

News from Academia

A Compendium of New Scientific Publications Relevant to the Pest Management Industry

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BRAZIL: PARTIAL PROTECTION FROM COVID-19 WITH DENGUE?

In a paper from Brazil (that is yet to be peer-reviewed), researchers have suggested that there is a link between the spread of COVID-19 and dengue. The authors are inferring that exposure to dengue may provide some protection to the coronavirus. The suggestion is that a dengue vaccine may help reduce the risk of COVID-19 disease. [SLD: before you go out and try to be bitten by mosquitoes to avoid COVID-19, many tens of thousands from dengue infection every year.]

Source: medRxiv (21/Sep/2020), www.medrxiv.org/content/10.1101/2020.09.19.20197749v1

CHINA: RED FIRE ANTS ARE ATTRACTED TO CERTAIN SOILS

A recent study from China found that when fire ants choose a new site for nests, they tend to favour soils that contain fewer fungi. This then represents an area of low pathogen risk that could be a harmful to the ants. The ants then to be attracted via volatile compounds produced by certain types of microbes, which inhibit other microorganism. Perhaps in future these smells could be used in baits as a form of control agent.

Source: PLOS Pathogens (10/Sep/2020), <https://journals.plos.org/plospathogens/>

[article?id=10.1371/journal.ppat.1008800](https://doi.org/10.1371/journal.ppat.1008800)

SINGAPORE: DETECTION OF JAPANESE ENCEPHALITIS IN MOSQUITOES

Japanese Encephalitis virus (JEV) occurs throughout much of Asia and into the Indian subcontinent. The disease from the virus has a high fatality rate with around 30% of those developing disease will succumb to the infection. Singapore is located within the JEV endemic region and around 14 annual cases between 1978 and 1982. Cases subsequently declined with only a total of six local cases over 1991 to 2005, with no further reports since then. However the animal hosts for the disease, various species of birds, occur in the island nation and so a study was initiated to examine the risk of JEV by testing mosquitoes for the presence of the virus over the years 2011-2013. A range of mosquitoes were trapped but JEV was only detected in *Culex tritaeniorhynchus* mosquitoes, with a total of five JEV detections being made. The study demonstrates that even though no human cases have been identified in recent years, there is an ongoing risk of JEV in the nation, especially in more natural areas.

Source: *The American Journal of Tropical Medicine and Hygiene* (2/Sep/2020), http://www.ajtmh.org/content/journals/10.4269/ajtmh.19-0377?_cf_chl_jschl_tk_=479

[50fe092271272bf08d0e98df557b88ed3a2a2-1595361783-0-AWGHq9k2lJl6houv bzToMQe50QrS4EqgyZP--X-v2NrAjiXB2a 3TLjLsssmqplweTOowbffNyVgAaXpsafJR ekeNyByAxiEhIXY2jWGklyFJH2c_IHX3ZR7j2ld0-yP6-onC5mlmr4xeHaczBhVi6sJj7rbZ7wEtN-v9RZEF1v8RjMAbZl2P8UXVxvzJNLjplW ey7xTRW0q1KKFFBNSr995FHp0339sAb0Uf5zTeBUOyQqX1FMUJ3rrNba4i13z 5dnPzfvvTDoNsj6Spmi09oCv1xIHjISNYx2I a8F2qEkc-FD40V3aFYesO8lpxfRo1ICLP5t-R3GSypHDG4oBxK0](https://doi.org/10.1038/s41467-020-18239-5)

VOLCANIC ROCK: A NEW INSECTICIDE FOR MOSQUITOES

Investigators at North Carolina State University in the US have tested a material for the control of mosquitoes derived from volcanic rock known as perlite, and is commercially known as 'Imergard'. This basically works like a desiccant dust to adsorb the waxy cuticle of the insect, which then leads to dehydration and death. The good news is that the product was found not to repel mosquitoes, which helps for the increased contact between the vector and the insecticide. In efficacy trials, the products was found to be almost as efficacious as lambda-cyhalothrin, but the real advantage is that the perlite would still be effective against pyrethroid resistant mosquitoes.

Source: *Entomology Today* (3/Sep/2020), <https://entomologytoday.org/2020/09/02/volcanic-rock-yields-new-kind-of-insecticide-for-mosquitoes/>

CLIMATE CHANGE COULD SLOW DOWN MALARIA ELIMINATION EFFORTS

In Africa, it is predicted that climate change will alter many environments and may lead to a boost in mosquito numbers. Some regions are expected not only to become warmer, but wetter as well, which is likely to resulted increased mosquito breeding. Areas that have not experienced malaria previously may see local transmission. All of this could well hamper efforts to eradicate malaria from the continent. Currently Africa has over 90 percent of the world's malaria cases with close to 230 million

cases in 2018.

Source: *Nature Communications* (28/Aug/2020), <https://www.nature.com/articles/s41467-020-18239-5>

TERMITES HAVE DIGGING RULES FOR THEIR SPECIES

Termites can build the most complex nests, yet it is through the repetitive process of a few simple actions of its workers. The actual building behaviour can be species specific, but can be shared between different castes. Often the same process can be undertaken quite differently between species. For example with tunnelling behaviour, some species carry the soil particles in the mandibles (jaws) to move it about, while other species kick the soil backward with their legs. This difference can result in quite different tunnel development.

Source: *Annals of the Entomological Society of America* (19/Aug/2020), <https://academic.oup.com/aesa/advance-article/doi/10.1093/aesa/saaa017/5891415>

'HELL ANTS' FOUND WITH PREY IN JAWS

Hell ants existed around 100 million years ago and were called that name by the weird set of elongated jaws they possess. Until recently it was not known how the jaws were used, however an amazing discovery was recently made; a hell ant that had captured its prey was found in amber (see <https://www.washingtonpost.com/wp-apps/imrs.php?src=https://arc-anglerfish-washpost-prod-washpost.s3.amazonaws.com/public/EJHJUZW5RUI6VNHREW3WFTN36Q.jpg&w=916>). Drawings of the hell ant can be seen in the paper below and a model can be seen at:

https://www.sciencefriday.com/wp-content/uploads/2020/08/Phillip_Barden_Lab-010.jpg

Source: *Current Biology* (6/Aug/2020), [https://www.cell.com/current-biology/fulltext/S0960-9822\(20\)31000-9#comments-heading](https://www.cell.com/current-biology/fulltext/S0960-9822(20)31000-9#comments-heading)

CHINA: TROPICAL BED BUGS FROM THE PEARL RIVER DELTA IN CHINA

In China, in spite of a number of reports of

bed bugs becoming a growing problem, there have been studies undertaken to determine the species of bed bug involved. Bed bugs were collected from the cities of Guangzhou and Foshan and the species were confirmed as the tropical bed bug, *Cimex hemipterus*. The identification of this species has implicated for bed bug control programs in the region.

Source: *Journal of Medical Entomology* (2/Aug/2020), <https://academic.oup.com/jme/advance-article-abstract/doi/10.1093/jme/tjaa155/5879795?redirectedFrom=fulltext>

BANGLADESH: POSSIBLE DRIVERS FOR THE 2019 DENGUE OUTBREAK

Last year in 2019, Bangladesh has the largest ever recorded outbreak of dengue virus with some 101,354 patient hospitalizations. According to a report from authors from the nation, it was felt that there was considerable underreporting of cases as data was compiled from only a select group of healthcare facilities. Dengue is caused by one of four closely related viruses and when one of the new strains enters an area, a larger outbreak may occur. In this case, a new strain of dengue virus entered into Bangladesh and there was no immunity to the strain. Additionally, it was a very wet year with an extended monsoon season providing more water for mosquito breeding, and local mosquitoes have high levels of insecticide resistance meaning that vector control initiatives were not very effective. The authors of the report are encouraging the establishment of a local community level surveillance system to identify cases of dengue early so that they can be enacted upon and hopefully prevent such large scale outbreaks from happening again.

Source: *Journal of Medical Entomology* (29/Jul/2020), <https://academic.oup.com/jme/advance-article/doi/10.1093/jme/tjaa150/5877896>

CLIMATE MAY HAVE HELPED CERTAIN MOSQUITOES PREFER HUMANS AS A BLOODMEAL

Researchers at Princeton University in the US

posed the question why certain mosquito species such as the dengue virus vector *Aedes aegypti* developed a taste for human blood. In order to address this, they collected *Aedes aegypti* from its ancestral home in rainforests of Africa where the native strains of the mosquitoes will feed on a wide range of hosts, not just humans. In fact these strains were found not to preferentially feed on humans. The researchers concluded that it was environment that drove the mosquito to feed on humans. In dry environments, the only water source was from humans and often they were the only blood source as well. As a consequence, the mosquito learnt to feed off humans. Sadly with climate change, as the world becomes drier and hotter, we may be driving more mosquitoes to feed off us.

Source: *Current Biology* (23/Jul/2020), [https://www.cell.com/current-biology/fulltext/S0960-9822\(20\)30978-7](https://www.cell.com/current-biology/fulltext/S0960-9822(20)30978-7)

NEW SYSTEM FOR ANT CONTROL DEVELOPED

Scientists at the University of Bath in the UK, have developed a novel system that involves the slow release of pheromones that attract ants to an insecticide bait. The system uses molecular sponges called 'metal-organic frameworks' that adsorb the pheromones and slowly releases them. Such an innovation has major potential and could lead to more targeted control with a dramatic reduction in pesticide use. Normally pheromones are highly volatile and disappear rapidly when used in baits. This means that they often have to be replaced daily in any monitoring or baiting system. Thus a mechanism that allows their slow release could have huge benefits.

Source: *Dalton Transactions* (21/Jul/2020), <https://pubs.rsc.org/en/content/articlelanding/2020/DT/D0DT02047H#!divAbstract> and <https://www.sciencedaily.com/releases/2020/08/200827101821.htm>

STUDY SHOWS THAT NIGHT AND DAY BITING

MOSQUITOES RESPOND DIFFERENTLY TO COLOURS

A research group based in California found that mosquitoes that preferentially bite and feed at different times of the day respond very differently to colours. Light preference of mosquitoes was found strongly linked to the species and sex. Some night biting mosquitoes are highly photophobic (repelled) by light of short wavelengths. According to the principal investigator, Prof. Holmes, "our results show that timing and light spectra are critical for species-specific light control of harmful mosquitoes." Perhaps in the future, light may be used to enhance a mosquito management program.

Source: *Current Biology* (2/Jul/2020), [https://www.cell.com/current-biology/fulltext/S0960-9822\(20\)30826-5](https://www.cell.com/current-biology/fulltext/S0960-9822(20)30826-5)

TOXIC LEVELS OF RAT POISON FOUND IN NATIVE AUSTRALIAN REPTILES

A recent study undertaken in Western Australia, found that several species of native reptiles had very high levels of anticoagulant rodenticides in their systems. This was the result of consuming poisoned rats and accumulating the poison over time. At one location 91% of dugite snakes were exposed five different rat poisons. The authors conclude with a warning that in some countries where reptiles are consumed by humans, the anticoagulants could pose a real risk to human health.

Source: *Science of The Total Environment* (1/Jul/2020), www.sciencedirect.com/science/article/abs/pii/S0048969720317319?via%3Dihub

TICKS PEE ON THEMSELVES TO COOL DOWN

Blood sucking arthropods face a huge challenge; namely the huge temperature change in their body when they suck blood. For most insects, a sudden temperature change of 10-15°C is instantly fatal. To prevent damage from this heat stress, some insects have developed what are termed 'heat shock proteins' to overcome the temperature change. However one group of arthropods have taken

a very different path; they pee on themselves to cool down. A soft tick that feeds on bats by the species name *Ornithodoros rostratus*, eliminates large amounts of urine while feeding on its host, which spreads over the body of the arthropod and thereby cooling it through evaporation. [SLD: I am so glad I am not a tick!]

Source: *BioRxiv* (1/Jul/2020), www.biorxiv.org/content/10.1101/2020.06.30.180968v1

TOXICITY OF THE PYRETHROIDS IN MICE

For a long time, the pyrethroids were considered a chemical class that posed a low risk to mammalian health. In more recent times, questions are being raised as to the safety of this class. A research group from Guangdong University of Technology in China recently examined the acute and chronic toxicity of deltamethrin and permethrin in mice. Mice were forced fed insecticides over a period. This induced weight loss and anxiety-like behaviours, excitatory behaviours, circulatory dysfunction in the blood, and induced reproductive toxicity. It appears that the mice were fed large volumes of the insecticides and there is a question as to how relevant this research is to human health.

Source: *Pest Management Science* (28/Jun/2020), <https://onlinelibrary.wiley.com/doi/abs/10.1002/ps.5978?campaign=wolearlyview>

CONVERTING FEMALE MOSQUITOES INTO MALES

Investigations at Virginia Tech University in the US has shown that a single gene can convert a female mosquito into a male. This is significant as only female mosquitoes bite and transmit pathogens that cause disease. By inserting what is known as the 'Nix' gene into the male genome, not only did sex conversion occur, but the subsequent males were unable to fly properly. Such observations may lead to novel mosquito control strategies in the future.

Source: *PNAS* (12/June/2020), <https://www.pnas.org/content/117/30/17702> ■