

News from Academia

A compendium of new scientific publications relevant to the pest management industry

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AUSTRALIA: INSECTICIDE RESISTANT MOSQUITOES BROUGHT IN ON AIRCRAFT

Over the last seven years, there has been an increasing number of detections of exotic mosquitoes at Australian sea and air ports. The main species detected has been *Aedes aegypti*, but *Aedes albopictus* and *Aedes japonicus* have also been detected. Australia is currently free of the latter two species and both pose a serious biosecurity risk to the nation. *Aedes aegypti* currently only occurs in Queensland and at present there is no evidence for any insecticide resistance in local strains. Following the exotic detections, researchers from the University of Melbourne undertook genetic analysis of 115 incursive *Aedes aegypti*, both to look for the potential origins of the mosquitoes and to test to see if they may be carrying genes for insecticide resistance. Most of the mosquitoes originated via flights from Bali in Indonesia and most possessed point mutations that confer knockdown resistance. In order to prevent the establishment of these mosquitoes through ports, which could act as a gateway for these exotic species, protocols must consider insecticide resistance.

Source: *Evolutionary Applications* (6/Mar/2019), <https://onlinelibrary.wiley.com/doi/full/10.1111/eva.12787>

IRAN: INSECTICIDE RESISTANCE IN THE COMMON BED BUG, *CIMEX LECTULARIUS*

Whenever bed bugs have been tested, with either the common or tropical species (*Cimex hemipterus*), levels of insecticide resistance have been reported to be very high. In the latest of such research, the common bed bug was tested for resistance to λ -cyhalothrin, malathion, and diazinon in northeastern Iran. Malathion at the highest concentration produced no control, and high levels of resistance were found to

the two other actives. Thus the three insecticides were found ineffective for the control of bed bugs in the region.

Source: *Journal of Medical Entomology* (1/Mar/2019), <https://academic.oup.com/jme/advance-article-abstract/doi/10.1093/jme/tjz011/5367286?redirectedFrom=fulltext>

INDIA: SENSITIVITY TO MITES IN ALLERGIC INDIVIDUALS

House dust mites are known to be the cause of allergic rhinitis. In a study undertaken in Kolkata, India, patients with allergic rhinitis were tested for sensitivity to dust and stored product mites. Of the 330 patients tested, 92% were sensitive to house dust mites, and rates of sensitization to other mites were also high with many as 88% reacting to certain species of stored product mites. This research may indicate routes of better management of the patient's conditions to the future.

Source: *Journal of Medical Entomology* (25/Feb/2019), <https://academic.oup.com/jme/article-abstract/56/2/347/5193814?redirectedFrom=fulltext>

MALAYSIA: RICKETTSIA FROM TICKS

Infections with *Rickettsia*, a primitive type of bacteria, is common in Malaysian communities living adjacent to forested areas. A research group tested for the presence of *Rickettsia* in ticks at the forest reserve of Kuala Lompat in Pahang. Using molecular tests, *Rickettsia* were detected in one third of the ticks tested, with multiple species of *Rickettsia* being detected. The research shows how the local community is at high risk from these potential pathogens (SLD: many species of ticks, and mites, transmit *Rickettsia* to humans. Some of these can produce high fatality rates, up to 30% in untreated patients. Fortunately, *Rickettsia* infections can be readily eliminated with antibiotic therapy).

Source: *Journal of Medical Entomology* (25/Feb/2019), <https://academic.oup.com/jme/article-abstract/56/2/547/5124549?redirectedFrom=fulltext>

PAKISTAN: INSECTICIDE RESISTANCE IN MALARIA VECTORS

Anopheles subpictus is a malaria vector through southern parts of Asia and insecticides form the main stay of controlling this species. In order to ensure that the most appropriate chemical is used for the control of this species, collections of the mosquito were made from the Kasur district and they were tested for susceptibility status against DDT, deltamethrin, and permethrin. In no case was 100% control achieved in any of the field strains collected, with mortality ranging between 28-79%. This highlights that significant insecticide resistance is occurring in the region and that a review of the chemical control program is warranted.

Source: *Medical and Veterinary Entomology* (18/Feb/2019), <https://onlinelibrary.wiley.com/doi/10.1111/mve.12367>

IMPROVE YOUR HOUSE FLY CATCHES: SWITCH THE TRAP ON AND OFF

Research on the house fly, *Musca domestica*, suggests that with the use of ultraviolet lights, that intermittent turning on and off the traps, can lead to an increase in trap numbers.

Source: *Journal of Insect Science* (17/Feb/2019), <https://academic.oup.com/jinsectscience/article/19/1/22/5321889>

THAILAND: INSECTICIDE RESISTANCE IN THE STABLE FLY.

With the anecdotal evidence for treatment failures with the use of pyrethroids against the Stable fly, *Stomoxys calcitrans*, a research project was initiated in the US to test for knockdown resistance. Stable flies were collected in the US, France, Costa Rica, and Thailand. For the US fly strains, evidence suggested that there are multiple forms of resistance. For Thailand, a mutation (L1014F) was detected that is known to confer knockdown resistance.

Source: *Journal of Medical Entomology* (15/Feb/2019), <https://academic.oup.com/jme/advance-article-abstract/doi/10.1093/jme/tjz012/5320708?redirectedFrom=fulltext>

WORLDWIDE DECLINE IN INSECTS

In a recent published scientific paper, it is claimed that over 40% of the world's insects are facing extinction. Large groups of butterflies, wasps, and beetles are most affected. The main reason for the decline related to the growing human population that has resulted in widespread habitat destruction, with conversion of forests to intensive agriculture. The decline has been accelerated by the use of agro-chemicals, invasive species, and climate change (SLD: it is a sad world that we are leaving for future generations...)

Source: *Biological Conservation* (12/Feb/2019), www.sciencedirect.com/science/article/abs/pii/S0006320718313636#!

SHHHHHH! THOSE MOSQUITOES ARE LISTENING!

New research has shown that the dengue mosquito, *Aedes aegypti*, can hear over much greater distances than previously thought. Experiments found that they can hear up to a distance of 10m away. While it is thought that this hearing is related to mating behaviours, it is possible they may be hearing humans as well. However, whether sound is also used to find humans as a blood source requires further investigation.

Source: *Current Biology* (7/Feb/2019), [www.cell.com/current-biology/fulltext/S0960-9822\(19\)30028-4](http://www.cell.com/current-biology/fulltext/S0960-9822(19)30028-4)

MONITORING OF THE RED FLOUR BEETLE USING PHEROMONE TRAPS

Researchers from the US have undertaken a monitoring program for the Red Flour Beetle, *Tribolium castaneum*, in rice mills and rice processing facilities. They employed a series of pheromone-baited traps in order to determine the areas of the mill that were most susceptible to the beetle. It was found that the beetle was more commonly collected in processing areas, with fewer numbers trapped in rough rice storage areas. Such information can help guide pest management processes.

Source: *Journal of Economic Entomology* (4/Feb/2019), <https://academic.oup.com/jee/advance-article-abstract/doi/10.1093/jee/toy422/5306467?redirectedFrom=fulltext>

CHINA: WESTWORLD, SCIENCE FICTION, OR HOPE FOR THE DISABLED? CYBORG RATS!

In a paper reminiscent of Westworld, researchers in China have successfully used human thoughts to control the movements of a rat implanted with a device attached to its brain. The rat 'cyborg' was able to be navigated through a complex maze from the thoughts of the researcher (SLD: while this appears to be part science fiction, perhaps this research paves the way for people who suffer severe spinal injuries)

Source: *Scientific Reports* (4/Feb/2019), www.nature.com/articles/s41598-018-36885-0

CHINA: INSECTICIDE RESISTANCE IN THE MALARIA VECTOR, ANOPHELES SINENSIS

Malaria has been on the decline in many countries, mainly due to effective vector management programs. In China, one of the main vectors of malaria (*Plasmodium vivax*) is *Anopheles sinensis*. In spite of ongoing control programs that rely on insecticides, little work has been undertaken examining resistance in this mosquito species. In testing strains of *Anopheles sinensis* from the port city of Wenzhou in Zhejiang province, it was found that field mosquitoes poses a range of resistance mechanisms, including knockdown and metabolic resistance. Such insecticide resistance

could lead to treatment failures and a rise in malaria cases.

Source: *Journal of Medical Entomology* (1/Feb/2019), <https://academic.oup.com/jme/advance-article-abstract/doi/10.1093/jme/tjz001/5305038?redirectedFrom=fulltext>

INSECT (BUG) BOMBS, INEFFECTIVE AT CONTROLLING COCKROACHES

This will come to no surprise for those us in pest management, however a new study has shown that total release aerosols (insect or 'bug' bombs) have little effect on controlling the German cockroach, *Blattella germanica*. In a study conducted in the USA, researchers compared the effectiveness of insect bombs with gel baits. Cockroach counts were undertaken four weeks after the treatments and it was found that the insect bombs failed to cause a decline in cockroach numbers. The bombs also resulted in significant insecticide residues throughout the kitchen (SLD: hardly any surprise here with this study. We have known for a long time that the aerosols from insect bombs do not penetrate into insect harbourage areas.)

Source: BMC Public Health (28/Jan/2019), <https://bmcpubhealth.biomedcentral.com/articles/10.1186/s12889-018-6371-z>

MALAYSIA: FEEDING MOSQUITOES APHRODISIACS TO MAKE THEM HORNY

One method of insect control involves the use of sterile males. With many insects, they only mate the one time, and thus if the male is sterile, no young will develop. Sterilisation of the males is normally achieved with gamma radiation. The challenge is to encourage the sterilised males to mate and even outcompete the non-sterilised males to find a female. A team of researchers from Malaysia, Japan, and Thailand, found that feeding male *Aedes aegypti* a herbal compound, they mated much more quickly and more often than mosquitoes not feed on the herbal compound. This research could prove promising in the use of sterile insects for population reduction programs (SLD: whoever thought that there would be Viagra for mosquitoes?)

Source: *Indian Journal of Medicine* (25/Jan/2019); <http://www.ijmr.org.in/article.asp?issn=0971-5916;year=2018;volume=148;issue=3;page=334;epage=340;aulast=Dieng>

SMELLS TO CONTROL MICE

The house mouse, *Mus musculus*, is a cosmopolitan pest that can seriously damage stored foods. Current control methods rely on the use of anticoagulant baits, however some mice are able to resist these chemicals. A group of researchers from Argentina looked at the effects of a range of odours to reduce reproductive success in the laboratory. They use a range of smells, including cat urine, smells from unfamiliar male mice, and other chemicals. One chemical, 2,5-dihydro-2,4,5-trimethylthiazoline, not only reduced the number

of mice born, but also reduced survival. To date this research has yet to be undertaken in the field.

Source: *Pest Management Science* (24/Jan/2019); <https://onlinelibrary.wiley.com/doi/10.1002/ps.5359>

NEW MOSQUITO REPELLENTS FROM BACTERIA

A chemical compound called 'fabclavines' has been isolated from bacteria has been found to deter biting in three well known mosquito vectors; *Aedes aegypti*, *Anopheles gambiae*, and *Culex pipiens*. Perhaps most impressively, is that very low doses of this chemical were as equally effective at repelling the mosquitoes as DEET and picaridin, the actives in most repellents on the market today. It is still yet to be determined if the bacteria derived chemical will be suitable for use on humans, but the finding opens the possibility of new repellents against insects that carry disease causing pathogens.

Source: *Sci News* (21/Jan/2019); www.sci-news.com/biology/mosquito-repelling-compounds-xenorhabdus-budapestensis-06830.html

PAKISTAN: FIRST DETECTION OF WEST NILE VIRUS

An investigation was undertaken to determine if the mosquito-borne virus, West Nile, is present in Pakistan. The research was undertaken by trapping and testing mosquitoes, and over 1,000 serum samples were collected from blood donors. None of the mosquitoes tested positive, however three of the blood donors were positive for the virus. This was the first detection of West Nile virus in Pakistan, which was from the Punjab Province. The researchers are now calling for authorities to undertake urgent coordinated surveillance to determine the extent of this virus and if humans are impacted (SLD: West Nile virus is one of the encephalitic viruses, which can cause death or permanent brain damage.)

Source: *International Journal of Infectious Diseases* (18/Jan/2019), www.sciencedirect.com/science/article/pii/S1201971219300311#!

CHINA: SPECIAL ISSUE ON PATHOGENS IN CHINA

The US based journal, *Vector-Borne and Zoonotic Diseases*, has just released a special issue focusing on pathogens in China including many papers on vector-borne diseases. Papers include:

- A serosurvey of sheep for the tick-borne infections (notably the bacteria that causes Lyme disease, *Borrelia burgdorferi*),
- A review of an outbreak of Japanese encephalitis virus from 2013 (a mosquito-borne virus),
- The change in the genotypes of Japanese encephalitis virus over 1935-2017,
- Detection of West Nile virus in patients (a mosquito-borne virus),
- The isolation of other mosquito carried viruses such as Akabane (which affects livestock).

Source: *VBZD* (18/Jan/2019); www.liebertpub.com/toc/vbz/19/1

BODY PAINTING PROTECTS AGAINST BLOOD SUCKING INSECTS

Many indigenous tribes undertake body painting, largely for tribal rituals, with the use of brightly coloured stripes on the skin. A group of researchers have tested to see if the stripes may deter the bites of horseflies as it is known that the flies are deterred by the stripes on Zebras. It was found that a model without stripes was 10 times more attractive to horseflies than a model with the stripes. The wearing of such stripes this has the potential to reduce irritation from the insects bite and decrease the risk of a vector-borne pathogen.

Source: *The Royal Society* (16/Jan/2019): <https://royalsocietypublishing.org/doi/10.1098/rsos.181325>

CHINA: REGULAR GROOMING PROTECTS TERMITE HEALTH

Researchers in China found that when the subterranean termite *Reticulitermes chinensis* was sprayed with deadly fungal spores, the insects quickly groomed themselves in order to remove the spores. This is clear evidence that grooming behaviour helps mitigate the effects of deadly pathogens.

Source: *Journal of Insect Science* (16/Jan/2019); <https://academic.oup.com/jinsectscience/article/19/1/6/5289805>

LAOS: BIOLOGICAL CONTROL OF RATS USING PARASITES

Rodent control offers many challenges, one of which is trying to prevent non-target animals from eating the baits used in control programs, and succumbing to the poison. One means to overcome this is via the use of biocontrol agents, which only affect the targeted species. *Sarcocystis singaporensis* is a rodent parasite that has been used within baits for the control of a range of *Rattus* species. In a control program in a World Heritage Region of northern Laos, baits containing lethal amounts of *Sarcocystis singaporensis* were able to achieve a significant reduction in rodent populations even up to 83%.

Source: *Pest Management Science* (13/Jan/2019), <https://onlinelibrary.wiley.com/doi/10.1002/ps.5335>

CHINA: MISUSE OF PESTICIDES IN CROP PRODUCTION

Investigations in the agricultural use of insecticides have found serious concerns in how they are employed. Misuse of insecticides was found to be widespread, especially in the production of rice, apple, tea, and vegetables. Some farmers were even unaware of which pests they were controlling or what insecticides they were using (SLD: the overuse and misuse of insecticides is a major problem. Food can be soiled with chemicals, and some such as the organophosphates, can cause cognitive impairment in the developing embryo. Overuse will more likely lead to the rapid development of insecticide resistance. Nobody should be applying insecticides without being properly

trained in the safe use and proper handling.)

Source: *Pest Management Science* (10/Jan/2019), <https://onlinelibrary.wiley.com/doi/10.1002/ps.5332>

ENCAPSULATION INCREASES TOXICITY TO NON-TARGET IMPACTS

These days, insecticides are often encapsulated with some form of protective coating made of a plastic compound or a starch. The encapsulation can ensure that the insecticide is slowly released over time, therefore increasing the residual effectiveness of the product. However, a recent study published in the journal *Nanomaterials* found that encapsulation increases the toxicity of the product to non-target organisms. Researchers from Oregon State University exposed an encapsulated form of cyhalothrin to *Daphnia*, a small invertebrate commonly known as 'water fleas'. They sorted the product into two encapsulation sizes, some were micron-sized and some nanometer-sized. The latter were found to be much more toxic for the water fleas. The researcher state that toxicity studies are rarely performed on the final formulated product, and it is important that such studies are undertaken in order to protect the environment.

Source: *Nanomaterials* (9/Jan/2019), <https://www.mdpi.com/2079-4991/9/1/81>

PATHOGENS CARRIED BY RATS IN EUROPE

Both black and Norway rats are known as carriers of a variety of pathogens that can cause disease in humans (which is one reason we try to control them). To investigate the range of pathogens they carry, a study was undertaken in Europe, where wild rats were captured and tested for a range of microbes. A range of zoonotic pathogens (i.e. those carried by animals) were detected including *Anaplasma phagocytophilum* and several *Bartonella* species. This study highlights the role that rodents play in the transmission of human diseases.

Source: *Pest Management Science* (9/Jan/2019), <https://onlinelibrary.wiley.com/doi/10.1002/ps.5323>

COCKROACH BLOOD TO FEED INSECTS; DELICIOUS!

Maintaining insects in colony can be a real challenge as trying to replicate the exact diet is difficult. One medically important insect is the kissing bug, *Triatoma recurva*, which has the potential to transmit *Trypanosoma cruzi*, the parasite that causes Chagas disease. Juvenile *T. recurva* were fed on a diet of cockroach blood and were able to develop from the first instar to the next. This suggests that the kissing bug can survive in the wild by attacking cockroaches and that to control *T. recurva* in the field, it will also be necessary to manage cockroach populations.

Source: *Journal of Medical Entomology* (31/Dec/2018); <https://academic.oup.com/jme/advance-article-abstract/doi/10.1093/jme/tjy233/5267884?redirectedFrom=fulltext> ■