NEW ZEALAND BIOSECURE

BORDER HEALTH NEWSLETTER – March 2017

Welcome!

Hi Everyone. Following the unpredictable 2017 NZ summer the mosquito numbers are also jumping up and down. We are currently receiving quite a lot of samples with many specimens after a relatively quiet period that was unusual for this time of the year.
We have also received some interesting public complaints regarding newly formed mosquito breeding habitat such as a swampy area following some road-work restoration that possibly causes nuisance biting in a Kapiti childcare center. Also the Kaikoura earthquake in November and the resulting seafloor uplift have created numerous rockpools that are now used by *Opifex fuscus* to raise their offspring. Unfortunately, in the need of blood, they are invading the dwellings near the Kaikoura coastline.
NZB has sent out a few larval sieve kits for those PHU's that often have thousands of young larval instars in the hope that the sampling and sample preparation time is reduced. The feedback about your experiences to date is pleasing.

SAMPLES

During March 1197 samples were collected by staff from the 12 DHBs with 495 positives, which is an increase after last month. The numbers of *Culex quinquefasciatus* larvae are still very high, precisely twice as many as last year in March.
Whereas the *Aedes notoscriptus* adults and larvae show a decrease in number compared to March 2016. Last year at this time Northland had sent many adult *Aedes antipodeus* specimens. For the same period this year, we have only received 3, one of which was interestingly found at the Auckland Airport. A rare find! The high number of adult *Cx. quinquefasciatus* is, as same as last year, due to many of them around the Auckland Airport, also reflected in the numerous suspected interceptions. This species is also more common now in Wellington and the North of the South Island.

Species	Adults		Larvae	
New Zealand Mozzies	**March 17**	**March 16**	**March 17**	**March 16**
Aedes antipodeus (winter mosquito)	3	753	Nil	Nil
Ae. australis (saltwater mosquito)	Nil	5	5	1
Ae. notoscriptus (striped mosquito)	394	2914	3014	6080
Coquilletidea iracunda	15	57	Nil	Nil
Coq. tennuipalpis	1	1	Nil	Nil
Culex astilae	Nil	Nil	2	5
Cx pervigilans (vigilant mosquito)	129	138	3751	2448
Cx. quinquefasciatus (southern house mosquito)	1787	2211	14883	7217
Cukisita tonnoiri	1	Nil	Nil	Nil
Maorigoeldia argyopus	Nil	Nil	Nil	2
Opifex fuscus (rockpool mosquito)	Nil	2	61	118
Total	**2330**	**6081**	**21716**	**15871**

Phone 021 522 476 Email Taxonomy@nzbiosecure.net.nz or Enquiries@smsl.co.nz Website www.smsl.co.nz
BIOSECURITY SPECIALISTS

INCURSIONS/INTERCEPTIONS

During March 15 suspected interceptions have been recorded.
Please note that the interceptions of live unwanted mosquitoes are highlighted in red. Exotic species in general are highlighted in light blue.

01.03.2017: One dead female *Aedes cinereus* has been found at Thermacraft Transitional Facility in AKL in a container with plastic sheets from the US.

02.03.2017: One unidentifiable (due to damage) female *Culex sp. (Cx. quinquefasciatus* possible) in an open container with grapes from the US.

03.03.2017: Some squashed insects sticking to the outside of a container from Australia filled with grapefruits were identified as female Culex sp. and chironomids (non-biting midges).

04.03.2017: One female *Cx. quinquefasciatus* caught and squashed when flying around at AIAL ITB near the search benches – likely to be local.

07.03.2017: One female *Cx. quinquefasciatus* found alive flying around near the green line at AIAL ITB.

10.03.2017: One female *Cx. quinquefasciatus* found alive when flying around at AIAL ITB near the dog search area – likely to be local.

11/12.03.2017: Three females and 1 male *Cx. quinquefasciatus* has been found alive when flying around at AIAL ITB near the dog search area – likely to be local.

13.03.2017: One male *Cx. quinquefasciatus* has been found alive when flying around at AIAL ITB in the MPI Lab – likely to be local.

14.03.2017: Two females and one male *Cx. quinquefasciatus* found alive at FreshMax in the MPI room close to oranges from California, likely to be local.

14.03.2017: One female *Cx. quinquefasciatus* found alive at a Transitional Facility in CHCH

15.03.2017 One female *Cx. quinquefasciatus* found alive flying around near the green line at AIAL ITB – likely to be local.

16.03.2017 One female *Cx. quinquefasciatus* found alive flying around near the search area at AIAL ITB – likely to be local.

26 March 2017 One male Cx. quinquefasciatus found alive flying around at Auckland Airport, ITB, near Green lane – likely to be local.

28 March 2017 One female Cx. quinquefasciatus found alive flying around at Auckland Airport, ITB, in the X-Ray Room – likely to be local.

28 March 2017 One female Cx. quinquefasciatus found alive flying around at Auckland Airport, ITB, in the MPI office – likely to be local.

Phone 021 522 476 Email Taxonomy@nzbiosecure.net.nz or Enquiries@smsl.co.nz Website www.smsl.co.nz
BIOSECURITY SPECIALISTS

VECTOR-BORNE DISEASES - OUTBREAK NEWS

South Pacific

Pacific syndromic surveillance report – Week 8, ending 26 February 2017

Dengue: There is an increase in the number of dengue cases reported in Fiji and American Samoa, dengue serotype-2 has been identified in both countries.
Nauru declared an outbreak on 25 February 2017.
Vanuatu: dengue serotype-2 outbreak ongoing with 1,831 cases as of 2 March 2017, including 45 hospitalisations (since Nov 2016). Source: Vanuatu MoH
New Caledonia: As of 21 February 2017 there have been 1,163 cases since 1 September 2016. There have been 3 deaths reported. Dengue virus serotypes 1, 2 and 3 are in circulation. Source: Department of Health & Social Affairs, New Caledonia

Public Health Surveillance
Information for New Zealand Public Health Action

MONTHLY NOTIFIABLE DISEASE SURVEILLANCE REPORT - Feb 2017

Chikungunya fever: One confirmed case of chikungunya fever was notified in February 2017 compared to two confirmed and one probable case notified during the same month of the previous year. The case reported overseas travel to Fiji during the incubation period.
Dengue Fever: 12 confirmed cases of dengue fever were notified in February 2017 compared to 41 cases notified during the same month of the previous year. All cases had been overseas during the incubation period, including two cases that visited more than one country. The countries visited included Vanuatu (4 cases), Fiji and Thailand (2 cases each), and India, Indonesia, New Caledonia, Papa New Guinea, Solomon Islands, Sri Lanka and Vietnam (1 case each).

Dengue fever cases hit 20-year high in Australia

By Craig Butt for Cowra Guardian, 14 Jan 2017,

Dengue fever cases in Australia reached a 20-year high last year, driven by travellers being infected in tropical areas such as Bali and bringing the virus back with them.
More than 2000 cases of the mosquito-borne disease were confirmed in Australia last year, federal Health Department data shows.
University of Sydney mosquito expert Cameron Webb said dengue fever cases were increasing globally, and travellers were bringing the disease back to Australia. But, he said, if a person brought dengue fever back as an unwanted souvenir, they were unlikely to pass it on because most local mosquito species could not transmit the disease.
Microbiology professor Cameron Simmons, of the Peter Doherty Institute, said dengue fever was endemic (constantly being transmitted) throughout much of south-east Asia and the western Pacific, which were popular destinations for Australian travellers.
"Dengue has been a problem globally for 20 years, and in the last 10 years we have seen epidemic spread of the virus through many countries in our neighbourhood," he said. "The chance of travellers being infected may well be increasing."
But he said the increased number of dengue fever cases in Australia could also be because more doctors were running tests that determined whether returned travellers were infected with the disease.
The disease takes between three and 10 days to incubate, and causes flu-like symptoms that last for about a week. "It can be a pretty miserable week of your life, and it sometimes

takes a few weeks to fully recover," Dr Simmons said.
An estimated 390 million people are infected with the dengue virus each year.
Dengue fever does not recur after the initial bout of the disease. However, if someone is infected a second time from another mosquito bite, the risk of potentially deadly complications, such as internal bleeding or hemorrhaging from the nose and gums, greatly increases, Dr Simmons said.
He said it was unlikely a person would be bitten by a dengue-carrying mosquito at a five-star resort in Bali, but anyone staying at a backpacker hostel that did not have a pest control plan would be more at risk.
Dengue fever cases hit a 20-year high in Victoria and New South Wales last year, with the states recording 461 and 450 cases, respectively.
Western Australia was the state with the most cases, at 553. It also had one of the highest infection rates of the disease of all the states and territories.
Dr Simmons said this could be because fly-in-fly-out workers in WA could easily travel to Bali, thanks to cheap four-hour flights from Perth.
Younger people were over-represented in the figures for dengue infections last year. Those aged 25 to 34 accounted for about one in four of the 2129 cases, despite making up just 15 per cent of the Australian population. There was a roughly even split of men and women contracting the disease.
Queensland has had by far the most dengue cases of any state over the past two decades, experiencing sudden rises in cases in 1993, 1998, 2003 and 2009 (when more than 1000 were confirmed).
Dr Simmons said that was because far north Queensland was one of the few parts of Australia with mosquitoes capable of spreading the virus, and local outbreaks had occurred after infected travellers brought the disease back with them from overseas.
only render this ad on smartphone
However, infection numbers in Queensland have been down in recent years, in part because of the Eliminate Dengue program, which effectively immunised the local mosquito population in tropical areas against the dengue virus.
only render this ad on smartphone
The mosquito that spreads dengue, *Aedes aegypti*, is also capable of transmitting the Zika virus, which led to warnings of similar outbreaks in far north Queensland if an infected traveller were to bring the disease into the country.
only render this ad on smartphone
There were 59 confirmed Zika cases in Australia last year, all of which were from travellers who were infected overseas.
only render this ad on smartphone
Dr Webb said travellers to Bali could reduce their risk of dengue infection by applying mosquito repellent in the morning as well as at other times. He said Australian tourists assumed overseas mosquitoes were only active in the afternoon and evening, but the bugs in Bali bite throughout the day.

Pakistan

Chikungunya engulfs coastal belt of Karachi

THE EXPRESS TRIBUNE By Mudaser Kazi, March 25, 2017
KARACHI: Chikungunya, a mosquito-borne viral fever, has now taken over the coastal belt of Karachi after its first outbreak in Malir district last year.
Thousands of patients have flocked to the hospitals but the Sindh health department and local government have unable to provide relief to the victims. The Sindh government is still unable to test the suspected cases of Chikungunya virus, still considering it a new and

unknown disease. However, the first case was tested positive in December last year when the samples were sent to Islamabad.

Muhammad, 20, a resident of Ibrahim Hyderi, told The Express Tribune that he has been suffering from severe joint pain for the last one week with high-grade fever. Although, the fever is gone but his body aches due to the virus, which according to the doctors, is Chikungunya.

Chikungunya virus: 235 cases being investigated

Another victim with the same symptoms, Ghulam Fatima, 40 remarked, “Three members of my family had the virus earlier this month but the doctors failed to diagnose the disease.” She added that the government still lacks the facility to treat the disease despite its first spread in Malir three months ago, which affected thousands of residents. “The hygiene and sanitary conditions in our area depict the worst picture but no government department seems committed to resolving the main issue of our area.”

Mir Zaman, a resident of Keamari, a costal neighbourhood also talked about his miseries. He said a mosquito-borne viral disease has affected the residents of Keamari but the government has failed to announce the outbreak and provide relief to the victims as it was done in Malir district. Zaman added that the disease has been affecting people but the government has not even maintained the record of the affected as the patients are not being diagnosed.

According to a medical officer in the government hospital of Ibrahim Hyderi, the flow of patients with high-grade fever and body pain has been stabilised. Earlier, he said, hundreds of patients visited the hospital with a complaint but the doctors have no other option but to prescribe them with a symptomatic treatment since they do not have a diagnosis facility in Karachi.

Pakistan officially reports Chikungunya outbreak to WHO

Karachi Health Director Dr Muhammad Tofique told The Express Tribune that the virus earlier affected a large number of people but it is under control now. However, he said, they fear the virus may spread again if measures are not taken to improve the sanitation conditions and prevent mosquito breeding by the Karachi Metropolitan Corporation (KMC). Karachi Mayor Wasim Akhtar told The Express Tribune that they have been spraying regularly in all the areas.

India

Anil Baijal holds meet on chikungunya

THE ASIAN AGE, Metros, Delhi Mar 24, 2017

L-G directs cops to widely publicise its ‘One Touch Away’ app.

New Delhi: Days after the municipal corporations reported at least 60 cases of chikungunya in Delhi, lieutenant-governor Anil Baijal on Thursday held a review meeting with the three municipal commissioners on preparations for combating vector-borne diseases in the city.

“The L-G reviewed preparation for combating dengue and chikungunya, with all stakeholders. He directed that SOPs (standard operating procedures) be strictly monitored and public awareness must be raised,” a senior official with the

L-G office said.

At least 60 cases of chikungunya have been reported in the national capital this year with nearly half of them registered this month. Sixteen cases of dengue have also been reported in the last three months, according to a municipal report released on Monday.

The municipal authorities had recently called an all hands workshop on prevention and control of vector-borne diseases to finalise a comprehensive action plan for combating the menace in the coming season. In the workshop, SDMC commissioner P.K. Goel had asked officials to “identify the cases of dengue and chikungunya coming to Delhi from other states”.Earlier in the day, Mr Baijal also directed the Delhi police to widely publicise its “One Touch Away” mobile application so that people could utilise its services optimally. The direction was issued at a meeting chaired by Mr Baijal who reviewed the “use of technology by Delhi police”.

The meeting was attended by Delhi’s principal home secretary, police commissioner and other senior officials. In the meeting, the L-G also directed the force to evolve the technology for proper upkeep of records.

Anil Baijal

The “One Touch Away App” is operational where various issues like loss report, motor vehicle theft, property theft, senior citizen app. “The L-G has asked the police commissioner to regularly test check the systems in place, utilise various apps in operation optimally, keep on digitising services offered to the people of Delhi,” the lieutenant-governor’s office said in a statement.

A total of 4,431 cases of dengue were reported till the end of 2016, according to the report by the South Delhi Municipal Corporation which tabulates the data on behalf of all municipal corporations in the city. Out of the 60 chikungunya cases reported till March 18, 27 of them were recorded this month. In January 20 cases were reported, while 13 in February. Six cases of dengue were reported in January, four in February and six in March till now.

Till January 14, only two chikungnuya cases were reported, while no dengue case had been reported till then. Chikungunya and dengue cases in the national capital had tapered off by December first week in last year ending the vector-borne disease season in the city that witnessed its outbreak in the last 10 years, but cases are still being registered.

At least 15 fatalities were reported last year at various hospitals in the city due to complications triggered by chikungunya, though the civic bodies have kept the death tally at zero.

At least 21 deaths due to dengue were reported last year at various hospitals, including nine at AIIMS, though the official tally of the SDMC stood at 10. The season for the vector-borne diseases begins from mid-July and generally lasts till November-end.

Europe

Yellow Fever

Netherlands imported yellow fever update: 1st case in Suriname since 1972

Outbreak News Today, March 29, 2017

Europe, Latin America and the Caribbean

Two weeks ago, we reported on the increase of imported yellow fever in Europe after health officials reported a travel-associated case of yellow fever in the Netherlands in March 2017 in a traveler to Suriname.

Suriname/CIA: On Tuesday, the World Health Organization released the following details on the case:
On 9 March 2017, the National Institute for Public Health and the Environment (RIVM) in the Netherlands reported a case of yellow fever to WHO. The patient is a Dutch adult female traveller who visited Suriname from the middle of February until early March 2017. She was not vaccinated against yellow fever.
The case was confirmed for yellow fever in the Netherlands by RT-PCR in two serum samples taken with an interval of three days at the Erasmus University Medical Center (Erasmus MC), Rotterdam. The presence of yellow fever virus was confirmed on 9 March 2017 by PCR and sequencing at Erasmus MC, and by PCR on a different target at the Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany.
While in Suriname, the patient spent nights in Paramaribo and visited places around Paramaribo, including the districts of Commewijne (Frederiksdorp and Peperpot) and Brokopondo (Brownsberg), the latter is considered to be the most probable place of infection. She experienced onset of symptoms (headache and high fever) on 28 February 2017 and was admitted to an intensive care unit (University Medical Center) in the Netherlands on 3 March 2017 with liver failure. The patient is currently in critical condition.
Suriname is considered an area at risk for yellow fever and requires a yellow fever vaccination certificate at entry for travellers over one year of age arriving from countries with risk of yellow fever, according to the WHO list of countries with risk of yellow fever transmission; WHO also recommends yellow fever vaccination to all travellers aged nine months and older. This is the first reported case of yellow fever in Suriname since 1972.

VACCINATION AND DRUG NEWS

To Test Zika Vaccines, Scientists Need A New Outbreak

WHO, 30 March 2017

WHO dispatched 3.5 million doses of yellow fever vaccine for outbreak response in Brazil!
In response to the yellow fever outbreak currently on-going in Brazil some 3.5 million doses of vaccine from the emergency stockpile were deployed to the country through the International Coordinating Group (ICG) on Vaccine Provision for yellow fever. The ICG oversees a continuously replenished emergency stockpile of 6 million doses of yellow fever vaccine. The ICG includes four agencies: the World Health Organization (WHO), United Nations Children's Fund (UNICEF,) the International Federation of Red Cross and Red Crescent Societies (IFRC), and Médecins Sans Frontières (MSF). The Government of Brazil will reimburse the cost of the 3.5 million doses sent through the yellow fever emergency stockpile financed by Gavi Alliance. The government of Brazil with the support of PAHO

Vaccination campaigns against yellow fever are currently ongoing in Brazil.WHO/A. Costa

/WHO is working to ensure protection of its population and preventing further spread of the yellow fever virus which is transmitted to humans via mosquitoes. Brazil is carrying out vaccination campaigns for yellow fever in several states, while strengthening surveillance and case management throughout the country since the outbreak began in January 2017. More than 18.8 million doses of vaccine have been distributed. PAHO/WHO has mobilized more than 15 experts through the Global Outbreak Alert and Response Network (GOARN), including US CDC, to provide specialized technical support to the federal authorities managing the outbreak. On 14th March 2017, Brazilian authorities formally requested the ICG for 3.5 million doses of yellow fever vaccine which arrived in Rio de Janeiro on 24 March to be used for vaccination campaigns in the states where outbreaks have been reported. Distribution plans are being updated as the situation evolves .

WHO is also supporting other yellow fever endemic countries through the Eliminating Yellow Fever Epidemics (EYE) Strategy. Implementation of the global strategy which is jointly governed by WHO, UNICEF and GAVI, ensures support to countries to respond to an increased risk of urban outbreaks of yellow fever with international spread. The strategy aims at protecting at-risk populations, preventing international spread and containing outbreaks rapidly. The most vulnerable countries and regions are prioritized and global risk is mitigated by building resilience in urban centres and preparedness in areas with potential for outbreaks. The EYE strategy aims to ensure reliable vaccine supply with a global coalition of partners to predict needs and shape vaccine production.

USA

Scientists Start Second Phase Of Zika Vaccine Testing

This round of trials is safe from Donald Trump's proposed budget cuts.

HEALTHY LIVING 04/03/2017, by Erin Schumaker

Researchers at Houston's Baylor College of Medicine last week began Phase 2 clinical trials for a Zika vaccine that is expected to have results as early as the end of this year.

Andrew Pekosz, a professor of microbiology and immunology at Johns Hopkins University's Bloomberg School of Public Health, praised the vaccine's potential to prevent disease, as well as how quickly clinical trials have taken place.

"It's really been a light-speed endeavor," Pekosz, who was not involved in the vaccine's testing or development at the National Institute for Allergy and Infectious Diseases, told The Huffington Post.

Phase 2 of the trial will have two parts. In the first part, scientists will vaccinate 90 healthy volunteers to determine the optimal dose and injection site of the vaccine.

The second part will enroll 2,400 healthy volunteers in areas with potential or active Zika transmissions, including the United States, Puerto Rico, Brazil and Peru. Participants will receive a vaccine or a placebo, and researchers will observe them over nearly two years to compare infection rates among vaccinated and unvaccinated participants.

After a successful Phase 2, the clinical trial would move on to a third phase. But a successful trial in the second phase could allow the government to use the vaccine in an emergency outbreak situation, Pekosz said.

The $100 million Phase 2 trial has been fully funded, so President Donald Trump's proposed $7 billion budget cuts to the National Institutes of Health, of which the NIAID is a part, won't affect this round of vaccine testing.

It's unclear if future phases will be funded.

"In public health circles, those are the type projects that oftentimes get the axe," Pekosz said, noting that it's hard to drum up public support for vaccine research or vaccine stockpiling when the public and politicians don't perceive an infectious disease as an immediate threat.

"If in two years have another outbreak, people will say, 'Why didn't we spend the money before?'" he said.
Dr. Anthony Fauci, director of the NIAID, said Friday during a conference call with reporters that developing a Zika vaccine "a very high priority" for the institute, STAT reported.
"I'm totally intent on getting this vaccine to the point where it can be a usable vaccine," Fauci said.
Despite the public's waning interest in Zika virus, it's still a serious public health threat for pregnant women and their sexual partners. The primary vector for Zika transmission is through mosquitos bites, but it can also be sexually transmitted. Women with the virus can give birth to children microcephaly — a severe birth defect often connected to lifelong learning and developmental disabilities, as well as smaller-than-average heads.
And according to Fauci, it's likely that the virus has or will become entrenched in the Americas, meaning the risk for pregnant women and their partners who live in or travel to the Americas is far from over.
Brazil declared Zika a public health emergency in 2015. The virus has since spread to most of Central America and South America, India, Southeast Asia, Central Africa, Miami, and Brownsville, Texas, according to the U.S. Centers for Disease Control and Prevention.
"The Brazil outbreak is the scenario we want to try to avoid," Pekosz said. "There's nothing that we've learned so far that an explosion of Zika cases can't happen again."
As of March 29, there were 38,303 people in U.S. territories and 5,182 people in the continental U.S. who had contracted Zika virus, according to the CDC. As of mid-March, 1,617 pregnant women in the U.S. had laboratory evidence of a Zika virus infection.

Dengue vaccine: Takeda enrolls 20,000 children and adolescents for Phase 3 trial
Outbreak News Today, April 7, 2017
Takeda Pharmaceutical Company Limited announced this week that it has completed enrollment of 20,100 children and adolescents ages 4 through 16 in its global, pivotal Phase 3 Tetravalent Immunization against Dengue Efficacy Study (TIDES) trial, a double-blind, randomized and placebo-controlled study designed to evaluate the efficacy, safety and immunogenicity of its live-attenuated tetravalent dengue vaccine candidate (TAK-003). Takeda initiated the TIDES trial, the largest vaccine clinical trial for Takeda to date, in September 2016 and completed enrollment in less than seven months.
An *Aedes aegypti* mosquito prepares to bite a human.
Image/USDA
"The successful enrollment of more than 20,000 children and adolescents in this Phase 3 trial, across several continents, and on an ambitious timeline, while maintaining a clear focus on quality and subject safety, reflects Takeda's prioritization of dengue and the substantial capabilities of our global organization," said Rajeev Venkayya, MD, President of the Global Vaccine Business Unit at Takeda.
The study is taking place in eight dengue-endemic countries in Latin America and Asia: Brazil, Colombia, Panama, Dominican Republic, Nicaragua, Philippines, Thailand and Sri Lanka. While dengue can affect people of all ages, it is a leading cause of serious illness among children in some countries in Latin America and Asia. The enrollment of children and adolescents between the ages of 4 and 16 years underscores the significant burden of dengue disease across the entire pediatric age range. Initial results of the TIDES trial are expected in 2018.
TIDES will build on previous studies, which have assessed the tolerability, safety and immunogenicity of the vaccine against all four dengue serotypes in multiple age groups to determine whether the vaccine helps prevent symptomatic dengue. In Phase 1 and Phase 2 studies, Takeda's vaccine candidate induced neutralizing antibody responses against all

four dengue virus serotypes across age groups and in both seropositive and seronegative individuals with no observed safety concerns. Interim results of one Phase 2 study (DEN-203) showed the vaccine to be generally safe and well tolerated. Results also showed that adults vaccinated with two doses had a sustained immune response against all four serotypes of the dengue virus, even after two years. Interim results of another Phase 2 study (DEN-204) showed an acceptable safety profile in endemic pediatric populations, as well as antibody responses against the four dengue-serotypes in dengue seropositive and sero-negative participants, with a sustained immune response through 180 days.

This enrollment milestone demonstrates our commitment to a thorough evaluation of the safety and efficacy of our vaccine candidates and, subject to licensure, ensuring that they are available to all populations at risk. It follows Takeda's recent decision to invest more than 100 million euros to build a new plant for the manufacturing of TAK-003," said Venkayya. "Beyond dengue, Takeda is pursuing a number of vaccine programs to address high-priority infectious diseases including our Zika program funded by the U.S. Government's Biomedical Advanced Research and Development Authority (BARDA)and our polio program supported by the Bill & Melinda Gates Foundation."

According to the World Health Organization (WHO), dengue is the fastest spreading mosquito-borne viral disease and causes 390 million infections and more than 20,000 deaths each year around the world in people of all ages. Forty percent of the world lives under the threat of dengue, which can affect people of all ages and is a leading cause of serious illness and death among children throughout the world.

MOSQUITO SCIENCE

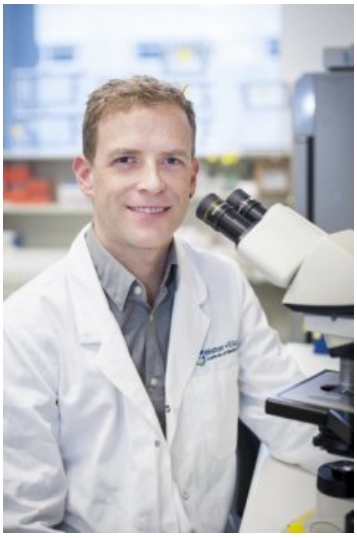
Malaria

Malaria parasites 'walk through walls' to infect humans

Science Daily by Walter and Eliza Hall Institute, March 28, 2017

Researchers have identified proteins that enable deadly malaria parasites to 'walk through cell walls' -- a superpower that was revealed using the Institute's first insectary to grow human malaria parasites.

The research has identified two parasite proteins that are the key to this superpower. The proteins could be targeted to develop much-needed antimalarial drugs or vaccines.



Dr. Boddey said pinpointing these proteins was a good avenue for new therapies.
Credit: Walter and Eliza Hall Institute of Medical Research

Dr Justin Boddey, Dr Sara Erickson and Ms Annie Yang led a team investigating how the deadly malaria parasite Plasmodium falciparum travels from the site of a mosquito bite to invade human liver cells, the critical first step in malaria infection. Their findings were published in the journal Cell Reports.

When a person is infected with malaria, the parasite silently invades and multiplies in liver cells, but doesn't cause disease. The parasites then burst out of the liver and infect the blood, causing symptoms such as fever, chills, fatigue and muscle and joint pain that are characteristic of malaria.

Dr Boddey said the research confirmed the deadly malaria parasite Plasmodium falciparum had the ability to 'walk through cell walls' as it sought out liver cells where it could hide and multiply.

"The malaria infection cycle begins with a mosquito bite, when parasites are injected into the skin, and then rapidly move to the liver, " Dr Boddey said.

"We have shown that P. falciparum employs a technique called cell traversal to quickly move through host cells in their path as they seek out liver cells to infect."
"Our study identified that P. falciparum parasites traverse human cells -- effectively walking through cell walls -- using two proteins called SPECT and PLP1 to achieve this superpower. This allows parasites to get from the skin to the liver very quickly following a mosquito bite."
Malaria causes more than 650,000 deaths each year, predominantly in children and pregnant women, and there is an urgent need for new malaria vaccines and treatments in an effort to eradicate the disease.
Dr Boddey said pinpointing these proteins was a good avenue for new therapies.
"Our long-term goal is to eradicate malaria, so we have to look at ways of breaking the cycle of infection," Dr Boddey said. "A vaccine or treatment that halts the liver-stage infection offers the best chance of eradication because it stops parasites before they take hold."
Dr Erickson manages the Institute's insectary which was established in 2012 to enable Institute researchers to study all developmental stages of human malaria parasites.
"In the past, it was impossible to examine the earliest stages of human infection with malaria parasites at the Institute," Dr Erickson said. "The insectary enables us, for the first time, to specifically work with the parasites that initiate human infection, particularly with P. falciparum that is responsible for most deaths from malaria globally. We hope this will fast track identification of potential targets for antimalarial vaccines or drugs."

Dramatic evolution within human genome may have been caused by malaria parasite
Science By Michael PriceMar. 23, 2017

The mosquito-borne parasite *Plasmodium vivax* might have sparked the strongest evolutionary response in humans yet known.
smuay/iStockphoto

A genetic mutation that protects people from a common form of malaria spread like wildfire in sub-Saharan Africa about 42,000 years ago, according to a new study. Today, it's nearly impossible to find somebody from this region who doesn't have it. That makes the mutation one of the swiftest, strongest changes to the human genome yet seen—though it remains a mystery why this particular disease sparked such a dramatic evolutionary response.
The world's most widespread type of human malaria is caused by *Plasmodium vivax*, a single-celled parasite transmitted by mosquitoes. Although less deadly than other strains, P. vivax malaria remains a disruptive disease: It infected some 16 million people across the globe in 2013. Yet across much of sub-Saharan Africa, P. vivax accounts for fewer than 5% of all reported malaria cases. That's because about 99% of Africans living here have a variant of a gene called DARC, which shuts off a particular protein receptor on the surface of red blood cells that the parasite needs to gain entry.
To learn more about how and when this mutation spread, Omar Cornejo, a population geneticist at Washington State University in Pullman, and colleagues analyzed full genome sequences from 1000 modern individuals from 21 population centers in Africa, Asia, and Europe. The researchers then employed a computer-based simulation that predicts how

certain genetic variants spread throughout a population over time given the region's known demographics and various selective pressures.

Based on rates of genetic change, the simulation suggests the most recent common ancestor of living Africans who possessed the DARC mutation lived about 42,000 years ago, the team reports this month in PLOS Genetics. Back then, the mutation was likely just a random genetic variant possessed by a handful of people, not a functional evolutionary defense. Then something changed—quite possibly the arrival of *P. vivax*—and some 8000 years later, more than 99% of people in the region had the mutation, according to the simulation.

Cornejo estimates that on average during that 8000-year period, for every 100 people born without the mutation, an additional 105 would have been born with it. Assuming that widespread exposure to *P. vivax* meant that people who had the mutation were more likely to survive than those without it—that would make this the strongest evolutionary response yet seen in the human genome, the researchers say.

That's a bit mysterious because the disease caused by *P. vixax* is much less deadly than that caused by other Plasmodium strains, says David Serre, a microbiologist at the University of Maryland's Institute for Genome Science in Baltimore who wasn't involved with this work. "You get sick, you stay in bed for a few weeks, and most of the time you get better." One wouldn't expect such a powerful evolutionary response to a relatively benign disease, he notes.

One possibility is that the disease was much deadlier thousands of years ago, and that further adaptations in our immune system have rendered it less threatening, Serre says. Another is that evolution was acting against an entirely different, as-yet-unknown disease that used the same technique as P. vivax to enter red blood cells. "The data are really good, the analysis is really good, but the story just doesn't quite make sense yet," he says.

Cornejo admits it's a perplexing finding, and he agrees a heretofore unknown disease theoretically could be responsible.

Either way, he says the study should serve as a warning. Just as humans in Africa evolved to combat the parasite, the disease continues to evolve as well. Recent cases of P. vivax malaria have been reported in Madagascar, Ethiopia, and Sudan in people who possess the protective DARC mutation. It's not yet clear whether some other factor made them susceptible to the disease, or whether the parasite evolved to find another way into red blood cells. If it's the latter, says Cornejo, millions of people who once didn't need to worry about P. vivax malaria might soon be at risk.

Posted in: AfricaHealth

PUBLIC IMPACT

Malaria

Kevin puts in the bike miles for Malaria

Kevin on his bike at the Alps

Wirral man hopes to cover 2080 miles in 22 days on epic charity ride - Kevin Gill is to embark on an epic 2,080 miles journey for charity, Malaria No More.

*LIVERPOOL ECHO, 4 APR 2017*by Taboola

Kevin, who grew up in West Kirby, went to West Kirby Primary school and then Neston High school, now works for Harlequins Rugby Club.

During summer Kevin has a month off and

it is during this time that he hopes to complete the challenge in only 22 days.
Kevin says: “I have done 1,500 mile charity bike trips in the last two years, one in the US from Montana to Arizona on which I raised £1,400 for RASA, the Rape and Sexual Abuse Centre on the Wirral.
“I do these trips solo, sleeping in my hammock with no assistance. I normally do around 90 miles a day and this year I’m looking to up the distance and do 2,080 miles in 22 days, that’s 95 miles a day.”

In a remote West African village, a revolutionary genetic experiment is on its way - if residents agree to it

Stat Plus by IKE SWETLITZ, MARCH 14, 2017
Photos by SOPHIE GARCIA FOR STAT

ANA, Burkina Faso — This small village of mud-brick homes in West Africa might seem the least likely place for an experiment at the frontier of biology.
Yet scientists here are engaged in what could be the most promising, and perhaps one of the most frightening, biological experiments of our time. They are preparing for the possible release of swarms of mosquitoes that, until now, have been locked away in a research lab behind double metal doors and guarded 24/7.

Scientists from the city and volunteers from the village work together to count the number of mosquitoes in a house in Bana.

The goal: to nearly eradicate the population of one species of mosquito, and with it, the heavy burden of malaria across Africa.
These scientists are planning to release mosquitoes equipped with “gene drives,” a technology that overrides nature’s genetic rules to give every baby mosquito a certain trait that normally only half would acquire. Once such an insect gets out into the wild, it will move indiscriminately and spread its modified trait without respect for political borders.

No living thing — no mammal, insect, or plant — with a gene drive has ever been set free. But if all goes as planned, it might happen here, in a remote village of about a thousand people, where the residents don’t even have a word for “gene.”
Despite such barriers, this is in some ways the most logical place to carry out the experiment. Nowhere does malaria exact a higher toll than here in sub-Saharan Africa, where hundreds of thousands die from the disease every year. And Burkina Faso already houses one of Africa’s highest-profile malaria research laboratories.
It may be six years before the gene drive mosquitoes are actually released in Burkina Faso, but scientists are already working around the clock to prepare the

community for their release. Researchers in Mali and Uganda are also working toward the same goal under the banner of the "Target Malaria" project, propelled by $70 million from the Bill and Melinda Gates Foundation and support from research laboratories in England and Italy.

Speaking through interpreters, residents across Burkina Faso told STAT that they are grateful for the scientists' work, and are eagerly looking forward to eliminating the dreaded disease.

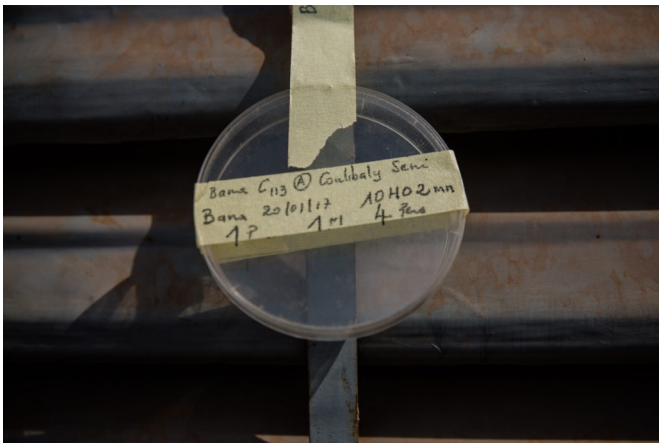
But scientists still face a challenge: making sure that people understand and accept the newfangled genetic technology behind it all. That means building trust and doing basic education — explaining not only the impact of genetically engineered insects arriving in their homes, but also what genetics is in the first place.

White coats are very familiar to residents of Bana.

At the height of the dry season in late December, eight scientists and social scientists pulled off the dirt road, carrying a box of a hundred adult mosquitoes and a 1-liter bottle filled with wriggling larvae.

For the past few years, the scientists from the Institut de Recherche en Sciences de la Sante (IRSS) in Bobo-Dioulasso, where the country's Target Malaria team is based, have been teaching Bana residents basic mosquito facts, including that the bugs transmit malaria. Many in Burkina Faso believe that malaria can be spread by eating too many greasy or sweet foods, said Lea Pare, the anthropologist who is leading a national effort to engage local citizens in Target Malaria.

Beyond live mosquitoes, the team also uses pictures to help explain the complicated scientific information: a set of thirteen cards, laminated like giant placemats, which detail the different phases of the project. In Bana, they talk through the first four of these cards, which show gigantic female mosquitoes biting humans, with small red squiggles flowing through the proboscis and into the person's body. On the fourth card, a scientist wearing a white coat is looking at those mosquitoes under a microscope.



On Jan. 20, researchers found one male mosquito in Seni Couliaby's home. Dead, it's sitting in this Petri dish, waiting for analysis.

For weeks at a time, white-coated scientists live in Bana, where they work alongside locals to characterize the village's mosquito population.

For the last three years, a team of researchers has lived part-time in the village, sleeping in an old cement house retrofitted into a scientific base camp. These technicians, with the help of local volunteers, count the number of mosquitoes in the homes, observe the mating swarms at

dusk, and dust mosquitoes with colored powder to track where they travel around the village.

They are gathering data on the mosquito population to feed into intricate computer models that will help them determine how the gene drive mosquitoes should be released.

When the technicians stepped into one home on a recent day, they laid thick sheets across the floor of a bedroom and filled it with acrid-smelling insecticide spray. After 10 minutes, they hauled the sheets out, opened them up, and crouched over a small pile of dirt specks: only one male mosquito.

For low mosquito season, it wasn't surprising. During the rainy season, however, which starts in June, there might be a few hundred mosquitoes in each room, said technician Ibrahim Diabate.

In the next phase of the project, scientists will have to explain to Ouattara why they're actually releasing more mosquitoes.

Going straight from zero to gene drives would be too extreme, so scientists are planning to release "regular" genetically engineered mosquitoes first — either here in Bana or in one of two other villages nearby.

Those mosquitoes, which could be released next year, are "sterile males": Most of them are male, and they cannot have offspring. Noufou Diabate sprays insecticide to kill mosquitoes in a mud house in Bana so that they can be accurately counted.

A field release is not intended to reduce the prevalence of malaria; rather, it is to prepare the scientists and the locals for the eventual arrival of the gene drive mosquitoes, said Delphine Thizy, who directs the work of engaging local, national, and international leaders for the project.

The outreach teams have started talking about DNA with their flash cards. But they aren't saying anything yet to the locals about the much more powerful, and complicated, idea of a gene drive.

Partly that's because researchers didn't want the residents of Burkina Faso to expect that a miracle solution to the malaria epidemic is just around the corner, Thizy said. Scientists in London haven't yet created the gene drive mosquitoes that would be used, and field trials of such mosquitoes are years away.

Also, she said, gene drives are hard to understand. "To be fair, even in Europe and in North America, it's complex to understand gene drives in one shot."

If gene drive mosquitoes arrive in Burkina Faso, it will be thanks to the vision of Abdoulaye Diabate, a soft-spoken medical entomologist with a singular mission: to stop malaria.

The disease is ever-present in this country — mosquito nets hang for sale by the roadside, and hotel proprietors lay out smoldering coils in the courtyards to ward off mosquitoes as dusk falls.

A map of Bana on one of the researchers' phones includes the houses that are being sprayed as part of a years-long effort to count the number of mosquitoes in the village.

Burkina Faso has experience with genetically modified organisms. One of the first

associations some residents make with genetic engineering is Monsanto, which has been selling genetically modified cotton seeds to Burkinabe farmers since the 2000s. But the country's grower's association stopped buying the seeds in 2016 in the wake of concerns about the cotton's quality and country-wide protests against the company.

One resident of Bobo-Dioulasso complained that genetically modified food rots quickly, and said that he hopes the mosquitoes suffer the same fate: an early death.

"The fight against malaria is a big concern, but the solutions are sometimes scary," said Sylvestre Tiemtore, the director of an organization that represents over half of the nongovernmental organizations in Burkina Faso. The group met with Target Malaria in July, a discussion which "was very heated," he said.

"In movies" — he cited "Jurassic Park" — "we've seen some research that went out of control," he said.

The mouthparts of a female Anopheles gambiae mosquito. (Jim Gathany/CDC)

"As long as you explain something about the specific capabilities of the mosquitoes, or the limitations of these particular mosquitoes and how they're supposed to behave in the wild or in the facilities, I think that serves the purpose of explaining genetic modification," Lezaun said.

And that's what many people are curious about. At the July meeting with NGOs, hosted by the Secrétariat Permanent des Organisations Non Gouvernementales (SPONG for short), attendees wanted to know: What would happen to the local ecosystem? And might these engineered mosquitoes be able to transmit other diseases?

Some of these questions don't yet have answers, but others do. A risk assessment commissioned by the Foundation for the National Institutes of Health, a US nonprofit that supports the federal agency, found that the risk of the sterile mosquitoes currently in Bobo-Dioulasso transmitting other diseases was incredibly low; the modified mosquitoes probably won't spread more malaria than their wild cousins; and the genetic modification probably won't spread from the mosquito to other animals.

Outside scientists, convened by the FNIH in May, had previously concluded that Anopheles gambiae is not a "keystone" species, meaning that if its population shrank dramatically, the ecosystem would not be substantially impacted.

The development of powerful new genetic engineering technologies, often outstripping regulators' ability to keep up, is forcing scientists to reckon with the ethics of their work in a new way.

Of course, humans have been making potentially irreversible changes to our environment for a long time: clearing forests for farming, building power plants that change the composition of the atmosphere, and producing untold tons of synthetic materials like plastic that will stay in the environment for hundreds of years.

But gene drives lend these questions a different sort of urgency. The genetic technology can quickly change the properties of an entire population of a species, undoing millennia of evolution in a handful of years. And once you let them out of the cage, there's no going back — other world-altering technologies have not been self-perpetuating like gene drive animals would be.

While researchers like Lavery are trying to determine how to measure success, research is

plowing ahead. Some scientists are thinking about releasing gene drive mice halfway across the world, in New Zealand, to eliminate invasive species. And Kevin Esvelt, a gene drive guru based at the Massachusetts Institute of Technology, is flying to Argentina in September to talk about using gene drives to get rid of flesh-eating flies.

He has said that gene drives are more important as a societal tool to change the way that science is done — it should be open to and inclusive of the people it will impact. To that extent, he praised Target Malaria's community work. "I honestly don't see how you could do it any other way," he said, citing the language and cultural barriers that the project is working to overcome.

How the project is going to introduce gene drive mosquitoes, though, is an open question. National regulators and international organizations like the World Health Organization are still working on developing guidelines for introducing gene drive animals.

And in Burkina Faso, Thizy said she hasn't even yet put a lot of thought into what it will mean for local leaders to understand a release of gene drive mosquitoes. She said it will probably include knowing that the modified mosquitoes will stay in the environment and grow in number, until some point at which the population of Anopheles gambiae will be reduced.

MOSQUITO INNOVATIONS

Now, a smartphone app to detect Zika, dengue, chikungunya in 30 minutes

By Zee Media Bureau Tuesday, March 21, 2017

inhabitat Design for Health, Health, News by Lacy Cooke

New Delhi: A smartphone-controlled, battery-operated diagnostic device that claims to detect Zika, dengue and chikungunya within 30 minutes has been developed by researchers including one of Indian origin.

The device costs only $100 and could enable care providers to test quickly for all three at the same time, preventing misdiagnoses.

Developed by the team at Sandia National Labs, part of the US Department of Energy, the device is based on the loop-mediated isothermal amplification (LAMP) diagnostic method which eliminates the need to process a biological sample such as blood or urine, before testing. "In addition to creating an app that serves as a simple interface to operate the device, we were able to adapt smartphone camera sensors to replace traditional laboratory sample analysis tools, allowing for unprecedented mobility," said Aashish Priye, chemical engineer and lead author of the paper.

Image credit: Randy Wong

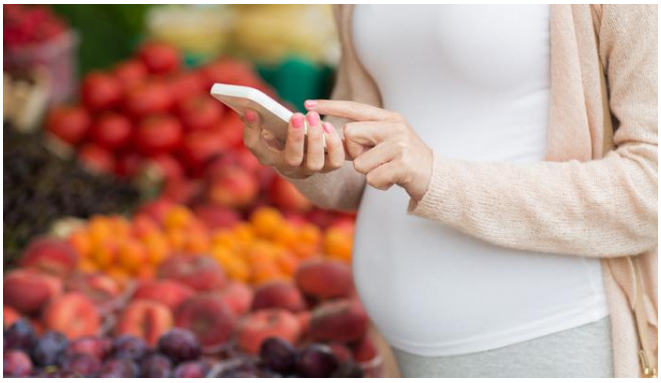
LAMP also eliminates the need for extra sample preparation before testing.

"We`ve demonstrated that the chemistry we`re using can amplify viral RNA directly from raw, unprocessed samples," said Sandia chemical engineer and project lead Robert Meagher.

Meagher and his team developed a technique known as quenching of unincorporated amplification signal reporters (QUASR), that involves tagging fragments of synthesised viral DNA called primers with fluorophores - molecules that emit bright light signals.

QUASR then causes samples containing viral DNA/RNA to appear bright, while negative reactions remain dark.

For the Zika project, Meagher`s team developed a novel algorithm that allows a smartphone sensor to act as a fluorimeter, detecting QUASR LAMP light signals if they appear.
LAMP works so simply that the user need only place the smartphone on top of the LAMP box and open an app. The app turns on the heater to initiate the LAMP reaction.
This smartphone-based image analysis offers much greater detection certainty than the lab technician`s naked eye, the authors said.
By enabling diagnosis in 30 minutes, Sandia`s prototype diagnostic tool could help clinicians make faster decisions about patient care and isolation, and rapidly alert public health authorities so they can take measures to prevent spread of the virus.



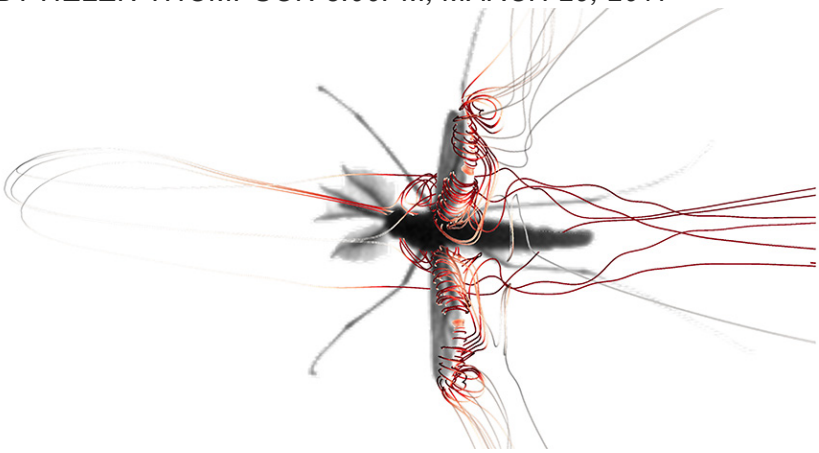
The same tool can also be adapted to detect other human or animal pathogens. Zika, dengue and chikungunya are spread by the same mosquito type and have similar early symptoms, and are on the rise globally. Zika virus has been linked to severe fetal abnormalities, including microcephaly and congenital blindness, as well as neurological disorders that can strike people at any age.

DID YOU KNOW?

Mosquito flight is unlike that of any other insect

Physics of skeeter wingbeats suggests insects may have traded efficiency for alluring buzz

BY HELEN THOMPSON 3:00PM, MARCH 29, 2017



BIZARRE BUZZ High-speed video and computer modeling detail forces involved in mosquitoes' wing rotation that help the insects generate enough lift (lines indicate air flow) to support their body weight in the air.
R.J. BOMPHREY, TOSHIYUKI NAKATA, NATHAN PHILLIPS, SIMON M. WALKER

Mosquitoes take weird insect flight to new heights.
The buzzing bloodsuckers flap their long wings in narrow strokes really, really fast — more than 800 times per second in males. That's four times faster than similarly sized insects. "The incredibly high wingbeat frequency of mosquitoes is simply mind-boggling," says David Lentink, who studies flight at Stanford University.
Mosquitoes mostly hover. Still, it takes a lot of oomph and some unorthodox techniques to fly that slowly. Mosquitoes manage to stay aloft thanks primarily to two novel ways to generate lift when they rotate their wings , Richard Bomphrey and colleagues write March

29 in Nature. The insects essentially recycle the energy from the wake of a preceding wing stroke and then tightly rotate their wings to remain in flight.

Most insects (and some birds and bats) rely on long wing strokes that create tiny low-pressure tornadoes called leading-edge vortices. The sharp front edge of the wing splits airflow in two, creating a bubble of swirling air along the front of the wing. Having low-pressure air above a wing and high-pressure air below generates lift.

But mosquitoes rapidly flap their wings up and down around a roughly 40-degree angle on average. Such short, speedy wingbeats make it impossible to generate enough lift from leading-edge vortices to stay in the air. “We knew something funny had to be going on. We just didn’t know what,” says Bomphrey, a biomechanist at the Royal Veterinary College of the University of London. So his team aimed eight high-speed cameras at hovering house mosquitoes (Culex quinquefasciatus) to model the physics of mosquito flight.

It turns out the insects flap their wings in a tight figure eight formation. Leading-edge vortices generate some lift as the wings briefly cut through the air horizontally. Then, as the wings start to rotate into the curve of the figure eight, they trap the wake of the previous stroke to create another series of low-pressure swirling vortices, this time along the back edge of the wing. “This doesn’t require any power. It’s a particularly economical way of generating lift,” says Bomphrey.

As the wings rotate, they also push air down, redirecting low-pressure air across the top of the wings. The wings rotate around an axis at their front edge, but if they go too far past vertical, they start to lose lift. So, the mosquito subtly shifts its wings’ turning axis from the front to the back of the wing, creating a more horizontal surface that allows the wings to continue to push air down. This also sets up the insect to benefit from the vortices along the trailing edge of the wing coming out of the turn.

Switching the axis mid-rotation “is impressive, especially since mosquito nerve cells fire just once for every few wingbeats,” says Itai Cohen, a Cornell University physicist not affiliated with the work. “Somehow this animal has evolved a complex wing stroke that takes advantage of aerodynamic forces and the mechanical infrastructure of the wing to generate complex motions with very few signals from the brain,” he says.

Bomphrey suspects that using these lift-driving forces may be common in mosquitoes and other insects that hover. But Lentink, who was not affiliated with the work, thinks it’s unlikely that lots of insects fly this way “because it seems so inefficient.”

Another force of nature may have driven mosquitoes to such illogical flight patterns: sex. Mosquito wingbeats make high-pitched tones, and males and females harmonize these tones in their search for a mate (SN: 01/31/09, p. 10). A flight style that entails fast flapping may have evolved as a result of sexual pressure to reach higher frequencies. That’s one theory anyway, and Cohen thinks it’s an interesting idea: “You’re talking about an insect sacrificing its flying capabilities in order to mate.”