ozone exposure. Ozone does have respiratory effects with decline in respiratory function and airway inflammation both associated with higher atmospheric levels and prolonged exposure.[9] Children, the elderly and those with chronic respiratory conditions, including asthma, are particularly susceptible to the health effects of ozone.[8]

Ozone one-hour and four-hour standards are only occasionally exceeded in Canberra, with no episodes observed since 2007.[8]

The public health response to reduced air quality in the ACT

Every weekday morning before 9.30am, an ACT Environmental Chemistry unit member from the Government Analytical Laboratory reviews the air quality data for the previous 24 hours. The level of pollution is ranked in accordance with the published AQI categories (Table 1). Depending on the AQI category, the recent trend in air quality and information from the Health Protection Service (HPS) about contributing factors (e.g. bushfires or weather events), public health action may be warranted, including more regular air quality reporting and/or the issuing of public advice.

Currently, ACT Health has not developed a predictive air quality system. However, the HPS maintains regular contact with agencies in the ACT and NSW that frequently advise on incidents, events and conditions that may lead to reduced air quality in the ACT. Such events may include large-scale hazard reduction burns and largescale or multiple bushfires. Agencies providing situational awareness in relation to possible air quality events include the ACT Environment Protection Authority, the ACT Emergency Services Agency (ESA), the Bureau of Meteorology and NSW Health.

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Image: Monash monitoring station. ACT Health

Article

Particulate pollution in the ACT

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The aim of this article is to provide a picture of air quality in the ACT based on data collected by the ACT Government's Ambient Air monitoring network since 2010 and data available on the Dust Watch NSW website. While overall the ACT has very good to good ambient air quality there have been a number of days since 2010 when the ambient air National Environment Protection Measure standard for PM_{10} and $PM_{2.5}$ has been exceeded. The majority of these events are confined to the Tuggeranong Valley (reported by the Monash station) and occur during the colder months. It would appear then that these are wood heater driven events and are occurring overnight when a significant portion of the population would not be exposed directly to the pollution. Events that impact across the ACT are relatively few and appear to be caused by bush fires and dust storm events. These events have led to higher pollution concentration at times when people are likely to be exposed to the pollutant (i.e. during day time hours). Long term trend data indicates that the ACT Government's efforts to reduce the use of solid fuel burners in winter are having an impact.

Air quality in the ACT

The Ambient Air National Environment Protection Measure (NEPM) seeks to provide equivalent protection for all Australians from poor ambient air quality by setting national standards for the key air pollutants to which most Australians are exposed: carbon monoxide (CO), ozone (O_3), sulfur dioxide, nitrogen dioxide (NO_2), and particles ($PM_{2.5}$ and PM_{10}). In the ACT, sulphur dioxide is not routinely measured due to a lack of heavy industry that is mostly responsible for high levels of this pollutant in the air.

The ACT Government divides the responsibility for meeting the ACT's obligations under Ambient Air NEPM between the Environment Protection Authority (EPA) and the Health Protection Service (HPS). The EPA produces the annual report for the Ambient Air NEPM, runs policies such as public education campaigns (e.g. 'Burn right tonight') and administers the ACT Government's wood heater replacement scheme. The HPS operates the ambient air monitoring network which is currently made up of three monitoring stations located at Florey, Civic and Monash. Data from this network is used by the EPA to produce reports and to evaluate the performance of ACT Government policies which seek to reduce ambient air pollution.

The aim of this article is to provide a picture of air quality in the ACT based on data collected by the ACT Government's Ambient Air monitoring network since 2010 and data available on the Dust Watch NSW website. Since 2010 in the ACT CO, NO_2 and O_3 ambient concentrations have been well below the Ambient Air NEPM standards and so data from these pollutants will not be considered in this article. Indeed, the only pollutants to exceed the standards in the ACT have been PM_{10} and $PM_{2.5}$. The standard for PM_{10} is 50µmg/m³, averaged over one day (i.e. 24 hours) and for $PM_{2.5}$ it is 25 µmg/m³, averaged over a day. The goal for both of these pollutants is to have less than five days annually where this standard is exceeded.

From the beginning of 2010 until July 2015 there have been 27 days where either the PM_{10} or $PM_{2.5}$ standard has been exceeded at one of the ambient air monitoring stations. There have been two days where a standard was exceeded at two of the ambient air monitoring stations.

Table 1 reports the $PM_{2.5}$ exceedences (i.e. where the standard has been surpassed) for Monash (the PM_{10} standard has not been exceeded at this station).

Year	Month	Day	Day of Week	PM$_{2.5}$ (µg/m³)[i]	PM$_{10}$ (µg/m³)[ii]
2010	March	19	Fri	52.4	48.8
		20	Sat	27.5	42.9
	July	4	Sun	25.7	21.9
2011	May	20	Fri	26.9	38.2
		21	Sat	32.8	33.6
	June	25	Sat	26.1	23.4
	July	2	Sat	29.1	30.4
2012	May	19	Sat	28.2	27.8
	July	7	Sat	26.0	25.6
		8	Sun	29.2	25.2
		9	Mon	25.0	23.9
2013	May	26	Sun	31.3	24.9
	June	9	Sun	32.9	26.1
	July	27	Sat	29.9	25.1
		28	Sun	27.2	23.7
	October	19	Sat	37.1	40.5
		20	Sun	38.4	43.5
2014	February	4	Tue	31.5	34.1
		10	Mon	26.0	39.2
		23	Sun	28.5	30.7
2015	May	17	Sun	26.7	23.9
		24	Sun	26.4	23.1
	June	6	Sat	27.1	24.4
		14	Sun	30.0	25.7
		27	Sat	29.3	23.3
	July	5	Sat	33.8	27.6

Table 1: PM$_{2.5}$ exceedences of NEPM standard since 2010 at Monash.

[i] **Standard for PM$_{10}$ is 50µmg/m3, averaged over a day.**

[ii] **Standard for PM$_{2.5}$ is 25 µmg/m3, averaged over a day.**

Additionally, the standard for PM_{10} was exceeded at Florey on one day and at Civic on two days. These were Saturday 19 October 2013 at Civic (57.8µg/m³) and Tuesday 5 May 2015 at Civic and Florey (63.9 µg/m³ and 70.8 µg/m³ respectively). Monitoring of $PM_{2.5}$ at Florey only started in February 2014 and at Civic in May 2015; there have been no exceedences recorded for $PM_{2.5}$ at either of these locations.

Potential sources of reduced air quality in the ACT

DustWatch is a community-based program which seeks to monitor and report on wind erosion across Australia. Information from the DustWatch website was used in Table 2 to examine environmental events, such as bush fires/controlled burns and dust storms, which could potentially explain the air quality exceedences in the ACT on the listed dates. The main source of data on this website comes from satellite systems that do not function well at detecting events, such as fires and dust storms when there is cloud cover and/or at night. While this is a limitation of these data there appears to have been five bush fire or dust storm events that are linked to an exceedence of a particulate matter standard since 2010. All the other occasions when the standard was exceeded occurred during the winter months and were probably due to wood smoke from home heating.

Particulate pollution in the ACT *(continued)*

Week ending	Fire or Dust activity	Comments
22 March 2010	Large number of fires in South East NSW (including one in the ACT). No dust reported.	The fires are the probable source of the air pollution event.
20 October 2013	Significant fires to the North and East of the ACT. No significant dust reported.	The fires are the probable source of the air pollution event.
10 February 2014	Significant fires in Victoria to the south of the ACT. No significant dust reported.	The fires are the probable source of the air pollution event.
24 February 2014	Significant fires in Victoria to the south of the ACT. No significant dust reported.	The fires are the probable source of the air pollution event.
10 May 2015	A few fires to the west of the ACT. Dust storm impacted on the ACT on 5 May.	Dust storm on 5 May the source of the air pollution event.

Table 2: Probable sources of particulate matter in the ACT since 2010 other than wood smoke for home heating. Information collected from DustWatch Web site http://www.environment.nsw.gov.au/dustwatch/dwreports.htm

Seasonal, weekly and daily variation in air quality in the ACT

Table 3 shows the seasonal distribution of days above the standard at one or more stations. It is clear that the vast bulk of the days exceeding the standard occur in the autumn and winter season. When dust storms and bush fire events are removed, the remaining exceedences occur in the cooler months of the year.

	Spring Sep to Nov	Summer Dec to Feb	Autumn Mar to May	Winter Jun to Aug
All events	2	3	7	15
Excluding bush fire & dust storms	0	0	5	15

Table 3: Seasonal distribution of exceedences since 2010 at Monash.

Table 4 shows the distribution of exceedences through the week at one or more stations. Weekends feature heavily in the distribution. After the removal of bush fire and dust storm events, the days remaining when an exceedence occurred fell over a weekend period (including Friday night and Monday mornings). This suggests that it is only on weekends that enough wood heaters are being used (either more heaters and/or burning for a longer time) to cause a significant air pollution problem; this may represent a significant shift in the way that ACT residents use their wood heaters.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
All events	10	2	2	0	0	2	11
Excluding bushfire & dust storms	8	1	0	0	0	1	9

Table 4: Distribution of exceedences based on day of the week since 2010.

The data from all the pollution events can be divided into three time periods: morning (midnight to 8am), day time (8am to 4pm) and night time (4pm to midnight) for any given day. Average pollutant concentrations can be categorised for these periods as high (three times the standard or higher), medium (above the standard and up to three times higher) and low (below the standard). From this analysis the following results are produced (Table 5).

Event	Day	Month	Year	Morning	Day time	Night time
1	19	March	2010	Low	Low	High
2	20	March	2010	Med	Med	Med
3	4	July	2010	Med	Low	Med
4	20	May	2011	Med	Low	Med
5	21	May	2011	Med	Low	Med
6	25	June	2011	Med	Low	Med
7	2	July	2011	Med	Low	Med
8	19	May	2012	Med	Low	Med
9	7	July	2012	Med	Low	Med
10	8	July	2012	Med	Low	Med
11	9	July	2012	Med	Low	Med
12	26	May	2013	Med	Low	Med

Particulate pollution in the ACT *(continued)*

| Event	Day	Month	Year	Morning	Day time	Night time
13	9	June	2013	Med	Low	Med
14	27	July	2013	Med	Low	Med
15	28	July	2013	Med	Low	Med
16	19	October	2013	Low	Med	Med
17	20	October	2013	Med	Med	Low
18	4	February	2014	Med	Med	Low
19	10	February	2014	Med	Med	Med
20	23	February	2014	Med	Low	Low
21	5	May	2015	Low	Low	High
22	17	May	2015	Med	Low	Med
23	24	May	2015	Med	Low	Med
24	6	June	2015	Med	Low	Med
25	14	June	2015	Med	Low	Med
26	27	June	2015	Med	Low	Med
27	5	July	2015	Med	Low	Med

Table 5: Distribution of air pollution through the day during high pollution events (blue shading highlights the days ACT residents are likely to have been exposed to elevated PM$_{10}$ and/or PM$_{2.5}$).

In the absence of a formal study on the ACT population's movements through a day, it is reasonable to assume that during the morning and at night, the bulk of the population is indoors. Being indoors reduces exposure to the pollutants in the ambient air. Examining the data in Table 5, there were five days since 2010 where people were more likely to have been exposed during the daytime period to elevated particulate concentrations. On these five days, there were documented bush fire events.

Trends in particulate matter air pollution in the ACT

The HPS currently uses two methods to monitor PM$_{10}$ concentrations in the ambient air. The first is the PM$_{10}$ high volume sampler method where a sample is collected from a large volume of air onto a pre-weighed filter, and the concentration is determined from the mass of the particles on the filter. The high volume sampler runs once every six days. The second method is the PM$_{10}$ beta attenuation monitor (BAM) method, where the build up of particles on a filter tape drawn from a continuous stream of air is measured to generate particulate matter concentrations down to 5 minute periods. The PM$_{10}$ high volume sampler method has been used at the Monash air monitoring station since 1996 and the PM$_{10}$ BAM method since late 2009.

In his report, the Preliminary Assessment of Wintertime Air Quality in the Tuggeranong Valley, ACT,[1] Howard Bridgman analysed the long term trend in particulate matter pollution using PM$_{10}$ high volume sampler results from 1995 to 2009. He found a downward trend suggesting an impact of the ACT Government's efforts to reduce the use of solid fuel burners in winter. The data analysis has been repeated for the 2010 to 2015 period and the results displayed in Figure 1 (below) of the winter daily averages from 2010 to 2015. Figure 1 includes both PM$_{10}$ high volume sampler method data used in Bridgman's report and the newer BAM method data. These data show a continuation of the downward trend found in the Bridgman's[1] report (noting that the high volume sampler averages are higher than the corresponding BAM data).
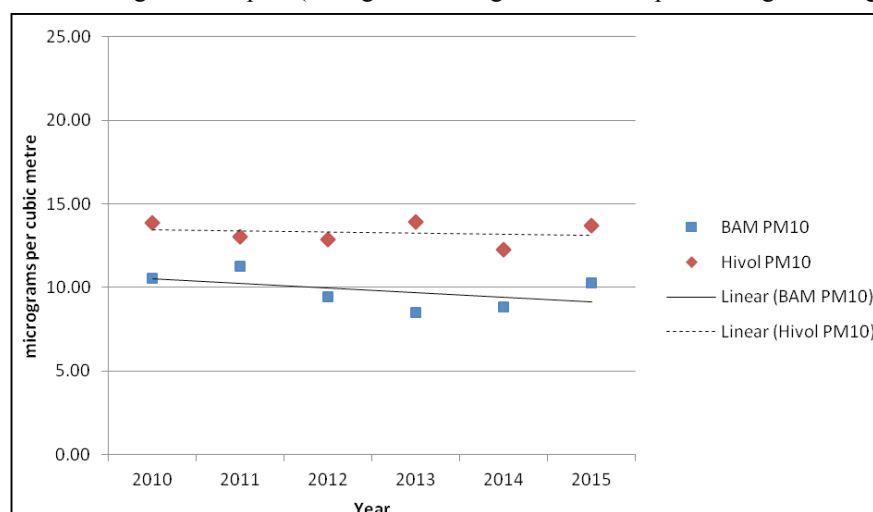
Figure 1: PM$_{10}$ winter daily averages 2010 to July 2015.

Particulate pollution in the ACT *(continued)*

Summary

Overall the ACT has very good to good ambient air quality. Since 2010, of the five pollutants routinely measured, only two have exceeded the national standard (PM_{10} and $PM_{2.5}$) and the ACT has met the NEPM goal of less than five days annually where the $PM_{2.5}$ standard was exceeded in most years. Nevertheless, the ACT has experienced a number of days since 2010 when the ambient air NEPM standard for PM_{10} and $PM_{2.5}$ were exceeded. The majority of these events appear to be correlated with wood heater smoke use and are confined to the Tuggeranong Valley (where the Monash station is located). These wood heater driven events generally occur overnight when most of the population would not be exposed directly to the pollution. There have been relatively few bush fires and dust storms events since 2010, but when these have occurred, they have impacted across the ACT and led to higher pollution concentration at times when people are likely to be exposed to the pollutant (i.e. during day time hours). Long term trend data indicates that the ACT Government's efforts to reduce the use of solid fuel burners in winter are having an impact.

Notes:

The data used to compile this table is PM_{10} data because there is no suitable time series of $PM_{2.5}$ data to use. However Table 1 demonstrates that the majority of PM_{10} is made up of $PM_{2.5}$ which means that it can be assumed that the daily distribution is similar in the majority of cases.

A variation to the National Environment Protection (Ambient Air Quality) Measure was registered on Wednesday 3 February 2016, and came into effect on Thursday 4 February 2016. This article was written prior to these changes and reflects the requirements of the previous version of the NEPM that were in place when these data were collected.

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Image: Canberra vista. ACT Government

Case Study/ Snap shot

Thunderstorm Asthma: What is it and does it occur in the ACT?

Prof Simon Haberle, Dept of Archaeology and Natural History, School of Culture, History and Language, College of Asia and the Pacific, The Australian National University

The phenomenon known as Thunderstorm Asthma[1] has been noted as occurring in a number of locations around southeastern Australia, most notably in Melbourne[2-3] and Wagga.[4] However, Thunderstorm Asthma is not yet fully understood, because it is caused by a combination of complex factors. These events appear to be triggered during the spring and summer by large storms caused by converging masses of air, in combination with hot and dry weather in the preceding period, high humidity, and possibly high levels of air pollution. Not all thunderstorms trigger asthma. Small local storms after a hot day are not thought to be triggers. Humidity before the storm must be high enough such that grass pollen or fungal spores are released and survive in the atmosphere.[5]

What do we know about it?

Asthma and allergic rhinitis (hay fever) are closely related, and approximately 80 percent of people with asthma also suffer from hay fever.[6] There is evidence that during the pollen season, thunderstorms can be associated with allergic asthma outbreaks in individuals with a history of hay fever but not necessarily of asthma.[6] During the first 20–30 minutes of a thunderstorm, individuals suffering from pollen allergy may inhale a high concentration of the allergenic material that is dispersed into the atmosphere, which in turn can induce (severe) asthmatic reactions in some cases.

Although rainfall usually acts to remove pollen from the air, this is not always the case. During a thunderstorm, dry updrafts capture pollens into the high humidity at the cloud base. When pollen grains get wet they can rupture or " explode". In addition, the strong electric fields that develop during thunderstorms are also thought to play a role in enhancing the potential for pollen grains to rupture, resulting in the release of large amounts of granules, containing allergens. Cold downdrafts can then carry these granules down towards the ground creating much higher concentration of allergen fragments at ground level.[4] In other words, these events create a high respirable allergen load in the air, where these smaller particles have a higher chance than whole pollen grains of entering the lungs and triggering a severe allergic response

Does it occur in the ACT?

During the last week of October 2014 a dry warm week culminated in a weekend of very warm and windy weather, with thunderstorms occurring in the ACT and surrounding region. On this weekend, the Emergency Department of Canberra Hospital received a record number of patients suffering from asthma attacks (26 October 2014). This occurred on the day that the Canberra Pollen Count and Forecast Project[i] recorded the first EXTREME grass pollen days for the season[7] (Figure 1). The high number of asthma presentations to Canberra Hospital at this time is in contrast to the situation three weeks later when there was another EXTREME grass pollen count, but no recorded thunderstorm activity in the region.
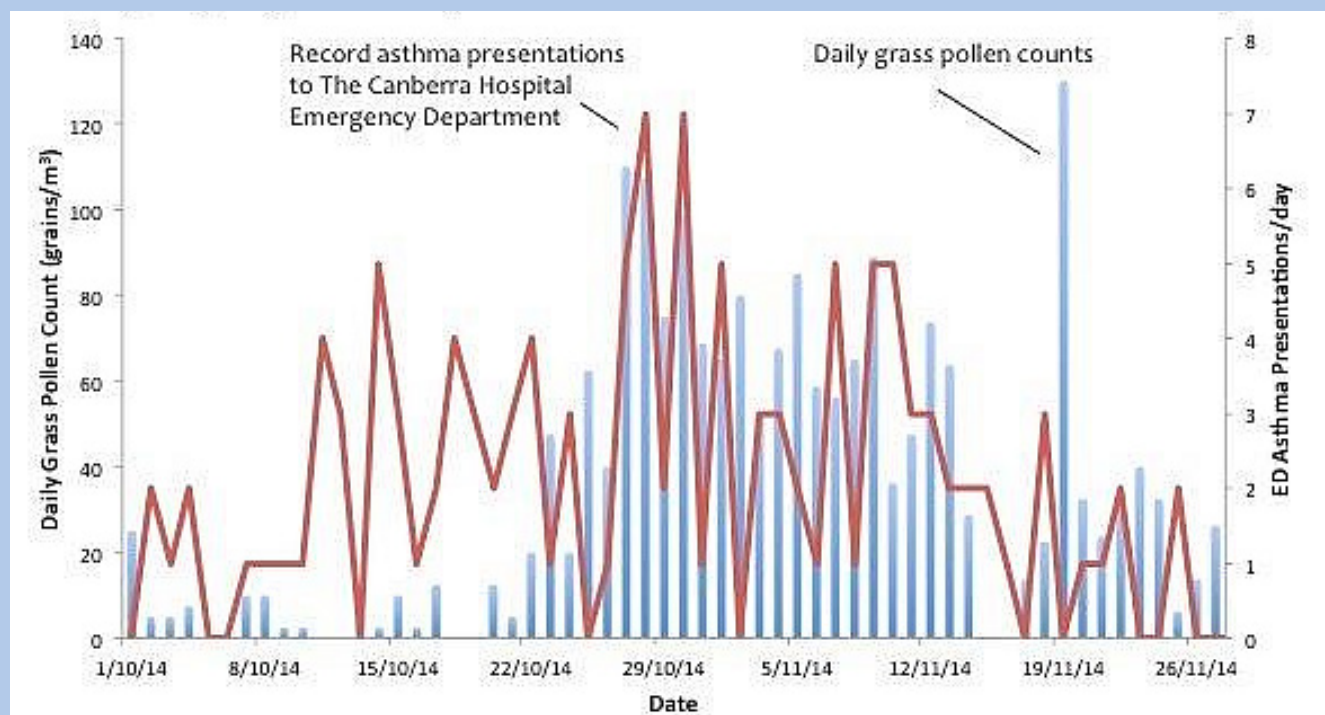

Figure 1. Relationship between Emergency Department (ED) admissions to Canberra Hospital (red line) and the daily grass pollen count in Canberra (blue bars) between 1 October – 26 November 2014. Record ED presentations for asthma were recorded on 28 and 30 October 2014, coinciding with the first EXTREME (>100 grains/m$_3$) grass pollen days in Canberra for that season.

Thunderstorm Asthma: What is it and does it occur in the ACT?

While data from a limited point in time does not provide conclusive evidence that Thunderstorm Asthma occurs in the ACT, the combination of circumstances and the severity of the impact on the population are suggestive of the two being related. There is a need to conduct further collaborative research to monitor pollen, climate and population health related to allergenic diseases in the ACT to understand this phenomenon further.

The best way to manage Thunderstorm Asthma is to prevent it occurring, where possible. For people with asthma, it is imperative to have an up-to-date asthma action plan from their doctor and to maintain awareness of weather conditions in the region in which they live.[8] Further research needs to be conducted into the impact on population health of establishing a coordinated daily pollen count and forecast that is linked with the daily weather warning system.

Image: Storm. E Ewing. Public Health Image Library

Acknowledgements

Notes:

i. Find out more at www.canberrapollen.com.au and follow us on Twitter @CanberraPollen and on Facebook.

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Promoting health through citizen science: airborne pollen in the ACT

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Within the past century, allergic diseases have developed from being rather rare conditions into medically and economically important chronic diseases that affect 500 million people worldwide.[1] Over 10 years ago in Australia the direct and indirect costs of allergic diseases were estimated at $7.8 billion annually,[2] which on a per capita basis represents a $0.17 billion dollar[i] burden on the ACT. This level of burden is likely to be maintained or even increase as the ACT also holds the national record for the highest rate of sufferers (1 in 5 people) of allergic rhinitis (hay fever)[3]. A new citizen-science project, where the people from the Canberra and regional community are encouraged to provide direct input of scientific data, has been designed so that airborne pollen levels are reported daily via a mobile app, while at the same time allowing users to give feedback on their hay fever suffering each day. This approach has provided the first insights into the impact of airborne pollen on people in the ACT. In this article I explore how airborne pollen has become the primary cause of allergic disease in the ACT and how we can help to reduce its impact through research and education.

Pollen are microscopic particles that carry the reproductive information from one plant to another. Pollen grains from different arboreal and herbaceous species have a remarkable diversity of shapes, sizes, and biochemical compositions (including allergenic proteins) that have evolved to be transferred by wind, water, birds, mammals and insects. In the case of plants that disperse their pollen by wind, copious amounts are required in order to ensure reproductive success and it is in this group of plants that we find a large number of species that can trigger allergic reactions in some people.[4]

The Canberra Pollen Count and Forecast Project at the Australian National University (ANU)[5] has been monitoring airborne pollen in the Canberra atmosphere over the past decade and has recently adopted a citizen science approach to enhancing our understanding of the impact of allergic rhinitis on people through an interactive app (CanberraPollen[ii]). Initial results from this project show a strong correlation between the amount of grass pollen and people suffering from allergic rhinitis during the spring and summer flowering season.[6] We also know that there are many other pollen types that trigger allergic reactions and a compilation of a new Canberra Pollen Calendar (Figure 1) shows the duration and peak periods of the pollen season for the top allergenic plants in the ACT.
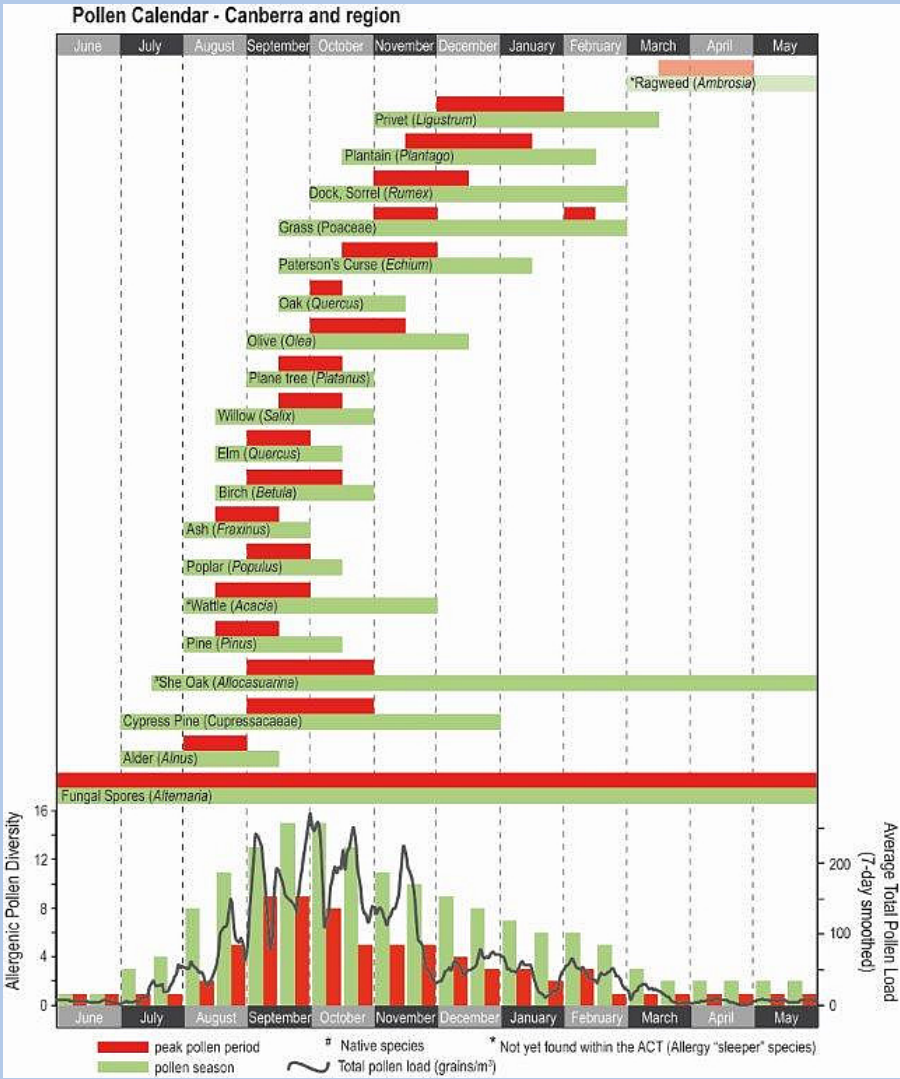

Figure 1. Pollen Calendar for Canberra and the region. Fortnightly estimates of the pollen production season (green bars) and the peak pollen production period (red bars) for the key allergenic pollen plants (native and introduced) in the Canberra region. The diversity of pollen types (present and peak) are tabulated in the lower graph. This is compared to the total daily pollen counts (all pollen types) averaged and smoothed for the entire year showing a strong correspondence between allergenic pollen production and airborne pollen counts.

Case Study/ Snap shot

Promoting health through citizen science: airborne pollen in the ACT *(continued)*

The calendar shows that the actual season for pollen–related allergic rhinitis in our region extends beyond the limits of the grass season (Spring), beginning as early as July when trees such as Alder, Cypress Pine and the native She Oaks begin to flower. This is followed in August and September by a number of other ornamental and weedy tree species such as Poplars, Pine, Elms and Plane trees. It is not until late September through to November that we see the peak pollen production in grasses and other allergic herbs such as dock, plantain and Paterson's Curse. The grasses (including Rye Grass or Lolium) are made up of many species, some of which produce their pollen in the summer months creating a second peak in allergenic pollen in late January to early February.[7] The pollen season then begins to wane by the end of February, though the constant presence of allergenic fungi (including Alternaria[8]) and the potential in the future for "sleeper" species such as Ragweed to become more prevalent in the ACT may extend the pollen-related allergic rhinitis season to encompass almost the entire year.

Predicting how the pollen season might change in the future is fraught with difficulty due to our limited understanding of the interaction between climate, pollen production and people. Global warming is likely to affect the onset, duration, and intensity of the pollen season as well as the allergenicity of the pollen. Studies on plant responses to elevated atmospheric levels of CO_2 indicate that plants exhibit enhanced photosynthesis and reproductive effects and produce more pollen.[9] By increasing the data available for research and the general public awareness of the impacts of different pollen types on population health and wellbeing through citizen science initiatives such as the Canberra Pollen Count and Forecast Project we can help to understand and begin to mitigate an increasingly significant health and economic burden in the ACT.

Acknowledgements

Notes:

i.   ACT economic burden calculation assumes the population of the ACT is 2.2 percent of the total Australian population (2.2 percent of 7.8 = 0.17)

ii. Find out more at www.canberrapollen.com.au and follow us on Twitter @CanberraPollen and on Facebook.

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Article

Clandestine Laboratories

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Illicit controlled drug laboratories, more commonly referred to as clandestine laboratories or simply as clan labs, are a significant and widespread concern throughout the world with over 740 detections within Australia in the 2014 reporting year alone[1]. The very nature of clan labs precludes the appropriate disposal of chemical waste, with many operators disposing of waste into the environment or simply storing it onsite. It is these practices, often combined with an inadequate chemical knowledge of the process being undertaken, which heighten the danger posed by clan labs to first responders, the environment and community.

Introduction

For many years the primary illicit drugs of concern in Australia consisted of modified plant extracts, these being heroin from the opium poppy and to a lesser extent cocaine from extracts of coca. The large scale agricultural operations required for these crops, combined with effective domestic controls on these activities, resulted in the primary source of these drugs being from international importation.[2] During the early 2000s a significant shortage of heroin resulted in an increase in the use of amphetamine type substances (ATS);[3] this increased use has persisted and ATS remain primary illicit drugs of concern.[4-6] The ATS of choice are predominantly Methylamphetamine[6] (commonly known as 'Speed' or 'Ice') and 3,4-Methylenedioxymethylamphetamine (MDMA)[5] (commonly known as 'Ecstasy' or 'E'). Whilst importation across national borders remains a significant source of many illicit drugs in Australia, the continued use of these fully synthetic ATS, which have traditionally been subject to domestic manufacture,[1] has led to a significant increase in the number of clan labs detected in Australia. These detections have risen from 58 in 1997, to 744 in 2014.[1,3] On a jurisdictional level, the ACT has been fortunate in comparison to neighbouring jurisdictions, with clan lab detections limited to an average of only one or two annually for the past decade.

Fundamentals of clan labs

The underlying driving factor of domestic manufacture of ATS is the simplicity of the chemistry involved and the relative ease of obtaining the required chemicals. There are numerous synthetic routes to the manufacture of Methylamphetamine and MDMA and many of these routes have been successfully followed by individuals (known colloquially as 'cooks') with limited formal chemical training, simply by learning the process by rote or by following basic written instructions. Whilst certain key chemicals are controlled within jurisdictional and commonwealth legislation, the vast majority of the chemicals required to undertake the various processes have multiple legitimate uses and are freely available. Examples include various acids, bases, and solvents, which can be purchased directly with anonymity at a local hardware store, from commercial chemical suppliers or over the internet. Other less common chemicals can be obtained from household, pharmacy or commercial products, which contain them as constituents. Additionally, whilst sale of appropriate commercial equipment for management of these reactions is in many cases controlled or tracked by law enforcement, many clan lab operators improvise equipment from common household or industrial sources. Kettles, pressure cookers and other common kitchen equipment have all been extensively repurposed to manufacture drugs. More advanced scientific equipment such as condensing columns and vacuum distillation apparatus can be improvised with adequate subject knowledge from materials available at kitchen and hardware suppliers.

Health hazards of clan labs

Chemical synthesis is routinely likened to baking a cake; this refers to the requirement to combine raw materials in appropriate ratios, at the appropriate time, with various steps being prerequisite for those that follow. Similarly to baking a cake successfully, control of the physical and chemical conditions is critical. This includes, amongst others, the appropriate control of pH, temperature and pressure. While the majority of methods utilised to clandestinely manufacture Methylamphetamine and MDMA are generally considered relatively simple from a scientific point of view, a significant variety of chemicals and equipment is required. In order to reduce the risk of accidental discovery, operators of clan labs often remove the factory chemical labels, decant chemicals into generic containers and hide or disguise contaminated equipment. Furthermore, the illicit nature of clan labs requires that operators take steps to prevent accidental or targeted discovery of their operations, for this reason clan labs are often constructed in confined spaces, such as basements, in rural areas with limited access or, alternatively, are designed to be highly mobile for use in motel rooms or caravans. For these reasons the challenges to first responders to locate, identify and mitigate risks within a discovered clandestine laboratory site are magnified in comparison to many other hazardous incident responses.[6]
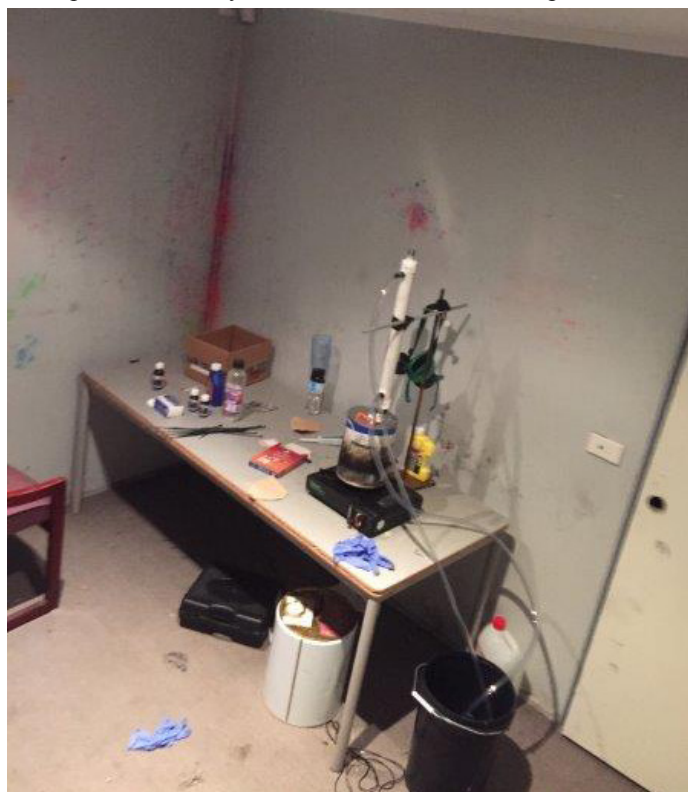

Image: Clandestine Laboratory. ACT Health

Perhaps the most significant challenge facing clan lab operators, and one of the most documented challenges to those agencies responsible for the investigation and remediation of clan lab sites is the disposal of chemical waste.[7-9] It is commonly estimated that for every 1 kilogram of clandestinely produced drug, there may be up to 10 kilograms of chemical waste requiring disposal.[8] A commercial chemical laboratory is subject to environmental and workplace health and safety regulation and control; these policies and regulations provide guidelines and enforce appropriate disposal of waste. Clan lab operators do not comply with these regulations and, as the wastes generated by their activities can be utilised by law enforcement to track, and later be used as evidence of their activities, operators actively avoid appropriate disposal methodology. Common methods of disposal of clan lab chemical waste are via sewage networks and wholesale dumping into the environment.[8] Stockpiling of waste prior to abandoning the site is an alternative method known to have been utilised for smaller operations.

Clandestine Laboratories *(continued)*

Due to the large variety of methods, the makeup of clan lab waste varies widely. Critically the waste from clandestine laboratories contains not only the raw chemicals from the processes, for which the specific dangers are often known and for which remediation guidelines exist, but also drug residues and many reaction by-products. These wastes are frequently corrosive, contain heavy metals and may contain incompatible chemicals. Several of the chemicals commonly discarded together are known to further react, producing compounds significantly more hazardous than those discarded. One such example is the explosive compound Triacetonetriperoxide (TATP) which can form from chemicals commonly discarded following the clandestine manufacture of MDMA.

The blend of inappropriate storage, handling and concealment of commercial chemicals, unknown waste and the necessary concealment of the operations from law enforcement, creates hazards far exceeding those encountered in normal chemical synthesis. These elevated risks are further exacerbated by the synthesis often being conducted by ignorant operators using improvised equipment. The failure of this improvised equipment, or lack of control of reaction conditions, has led to innumerable injuries and many deaths, particularly from explosion of confined flammable vapour and from exposure to phosphine gas.[10,11] This danger is present not only for the operators themselves, but also endangers first responders, those responsible for remediation and either directly or through environmental contamination, the community at large. The hazards are considered so great, that many jurisdictions internationally and all jurisdictions within Australia maintain chemists specifically trained to manage the chemical risks found at clan labs. In the ACT this capacity is maintained by staff of ACT Health, Health Protection Service.

Health risks of clan labs for first responders

The initial response to a clan lab discovery is high risk.[12] The training required to manage these environments is extensive and requires knowledge and experience in the selection and use of high level personal protective equiptment (PPE) clothing, and an extensive understanding of drug manufacture methodology, improvised equipment, required chemicals and current clandestine laboratory trends.[12] The level of appropriate PPE is dependent on the risks expected and can range from air purifying respirators (APR) or self contained breathing apparatus (SCBA) combined with chemical splash suits, to fully encapsulating suits.

Image: Personal Protective Equipment. ACT Health

The choice of PPE is critical, as in many cases one risk is mitigated at the expense of another. This is most clearly demonstrated in relation to the use of fully encapsulating suits which are excessively cumbersome, physically demanding to work in and drastically obscure vision. Additionally, whilst fully encapsulating suits provide the highest level of protection available from chemical agents, as they are made of plastic, they are completely incompatible with flammable environments. For this reason they are an option of last resort and rarely used. More commonly SCBA, in combination with a chemical splash suit, is utilised for initial safety assessment and risk mitigation, with breathing protection being downgraded to APR as soon as practicable. Whilst modern APR facemasks are relatively light and comfortable, forensic processing of clan labs can last several days and the exertion of drawing air through passive filters over many hours of physical labour is demanding. These physically demanding conditions, when combined with the necessary use of chemical splash suits which prevent natural body temperature regulation, can have significant occupational health and safety implications for those investigating clan labs. [12]

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Mosquito-borne viral diseases in the ACT

Dr Ranil Appuhamy, Office of the Chief Health Officer and Dr Cameron Webb, NSW Health Pathology and University of Sydney

There are numerous mosquito species in the ACT but the topography and climate in the ACT do not provide optimum conditions for mosquito activity; hence their numbers are relatively low. Some mosquitoes in the ACT are known vectors of mosquito-borne pathogens including Ross River and Barmah Forest viruses. However, given the relatively low numbers of mosquitoes, the incidence of mosquito-borne diseases is similarly low in the ACT. Travel of residents to regions of higher mosquito-borne disease risk, the abundance of suitable reservoir hosts (i.e. kangaroos) locally and the construction of wetlands in new residential developments may drive increasing mosquito numbers and mosquito-borne disease risk in the future.

Mosquito-borne disease in the ACT

Mosquitoes are not only a nuisance due to their biting effects but also have the potential to cause public health risks through the transmission of pathogens. Mosquito-borne diseases in Australia include Dengue fever, Murray Valley Encephalitis, Kunjin virus disease, Ross River (RRV) virus disease and Barmah Forest (BFV) virus disease. Dengue is the most important viral disease transmitted by mosquitoes affecting humans in a global context but, in Australia, local activity of Dengue is restricted to Queensland, where the only local vector, *Aedes aegypti*, is found. Cases of malaria, which is caused by a mosquito-borne parasite rather than a virus, are recorded in Australia in travellers who have returned from countries with ongoing transmission. Australia was declared free of malaria in the 1980s.

RRV and BFV are responsible for most mosquito-borne illness in Australia, with an average of 7,218 (5412 RRV and 1806 BFV) cases reported each year. Infection with these pathogens cause illness typified by symptoms that include fever, rash, joint pain and fatigue. Other arboviruses, such as Murray Valley Encephalitis Virus (MVEV) and Kunjin Virus (KUNV) are not very common but, in the case of MVEV, can cause potentially severe and sometimes fatal disease in Australia.

Queensland and the Northern Territory carry the largest burden of mosquito-borne diseases in Australia, with favourable climatic and environmental conditions resulting in abundant mosquito populations and an extended mosquito season. In NSW, the ongoing focus of mosquito-borne disease risk is along the coast, with inland regions experiencing elevated risks only during periods of above average rainfall and subsequent flooding.

In the ACT, between 2006 and 2013 there were, on average, 11 cases of RRV, 4 cases of BFV and 13 cases of dengue virus disease notified each year. All dengue cases are in returned travellers. Overall, ACT has a lower incidence rate of arboviral disease notifications compared to the surrounding state of NSW. This is a reflection of the relatively low abundance of the mosquito population in the ACT.

Ross River virus disease

Over a 10-year period from 2006 to 2015, there were 110 cases of RRV infections notified (average 11 per year). Over this time period, the average rate of RRV notifications was 3.08 per 100,000 population per year. This was lower than the notification rates in neighbouring NSW and nationally. (Figure 1 on page 22)

Barmah Forest virus disease

There were 41 cases of BFV infections notified in the ACT from 2006 to 2015. The average rate of BFV was 1.15 per100,000 population per year. Similar to RRV, the notification rates of BFV were lower in the ACT compared to NSW and Australia (Figure 2 on page 22).

Dengue

From 2006 to 2015, there were 131 cases of Dengue notified in the ACT and all cases were associated with travel. In Australia, as discussed, local transmission of dengue viruses is limited to areas of North Queensland where the primary mosquito vector, Aedes aegypti, is present.[2] Where place of acquisition was known, Dengue notifications in the ACT were overseas acquired. Nationally, most of the overseas-acquired Dengue cases between 1999 and 2012, were from Indonesia.[3] Similarly, in the ACT the most common country of disease acquisition was Indonesia.

Other arboviruses of significance to human health

There were no notifications of human infection with MVEV, KUNV, or Japanese encephalitis virus in the ACT. Chikungunya and Zika are two other arboviruses of human health importance which have never been recorded in the ACT (see Hot issues on page 31)

Mosquitoes in the ACT

There are over 300 species of mosquitoes in Australia but only a small percentage of these pose a significant biting nuisance or public health risk. The diversity of these species can vary greatly across the country, as well as within regions, as a result of variable patterns of rainfall, temperature and, along the coast, tides.

In 2012/2013, a mosquito survey was undertaken in the ACT for the first time to determine the relative abundance, diversity and distribution of mosquitoes. Sampling of mosquitoes was done using carbon dioxide baited traps, in areas where there were actual or potential mosquito habitats as indicated by the presence of natural and/or constructed wetlands, bushland areas or extensive storm-water systems.

Over the course of the survey, a total of 594 mosquitoes representing 12 species were collected in 90 traps. The three most commonly collected mosquito species were *Aedes notoscriptus* (28.1 percent), *Culex annulirostris* (23.1 percent) and *Culex quinquefasciatus* (22.4 percent). All three mosquitoes are potential pest and vector (able to transmit disease) species. Overall, the survey confirmed low mosquito numbers in the ACT, compared to NSW.[4] Most were collected with fewer than 10 mosquitoes per trap. There are likely to be more species that were not collected in this survey, associated with bushland areas throughout the region, but these are unlikely to pose any greater pest or public health risk.

Image: *Culex quinquefasciatus.* **James Gathany, Public Health Image Library**

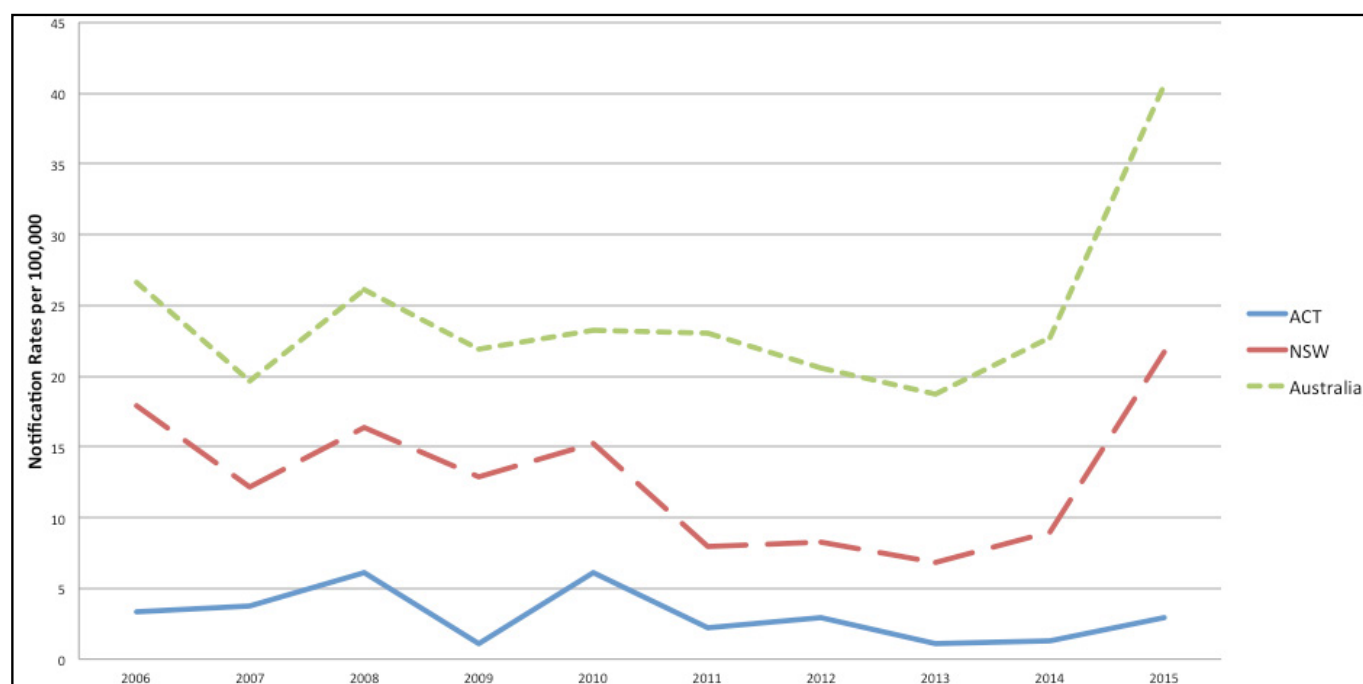# Mosquito-borne viral diseases in the ACT *(continued)*

Figure 1: Notification rates per 100,000 population for Ross River virus in the ACT, NSW and Australia. Source National Notifiable Disease Surveillance System.[1]
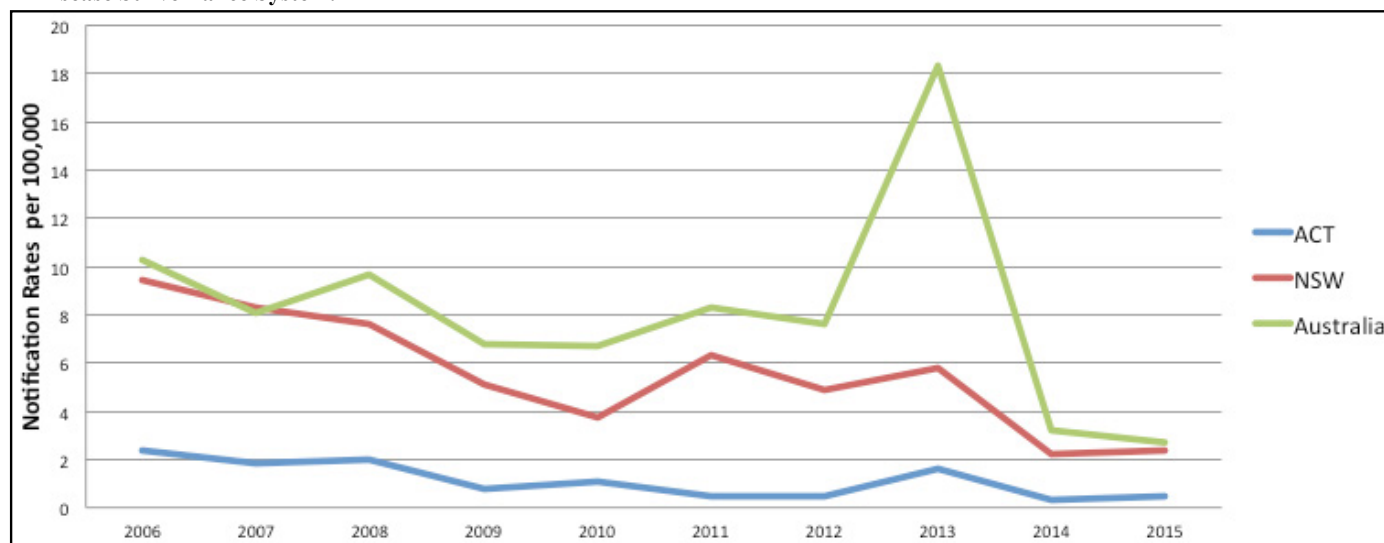

Figure 2: Notification rates per 100,000 population for Barmah Forest virus (BFV) Virus in the ACT, NSW and Australia. Source National Notifiable Disease Surveillance System.[1]

The low abundance of mosquitoes is primarily due to the absence of significant wetland habitats and the generally dry conditions during the study period. Although there are large water bodies throughout the ACT, the majority of these do not provide suitable conditions for mosquitoes. The topography of the ACT limits opportunities for extensive inundation to occur after rainfall, as is the case for inland flood plain habitats. The low average temperature in the ACT also limits the period that mosquitoes are most active.

A limitation of the recent survey was that it was undertaken at a fixed time, thereby providing only a snapshot of the mosquito fauna during summer 2012/2013. The diversity and abundance of mosquitoes will vary from season to season, with rainfall and temperatures driving potential mosquito abundance. The greatest mosquito populations are likely to occur during summers with average to above average temperatures combined with above average rainfall, ideally distributed over the summer period (as opposed to a single substantial rainfall event).

Implications for the ACT

There are a number of conditions that are required for local transmission of arboviral diseases. These include adequate numbers of reservoir hosts (i.e. a long term source of a pathogen of an infectious disease), mosquitoes and the right climatic conditions.[5] Although the mosquito population in the ACT is relatively low, there are known mosquito vectors of RRV and BFV, which may have the potential to trigger local outbreaks. The highest risk factors for this are climatic conditions, such as high rainfall and/or outbreaks of mosquito-borne disease in nearby regions of NSW. It is possible that infected people returning to the ACT could act as reservoir hosts, infect the local mosquito population and trigger clusters of locally acquired infection.

One critical issue for ACT is that there is an abundance of kangaroos close to residential areas. Macropods, including both kangaroos and wallabies, are considered the major reservoirs for RRV. Outbreaks of RRV disease rarely, if ever, occur in regions without the presence of macropod populations and they appear to be a critical component of RRV transmission cycles.

Mosquito-borne viral diseases in the ACT *(continued)*

Preventing mosquito borne diseases

There are a number of ways to prevent mosquito-borne diseases. These include behavioural measures such as:

- Avoiding areas where mosquitoes are most active, particularly bushland and wetlands areas within two weeks of major rainfall;
- Avoiding being outside and unprotected at times where mosquitoes are most active (usually dusk and dawn);
- Applying topical insect repellent containing diethyltoluamide (DEET) or picaridin as a thin, even covering of all exposed skin when outdoors;
- Wearing light-coloured, loose fitting clothing and covered footwear when outside;
- Using flyscreens or sleeping under mosquito nets when camping; and
- Limiting sites where mosquitoes can breed around the house by discarding items that can hold water or emptying them regularly.

These preventive strategies are particularly important for people travelling to other parts of the country, or overseas, where mosquito activity is high. It is important that ACT residents are not complacent about mosquitoes as, despite relatively low populations at home, mosquitoes can be extremely abundant in nearby regions (e.g. coastal areas) due to differences in the environmental drivers of activity.

Additionally, with the increased number of constructed wetlands in the ACT associated with more recent urban developments, we may see a relative increase in mosquito activity in the future. Nuisance biting and disease transmission risks in the future can be mitigated through appropriate design of urban development and constructed wetlands. Many of the constructed wetlands within the ACT are currently in their infancy and aquatic and terrestrial vegetation has yet to become established. As this grows, there is the potential that suitable conditions for mosquitoes will occur.

Mosquito surveillance provides a useful way of monitoring mosquito activity. Given the low notification rates, the ACT does not currently have a surveillance system similar to the NSW Arbovirus Surveillance and Mosquito Monitoring Program that monitors mosquito activity in NSW.

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Mosquito-borne and other insect-borne diseases

Yellow fever: If you're travelling to parts of Africa, South or Central America or the Caribbean you may be exposed to yellow fever. Yellow fever is transmitted by mosquitos. It is a serious and potentially fatal disease which is preventable by vaccination. We recommend that you check the yellow fever entry requirements for all countries you intend to enter or transit by contacting their embassy or consulate. Some airlines may require passengers to present a valid yellow fever vaccination certificate before being allowed to board flights out of the country.

If you have visited countries where yellow fever is endemic in the days before you return to Australia, you will be asked to present a valid yellow fever vaccination certificate upon entry into Australia. For more information about yellow fever, including Australian re-entry requirements, see the Department of Health website.

Zika virus: A number of countries in South and Central America, the Caribbean, Africa and the Pacific are experiencing ongoing transmission of the mosquito-borne Zika virus (ZIKV). The infection often occurs without symptoms but in some cases can cause fever, rash, severe headache, joint pain, and muscle or bone pain. There are no vaccines. All travellers are urged to protect themselves by taking measures to prevent mosquito bites. Given possible transmission of the disease to unborn babies, pregnant women (or women trying to become pregnant) should consider postponing travel to Bolivia or talk to their doctor about implications. See our travel bulletin on Zika virus for more information and the particular countries of concern.

There are a number of other mosquito-borne diseases that can affect travellers visiting warm climates (including malaria, dengue fever, chikungunya and Japanese encephalitis). Also ticks, sandflies and other insects spread other diseases in some countries. Take measures to avoid insect bites, including using an appropriate strong insect repellent and wearing long, loose fitting, light coloured clothing.

Medication to prevent malaria may be recommended for some high-risk destinations. Our country-specific travel advice indicates where malaria is a risk. In addition to taking precautions against mosquito bites, you should also consult a doctor about the need for malaria medication.

For more information visit http://smartraveller.gov.au/guide/all-travellers/health/

Legionella: the unseen environmetal threat

Radomir Krsteski, ACT Government Analytical Laboratory, & Andrew Stedman, Environmental Health, Population Health Division

Legionellae are generally found in aquatic environments ranging from fresh or brackish waters to coastal waters, and in potting mixes, including moist soils. They can also be found in modern urban environments including cooling tower air conditioning systems, hot water distribution systems, swimming pools and decorative water fountains. The genus *Legionella* can cause respiratory illness in humans (termed Legionellosis), ranging from flu-like illness through to acute pneumonia. All infections caused by Legionella in the ACT are notifiable under the *Public Health Act 1997* to enable timely investigation into any link with potential sources. Legionella infection is generally traced to cooling tower air conditioning systems and hot water distribution systems. These systems are regulated within the ACT under the *Public Health Act 1997* that mandates strict operational standards, monitoring, maintenance and ongoing disinfection.

Legionella: the organism

Legionella pneumophila and related species are found in aquatic environments and are most often transmitted to humans via inhalation of aerosolised contaminated water, with no recorded person-to-person transmission.[1] The first known isolation of a *Legionella* species was among US soldiers more than 60 years ago; however, the genus *Legionella* came into significance as a respiratory pathogen in 1976 following a pneumonia outbreak at the American Legion Convention in Philadelphia the same year year.[2,3] The bacterium isolated from cases in the outbreak was named *Legionella pneumophila* – *Legionella*, after the sick American legionnaires and *pneumophila* from the Greek word meaning "lung-loving".[3] Since then there have been more than 50 species of legionellae discovered.[1]
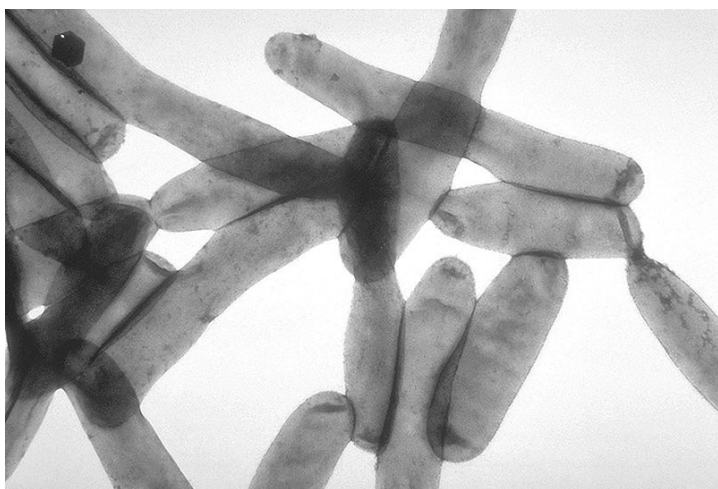

Image: *Legionella pneumophila*. **Public Health Image Library**

Legionella species are generally found in aquatic environments ranging from fresh or brackish waters to coastal waters, and in potting mixes, including moist soils.[4] They can survive in a wide variety of aquatic conditions in:

- temperatures between freezing to 63°C;
- pH between 5.0-8.5; and
- dissolved oxygen concentration in water of 0.2-15 ppm.[3]

Legionella can multiply in the temperature range of 20 to 45°C; the optimum range is between 30 and 43°C.[4]

Legionellae are free living organisms but generally have symbiotic relationships with algae, protozoa and other bacteria.[4] These symbiotic relationships greatly enhance survival and distribution of legionellae, as they obtain most of their nutritional requirements for growth through interactions with these other microorganisms. Free living legionellae can also utilise organic and inorganic material in moist environments.[1,4] Symbiotic relationships between legionellae are best illustrated in their colonisation of biofilms and cysts formed by algae, protozoa and other bacteria.[2,3] Biofilms are a community of microorganisms that are enclosed in self-produced substances that form a protective matrix that sticks to surfaces.[5] Biofilms provide legionellae with nutrients for growth and also offer protection from adverse environmental conditions, such as dehydration and water disinfection. The concentration of legionellae in biofilms depends upon water temperature. At higher temperatures they can more effectively compete with other bacteria. Biofilms can colonise drinking water distribution systems and provide a habitat suitable for proliferation of legionellae in systems that would otherwise be considered clean, which in turn can lead to human exposure.[3]

Modern urban environments provide a wide diversity of sites for legionellae and associated biofilms to colonise and multiply to high concentrations when conditions are suitable. Common areas include cooling towers, swimming pools, domestic hot-water systems, moist potting mixes and decorative water fountains.[1,4,6] The University of New South Wales has recently reported that *Legionella* can also colonise domestic garden hoses.[7]

Image: **Cooling Tower. ACT Health**

Illness caused by *Legionella*

The generic term "legionellosis" is used to describe infections caused by bacteria of the genus Legionella. The most common presentation is acute pneumonia (known as Legionnaires' disease), which ranges in severity from mild illness to severe pneumonia that may involve multiple organs; usually the brain, kidneys, liver and bowel, giving rise to symptoms of mental confusion, renal and liver failure, and diarrhoea.[2,4] Most patients respond promptly to appropriate antimicrobial therapy, but recovery is often prolonged (lasting many weeks or even months).[2] The incubation period of this form of the disease generally ranges from 2-10 days but can be longer.[8]

Article

Legionella: the unseen environmetal threat

Another form of respiratory illness caused by these bacteria is called 'Pontiac fever' after the city in Michigan where the first epidemic was recognised.[1] Pontiac fever is a non-invasive illness associated with respiratory exposure to legionellae or their antigens. The incubation period ranges from 4-66 hours and the infection presents as a short influenza-like illness including fever, headache, and severe muscle aches. Recovery from this form of legionellosis is relatively quick.[2,8]

Most people exposed to *Legionella* do not become infected. The risk of infection increases with age, especially amongst smokers. People with chronic medical conditions that weaken the body's immune system (such as cancer, lung disease, diabetes and transplant recipients) may be at increased risk of legionellosis.[4,8,9]

Legionellosis within the ACT

Within the ACT, infections caused by *Legionella* are a notifiable condition under the *Public Health Act 1997*.[10] Notifications of infections are investigated by the Health Protection Service (HPS) to determine the patient's exposure to any potential sources of *Legionella*. These exposures are then assessed and further investigations are conducted if a plausible link between a potential source and a human infection is identified.

Worldwide, the most common cause of Legionella cases, including outbreaks, has been due to waterborne *Legionella pneumophila* present in cooling tower air conditioning systems and hot water distribution systems.[1] The largest outbreak of Legionnaires' disease in Australia occurred at the Melbourne Aquarium in April 2000. There were 125 confirmed cases of Legionnaires' diseases associated with this outbreak. The cause of the outbreak was attributed to poor cooling tower maintenance at the Melbourne Aquarium.[11] However, legionellosis within the ACT is infrequent, with five confirmed cases detected between 2013 and 2015.[12]

Regulation of sources of *Legionella*

Cooling towers and warm water storage systems (named Specialised Systems) are regulated under the *Public Health Act 1997* and are required to be operated in accordance with the Cooling Towers, Evaporative Condensers and Warm Water Storage Systems (Specialised Systems) Code of Practice 2005 (code of practice).

The code of practice adopts AS/NZS 3666 – Air handling and water systems of building - microbial control and provides a framework for the design, location, commissioning, operation and maintenance of specialised systems. Regular maintenance, inspections and record keeping are ongoing components of the control of *Legionella* in building water systems.

The growth of *Legionella* within specialised systems is primarily controlled through the use of chemical and/or physical disinfectants. Cooling tower systems are required to be fitted with automatically regulated water treatment systems to manage corrosion, scaling, fouling and microbial growth (including of *Legionella*).[13] Warm water storage systems are required to have a physical or chemical process or a combination of the two that ensures Legionella and heterotrophic microorganisms do not flourish within water in the system.[13]

Monitoring of water quality within cooling tower systems is undertaken through monthly water testing to detect the presence of *Legionella*, whilst warm water systems are required to conduct monthly testing for the first six months of operation to verify the effectiveness of the chosen disinfection process in controlling Legionella. Since 2013, the HPS has undertaken an annual *Legionella* compliance and monitoring program. This involves checking compliance with the code of practice relating to the operation of the cooling tower and the tower water quality.

Testing of water samples is required to be performed by a National Association of Testing Authority (NATA) registered laboratory and *Legionella* must not be detected at levels of 10 or more colony forming units per millilitre (CFU/mL). Where *Legionella* is detected, specialised system operators are required to initiate a control strategy detailed within the code of practice. Control strategies may involve disinfection of the system, resampling of water within the system, reviewing the water treatment program and notifying the HPS where *Legionella* counts exceed 1000 CFU/mL.[13]

In the event of an elevated *Legionella* count exceeding 1000cfu/mL the HPS inspects and investigates the specialised system to determine compliance with the code of practice. In the event of an imminent public health risk, such as during a legionellosis outbreak, the Chief Health Officer may order the closure of a specialised system or the evacuation of premises where a suspected outbreak has occurred.[10,13]

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Drinking water quality in the ACT

Radomir Krsteski, ACT Government Analytical Laboratory & Adrian Farrent, Environmental Health, Population Health Division

The ACT has one of the most pure water sources in the country, fed by rainfall and melting snow. This is also one of the lasting legacies of NSW Government Surveyor Charles Scrivener who recommended the Canberra valley as the most appropriate location for the capital, partly because of its water availability, quality and security. The ACT Government constantly monitors the ACT drinking water supply for safety. The strong partnership between Icon Water and ACT Health today provides the community with one of the most fundamental resources; safe drinking water.

In the beginning

Good quality drinking water was one of the most important criteria in selecting the Canberra valley as the most appropriate location for the ACT.

Since the first Royal Commission was established to determine the seat of Government for the Commonwealth in 1899, the proposed location of the capital changed a number of times. Tumut was the preferred site chosen by the Royal Commission and was put to Parliament in 1904. The site was rejected by the Senate in preference for Bombala. This put the process of selecting the seat of Government back a number of years. From 1904 to 1908, more sites were inspected by NSW Government Surveyor Charles Scrivener. He paid particular attention to the availability of water, sanitation and a 'commanding position'.[1]

In November 1908 the Parliament of Australia chose the Yass-Canberra region and Scrivener advised that Canberra valley was the most appropriate location for the capital. Scrivener thought the capital should be located within an amphitheatre of hills, visible on approach for many miles. Water quality, quantity and security were key factors that led to Scrivener recommending Canberra as the location for the capital. Within the Territory's boundaries are three watersheds: Naas Creek to the south, Cotter River to the west, and the Molonglo/Queanbeyan River to the north-east.[1]

Image: Canberra Waterway. ACT Health

As a result, Canberra's drinking water is sourced from the Cotter, Queanbeyan and the Murrumbidgee rivers. The Cotter catchment where Canberra's first dam was built in 1915 is the primary source of Canberra's water supply and consists of three reservoirs: Corin, Bendora and Cotter.[1,2] Queanbeyan river catchment in NSW has ACT's largest reservoir; Googong dam. Even though Googong reservoir is in NSW it is managed by the ACT Government and Icon

water. Googong reservoir is generally only used when water levels in the Cotter catchment are low or when switching water supplies to conduct general/preventative maintenance. In an emergency and as part of enhanced water security contingency measures, the ACT has the capacity to directly pump water from the Murrumbidgee River into the water treatment works at Stromlo or pump water directly from the Murrumbidgee near Williamsdale to Burra creek that feeds into Googong reservoir. This increased uptake of water from the Murrumbidgee River can be supplemented through the Tangtangara water transfer scheme.[2]

Blue-green algae and its impact on ACT drinking water

One major factor that can affect drinking water quality is cyanobacteria or blue-green algae, as it is generally referred too. Cyanobacteria are bacteria that contain chlorophyll.[3] The presence of chlorophyll is what gives cyanobacteria their blue-green colour.

Cyanobacteria occur naturally in all water bodies and when conditions are ideal, they can grow abundantly and form blooms. This is more likely to occur when temperatures are high, with long sunny days, and there is nutrient enrichment associated with increased agriculture and urbanisation.[3] One of the main reasons that Cotter catchment is the preferred water source over Googong reservoir and Murrumbidgee River is the lack of urban and agricultural activity in the area.[2]

Most cyanobacteria toxins are intercellular in that they are not released until the cyanobacteria die or cell walls are broken.[3,4] This is significant, as treatment of contaminated water should aim to minimise cell wall disruption. The four types of toxins that are of concern in drinking water should contamination occur are:

- Hepatotoxins (e.g. microcystins, nodularin and cylinderospermopsins) that damage liver cells.
- Neurotoxins (e.g. Anatoxin-a, Anatoxin-a (s) and Saxitoxins) that damage nerve cells.
- Dermatotoxins (e.g. Lyngbyatoxin-a (1) and Aplysiatoxins (2)) that have been linked to skin irritation, gastroenteritis and allergic reactions.
- Endotoxins (lipopolysaccharides structure on the surface of all cyanobacteria) that can lead to gastroenteritis and allergic reactions.[3-5]

Blooms of cyanobacteria in drinking water reservoirs can create problems in drinking water supplies by producing undesirable toxins and compounds. Icon Water carries out regular monitoring of most types of blue-green algae in all of the reservoirs and raw water sources at different points and depths. The extent and frequency of monitoring varies with the seasons, but is generally at its most frequent in the warmer months as algal blooms typically peak in summer. The different types of cyanobacteria monitored in the ACT are *Anabaena, Anabaenopsis, Aphanizomenon, Tychonema, Spirulina, Oscillatoria, Cylindrospermopsis, Nodularia, Microcystis, Aphanocapsa* and *Pseudanabaena* species. The dominant cyanobacteria in algae blooms are *Anabaena* and *Microcystis* species. Both of these types of cyanobacteria can produce odour and taste compounds as well as toxins.[3]

Other compounds (geosim and 2-methylisoborneol) produced by cyanobacteria can taint drinking water with an earthy and musty odour or taste. Whilst these compounds are not harmful they can make drinking water unpleasant even at low concentrations such as 5ng/L.[4] To supplement the monitoring of algae Icon Water also monitors drinking water for the various hepatoxins, neurotoxins and taste compounds algae can produce to quantify the impact of any cyanobacteria growth.[2]

Article

Drinking water quality in the ACT

The ACT storage reservoirs do occasionally experience blue-green algae blooms in Googong and Cotter. Googong reservoir will always be susceptible to blooms due to the agricultural and urban inputs that impact on the catchment. The first blue-green algae (*Anabaena*) bloom was detected in the Cotter reservoir in December 2013. This was due to the construction of the new dam wall and flooding of new ground. Since then the numbers of blue-green algae have decreased and it is expected they will continue to decrease as nutrient levels stabilise.[3]

Regulatory Framework

The Public Health (Drinking Water) Code of Practice 2007 (the Code) provides a framework for water quality management relating to the supply of drinking water. The Code sets out operational, communication, reporting and response requirements of ACT Health and the drinking water utility (Icon Water) for the supply of safe drinking water to the ACT, Queanbeyan and Googong.[6]

Under the Code raw water storage reservoir should be monitored for the following cyanobacteria: *Microcystis, Oscillatoria, Spirulina, Anabaena, Anabaenopsis* & *Nodularia* species. If levels of these cyanobacteria exceed 2000 cells/mL or a total biovolume of 0.5mm3/L or more, ACT Health must be notified within 24 hours.[6] As well as notifying ACT Health, Icon Water's Blue-green Algae Response Plan is activated when these parameters are exceeded.[2]

Image: Drinking Water. Theeradech Sanin. FreeDigitalPhotos.net

Treatment of Drinking water

The water storage reservoirs naturally assist to stabilise water quality through detention and settling of contaminants, although there are times when high inflows stir-up sediments or currents mix the reservoirs.[2-4]

The extensive treatment regime for removing cyanobacteria and the related toxins currently in place in the ACT consists of:

- Selective abstractions: ensures the most suitable water is sourced from the right depth;
- Powdered activated carbon: is commonly used to remove organic contaminants such as herbicides, pesticides, algal toxins, metabolites and compounds that may have an adverse impact on the taste through adsorption;
- Coagulation and flocculation: chemical coagulant and floccu-

lants are used to remove some natural organic matter, colour and microorganisms, such as algae by binding to them. This creates bound suspended solids that aggregate together (floc);
- Clarification or dissolved air flotation: clarification removes floc by sedimentation whereas dissolved air flotation is used to float the floc to the surface where it is removed;
- Filtration: removes most suspended matter that was to slow settle or did not float; and
- Chlorination and ultraviolet disinfection: is the final step in water treatment used to remove bacteria, viruses, algae and some protozoa. It also has some but not a significant effect in reducing cyanobacteria toxins.

The main aim of the treatment process described above is to ensure that cyanobacteria cells remain whole, as intact cells provide the best opportunity to remove toxins from the water supply.[2-4] As previously discussed, the dominant cyanobacteria species in the ACT produce intercellular toxins and they are not released until the cyanobacteria die or cell walls are broken.

Conclusion

The strong partnership between Icon Water and ACT Health today provides the community with one of the most fundamental resources; safe drinking water. This agile partnership works together to provide water security and protect our natural resources, as well as meeting high community expectations.

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Section Highlight

Business Support Section

The role of the Business Support Services (BSS) section of the Health Protection Service (HPS) is to provide administrative support to HPS program areas including business/quality improvement; database administration; licensing and registration; administrative, corporate and executive support; records management; and management of the HPS facility. The section consists of 13 staff and is headed up by the Manager, Business Support Services and includes the Personal Assistant to the Executive Director, Health Protection Service. BSS provides customer service as the first point of contact to HPS stakeholders visiting the site or contacting the Service by phone. The Section is responsible for processing in excess of 5000 licences and registrations annually for activities regulated by the HPS including food businesses; community pharmacies; radiation sources and operators; infection control and cooling towers. BSS also provides support to Pharmaceutical Services by processing approximately 22,000 applications annually for approval to prescribe controlled substances. The Business Improvement Manager; Database Administrator and BSS Project Officer make up the team responsible for business/quality improvement for the HPS. Some of the main responsibilities of this team include management of the SharePoint site and HPS content on the ACT Health website; administration of a number of HPS databases; and management of various HPS wide programs including internal audits and customer satisfaction surveys.

Business Management Group

The Business Management Group (BMG) are responsible for providing strategic and operational financial and budget management support to the Chief Health Officer and all Branches of the Population Health Division. BMG also provides a number of other services including, but not limited to, accounts payable/accounts receivable; asset management; fleet management; petty cash reimbursement; procurement; stationary ordering and travel arrangements.

Executive Support Office

The Executive Support Office (ESO) is made up of an Executive Officer and a Personal Assistant. The PHD Executive Support Office provides executive support for the Chief Health Officer and is responsible for the coordination of Directorate and Government business across the Population Health Division.

Health Improvement Branch Support Team

The Health Improvement Branch Support Team consists of three staff, including: a Branch Administration Officer who works closely with the Executive Director and senior managers to initiate, improve and implement branch administrative processes while ensuring compliance to Division and ACT Health policies and timeliness in meeting deadlines; a Personal Assistant to the Branch Executive Director, who provides extensive diary and email management, both internal and external; a Finance Officer who oversees all Branch financial and HR matters to ensure the Branch meets its budgetary and compliance obligations.

Photograph: Back row standing L-R: Kirstie Allard, Lyndal Crane, David Mills, Lametred Jones, Kate MacKinnon, Janet Reed, Jennifer Barnes, Ying Tu, Annette Wilke, Maggie Shao

Front row sitting L-R: Louise Kelly, Milly Olsson, Maddie LeLievre, Mariah McCrorey, Casey Shaw

Absent: Emm Dale, Judy Farrugia, Vicki Harrisson Laura McNeill, Natasha Siebels, Cathie Smith

Notifiable Disease Report

Notifications of selected notifiable diseases received in the Australian Capital Territory between October - December 2015

Cases of interest and diseases with higher case numbers than expected in the last quarter, October – December 2015, are shown.

	2015	1st QTR 2015	2nd QTR 2015	3rd QTR 2015	4th QTR 2015	2014	5 year average (2010-2014)
VACCINE PREVENTABLE CONDITIONS							
INFLUENZA A	**516**	72	86	314	44	1167	**468.6**
INFLUENZA B	**689**	13	42	606	28	97	**100.4**
MEASLES *	**2**	1	1	0	0	7	**6**
MUMPS	**5**	1	0	3	1	2	**2.2**
PERTUSSIS *	**487**	88	136	129	134	233	**487.2**
GASTROINTESTINAL DISEASES							
CAMPYLOBACTERIOSIS	**608**	122	129	159	198	507	**481.4**
CRYPTOSPORIDIOSIS	**26**	4	6	5	11	30	**22.6**
SALMONELLOSIS	**240**	93	32	42	73	225	**223.4**
SHIGELLOSIS	**8**	0	0	2	6	7	**7.8**
TYPHOID	**2**	0	1	0	1	1	**2.2**
YERSINIOSIS	**22**	5	8	4	5	13	**5.6**
VECTORBORNE & ARBOVIRAL INFECTIONS							
BARMAH FOREST VIRUS	**2**	2	0	0	0	1	**3**
DENGUE FEVER*	**19**	8	0	7	4	16	**16**
MALARIA	**7**	2	1	2	2	10	**10.6**
Q FEVER	**0**	0	0	0	0	1	**0.8**
ROSS RIVER VIRUS INFECTION	**9**	6	2	0	1	5	**10**
SEXUALLY TRANSMITTED INFECTIONS & BLOODBORNE VIRUSES							
GONNOCOCCAL INFECTION	**141**	42	42	28	29	119	**101.8**
HEPATITIS B	**0**	0	0	0	0	2	**2.6**
RESPIRATORY & OTHER CONDITIONS							
TUBERCULOSIS #	**15**	5	4	5	1	30	**19.0**

Tuberculosis is reported by notification date. All other diseases are reported by onset date or closest known test date.

* This condition includes cases that meet the probable and confirmed case definitions. Both probable and confirmed cases are nationally notifiable.

For the relevant year, Q1 refers to 1 January to 31 March, Q2 refers to 1 April to 30 June, Q3 refers to 1 July to 30 September, Q4 refers to 1 October to 31 December. YTD refers to total number of cases in the year to date.

N.B. Data reported are the number of notifications received by ACT Health. Data are provisional and subject to change.

The number of notifications received for all notifiable diseases in the ACT is available at
http://www9.health.gov.au/cda/source/cda-index.cfm

HIV data are reported annually by the Kirby Institute: http://www.kirby.unsw.edu.au/surveillance/Annual-Surveillance-Reports

Notifiable Disease Report

Notifications of selected notifiable diseases received in the Australian Capital Territory between October - December 2015

Overview of the 4th quarter

In the 4th quarter of 2015, there were increases in the number of notifications of campylobacteriosis, cryptosporidiosis, salmonellosis, and shigellosis compared to the July to September quarter. This is not unexpected as the incidence of gastrointestinal diseases increases in the warmer months. Over 600 campylobacter notifications were reported for the year, compared to an average of 481 notifications annually over the previous five years. The number of yersiniosis infections has increased throughout 2014 and 2015. In additional to expected seasonal increases, recent changes in testing methods and subsequent reporting is likely to have contributed to the increases.

In the 4th quarter there was one case of mumps in an elderly, unvaccinated ACT resident. There was one listeria infection reported in an elderly person, and the source was unknown. In the ACT, local transmission or acquisition of typhoid, dengue, malaria is not expected. In this quarter, the typhoid case was in a young male and was acquired in Bangladesh and the four cases of dengue and two cases of malaria were all acquired overseas.

Overview of 2015

Compared to the average number of cases received in the previous five years, in 2015 there were increases in the number of cases of influenza B, mumps, campylobacter, yersiniosis and gonorrhoea and decreases in measles and hepatitis B infections compared to the previous five years.

Although the total number of influenza cases reported in the ACT in 2015 was similar to 2014, the number of influenza B cases was nearly seven times that of the five year average (n=689). Influenza B was the predominant strain in the 2015 season in Australia and the ACT but influenza A is usually more common. More information is available about the ACT's 2015 influenza season: http://www.health.act.gov.au/public-information/public-health/public-health-alerts/influenza-act.

Five mumps cases were notified in the ACT in 2015, compared to an average of 2.2 over the previous five years. Three cases were aged over 40 and two were aged less than five years. The source of infection was unknown for all cases, and there were no known links between them. Mumps is caused by an infection with the mumps virus. Mumps vaccine is included in the MMR or MMR-V (measles, mumps, rubella, varicella) vaccines routinely provided to Australian children in the National Immunisation Program. Adults who do not have two documented doses of MMR vaccination can also be vaccinated.

The number of gonorrhoea cases has increased in 2015 compared to 2014. There were 141 cases notified in the ACT in 2014, which is the greatest number reported since 1991. Eight-nine percent of cases (n=126) were in males and 72 percent (n=102) were aged 20 to 39 years. Gonorrhoea is a treatable sexually transmitted infection caused by bacteria, which can affect both men and women.

Measles infection is rare in Australia and the ACT, being well controlled by immunisation and public health measures. However, measles is common and a serious cause of illness and death in other parts of the world. In 2015, two cases of confirmed measles were reported in the ACT, compared to seven in 2014. Both cases were in unvaccinated infants and were acquired overseas. While the average number of cases reported annually in the ACT is six, this is affected by a large outbreak in a school in 2011 when 21 cases were reported.

There were no cases of newly acquired hepatitis B infections reported in the ACT in 2015, compared to an average of 2.6 notifications in the previous five years. Hepatitis B infection is caused by the hepatitis B virus. In Australia, vaccination against hepatitis B is provided to children under the National Immunisation Program. The majority of cases reported in the ACT are in people born overseas in a high incidence country.

Hot Issues

Zika Virus

Zika is a mosquito borne virus that is closely related to dengue and also yellow fever. Zika can be found in animals in many parts of Asia and Africa without any outbreaks in humans. In other setting it has caused outbreaks in humans.

Between 2013 and 2015 there were large outbreaks of Zika in a number of Pacific countries, and in 2015 and 2016, large outbreaks have occurred and are ongoing in Central and South American countries.

Recent outbreaks in the Pacific and Central and South America have raised concerns that Zika might cause certain birth defects if a woman gets Zika while pregnant, but further studies are required to prove that Zika is the cause and to understand how and when the infection may be passed on to the baby. Zika has also been associated with the Guillain-Barrè Syndrome which causes rapid onset muscle weakness.

There have been no notifications of Zika virus infection in the ACT. The mosquito *Aedes aegypti* is the mosquito that is primarily responsible for spreading Zika virus to humans. This mosquito is not found in the ACT. In Australia it is found in north Queensland and parts of central Queensland.

The Commonwealth Department for Health has up-to-date information about Zika virus for clinicians and the general public on their website at http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-zika.htm

Salmonella anatum outbreak

An outbreak of *Salmonella anatum* gastroenteritis in Victoria has been linked to pre-packaged salad products grown and distributed by the Victorian-based company Tripod Farmers. The affected products were sold through Coles and Woolworths supermarkets and were distributed nationally, including into the ACT. On 4 February 2016 the company initiated a voluntary food recall of a number of different salad products that had use-by-dates on or before 14 February 2016. A multi-jurisdictional outbreak investigation was initiated to coordinate collation of data and response activities at a national level. ACT Health is working closely with the Commonwealth and other jurisdictions in the outbreak investigation.

Since the start of the outbreak, ACT Health has received notifications of *Salmonella anatum* for two ACT residents. These cases are probable outbreak cases and will either be confirmed or excluded based on the genetic similarity of these sample isolate to other samples in the outbreak.

The salad leaf product that has been implicated in this outbreak should no longer be in circulation in the ACT. Therefore, there should be no ongoing risk to consumers in the ACT arising from this outbreak.

Salmonellosis is caused by the bacteria Salmonella. Symptoms of infection include diarrhoea, abdominal pain, nausea, fever, vomiting and headache. These symptoms usually start within 12 to 36 hours after exposure to the bacteria and most people are sick for 4 to 7 days. Anyone who is unwell with symptoms of salmonellosis should consult their GP.

Information about the products that have been recalled is available on the Food Standards Australia and New Zealand website: http://www.foodstandards.gov.au/industry/foodrecalls/recalls/Pages/Pre-packaged-salad-leaves.aspx

Information about salmonellosis is available on the ACT Health website at: http://www.health.act.gov.au/datapublications/fact-sheets/communicable-diseases#Salmonella