

# The Australian

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## Superbugs lead infection race

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### **From humble beginnings in the outback of WA, an antibiotic resistant bacterium has gone global**

TWENTY years may not seem like a long time in evolution. But in two decades, what started as a few isolated cases in the West Australian Kimberley has become an epidemic plaguing all parts of Australia and most nations.

The culprit? Community-associated methicillin-resistant *Staphylococcus aureus*, CA-MRSA for short.

The problem is so serious, Australian experts are calling for a national awareness campaign. The move comes ahead of a report due next year that is expected to show continuing increases in infection rates, including cases of the most virulent form of the microbe.

The healthcare-associated form of MRSA has been rife in hospitals for more than a half century, generally infecting vulnerable people with weakened immune systems. But CA-MRSA can infect anyone in any setting, young and old alike.

Those early Kimberley cases were the world's first confirmed cases of CA-MRSA, reported during early 1990s by researchers from Royal Perth Hospital.

Present team members are Geoff Coombs and Keryn Christiansen, microbiologists at the hospital who work for PathWest Laboratory Medicine, WA.

Back then, they had no idea they were seeing the beginning of an epidemic. "When we first reported the concept of CA-MRSA at international meetings we were met with considerable scepticism," Coombs says.

Scientists knew those first CA-MRSA cases were distinct from healthcare-associated methicillin-resistant *Staphylococcus aureus* since the patients, all from remote indigenous communities, had never been in a hospital. During the next decade, other countries experienced cases of CA-MRSA.

Multiple strains have emerged globally since. The US, for instance, has a CA-MRSA epidemic of the USA300 strain, which has posed a heavy burden on the healthcare system. Now this strain has appeared in Australia.

"We've seen a steady increase in skin and soft tissue infections across all communities in the Kimberley region in recent years," says Carole Reeve, regional public health physician for the Kimberley Health Region.

"In most cases those infected realise the importance of treatment and are receptive to it."

But Reeve says the problem in the Kimberley is bigger among indigenous Australians and that improving socioeconomic conditions in those communities is vital to bringing down CA-MRSA infection rates.

"Raising community awareness of these infections is crucial, and we are particularly targeting schools, and combining information on raising hygiene standards with other programs such as those to reduce [bacterial infections] like trachoma."

Since 2000 surveillance of CA-MRSA has been conducted by the Australian Group for Antimicrobial Resistance, which reports every two years. The federal government is the primary funder of AGAR, a national network of 31 public and private laboratories.

Across Australia, the recent explosion in CA-MRSA cases is largely attributed to the Queensland CA-MRSA strain known as ST93. First reported in 2000, ST93 is a virulent form of CA-MRSA that carries the toxin gene Panton-Valentine leucocidin and is frequently associated with skin and soft tissue infections in young Australians. It's the most common CA-MRSA strain detected nationwide. The AGAR also has identified an HA-MRSA strain known as EMRSA-15, common in Australia's long-term care facilities, which causes increased infection rates in the elderly.

"The factors responsible for different MRSA clones [strains] causing infections in different age groups are yet to be determined, but acquired immunity may be what protects some groups," Christiansen says. "The ST93 clone has become Australia's equivalent of USA300."

Of great concern is the fact ST93 can also lead to severe invasive infections including necrotising fasciitis, where internal flesh is eaten away, and rapidly progressive necrotising pneumonia, which is often fatal.

A recent ST93 case was that of then 10-year-old Sean Fisher of Wondecla, near Cairns. His infection spread through his leg and left him with a rash engulfing his torso, scalp, face and ears, as well as serious breathing problems. He survived after five weeks in hospital, hooked up to a ventilator and treated with the intravenous antibiotic vancomycin.

Sydney teenager Reis Gray was not so lucky. He came home one day feeling lethargic and three days later, as his condition worsened, he was hospitalised. Astonished doctors discovered CA-MRSA had eaten away three-quarters of his lung tissue, and the 17-year-old never regained consciousness, dying 24 days later.

The AGAR 2008 CA-MRSA report shows CA-MRSA accounts for 11 per cent of all community *S. aureus* infections, and cases have more than doubled since 2000. In 2008 the mean age of patients with CA-MRSA infections (40 years) was much lower than that for HA-MRSA (69 years); and between 2006 and 2008 the proportion of CA-MRSA infections caused by the most virulent strains increased from 52 per cent to 65 per cent.

Just among CA-MRSA cases, the mean age of patients with the most virulent CA-MRSA infections (33 years) was significantly lower than the mean age of patients infected with the less virulent strains (53 years).

As with HA-MRSA, CA-MRSA is resistant to first-line treatment antibiotics. Vancomycin is used for many serious infections, but treatment can fail and MRSA strains resistant to this drug are emerging. Fortunately, a handful of drugs in development --some of which are related to vancomycin -- have shown promise in clinical trials.

"Control strategies for CA-MRSA vary between the Australian states," says AGAR member Graeme Nimmo, president of the Australian Society for Antimicrobials and state director of microbiology for Pathology Queensland. "The most active program is in WA where control focuses on treatment of cases and any symptomatic contacts, usually in the same household; screening of those household contacts for carriage of the organism, usually by nose swab; and treatment to eradicate carriage.

"There are also recommendations for increased cleaning and laundering in affected households. This requires education of primary-care practitioners and of patients and their household."

According to factsheets on CA-MRSA on the WA government website, people with less serious CA-MRSA infections often have skin infections, including boils. Serious infections can be accompanied by high fever, shakes, weakness and shortness of breath, and in such cases urgent hospital treatment is required.

Coombs and Christiansen are leading the push for a national awareness campaign for patients and general practitioners. And since levels of CA-MRSA are poorly known, they also call for population-wide prevalence studies, along with trials of community interventions to reduce CA-MRSA carriage.

"I would like to see MRSA isolation notifiable nationally as it is already in Western Australia," Nimmo says.

The WA program focuses on the virulent USA300 and ST93 strains.

"For the USA300 strain about half of those patients infected report recurrent infections and a third have been hospitalised because of their infection. Many have travelled overseas. We're finding more than 10 per cent of family contacts are also testing positive," Christiansen says.

In Canberra, Australian chief medical officer Jim Bishop says: "New strains of antimicrobial-resistant bacteria appear to have been increasing in Australia in recent years, with significant social, health and economic costs. These include failure of treatment leading to prolonged recovery, increased time away from work, increased need for more expensive and more toxic treatment options, and increased hospitalisations."

Bishop says data shows the proportion of *S. aureus* identified as MRSA in the outpatient population increased from 13 per cent in 2000 to 16 per cent in 2006. NSW and the Northern Territory were particularly hard hit.

"This has implications for the treatment of patients presenting at outpatients clinics, emergency departments and general practice," Bishop says.

As well as AGAR, the federal government also funds the National Antimicrobial Utilisation Surveillance Program. It collects data from 25 hospitals to develop strategies for minimising antimicrobial resistance.

Bishop also highlights efforts by the Australian Commission on Safety and Quality in Health Care to reduce MRSA and other infectious diseases, including national infection control guidelines, the national hand hygiene project and surveillance for prevention.

"All health ministers have endorsed a national approach to surveillance for blood-stream infections, including *S. aureus*, which will be progressed through the commission," he says.

And rightly so, say Coombs and Christiansen, reiterating that CA-MRSA has become a serious public health concern, one demanding surveillance, public information and improved prescribing and treatment policies. There's no time to waste, they say. The bacteria are winning the evolutionary race, one microbe after another.

**[www.public.health.wa.gov.au/3/896/3/camrsa.pm](http://www.public.health.wa.gov.au/3/896/3/camrsa.pm)** (<http://www.public.health.wa.gov.au/3/896/3/camrsa.pm>)

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