THE WORLD'S MOST DANGEROUS ANIMAL

A 2016 ROADSHOW PRESENTATION

There are over 300 species of mosquitoes in Australia. Of these only up to 40 are involved in disease transmission to people and animals.

Mosquitoes transmit disease by mechanical or biological modes. The major diseases are spread by biological method where the parasite or pathogen undergoes an obligatory period of development and/or multiplication within the vector before being passed onto another host. There are 67 diseases included in the Australian National Notifiable Diseases Surveillance System (search 'NNDDS' to find). The list includes nine vectorborne (all by mosquitoes) diseases. The figures for the last 15 years and the current year-to-date for Australia and by State are published on the Federal Government Health web site. The symptoms of diseases spread by mosquitoes are usually a general malaise that lasts a few days up to a month and may include fever, joint pain and tiredness. Some people may struggle to even get out of bed due to the effects.
Not all infected people are affected by these diseases – often as many as 80% do not show any symptoms, in others the symptoms will be mild. The cases of Zika recorded in Australia (Zika is included in a group of flaviviruses) has risen from 11 in 2015 to about 80 by August ytd 2016 as people returning to Australia are more likely to present with a fever and doctors send samples for testing as the population and medicos have become more aware of these viruses.

MALARIA – NO TRANSMISSIONS WITHIN AUSTRALIA SINCE 1962
WHO estimate there were 214 million cases of malaria in 2015, a decrease of 37% compared to 2000 (taking into account population increase) when there were an estimated 262 million cases. In 2015 there were 438,000 deaths, a decrease of 60% compared to the estimated 839,000 deaths in 2000. 90% of the deaths occurred in Africa and 70% were children under the age of 5.

There has been a massive effort to reduce the incidence of malaria from many groups with WHO at the forefront. The R&D chemical companies are great supporters of the fight against malaria, especially by supplying bednets impregnated with insecticide. On a local level, Rotary has taken an active role through its group Rotary Against Malaria – RAM – which has supplied more than 9 million bednets to PNG where malaria has dropped from the number one killer in 1990 to number eight.

In 2015 there were 233 cases of malaria recorded in Australia which was by far the lowest number since 1991. These were spread evenly between Vic (57), Qld (56), WA (49) and NSW (47).

DENGUE / CHIKUNGUNYA / ZIKA
These are best dealt with as a group because they are spread by two mosquitoes, Aedes aegypti and Aedes albopictus.

A. aegypti used to be found as far south as Wollongong but a decrease in potential breeding sites (such as the banning of water tanks in Brisbane) and work by health authorities reduced their distribution in Australia to north-eastern Australia – A. aegypti is found north of Gladstone with pockets around Gin Gin and the Burnett. A. albopictus, known as the Asian Tiger mosquito, has come down through Indonesia and New Guinea and reached the Torres Strait Islands, spreading Chikingunya to thousands along the way.

Both mosquitoes breed in containers such as water features, tyres, pot plant sauces and even bromelaids – anything that holds water. A. aegypti then tends to fly to darker areas such as inside houses, whereas A. albopictus harbours in vegetation.

There are four Dengue serotypes, each with the potential of causing fever and extreme tiredness, often with an intense headache and joint pain. However, infection later with a second serotype often results in the sometimes fatal dengue haemorrhagic fever. Of the 320 cases of Dengue acquired overseas in Queensland to 30 August ytd 2016 there were 130 identified as serotype 2, 45 as serotype 3, 41 Serotype 1 and 25 serotype 4 (79 unavailable), so the chance of a second case of Dengue being a different serotype is high.

In 2015 there were 1,714 cases of dengue recorded in Australia – with the largest record (554) being from Western Australia. Most cases of dengue notified in Australia result from trips to Bali.

There were 110 cases of Chikungunya recorded in Australia in 2015. Only 18 of these were from Queensland with only one from the Torres Hospital and Health Service area (0 ytd end August 2016) where the vector A. albopictus is present.

Zika was discovered in rhesus monkeys in Uganda in 1947 and was only known as causing a mild fever in 20% of infected people. However in October 2015 the virus was linked with cases of microcephaly in Brazil. The other unique character of Zika is that in 2008 a US researcher returning from Senegal infected his wife via semen on his return to Colorado.

Patient with Dengue Fever

TECHHUB
www.garrards.com.au

AUSTRALIAN MOSQUITO BORNE VIRUSES

Australia has a range of viruses that, between them, can infect people all over mainland Australia. These viruses build up in animal populations – including possums, kangaroos, and water birds – and are then transmitted to people after multiplying within the mosquito.

Ross River Virus (RRV, also called epidemic polyarthritis) was first described in 1928 and occurs widely around Australia. About 40 species of mosquitoes are capable of transmitting the virus. With a range of mosquitoes, there is also a wide range of potential breeding sites of mosquitoes that transmit the virus – eg Culex annulirostris breeds in permanent bodies of fresh water, Aedes vigilax breeds in salty pools in mangroves and in salt marshes after high tides and heavy rains while Aedes notoscriptus breeds in containers similar to the 'dengue mosquito'.

Symptoms may include fever with joint pain and a red rash, but many, especially children, become infected without feeling any symptoms. In most years there are between 4-5,000 cases reported. In 2015 there was a record 9,562 cases of Ross River Virus in Australia with 6,192 from Queensland, 1,620 from NSW and 959 from Western Australia.

Barmah Forest Virus was first isolated in the 1980's. There are a broad range of mosquito hosts with some overlap with those that transmit RRV. Symptoms of infection include inflammation, joint pain, a rash and tiredness lasting 7-10 days. There are often between 1-2,000 cases per year but in 2013 there were 4,238 cases with 2,223 in Queensland, 1,025 in WA and over 400 in NSW and NT. In 2015 there were 625 cases with , again, over half (360) in Queensland.

Murray Valley Encephalitis (MVE) and Kunjin

The term 'Australian encephalitis' has been used for encephalitis caused by these viruses. The symptoms are a sudden onset of fever, anorexia and headache are common but may also result in permanent brain dysfunction and death. Only 1 in 500 infected people show symptoms. The first recorded outbreak of MVE was in 1917 (NSW 132 cases, 71% mortality; Queensland 9 cases with 78% mortality). Further outbreaks were recorded 1922 and 1925. After 45 cases (42% fatal) in Mooroopuna, Victoria in 1951 and sporadic cases in 1956 it seemed to disappear. Kunjin was first isolated in 1960. Epidemics occurred in all states around the 1974 floods. Although historically it has been transmitted in many parts of Australia, since 1974 all reports have been in NT and north-west WA. There have only been a couple of cases each year since 2011 when there were 16 cases of MVE. The two cases of MVE in 2016 were children in different areas of outback NT who will remain affected for life. Outbreaks generally occur at times of high rainfall, even though the vector is continuously present. The outbreaks in south-eastern Australia are triggered by birds breeding in the flood plains bringing the virus.

PUBLIC PERCEPTION OF MOSQUITOES

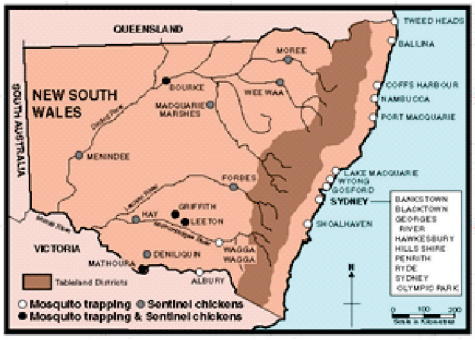
The reaction to mosquitoes in an area will depend on where they live and their experiences. The question most people will ask is – what is the potential health effect on me and my family. In north Queensland there is the potential of local dengue transmission but most of the population of Australia lives in areas where mosquitoes can transmit other diseases such as Ross River and Barmah Forest viruses.

Even in Tasmania where local transmission of disease is unlikely, some of the 17 mosquito species found are known to be nuisance biters. Mosquitoes inject saliva before taking a meal. The saliva contains an anticoagulant to thin the blood and an anaesthetic so the bite will not be felt. The saliva may react with proteins in the body causing the tell-tale mozzie bite lumps.

NATIONAL SURVEILLANCE AND PLANNING

All States and Territories conduct comprehensive mosquito surveillance including light traps and checking animals for antibodies to the viruses. This is conducted in cities and country areas but especially around international airports and shipping ports. This information is collated and used by the National Arbovirus and Malaria Advisory Committee to ensure management strategies are effective.

NSW Arbovirus Surveilance & Vector Monitoring Program



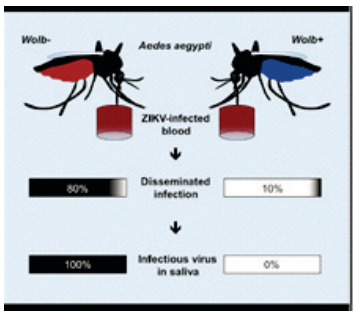
MOSQUITO RESEARCH AND CO-OPERATION

Around Australia there are a couple of hundred people directly involved in mosquito work, from research to implementation of management programs. They have created a great collaboration network – far more than sharing at their biennial conference. This allows any advances to be quickly implemented into programs. Councils plan their probable treatment dates well out to ensure availability of resources (helicopters etc). They also conduct ongoing inspections to check if treatments are required and that they are successful.

There are many research groups working on different projects in Australia. General Blamey recognised the importance of mosquito control in WWII campaign in Papua New Guinea. On return he established the John Curtin Tropical Health Institute in Canberra. A couple of decades ago much of the research was around safely modifying habitat, this has progressed to modifying the mosquito.

Most states are undertaking great research on mosquitoes. Also the army is looking at repellents to protect soldiers going into mosquito areas.

Between 40-60% of insects contain a bacteria called Wolbachia. Prof. Scott O'Neill (Dean of Science at Monash University) transferred Wolbachia from fruit flies to A. aegypti (the dengue mosquito). He found infected Aedes could not transmit dengue and their progeny contained Wolbachia. After many steps and support from the Bill and Melinda Gates Foundation the program is being ramped up to cover cities with the infected mosquitoes. There have been no locally transmitted cases of dengue where the mosquito population has been infected. Recent studies have confirmed that Zika cannot be spread by mosquitoes infected with Wolbachia.



MOSQUITO MANAGEMENT
In the past, when pest managers have been asked about treating mosquito and midge the reply was – mosquitoes are a council responsibility. This is true where mosquitoes are breeding on public property – local, state or federal government owned – which is often salt marshes and other large tracts of water. Many of the species that breed in these areas do not transmit disease, they are nuisance biters, but some spread Ross River and Barmah Forest viruses and other endemic diseases. It is important that pest managers know which species of mosquitoes are in their area, where they breed and the likelihood of them spreading disease.

MOSQUITO BREEDING SITES
Mosquitoes breed in three areas – salt marshes, fresh & brackish water and in 'containers'.

SALT MARSHES
Where salt marshes mosquito breeding sites are close to large populations, local governments are charged with the responsibility for managing their activity.

FRESH AND BRACKISH WATER
Dams and stagnant water are breeding sites for a range of mosquitoes. These areas are often on private land and Garrards carry a range of products that are effective in these situations.

CONTAINERS
Mosquitoes that breed around our homes obviously present a great risk if they are capable of transmitting disease. Education and constant vigilance are obviously important. Sometimes people 'look but do not see' around their home so it is important we show our customers any breeding sites.

MANAGEMENT
Once breeding sites have been identified they can be treated. Mosquitoes are most easily controlled in the larval (wriggler) stage. The simplest treatment is to remove standing water. Garrards Vector Control Catalogue includes many products and where they can be used.

If the breeding site is not on the property, a harbourage treatment can give effective control for up to six months. Adult mosquitoes harbour in areas of high humidity such as under decks and in dense foliage shrubs. Simple surfaces can be treated using normal spray gear, treating the surface up to the point of run-off. Dense foliage should be treated using a back-pack mister. The treatment should be aimed at the underside of leaves where the pores of the leaf let out oxygen with a little water vapour, creating a micro-climate of high humidity.

The air current from the back-pack mister swirls the leaf allowing chemical to coat the leaf. The mister should be run at low revs and the diffuser removed to create the maximum droplet size to reduce drift. All care should be taken to ensure that drift does not enter waterways.

More information
A Guide to Mosquitoes of Australia: Webb, Doggett and Russell 2016 (available from CSIRO online)