THE 'ICK' FACTOR

Maggots have been making a medical comeback for many years. But they are not yet mainstream in Australia, writes CARMEL SPARKE.

A MODERN-day medical treatment that has helped more than 1000 patients around Australia started in a Sydney backyard with a chunk of rotting meat and a fly.

The yard belonged to entomologist Dr Stephen Doggett (PhD). In early 2000, he had been following the re-emergence of maggot treatment programs in other parts of the world and wanted to give the treatment a go locally.

So, using the meat as bait, he started catching flies, singling out the species he needed for a breeding program. This, it turns out, was the green-bottle blowfly, or *Lucilia sericata*. It is the perfect species for wound work, a creature that dispenses helpful antibiotics while feasting on what it seems to like best — dead flesh.

'YOU'VE GOT TO FOLLOW THE PROTOCOL, AND DISCARD THE BANDAGES AFTER 2-3 DAYS; WE'VE HAD REPORTS OF PEOPLE WALKING AROUND SHEDDING MAGGOTS.'

— Dr Stephen Doggett, senior hospital scientist, NSW Health Pathology

Nearly two decades later, the colony born by that one blowfly has gone through numerous generations and is now the main source of medical grade wound cleaning larvae in Australia.

"Basically, you put a chunk of smelly meat outside, collect every fly that comes across it with a net, then identify the adult fly and breed through the larvae," says Dr Doggett, senior hospital scientist for NSW Health Pathology.

Thanks to the persistence of Dr Doggett and his team from Pathology West's department of medical entomology in Westmead, the unit is sending off 4-5 batches of maggots a week, primarily to wound specialists in hospitals. Requests also come from doctors in private practice as well as for home care; with some veterinarians also putting in orders.

Dr Doggett is proud of his team, who, he says, have "virtually single-handedly developed and progressed the technique in Australia, going out of their way to supply maggots to patients, spending many unpaid hours over multiple weekends in order to get the therapy to them".

So what does it involve?

Maggot debridement therapy (MDT) is a biotherapy that involves placing live, disinfected maggots onto necrotic or sloughy, non-healing wounds to help clean and heal the area. Soft tissue wounds, including pressure ulcers, venous stasis ulcers, foot ulcers and non-healing traumatic or post-surgical wounds, are potentially suitable for MDT.

The maggots are placed inside the wound, with dressings applied over the top to help contain the wrigglers, as well as absorb the liquid from the process. They work by debriding the necrotic tissue while disinfecting the wound with enzymes they excrete. Their

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movement across the wound surface also helps to remove dead cells.

"The maggots themselves ingest bacteria, but they also release antibacterial agents with a wide spectrum. As well, they change the pH from acid to alkaline, which encourages new cell growth," says Dr Doggett.

Maggots are left on the wound for 2-3 days, growing from 1-2mm to 7-8mm in a few days of feeding, then discarded as waste along with the dressings.

"You've got to follow the protocol, and discard the bandages after 2-3 days; we've had reports of people walking around shedding maggots," Dr Doggett says.

Merilyn Geary, senior technical officer in medical entomology at Westmead Hospital in Sydney, with a case of adult egg-laying green bottle flies. The flies are used to breed maggots, which are then sold for wound debridement.

Smelly business

The larvae for treatment in Australia start life in insectaries at Pathology West, where mature blowflies are housed in cages kept in special cabinets, and lined with charcoal to absorb smells.

"We have to put liver in the cages to feed the larvae to get them through to the adult stage, and it becomes pretty rank and pretty smelly I assure you," Dr Doggett says.

The eggs are separated chemically, then treated with diluted bleach to surface sterilise them, placed into egg media and allowed to hatch. They're tested for the presence of bacteria and only batches that are free of contaminants are sent for patient use.

About 200 disinfected maggots are placed on a piece of moistened sterile gauze about 5cm by 5cm, put inside specimen pots and couriered in cooler bags to wound specialists.

The department charges about $90 per pot of 200 larvae, and the number used would depend on the size of the wound. Some require just one treatment, while others need two or three.

Clinicians remove the larvae from the container with gloved fingers or forceps and apply them to the wound, which is then covered with a number of dressings. The outer covering is a dry gauze to absorb the wound exudate and should be changed at least daily, because the maggots will drown if the wound becomes too wet.

An image problem

Dr Doggett is the first to admit the maggot has an image problem.

"It does take a bit of getting over that mental hurdle of ordering them initially, but we find that when a wound consultant uses them once, they tend to reorder, because they get such good results," he says.

"It is a bit gruesome to look at, seeing live maggots in a wound. It doesn't look right, let's face it.

"It is one of those slightly unpleasant things, but it's doing good."

Yet it's rarely the patients who baulk at the concept of using live maggots to help heal.

"Patients are generally pretty okay with it, because they are

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'IN SOME PATIENTS, SUCH AS THOSE WITH COMPLICATED DIABETIC WOUNDS, THERE ARE SPECIFIC METABOLIC AND VASCULAR FACTORS THAT INFLUENCE THE EXTENT TO WHICH WOUNDS CAN AND WILL HEAL. '

— Professor Ramon Shaban, chair of infection prevention and control at Griffith University, Gold Coast, Qld

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usually desperate; they want to save their leg or their foot," Dr Doggett says.

"It's generally the nursing staff who are responsible for the application and removal who have a problem with it.

"I always find that amazing, considering they are used to dealing with pots of faeces and such.

"Some nurses have even refused to work with them."

A 2009 article titled 'Maggots Down Under', published in *Wound Practice and Research,* described a survey of 22 patients. Only one respondent apparently indicated a "crawling sensation" as a side effect.

"Usually they do not feel the larvae as their wound is quite painful anyway," Dr Doggett says.

And once you get over the mental barriers, maggots have been shown to be effective.

A 2014 review of MDT for chronically infected wounds and ulcers found the therapy not only shortened healing time, but also improved the rate of healing, and was a feasible alternative treatment.

Published in the *International Journal of Infectious Diseases*, the review included studies on the costs, including one 2001 study that looked at the price of 30 days of treating leg ulcer patients. Including the cost of nursing, dressing, and "larval costs", maggot therapy cost $1328 compared with $2808 for the hydrogel group (2001 prices).

Creepy crawly future

So there are reasons for the demand. Word of mouth and repeat business have seen requests for Pathology West's maggots grow by 10-15% each year. But, in the grand scheme of things, demand is still small scale.

Pathology West, for instance, is the only supplier in Australia, and it handles fewer than 200 orders a year.

The hope among its supporters is that MDT could help reduce the number of amputations. It has been estimated that every three hours, one Australian loses a lower limb to diabetic foot-related amputation.

Supporters also point to the UK, where doctors have been using maggots as a first-line wound treatment instead of a last resort as in Australia, treating thousands of patients a year since being approved as an NHS treatment in 2004.

But one issue is the challenge of getting the maggots and the patient together within the approximate 48-hour window when the maggots are effective.

With a limited supply chain in place across Australia, that can be problematic.

And there is also the clinical reality that MDT is not always enough for complicated wounds. Professor Ramon Shaban, president of the Australasian College for Infection Prevention and Control, argues that MDT is an important option.

"In some cases where there is a need to remove the necrotic tissue that interferes with wound healing, then maggot debridement therapy is a suitable option to consider, with strong prospects of good outcomes.

But the chair of infection prevention and control at Griffith University, Queensland, adds: "In many patients there are a range of factors, both clinical and non-clinical, that are beyond the presence of necrotic tissue that interfere with or influence wound healing.

"In some patients, such as those with complicated diabetic wounds, there are specific metabolic and vascular factors that influence the extent to which wounds can and will heal."

Dr Doggett says Australian clinicians and authorities should get behind MDT, especially in light of increasing number of diabetes patients. "MDT needs to be taken up as a serious therapy, and we really need to support it as a nation, as we will increasingly be in need of such treatments." ●

Additional reporting by Paul Smith

***Australin Doctor* is grateful for the assistance of Frank Stadler, a PhD student at Griffiths University.**

Antibiotic resistance sees resurgence in maggot therapy

MAGGOTS have been used to clean wounds since biblical times, but their rise as agents in modern medicine owes something to World War I.

Faced with battlefield wounds on an unprecedented scale in the trenches of France, Johns Hopkins University physician Dr William Baer began seeing injuries that had become infested with maggots.

His first instinct was to clean out the larvae, but then, like other doctors before him, he noticed something strange: the wounds with maggots didn't become infected, they healed faster, and the soldiers were much less likely to die of their injuries.

After the war, Dr Baer returned to Johns Hopkins and brought his insights into maggot therapy with him. He bred and raised *Lucilia sericata* maggots on the windowsill of his Baltimore laboratory, and used the larvae on 21 patients with chronic osteomyelitis for whom all previous treatments had failed.

Two months later, Dr Baer noted, all of their wounds had healed.

Throughout the 1930s and 1940s, the popularity of maggot therapy grew — at least, until the discovery and widespread use of penicillin.

Within a few decades, maggot therapy was relegated to a "historical backwater, of interest more for its bizarre nature than its effect on the course of medical science", said the US microbiologist Milton Wainwright. However, a tsunami of hard-to-heal wounds brought this backwater back to the forefront of medicine.

As conditions such as type 2 diabetes began to grow more common in the 1980s, doctors in the US like Dr Ron Sherman, a pioneer in the reintroduction of the intervention, saw increasing numbers of patients with wounds that refused to heal.

He remembered learning about chronic wounds and the archaic-sounding maggot therapy when he was fresh out of medical school. Far from being a historical backwater, maggot therapy sounded like exactly what his chronic wound patients needed.

"The maggots were able to dissolve the dead and infected tissue, thereby cleaning the wound faster than any of the other non-surgical treatments available," he said. "I was able to treat patients who were scheduled for amputation because they had failed all other therapies."

In 2004, the US Food and Drug Administration approved medical-grade maggots as a "medical device" to debride chronic or non-healing wounds as did the UK's health service.

DR WILLIAM BAER ... NOTICED SOMETHING STRANGE: THE WOUNDS WITH MAGGOTS DIDN'T BECOME INFECTED.

Source: 'How maggots made it back into the mainstream', by Carrie Arnold/Mosaic Science.