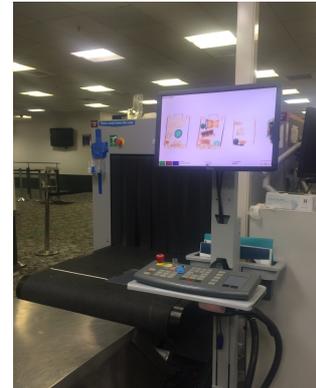




## BORDER HEALTH NEWSLETTER - July 2016

### WELCOME!

Hi everybody! If you haven't been to the most recent Border Health and Ship Sanitation Course in Wellington, I am sure you have heard from your colleagues about it (what a rare nice day in Wellington to practice ship sanitation on NIWA's research vessel). I particularly enjoyed learning about how to interpret the x-ray pictures at Wellington Airport. I hope everyone who attended has had a great time and is eager to integrate new knowledge and experiences into their part of Border Health (Tsjakka!). The Medical Vector Handbook has been revised and apart from the scientific facts about vector-biology and diseases it includes new (and old) technical instructions about vector surveillance in NZ. After some more proofreading and formatting it will be uploaded to our website. Watch this space!





# NEW ZEALAND BIOSECURE

## SAMPLES

During July 500 samples were collected by staff from 12 DHBs with only 59 positive. Not much to say about so little! But July '16 actually shows much more than compared with July '15. The higher number of *Ae. notoscriptus*, both adults and larvae, are thanks to our "tropical" Northland. The same applies to *Cx. astilae* that only occur there. Hawkes Bay has also been quite productive. All *Opifex* were found in Wellington while *Ae. subalbirostris* only occurs in the South.

Species	Adults		Larvae	
	July 16	July 15	July 16	July 15
<b>New Zealand Mozzies</b>				
<i>Aedes antipodeus</i> (winter mosquito)	2	Nil	Nil	Nil
<i>Ae. australis</i> (saltwater mosquito)	Nil	Nil	1	1
<i>Ae. notoscriptus</i> (striped mosquito)	62	1	1362	949
<i>Ae. subalbirostris</i>	Nil	Nil	76	Nil
<i>Culex astilae</i>	Nil	Nil	19	9
<i>Cx. pervigilans</i> (vigilant mosquito)	3	Nil	139	30
<i>Cx. quinquefasciatus</i> (southern house)	3	1	59	70
<i>Opifex fuscus</i> (rockpool mosquito)	Nil	Nil	23	12
<b>Total</b>	<b>70</b>	<b>2</b>	<b>1679</b>	<b>1071</b>

## INCURSIONS/INTERCEPTIONS

During July 2 suspected interceptions were detected and responded. Please note that the interceptions of live unwanted mosquitoes are highlighted in red. Exotic species in general are highlighted in light blue. 12.7.2016 One dead male *Cx. quinquefasciatus* was found at Menzies Aviation associated with fresh flowers from Colombia - likely to be from Colombia. 18/19.7.2016 One live female chironomid was found at AIAL – arrival desk 8.

## Important Dates

**Ministry for Primary Industries**  
Manatū Ahu Matua



### Biosecurity 2025

Biosecurity 2025 is about reviewing and future-proofing New Zealand's biosecurity system. The aim is to ensure that our already strong biosecurity system continues to protect New Zealand against pests and diseases.

#### CONSULTATION ON BIOSECURITY 2025

Between 26 July and 9 September 2016, MPI is consulting on the Biosecurity 2025 discussion document.

The document outlines proposals for what might be in a Biosecurity 2025 direction statement, which will guide New Zealand's biosecurity system into the future.

*Have your say*

All New Zealanders have an opportunity to play an active role in the biosecurity system. We want to hear your feedback on these proposals.



## NEW ZEALAND BIOSECURE

Your input to the consultation will help make sure that the system continues to adapt and respond to future challenges.

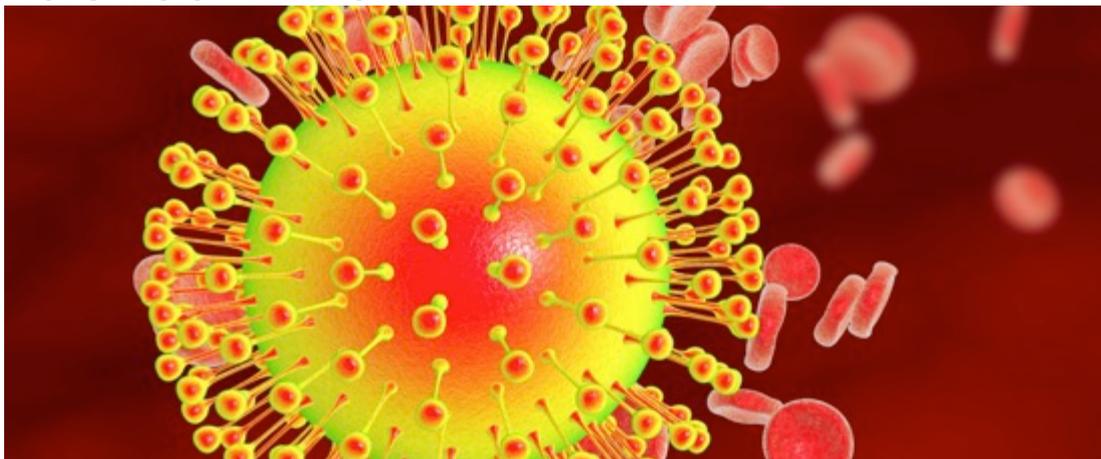


### MOSQUITO CONTROL ASSOCIATION OF AUSTRALIA INC

#### The 12th Mosquito Control Association of Australia and Arbovirus Research in Australia Symposium - 4-9 September 2016

The 12th Mosquito Control Association of Australia and Arbovirus Research in Australia Symposium will be held at The Mantra Legends Hotel in Surfers Paradise, Queensland from the 4th -9th September 2016. The symposium is shaping up to be an exciting forum.

#### PICTURES OF THE MONTH



#### STORY OF THE MONTH

##### Zika Virus May Remain in Semen Longer Than Previously Thought

By MICHAEL NEDELMAN GILLIAN MOHNEY Jul 21, 2016

The Zika virus has been found in one man's semen 93 days after he first reported symptoms, topping the previous known record of 62 days, according to a letter published in *Lancet Infectious Diseases* this month.

The patient, a 27-year-old man in France, came down with mild symptoms -- weakness, muscle pain and conjunctivitis -- shortly after returning from Thailand late last year. He had decided to freeze his sperm before an upcoming chemotherapy treatment, which led to a French laboratory testing his semen for Zika on March 9. While the virus was found in his semen, it was not found in his blood or urine.

After taking a detailed medical history, the authors of the letter were unable to identify other ways the man could have been infected. The virus is most commonly spread by a species of mosquito that is found in Thailand, but it may also be spread through sexual contact, contaminated blood or needle sticks.

Thailand does not have active transmission of the virus, according to the U.S. Centers for Disease Control and Prevention, but it has reported sporadic cases of Zika since 2012, according to the Thai Ministry of Public Health.



## NEW ZEALAND BIOSECURE

The CDC currently recommends that men diagnosed with Zika wait six months before having unprotected sex so that they do not infect their partner. Infected men who have a pregnant partner are advised to wear barrier contraception for the duration of the pregnancy. The U.S. Food and Drug Administration does not routinely test donated sperm for Zika, but it does bar anonymous donors for six months if they have received a Zika diagnosis, traveled to an affected area, or had sex with someone who may have been infected.

The authors of the Lancet letter advised that CDC guidelines should “be regularly revised to keep pace with the evolution of scientific knowledge” about Zika virus, especially in light of the finding that it can remain in semen for months.

The Zika virus is most commonly transmitted via infected mosquitoes to people, but in rare cases has been transmitted through sexual contact. The virus usually results in minor symptoms including fever, rash and pink eye that resolve in about a week. However, the Zika virus has been found to cause devastating birth defects including microcephaly, which is characterized by an abnormally small head.

### VECTOR-BORNE DISEASES - OUTBREAK NEWS

#### South Pacific



#### Pacific syndromic surveillance report – Week 29, ending 24 July 2016

*Dengue:* Samoa: As of 17 July there have been 1,405 since May 2015. The serotype-3 outbreak was at its peak around August 2015 with increased cases in January 2016, however the number of cases has steadily declined since. Source: Samoa Ministry of Health

*Yellow Fever:* As of 15 July 2016, Angola has reported 3682 suspected cases of yellow fever with 361 deaths. Among those cases, 877 have been laboratory confirmed. Despite extensive vaccination campaigns, circulation of the virus persists.

As of 11 July, the Democratic Republic of Congo has reported 1798 suspected cases, including 68 confirmed cases and 85 deaths, Of the 68 confirmed cases, 59 were imported from Angola.



### MONTHLY NOTIFIABLE DISEASE SURVEILLANCE REPORT - June 2016

#### Key notifiable disease trends

*Chikungunya fever:* One confirmed case of chikungunya fever was notified in June 2016 compared to three confirmed and one probable case notified during the same month of the previous year. Fifteen cases have been notified in the year to date compared to 44 at the same time in the previous year. The case was in the 20–29 years age group, from Waitemata DHB and travelled to Fiji during the incubation period for the disease.

*Dengue fever:* 21 cases of dengue fever (19 confirmed and 2 probable) were notified in June 2016 compared to five cases notified during the same month of the previous year. All cases had been overseas during the incubation period, and countries visited included Indonesia (13 cases), Fiji (3 cases), Samoa (2 cases), Cook Islands, French Polynesia and Papua New Guinea (1 case each). One interim dengue fever outbreak was created in June (case numbers yet to be determined, cases had travelled to



Indonesia).

*Typhoid fever:* Four confirmed cases of typhoid fever were notified in June 2016 compared to two cases notified during the same month of the previous year. Cases were reported from Auckland (2 cases), Bay of Plenty and Capital & Coast (1 case each) DHBs. Cases were in the 20–29 years (2 cases), 50–59 years and 70 years and over (1 case each) age groups. Three cases were hospitalised. All cases were lab confirmed and the species was recorded as *Salmonella*

*Zika virus infection:* Two confirmed cases of zika virus infection were notified in June 2016. Cases were reported in the 15–19 years and 50–59 years age groups (1 case each) and both were confirmed by PCR. Both cases travelled during the incubation period for the disease, and countries visited were Fiji (1 case), Nicaragua and the United States of America (1 case).

## ZIKA

### USA

**Life** | Thu Jul 21, 2016 6:08pm EDT

Related: HEALTH, BRAZIL REuters

#### **Brazil scientists find Zika traces in Culex mosquitoes in wild**

Brazilian researchers on Thursday said they found signs of the Zika virus in a common mosquito that is a separate species from the insect known to be the primary means of transmission.

They warned, however, that further tests are needed to determine whether the species, known as *Culex quinquefasciatus*, is in fact responsible for transmitting the virus to humans and, if so, to what extent.

The scientists, from a leading Brazilian research institute known as the Oswaldo Cruz Foundation, discovered the Zika traces in *Culex* mosquitoes captured in and around the northeastern Brazilian city of Recife, capital of the state that was hit hardest by the Zika outbreak since last year.

In March, the same researchers said they had successfully transmitted the Zika virus to *Culex* mosquitoes in the lab, but were not yet sure at the time whether the species could carry the virus naturally.

The Zika traces, the scientists said in a statement, were found using methods that identify ribonucleic acid from the virus. The findings, they said, "confirm the species as a potential vector of the virus."

Still, many questions remain to determine whether *Culex*, even if capable of carrying Zika, would be a significant source of infection in humans.

*Culex* mosquitoes are more common than *Aedes aegypti*, the species primarily responsible for transmitting the Zika virus, and are able to withstand more temperate climates. They are common across the Americas and in tropical and subtropical climates elsewhere.

*Aedes aegypti* has different breeding, feeding and overall habits that scientists say make it an efficient vector for the disease in humans.

Compared with that mosquito, which is fond of urban and household environments and likes to feed on humans, *Culex* likes to live around trees and other high areas and is as likely to feed on birds and other animals as it is on humans.

"Just finding the virus in another species doesn't mean that it can efficiently transmit it," says Jerome Goddard, an entomologist and specialist in mosquito-borne illnesses at Mississippi State University.



Because mosquitoes of various species are capable of carrying any number of infections or parasites, scientists say that eradication efforts for any illness must concentrate on the insects known to best transmit each particular disease.

### **Zika-Spreading Mosquitoes Are Becoming More Resistant to Common Pesticides**

By GILLIAN MOHNEY Aug 2, 2016

Health officials working to contain Zika outbreak in northern Miami are now investigating whether the Zika-spreading mosquitoes have become resistant to common pesticides used to combat the insect -- as studies suggest has been the case in other parts of the world.

Currently, 14 people have been found to be infected with the Zika virus from mosquito bites in a 1-square-mile area in northern Miami, according to the U.S. Centers for Disease Control and Prevention. Mosquito control measures were implemented after four people were found infected with Zika in July, but health officials said on Monday those initial mosquito control measures were not enough.

The *Aedes aegypti* mosquito has been called a "cockroach" mosquito for its ability to live indoors and reproduce even in tiny pools of water. The insect is the primary way the Zika virus is spread, although the disease can also be transmitted through sexual contact.

"Aggressive mosquito control measures don't seem to be working as well as we would have liked," CDC Director Tom Frieden told reporters on Monday after 10 additional Zika cases were announced. He pointed out that it was unclear if the insects themselves are biologically resistant to the chemicals used in common insecticides used or if there were other environmental factors like standing water that was not visible that lead to the mosquito population bouncing back.

Frieden said an expert was investigating the mosquitoes to test if they are genetically resistant to pesticides but that it could take weeks to get the findings.

The case has highlighted a problem health departments and mosquito control districts have dealt with for years: some mosquito species are becoming resistant to pesticide. In the Florida Keys, the local mosquito control district has been looking at new ways to diminish mosquito populations as some of the 46 species present have become more resistant to pesticide. They have even considered a test run of genetically modified mosquitoes near Key West.

Dr. William Schaffner, an infectious disease expert at Vanderbilt University Medical Center, said the *Aedes aegypti* mosquito is especially hard to combat for multiple reasons. "There's a history of *Aedes* being relatively resistant to conventional pesticide," Schaffner said. "When we say they're resistant that means the mosquito inherently can shrug off the pesticide."

Research on why the mosquitoes are so resilient have found the insects may have some genetic mutations that help them survive. Scientists in Thailand found that the *Aedes aegypti* mosquito had genetic mutations that made the pesticide less likely to bind to them, according to a 2016 study published in *Parasites & Vectors*. A *bacteria* called *Bacillus thuringiensis israelensis* used as larvicide has been found to be less effective on multiple mosquito species, including the *Aedes aegypti* mosquito, according to a 2014 study published in *BMC Genomics*.

Schaffner explained that when the initial pesticide stops working, mosquito control is forced to turn to other chemicals that are not as ideal for use in a public area.

"They are wonderfully biodegradable, they can be dispersed in fine mist ... and they're very, very safe," he explained. "When we have to start using others, there are sometimes issues."

Some secondary pesticides may be more likely to cause irritation, he noted.



## West Nile

### Canada

#### **Toronto mosquitoes test positive for West Nile virus, Toronto Public Health says**

City's public health officials say risk of catching the virus is still low, but take precautions

*By Priscilla Hwang, CBC News Posted: Aug 03,*

Toronto mosquitoes have tested positive for West Nile virus for the first time this year, Toronto Public Health confirmed Wednesday.

"The positive test result is a good reminder for Toronto residents to take precautions to protect themselves from mosquito bites and to remove standing water from their properties to prevent mosquito breeding," said Dr. Barbara Yaffe, Toronto's Acting Medical Officer of Health.

Mississauga mosquitoes test positive for West Nile virus

But health officials say the risk of getting infected is still low, and protecting yourself with light-coloured long clothing and insect repellent can further reduce that risk.

There are no reported human cases of the virus in Toronto in 2016 so far.

The city tests batches of mosquitoes throughout the city every week in laboratories, between June and September. Each batch has up to 50 mosquitoes of one species, the city agency says.

Toronto currently has 43 traps across the city to test for West Nile virus.

Two of these pools of mosquitoes tested positive for the virus, Toronto Public Health announced in a news release Wednesday.

Last year, 18 mosquito pools tested positive and there were 13 confirmed human cases, according to Toronto Public Health.

#### **RI Co. seeks dead birds for mosquito survey**

*Quad City Times by Deirdre Baker Jul 18, 2016 0*

Gravid traps such as this may be used by county health officials later in the summer when disease-spreading Culex mosquitoes are more prevalent. These traps collect only gravid, or pregnant, Culex mosquitoes that are ready to lay eggs. These mosquitoes are then pooled and tested for viruses, and the data is used to monitor virus activity, including for West Nile.

The Rock Island County Health Department is seeking reports from residents of dead birds for its mosquito-surveillance program.

West Nile Virus is from Africa and it may spread to humans and other mammals via mosquitoes, causing encephalitis and flu-like symptoms, with some fatalities. Both Scott and Rock Island counties also trap and test actual mosquitoes to test for the virus.

Illinois send suitable dead birds to the Illinois Department of Agriculture Animal Lab to be tested.

QUAD-

When tests find the West Nile Virus, further public health alerts are made to recommend protective measures.

An eligible dead bird has recently died and shows no signs of trauma, such as being hit by a car, crashed into a window, killed or chewed by a predator. Most bird species are accepted except eagles, large hawks or owls or waterfowl.

In Scott County, there are no tests on birds, but officials





have two types of mosquito traps set up in the county, including the light trap and gravid trap.

Both states monitor this public health concern. In Iowa, for example, no human case has been reported of West Nile Virus in 2016 but it has been found in one monitored mosquito pool.

During the 2015 surveillance season, 14 human cases of West Nile were reported in 13 Iowa counties.

### CHIKUNGUNYA

#### India

#### **Chikungunya fears bite again - Are chikungunya cases on the rise in Delhi?**

*Durgesh Nandan Jha | TNN | Jul 23, 2016*

While the corporation data shows there are no such [cases](#), several private hospitals say there has indeed been a spike in their numbers.

Dr Rommel Tickoo, senior consultant (internal medicine) at Max hospital, Saket said they got at least five chikungunya patients in the past week. "Two patients had to be admitted due to unbearable pain in the body as well as fever," he said.

Like dengue, chikungunya also causes high fever, rashes and body ache. The diseases are spread by the same mosquito. But there is a distinctive joint pain in most chikungunya cases that can persist for weeks, said Dr Suranjit Chatterjee, senior consultant (internal medicine) at Apollo hospital. However, he added that there were few confirmed cases at his hospital.

Dr Navin Dang, who runs a private lab in south Delhi, said they have confirmed at least five chikungunya cases over the past week. "Due to poor sanitation and mosquito control, all diseases spread by the vector are on the rise. We should act in time to control this," he said, referring to the trend of rise in mosquito-borne diseases post-monsoon.

Though Chikungunya is a notifiable disease, experts said not many doctors prescribe confirmatory tests because they are costly. "Treatment is mostly symptomatic. Patients are given an anti-pyretic to reduce fever and pain relievers. Admission is required in rare cases," said Dr Atul Gogia, senior consultant (internal medicine) at Sir Ganga Ram hospital.

Municipal health officials said that not many hospitals are reporting chikungunya cases, so there is discrepancy in notification of the disease. "We only report or notify case details received from hospitals," said a senior official.

The director of internal medicine at BLK superspeciality hospital, Dr RK Singal said that often joint pain caused by chikungunya is prolonged. "Confirmatory tests can help decide the right treatment and reassure that the patient is not suffering from any serious condition," he said.

Dr Singal added that cases of chikungunya are often under-reported because its symptoms are similar to that of viral fever and dengue.

### DENGUE

#### India and Oriental

#### **Creating breeding spaces for mosquitoes**

*The Hindu 3.8.2016*

While the figures available with the Health Department do not indicate large clusters of dengue cases, the steady and spread out occurrence reveals a let-up in the efforts to prevent the breeding of mosquitoes that transmit the dengue-causing virus. Figures available with the department say that up to July 20 this year, the district had recorded 90 cases of dengue, of which 26 confirmed cases were reported between July and August.



And, fingers point at reckless dumping of water-holding waste items.

Coconut shells, worn-out tyres, broken bottles and bulbs still get dumped in open spaces and turn into receptacles of rain water that the mosquitoes need as breeding space. With plastics waste recycling unit closed, carry bags too get dumped along roads or on vacant land. Regular scene Conservancy workers pulling up errant residents or shopkeepers has become a regular scene in the morning. An anguished worker vents her anger on the occupant of a house on East Hill Road, after catching the latter hurling coconut shells into the open space across the road. "We have been telling you about the risks every day, and still you people do not learn," she shouts. Public cooperation has been good whenever the campaign starts off on an intensive note. As days pass, the cooperation wanes and these breeding sources are dumped recklessly again, Kozhikode Corporation Health Committee Chairman K.V. Baburaj said on Tuesday. As for plastic bags, Mr. Baburaj says people alone cannot be blamed.

Rainwater in discarded tender coconut shells is ideal reeding space for mosquitoes. Photo: S. Ramesh Kurup

"We are not able to blame it entirely on the people because we (the Corporation) have closed the recycling plant as the private operator withdrew citing non-viability. In a couple of days, we will invite bids and look at reopening it as early as possible," he said.

The committee chairman, however, said that no such excuse could be made for dumping other fresh-water holding items in the open. "Whenever we involve volunteers in surveillance, the cooperation is good. It dips when the surveillance shifts from one area to another," he said.

Health officials too seem to have reconciled to the ground-level situation, stating that unless local bodies had a totally efficacious waste management system – from primary collection to disposal – it is difficult to prevent dumping in the open.

### **West Bengal: Dengue toll rises to seven**

*IANs Aug 3, 2016 20:17 IST*

Kolkata: The dengue toll has risen to seven in West Bengal amid experts cautioning against a viral strain triggering hyper-active immune response, an official said on Wednesday.

"The total number of deaths due to dengue is seven since June-end. We have confirmed the death of a 12-year-old child from Howrah due to dengue. A total of 995 people have been affected by the disease since January 2016 in the state," Director of state's health services B.R. Satpathi said.

Experts say this time a considerable number of patients complaining of typical dengue symptoms (joint pain, rashes etc.) have, however, failed the dengue screening that establishes the mosquito-borne viral disease.

"A lot of people are exhibiting typical dengue symptoms but tests do not reveal dengue," said protozoologist Amitabh Nandy.

Expert Shyamasish Banerjee said the strain that is prevalent this year is triggering an



abnormal immune response.

"Liver affection is more than last time and we are observing more inflammation in the gall bladder etc. Also, people don't know about this but this time, we are also seeing macrophage activation syndrome (MAS) due to the particular strain that is circulating," said Banerjee.

MAS leads to hyper-activated but dysregulated immune activity causing overwhelming inflammatory response resulting in non-remitting high fever, inflammation of spleen, liver and nervous system dysfunction as well as haemorrhage.

Four different strains of the dengue virus are responsible for the disease: DENV1, DENV2, DENV3 and DENV4.

"In 2014, in Bengal the DENV1 and DENV3 strains were mainly prevalent. In 2015, we saw the more fatal DENV2 and DENV4. We are yet to establish which of the four is circulating now. It will take some time," added Satpathi.

## YELLOW FEVER

### Africa

#### NIAID announces phase 1 trial of yellow fever vaccine

Healio, August 3, 2016

The National Institute of Allergy and Infectious Diseases has begun an early-stage, phase 1 clinical trial of an investigational vaccine for the prevention of yellow fever virus.

In 2013, yellow fever virus caused an estimated 84,000 to 170,000 cases of severe disease and 29,000 to 60,000 deaths, according to WHO.

"Yellow fever has recently re-emerged as a major public health threat in parts of Africa. Although a vaccine exists to prevent this serious disease, it is currently in short supply, and it is not recommended for certain populations, such as pregnant women and people older than 60 years," **Anthony S. Fauci, MD**, director of NIAID, said in a press release, "We must develop new options for preventing this terrible disease."

Since 2006, over 105 million people in Africa have received yellow fever vaccinations, according to WHO. However, supplies are limited, and in some cases the vaccine has caused severe adverse reactions.

The NIAID's placebo-controlled, double blind study will include 90 healthy men and women aged 18 to 45 years who have never been infected with a flavivirus such as yellow fever. Researchers will place participants into 6 groups — one group will receive the current yellow fever vaccine subcutaneously and five will receive the investigational MVA-BN-YF vaccine, developed by Bavarian Nordic, intramuscularly. Researchers will administer both vaccines either with or without ISA 720, an experimental adjuvant shown in previous clinical trials to induce an immune response after one dose of vaccine. Participants will receive one or two doses of vaccine or placebo 1 month apart.

According to the press release, the MVA-BN-YF vaccine is based on Bavarian Nordic's proprietary MVA-BN platform that uses an attenuated version of the Modified Vaccinia Ankara (MVA) virus as a vector. MVA-BN-based vaccines have been successfully used in over 7,600 people — 1,000 of whom were immunocompromised.

One goal of the trial is to determine whether two doses of unadjuvanted vaccine or a single dose of ISA 720 adjuvanted vaccine could provide protection against yellow fever, according to the press release.

NIAID-funded Vaccine and Treatment Evaluation Units will conduct the multi-site trial at the University of Iowa in Iowa City and Saint Louis University in Missouri, and Emory Vaccine Center in Decatur, Georgia will help with data evaluation.



## JAPANESE ENCEPHALITES

### China

#### **Hong Kong reports 1st Japanese encephalitis case of the year, possible local transmission being investigated**

*Outbreak News by News Desk on July 27, 2016*

The Hong Kong Centre for Health Protection (CHP) of the Department of Health (DH) last week reported the first case of Japanese encephalitis (JE) in 2016, and again urged the public to maintain strict environmental hygiene, mosquito control and personal protective measures both locally and during travel.

“As the patient had both travel history and local movements during the incubation period (IP), it cannot be ruled out at this stage that the case was locally acquired. As a precautionary measure, we are working closely with the Food and Environmental Hygiene Department (FEHD) to assess and prevent any possible spread of infection,” a spokesman for the CHP said.

The female patient, aged 22 with good past health, has developed fever, headache and neck pain since July 10. She was admitted to Queen Elizabeth Hospital on July 13 for management and has all along been in stable condition.

Her cerebrospinal fluid tested positive for immunoglobulin M (IgM) antibodies against JE upon testing by the CHP’s Public Health Laboratory Services Branch.

Initial enquiries revealed that the patient had travelled to Thailand and Myanmar from June 19 to 26. According to the patient, travel collaterals have remained asymptomatic so far. Locally, the patient lives in a flat on Maidstone Road, To Kwa Wan, and home contacts who have remained asymptomatic are put under medical surveillance. She mainly stayed at home while in Hong Kong. She could not recall mosquito bites during the IP. Epidemiological investigations are ongoing.

## MALARIA

### Africa

#### **Africa: How Building New Dams Is Adding to Africa's Malaria Burden**

More than 2,000 large dams have been built and more than 200 are currently under construction or planned in sub-Saharan Africa. The general aim is to enhance food security, increase hydropower generation, manage rainfall variability and promote economic growth.

In 2012, the continent's heads of state and government laid out an ambitious, long-term plan for closing Africa's infrastructure gap. Ethiopia has built several dams in recent years that have helped satisfy its growing energy demand. The Democratic Republic of Congo has initiated the construction of several dams along the Congo River at Inga Falls. The height of the Kamuzu Barrage is being augmented in Malawi.

Encouraged by recently renewed international aid for water resources development, feasibility studies are underway for many more dams throughout the continent.

But the construction of these dams brings an unintended consequence - an increase in malaria cases in the surrounding areas.

#### **Malaria risk around dams**

Africa is home to 90% of the global malaria burden, carrying at least 174 million cases annually. A conservative estimate is that more than one million malaria cases result from large dams in Africa each year. Specific examples of elevated transmission around dams have been documented in Cameroon, Ethiopia, Ghana, Kenya, Senegal and Zimbabwe. One example is the Koka Reservoir in central Ethiopia.

Water impounded in reservoirs generally increases the abundance of sites - typically



shallow puddles - in which larvae of the malaria-carrying Anopheles mosquito thrive. This causes a drastic increase in the overall number of adult mosquitoes. These mosquitoes often bite people in the evening and night, increasing the rate of malaria transmission among human populations living within a few kilometres of reservoirs.

The puddles that create breeding sites for mosquitoes are located in seepage areas just below dams, around reservoir shorelines, and in human-constructed areas like irrigation channels in the vicinity of reservoirs.

Our evidence suggests shoreline sites are the most important of the various malaria mosquito breeding sites. Reservoirs create these shoreline puddles when the water level recedes; they then become ideal places for mosquitoes to breed.

The impact of malaria around dams where there have been efforts to control it suggests that conventional control strategies may be insufficient. So it is crucial to consider additional options for control in conjunction with conventional approaches:

### **Dam placement**

Decision-making related to placement of dams in a river basin may affect malaria, given the differing impact of dams on malaria in different conditions.

There is growing evidence that a dam's impact varies according to the nature of malaria stability in a region in which they are built. Water that is impounded in areas of unstable, less intense or seasonal transmission of malaria produces a greater adverse effect than water impounded in areas of stable, more intense and year-round transmission.

Such a different impact can be incorporated into basin development planning.

### **Dam design and reservoir sizing**

The design of dams and the size of reservoirs behind them hold potential to affect levels of malaria in surrounding communities.

The way a dam is designed can, for example, influence the degree to which downstream seepage occurs. The potential to create productive larval puddles in reservoir shoreline sites can be factored into decisions on the height of future dams.

The size of the reservoir determines the size of the shoreline for mosquito breeding - smaller dams have lesser shorelines than large dams - so less malaria impact.

### **Reservoir management**

Reservoir water levels can be manipulated to create a habitat less favourable for development of Anopheles larvae.

Faster water release rates during the main transmission season have been shown to suppress mosquito breeding by desiccating shoreline puddles. This will reduce prevalence of malaria in surrounding communities.

Work around the Koka Reservoir in Ethiopia, for example, has shown the potential of using optimised dam management for malaria control without sacrificing the primary purposes of the dam.

### **Larvivorous fish**

A final possibility for malaria control around reservoirs involves introducing larvae-eating fish into dams.

In India, larvivorous fish were used as a major component of the integrated malaria control program.

### **Malaria: should we abandon insecticide-treated bednets?**

*July 12, 2016 7.05am AEST*

*University of Glasgow*

In Africa, some malaria-carrying mosquitoes have found ways to survive exposure to insecticides. This means that bednets treated with these chemicals may become less effective at preventing malaria. A new study we've published in [PNAS](#) shows that



although these resistant mosquitoes don't die immediately on contact with insecticide-treated bednets, their risk of death in the days and weeks following contact is greatly increased. As a result, the opportunity for these mosquitoes to transmit malaria to a human drops by two-thirds.

There were over 200m cases of malaria in 2015, causing more than 400,000 deaths, mostly in Africa. While these numbers are still shockingly high, since 2000, the rates of malaria have been decreasing dramatically, largely due to the widespread use of insecticide-treated bednets.

Such bednets help control malaria in two different ways: by providing a physical barrier between the human and the disease infected mosquito; or by turning the person sleeping under the bednet into a deadly mosquito trap, where the mosquito is lured towards the scent of the sleeper. The mosquito then flies into a wall of insecticide that not only stops it from biting but kills it too. So impregnating bednets with insecticide has been very useful for controlling malaria mosquito populations.

The problem with the widespread use of insecticide-treated bednets is that many mosquitoes have now become highly resistant to these chemicals. Insecticides are designed to kill mosquitoes immediately on contact, so when more than 10% of them are still alive in the day following exposure we know they are getting resistant to insecticides.

To worsen the problem, there is only one type of insecticide that can be safely used to treat bednets. So when mosquitoes become fully resistant, we could enter an era where our primary weapon against malaria can no longer be used and the public health gains achieved so far reversed.

Thinking beyond 24 hours

While the spread of insecticide resistance is of great concern, our results indicate that by classifying mosquitoes as resistant only on the basis of mosquito survival in the 24 hours following exposure, we are overseeing important long-term costs arising from exposure to insecticides. By rearing thousands of mosquitoes in the laboratory and exposing them to nets impregnated with insecticides we were able to closely monitor the longer-term fate of resistant mosquitoes that encounter an insecticide-treated bednet. We found that while they survive the first day, there were consistent reductions in their daily survival for the rest of their lives. Over the life time of the mosquito, these small but consistent reductions combine to reduce their lifespan by half.

The malaria parasites needs at least nine days to mature inside the mosquito before they can be passed onto a human, so these longer-term survival reductions could have a big impact on malaria transmission.

In total, we estimated that contact with a treated bednet can reduce the transmission potential of even highly resistant mosquitoes by two-thirds. This may explain why bednets appear to be effectively controlling malaria in areas of Africa where mosquito populations are highly resistant. So for now, it would be premature to abandon this strategy.

Unfortunately, we also found evidence that these longer-term impacts on mosquito survival may be temporary and could disappear as mosquitoes develop more intense levels of resistance. This is why there remains a huge urgency to find alternative methods to control malaria mosquitoes.

By making new insecticidal products - or finding alternative or other complementary solutions - we may be able to start killing these resistant mosquitoes again. As we wait for these developments, we should continue to use mosquito insecticide-treated bednets. Despite the rapid spread of insecticide resistance, they are still the most effective method to prevent malaria transmission.



### WORLD OF MOSQUITO SCIENCE

#### USU scientists developing tool to predict mosquito resistance to insecticides

*CacheValleyDaily.com* , July 19, 2016

LOGAN – Utah State University researchers are developing a tool that could help keep mosquito populations low while using less insecticide.

What happens, according to USU researcher Scott Bernhardt, is that mosquito abatement districts use strong insecticides to reduce the populations, but over time the disease transmitting insects become resistant.

Many different types of mosquitoes are kept in a USU lab where they are allowed to feed – often on the scientists themselves – and reproduce. After a number of generations, the mosquitoes begin to develop the resistance. The USU scientists are trying to stay one step ahead by developing a way to predict the pattern of resistance.

“Can we develop a diagnostic tool where we can go out natural field populations and say, “Hey these mosquitoes are starting to develop resistance to the type of chemical insecticide we are using. Can we change that insecticide to one where they are not resistant?” If you can remove that exposure they’ll become susceptible again.”

Development of such a tool is what abatement districts want to have happen. If resistance can be predicted, and even measured using a tool, the amount of insecticides used can be reduced. The abatement districts, according to Bernhardt, will know when “enough is enough.”

“The work that we are doing is actually work that can affect people in Cache County,” he said. “We want to be able to have effective insecticides but not use too many. There are environmental consequences to using too many insecticides.”

“This type of data we are collecting in this research is much broader than just Utah. Utah can benefit from it, but this more of an international approach.”

When it comes to mosquito-carried diseases, the issue comes down to a question of prevention vs. treatment.

“Those are two different approaches and the antiviral research group on campus takes that latter approach, where ‘If you get bit can we give you an antiviral or can we have a vaccine to where you don’t even get sick?’” Bernhardt said. “Whereas my research is more from the approach of ‘Can we just reduce that potential of ever coming into contact with mosquitoes?’”

### WORLD OF MOSQUITO TECHNOLOGY

#### MICROSOFT DRONES ARE SEARCHING FOR ZIKA-INFECTED MOSQUITOES AROUND HOUSTON FIGHTING FLYERS WITH FLYERS

*PopularScience.com* by Kelsey D. Atherton 2.8.16

Project Premonition, a Microsoft research project to find diseases early and in the wild, is working with the local government to deploy drones and traps to Houston.

The Zika virus has finally reached the United States, so to fight back, the United States is enlisting one of the weapons it knows best: drones. Not big, high-altitude drones with weapons, but smaller quadcopters, flying low to the ground, to seek out where the mosquitos that carry Zika breed and live.



Project Premonition, a Microsoft research project to find diseases early and in the wild, is working with the local government to deploy drones and traps to Houston. The drones will try to spot the expected flow of Zika-carrying mosquitoes to the area, before people start getting infected. When Microsoft announced Project

Premonition last year, it looked like they were flying DJI Phantom style drones, though in this morning's Today Show segment about Premonition's fight against Zika, it looked like the drone of choice was a 3D Robots Solo quadcopter.

The drone is just part of the process. Also key is a new type of mosquito trap that collects data as it captures insects.

Project Premonition requires lots of interesting mosquitoes, but this is easier said than done. Existing mosquito traps can't distinguish mosquitoes from other insects, requiring entomologists to process the insects collected from every trap. Project Premonition redesigned the mosquito trap to be robotic and smart. It is comprised of 64 smart cells, each of which monitors the insects flying into it. If the wing movements of an insect match that of an interesting mosquito, then a cell can close a door, capturing that insect and tagging with key environmental data including time, temperature and light levels. The trap can learn from its mistakes to become more efficient, and it is designed to run for more than 20 hours in hot and humid environments. It is currently being deployed in Houston and is capturing an unprecedented 100's of gigabytes of data per week about mosquito behavior.

When we first saw Project Premonition, it was testing in Grenada. Now, the system is deployed around Houston, as an early line of defense from the Zika-infected mosquitoes in Florida.

## DID YOU KNOW?

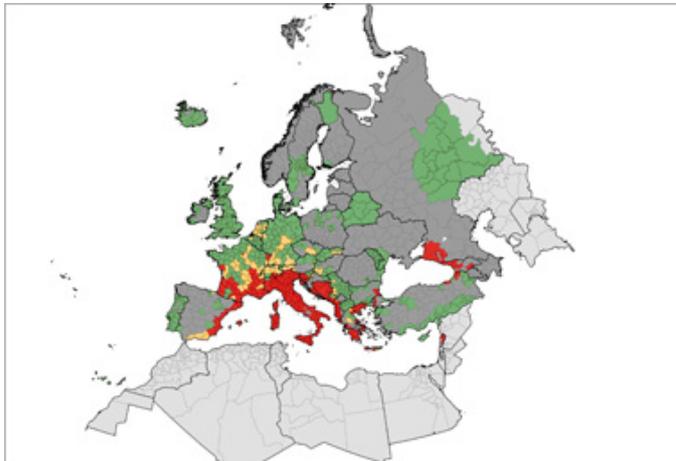
### Europe

#### Zika and dengue: maps track distribution of vectors

*Efsa in 3 August 2016*

The European Centre for Disease Prevention and Control (ECDC) has updated its maps on the presence of invasive mosquitoes in Europe with new information on the geographical distribution of *Aedes albopictus* and *Aedes aegypti* – invasive mosquitoes which can transmit diseases, such as dengue and Zika.

The maps, which are presented in a new layout, show the current known distribution of *Aedes* species in Europe and the Mediterranean basin. Data shown in the maps is collected through VectorNet, a joint initiative of EFSA and ECDC. The information on the mosquito presence is gathered by external experts of mosquitoes and mosquito-borne diseases and validated by designated experts. However, the data do not represent the official view or position of the countries.



Zika and dengue: maps track distribution of vectors

### Chickens to aid in fight against malaria

#### *World poultry*

Researchers at the Swedish University of Agricultural Sciences and Addis Ababa University, Ethiopia conducted experiments in western Ethiopia, including suspending a live chicken in a cage near a volunteer sleeping under a bed net.

Although infection and death rates of Malaria are declining, health officials are continuing to look for new ways to prevent the spread of the disease. According to UN data nearly 400,000 people died due to malaria in Africa last year.

Mosquitoes use their sense of smell to locate an animal they can bite but the researchers found that malaria causing mosquitoes, known as *Anopheles arabiensis*, showed a taste for human blood over that of animals when feeding indoors.

However, the insects randomly fed on cattle, goats and sheep, but always steered clear of chickens when outdoors. Addis Ababa University's Habte Tekie, who worked on the research, said that the compounds from the smell of the chicken can be extracted and could work as a repellent and aid in the fight against malaria.

Researchers from the Swedish University of Agricultural Sciences were also involved in the project. Compounds extracted from chicken feathers were also used in the experiments, as well as live chickens. Researchers discovered that the use of the chicken and the compounds significantly reduced the number of mosquitoes that were found in the trap nearby.

Rickard Ignell a corresponding author said: "Mosquitoes are becoming increasingly physiologically resistant to pesticides, while also changing their feeding habits for example by moving from indoors to outdoors. For this reason there is a need to develop novel control methods.

"In our study, we have been able to identify a number of natural odour compounds which could repel host-seeking malaria mosquitoes and prevent them from getting in contact with people."

## NOT ONLY MOSQUITOES

### Austin health officials warn of increase in murine typhus

*Outbreak News Today by News Desk on July 22, 2016*

Murine typhus fever is a disease that occurs when people come into contact with fleas infected with a bacteria called *Rickettsia typhi*. Since 2008, when murine typhus became endemic in Travis County, the annual number of reported cases has ranged from 4 to 54.

As of July 11, 2016, 14 cases had been reported to Austin/Travis County Health and Human Services, whereas in all of 2015, we had a total of 15 cases. Most of the 2016 cases (84%) have been hospitalized. All cases reported during 2015 and 2016 have been adults except for one child. In 2012, Travis County had one death from murine typhus, with no additional deaths since that time.



Although murine typhus happens year round, most cases have onset of illness from May through September. Symptoms can begin from 6 to 14 days after exposure to an infected flea. Symptoms include high fever, headaches, chills, body aches and pains. A rash on the chest, back, arms and legs can sometimes occur. The disease is readily treatable with antibiotics.

In Austin/Travis County, wild animals such as rats and opossums as well as pets can carry the fleas that transmit the disease. Because these animals frequently come into close contact with people, they can be involved in the transmission cycle of this disease to humans.

Infected pets usually do not show any symptoms. If pets are infested with fleas, their fleas may become infected and transmit the disease to humans. Here are some steps to take to prevent pets and humans from getting murine typhus disease:

### **Cutaneous leishmaniasis outbreak infects scores in northwestern Pakistan**

*Outbreak News Today by Robert Herriman on July 17, 2016*

Nearly 200 cases of cutaneous leishmaniasis have been reported recently in the Safi Tehsil (administrative division) of the Mohmand Agency district in the Federally Administered Tribal Areas of Pakistan (FATA) concerning health officials of its possible spread into other tehsils, [according to a Daily Times report](#).

Mohmand Agency Surgeon Dr. Razaullah said health officials in other tehsils have been warned of the outbreak, which has infected 193 to date.

Dr. Razaullah said the disease was a major public health problem in the Agency, especially alongside regions bordering Afghanistan and the tehsils of the agency with a heavy influx of refugees.

Vaccination drives would be conducted in neighboring tehsils.

The Centers for Disease Control and Prevention (CDC) says Leishmaniasis is a parasitic disease that is found in parts of the tropics, subtropics, and southern Europe. Leishmaniasis is caused by infection with *Leishmania* parasites, which are spread by the bite of infected sand flies. There are several different forms of leishmaniasis in people. The most common forms are cutaneous leishmaniasis, which causes skin sores, and visceral leishmaniasis, which affects several internal organs (usually spleen, liver, and bone marrow).

*Leishmania major* and *L. tropica* are found in Pakistan.

People with cutaneous leishmaniasis who develop clinical evidence of infection have one or more sores on their skin. The sores can change in size and appearance over time. The sores may start out as papules (bumps) or nodules (lumps) and may end up as ulcers (like a volcano, with a raised edge and central crater); skin ulcers may be covered by scab or crust. The sores usually are painless but can be painful.

There is not a vaccine available to prevent leishmaniasis. The best way is to avoid sandfly bites.