BORDER HEALTH NEWSLETTER – January 2017

Welcome!

A busy start to the year, with 12 suspected interceptions and more than 1200 samples received, well done to all! Included this month are some interesting articles on Yellow Fever, Malaria and discussion and development of GM mosquito release trials. Most interesting is the robotic trap and drone technology – how we would love to be involved in such trials. In the USA a new president is in play and a question that people, involved in the field of arbovirus related matters, ask themselves a lot these days might be: "What brings the future of emerging infectious diseases in the Trump era?"

The same question was asked by *Krisztian Magori*, who wrote the following comment (*20.1.2017 BugBitten*):

Today marks the inauguration of Donald J. Trump as the 45th President of the United States. After a long, tumultuous and often divisive campaign, Mr. Trump won the majority of the votes in the Electoral College, despite gaining less than the majority of the popular votes. At the beginning of this transition, a large proportion of the US population, including researchers and scientists are wondering what his election and the new government will bring. Here, we consider the same question for emerging and re-emerging infectious diseases and their impact and control around the world.

The United States is, and has been for more than a century, one the biggest contributors of research and aid for global health. Specifically, the federal government has had an important role in combating emerging infectious diseases. The President's Malaria Initiative has been the driving force behind the dramatic reductions in malaria morbidity and mortality throughout sub-Saharan Africa in the last 20 years, contributing to the lowest rate of under-5 mortality in the region in recorded history. The Center for Disease Control, in collaboration with WHO, has been at the forefront of fighting emerging infectious diseases globally, exemplified by their critical response, supported by the US Armed Forces, in the mitigation and eventual containment of the Ebola outbreak in West Africa in 2015. In addition, funding from the federal government through the National Institutes of Health led to ground breaking and momentous discoveries, such as the vaccines against Ebola and malaria last year.

Many wonder how the new administration might change this critical role of the United States, and the federal government in particular, in global health. Based on the rhetoric that Mr. Trump has demonstrated on the campaign trail, one might suggest that we can expect a reduction in it, at least temporarily.

Many of the arguments put forward by Mr. Trump suggest that as President, he will focus on issues that are important in the United States internally, and will reduce the focus on international affairs. Such shift in emphasis typically is reflected in suggested budget allocations to Congress, which would indicate that there will be less funding dedicated to service and research on emerging infectious diseases that are important outside of the United States. Outbreaks of diseases in other countries might be seen as distractions that do not require the focus of the federal government. This could change once such outbreaks are imported into the United States and garner significant media attention, such as that happened with Ebola in 2014.

What might such reductions in focus and funding mean for emerging infectious diseases, their impact and their control worldwide?

There is definitely a potential for disruption of services to vulnerable populations, which hitherto received aid and medical support using funds from the federal government.

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BIOSECURITY SPECIALISTS

Research on diseases that are not considered priority in the US, such as most neglected tropical diseases, might not get funded, or fall behind, and drugs and vaccines being developed to treat and prevent them might get shelved. Distant areas of the world, and the emerging infectious diseases lurking there, might get forgotten and ignored, until a new pathogen, such as Zika virus, emerges from there. These reductions might put the whole world at greater risk to epidemics that only get noticed when widespread. Most importantly, the new President and his administration could further disrupt the precarious economic and political balances of our world, with potentially catastrophic consequences.

Historically, there has never been a time when there was so much support for healing people and combating emerging infectious diseases. The scientific advances of the last century, ranging from drugs to vaccines and vector-control innovations (such as genetically modified mosquitoes and Wolbachia) reduced human death and suffering due to infectious diseases to levels never before seen.

Looking back at history again, scientific research has progressed under and despite far more challenging times, such as during World War II, and in economic crises.

In addition, while the United States and the federal government has a very important role to play, there are many other key players in global health; Institutions, such as the WHO, as well as other countries (e.g. the UK, France, Brazil, India) will keep committed to these goals. Physicians, clinicians, researchers and scientists, who dedicated their life to helping patients and solving problems of infectious diseases will not cease and abandon their values and goals; they will keep working for their patients and the public. Will they have a more difficult time finding support and funding in this new era? Yes, possibly. However, finding funding has never been easy, and the community will adapt. Private funding sources, such as the Bill and Melinda Gates Foundation, will continue to support their work, even more so if there is clearly a funding gap left by the federal government.

Importantly, there will be a continued need for their work ("a fierce urgency of now"), as the risk of emerging infectious diseases will not diminish. Neither pathogens, nor vectors do not care who is in charge of the federal government, and will continue to infect people, especially those already in vulnerable conditions. We, the scientific community, owe them to not give up, and keep working for them.

The transition to a new era, especially now, with a President whose trademark is unpredictability, brings with itself a tremendous amount of uncertainty. We can't reasonably predict the decisions that the new President and federal government will make in the next 4 years, and the potential consequences of those decisions. While some of these can further exacerbate existing problems driving the emergence and re-emergence of infectious diseases, some of them might actually help. A major focus of the campaign of President Trump was to target the concerns of working class, especially rural, white Americans. Effective steps to lift them out of poverty and improve their quality of life will also protect them against infectious diseases.

Unfortunately, we cannot hope that this will be the norm. What we lack in hope, we will have to make up by re-doubling our determination, especially in the US, to our core values as scientists and physicians, to uphold the basic human right to health, regardless of the conditions under which we work. I believe the words of Martin Luther King Jr. apply to here in terms of health inequality as well: "the arc of the moral universe is long, but it bends toward justice". However long it may be, let's bend it all together!

Background: The President's Malaria Initiative

The President's Malaria Initiative (PMI) is a U.S. Government initiative designed to cut malaria deaths in half in target countries in sub-Saharan Africa. It was announced on

June 30, 2005, when President Bush pledged to increase U.S. funding of malaria prevention and treatment in sub-Saharan Africa by more than $1.2 billion over 5 years (FY2006-FY2010).
In 2008, the Lantos-Hyde Act authorized an expanded U.S. Government malaria program for FY2009–FY2013. With the launch of the Global Health Initiative and a congressional authorization of extended funding, an expanded USG Malaria Strategy (2009–2014) was developed to achieve Africa-wide impact by halving the burden of malaria in 70 percent of at-risk populations in sub-Saharan Africa, or approximately 450 million people. The Global Health Initiative, announced by President Obama in May 2009, includes PMI and other U.S. global health programs in approximately 80 countries worldwide.
Target Countries and Region
PMI is at work in 19 countries in sub-Saharan Africa and in one region in Asia—the Greater Mekong Subregion, which includes Burma, Cambodia, China (Yunnan Province), Lao People's Democratic Republic, Thailand, and Vietnam.
PMI target countries in Africa:
Angola, Benin, Democratic Republic of Congo, Ethiopia, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia, Zimbabwe

SAMPLES

During December an amazing 1207 samples were collected by staff from the 12 DHBs with 266 positives.
We received samples with extraordinarily high numbers of *Culex quinquefasciatus* larvae last month compared to the same time last year while numbers of Cx. pervigilans is relatively low. Looking at *Aedes notoscriptus*, the number of the larvae is double what it was in January 2016 whereas the adults were almost 500 specimens more. We where delighted to see so many *Coqulletidea iracunda* and we have received a confirmed private communication of *Coquilletidea tenuipalpis* from Kapiti, which is a very interesting record.

Species	**Adults**		**Larvae**	
New Zealand Mozzies	**Jan 17**	**Jan 16**	**Jan 17**	**Jan16**
Aedes antipodeus (winter mosquito)	2	Nil	Nil	Nil
Ae. australis (saltwater mosquito)	Nil	4	5	Nil
Ae. notoscriptus (striped mosquito)	579	70	962	1844
Coquilletidea iracunda	84	4	Nil	Nil
Cq. tennuipalpis	Nil	Nil	Nil	Nil
Culex astilae	Nil	Nil	Nil	10
Cx pervigilans (vigilant mosquito)	38	26	2719	4357
Cx. quinquefasciatus (southern house mosquito)	845	389	4267	1470
Opifex fuscus (rockpool mosquito)	1	1	70	65
Total	**1549**	**494**	**8023**	**7803**

INCURSIONS/INTERCEPTIONS

During January 12 suspected interceptions was received.

Please note that the interceptions of live unwanted mosquitoes are highlighted in red. Exotic species in general are highlighted in light blue.

04.01.2017: At AKL Air NZ Cargo, 4 Ogilvie Crescent, AIA 1 F *Culex sp*. was found alive on a sealed box from Hong Kong - likely NZ origin.

05 .01.2017: At AIAL, ITB 1 F *Culex quinquefasciatus,* was found alive at the MPI search bench near luggage from Fiji.

07.01.2017: At AIAL, ITB, 1 F *Culex sp* + 1 F *Cx. pervigilans* was found alive at the MPI search bench and in the MPI lab .

13 .01.2017: At : AIAL, ITB 1 F *Aedes aegypti* was caught flying around in the Risk Assessment area, Desk 9 after flights from USA / Rarotonga /Australia / Argentina have arrived.

14.01.2017: At AIAL,, ITB, 1 M *Aedes aegypti* was caught flying around in the Risk Assessment area, Desk 11 after flights from Australia / New Caledonia / Taiwan/ Fiji / China have arrived.

15.01.2017: At AIAL, ITB, 1 M *Aedes aegypti,* USA, was caught flying around in the Risk Assessment area, Desk 9 after a flight from California has arrived.

15 .01.2017: At AIAL ITB 1 F *Cx. quinquefasciatus* was caught flying around in the X-ray scanning area - NZ or foreign origin possible.

16.01.2017: At MG Marketing, Great South Road, Penrose 1 F *Cx. quinquefasciatus* was found in the MPI lab after a container of Mangos from Australia had been removed.

16.01.2017: At Air NZ Cargo, 4 Ogilvie Crescent, AIA 1 F *Cx. pervigilans* + 31 Chironomids were found in an Air Can of radioactive material from USA/ Australia. Air Can has been opened - NZ origin.

20.01.2017 : At AIAL Trans Fac. NZ Van Lines 1 dead F *Cx. pervigilans* was found on the windscreen of an imported car from the UK.

25.01.2017 : On the plane flight NZ 31 from Argentina was found a *Culex sp*. unfortunately damaged beyond recognition when caught by the flight crew.

31.01.2017 : At AIAL Trans Fac. World Fright one F *Cx. quinquefasciatus* was found in a box from the US consulate.

VECTOR-BORNE DISEASES - OUTBREAK NEWS

South Pacific

Pacific syndromic surveillance report – Week 4, ending 29 January 2017

Dengue: Vanuatu: dengue serotype-2 outbreak ongoing with 1,061 cases as of 26 January 2017 (since Nov 2016). An average of 200 new cases have been reported per week for the past four weeks: Vanuatu Ministry of Health

New Caledonia – As of 26 January 2017 there have been 431 cases since 1 Sep 2016. The number of cases reported is increasing; 62% of the cases occurring in January. Dengue serotype-1 has been confirmed. Source: Department of Health & Social Affairs, New Caledonia

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MONTHLY NOTIFIABLE DISEASE SURVEILLANCE REPORT - Dec 2016

Chikungunya fever: One confirmed case of chikungunya fever was notified in December 2016. Twenty-eight cases have been notified in the year compared to 48 in the previous year. The case was a female in the 70 years and over age group from Bay of Plenty DHB. The case reported overseas travel to India during the incubation period for the disease.

YELLOW FEVER

Angola

Fears of global yellow fever epidemic grow as vaccine stocks dwindle

One of the largest emergency vaccination campaigns ever attempted aims to stop virus taking hold in central Africa

Residents of the Kisenso district of Kinshasa, receiving yellow fever vaccine injections last. Photograph: Jerome Delay/AP

A last-ditch effort to prevent yellow fever spreading through *Kinshasa in* the Democratic Republic of the Congo and potentially developing into a global epidemic is to be launched using vaccines containing a fifth of the normal dose because the global stockpile is so low.

Yellow fever is frequently lethal, killing half of those who develop severe symptoms. It is transmitted by the bite of the Aedes aegypti mosquito, which is also responsible for the spread of Zika virus. There is a vaccine which protects people for life, but few adults had been immunised in Angola when yellow fever broke out there in December last year, and in the DRC, to where it has spread.

If it takes hold in Kinshasa, a densely packed city of more than 10 million people, it is feared that infected mosquitoes could travel beyond the central African region, which has been experiencing so severe an outbreak that vaccine stocks are almost exhausted.

In Angola, there have been nearly 4,000 suspected cases of yellow fever of which 879 have been confirmed while DRC had 68 confirmed cases and more than 2,200 suspected cases, with about 400 reported deaths in the two countries, mostly in Angola. Almost 19m doses of vaccine have been administered since January, but there are only 5m left in the emergency stockpile. The vaccine takes a year to make, so even with the handful of manufacturers working flat out, stocks cannot be replenished quickly.

"It has got us incredibly worried," said Ruairidh Villar of Save the Children, which is helping with the vaccination effort. "We've just scrambled an emergency team to DRC to support a last-ditch vaccination campaign before the outbreak reaches Kinshasa. Members of a Médecins Sans Frontières team fumigate the Yolo Sud neighbourhood of Kinshasa. Photograph: Jerome Delay/AP

Our fear is it is likely to go global if we can't stop it soon and it hits the city."
He added: "It is not as fatal as Ebola but it is pretty awful. The symptoms include fever, headache, jaundice, muscle pain, nausea, vomiting and fatigue. Some people recover within a few days but a minority become severely ill, suffering organ failure, bleeding from the eyes and death.
Some say the spread of yellow fever shows the world has not learned the lessons of Ebola.
"Yellow fever is something that we know and it is something for which we have the tools to prevent the spread, which is the vaccine," said Dr Joanne Liu, international president of Médecins Sans Frontières, which is involved in the yellow fever response. "The first cases of yellow fever were in December 2015 and confirmed in January. The first vaccination started a few weeks afterwards, but it could have been a bit more prompt.
"What does it tell us? Even if we have the best surveillance systems and tools, we still need the political will to act at local level, regional level and international level. As with Ebola, when that is not enacted, we always, always have a delay in the response. There were some critical weeks which basically allowed fertile ground for spread.
There have been reports of 1m doses of vaccine disappearing after being delivered to Angola, but the World Health Organisation denies any doses went missing. The government appears to have used the vaccine elsewhere in Angola.
"Following a review of the first round of vaccination campaigns in Angola, it was found that around 1m doses from the emergency stocks had been used to vaccinate people in other medical facilities that were not part of the initial approved emergency vaccination plans," a WHO spokesman said.
A mass vaccination campaign in western DRC in May immunised more than 200,000 people, said Heather Kerr, Save's country director there. But it did not stop the spread.
"Now we're planning a second response with the emergency health unit. We work together with them to support the government. The plan is to vaccinate in all the provinces bordering Angola because the yellow fever originally arrived from Angola," Kerr said by Skype from Kinshasa.
"Kinshasa is such a huge city. We don't really know how big it is. We think there are about 10 million people here. Some of the suburbs are very, very crowded. We are close to the Angolan border as well. There have already been cases in Kinshasa – not many, but a few – because of the density of the population and the ability of the mosquitoes to travel far.
"Fortunately for us, we're in the dry season but there are still people being bitten by mosquitoes and not everybody is sleeping under a mosquito. Time is running out to check the spread, however, because the rains will begin in September.
The emergency vaccination campaign beginning on Wednesday was one of the largest ever attempted, WHO said.
"Working with ministries of health in the two countries, WHO is coordinating 56 global partners to vaccinate more than 14 million people against yellow fever in more than 8,000 locations," it said in a statement. "The yellow fever outbreak has found its way to dense, urban areas and hard-to-reach border regions, making planning for the vaccination campaign especially complex."
The decision to give people one-fifth of the normal dose of vaccine – known as fractional dosing – was taken by WHO's strategic advisory group of experts on immunisation (Sage). There are some small studies that show it gives protection for at least a year and possibly longer.

"Protecting as many people as possible is at the heart of this strategy. With a limited supply we need to use these vaccines very carefully," said William Perea, coordinator for the control of epidemic diseases unit at WHO.

Brazil

Brazil on high alert as yellow fever threatens major cities

Jonathan Watts in Rio de Janeiro 2 February 2017

Health ministry ramps up vaccination campaign but cautions against 'disinformation', as disease spreads to areas where it is not normally found

yellow fever vaccine

As a precaution, Brazil's health ministry has expanded production of vaccines and administered 3.3m doses in Minas Gerais, where the outbreak is concentrated. Photograph: Douglas Magno/AFP/Getty Images

Brazil has ramped up an emergency yellow fever vaccination campaign as the worst outbreak in decades spreads towards major population centres, killing dozens of people and decimating wild monkey populations.

The uptick comes exactly a year after the Zika virus – another mosquito-borne disease – was declared a global health emergency, and as during the previous epidemic Brazilian authorities are struggling to calibrate an appropriate response.

Because there is a vaccine, yellow fever should, in theory, not cause as much of a panic but global vaccine stocks are dwindling, and the disease is far more deadly than Zika.

Of the 107 confirmed cases in the state of Minas Gerais, 40 ended in death. Three patients have also died in São Paulo state and one in Espírito Santo.

Although the disease has a more than 200-year history in Brazil, concern has picked up steadily in recent months as it moved to areas of the south-east, such as Espírito Santo, where it is not normally found. Doctors have so far reported 568 suspected cases in 51 counties, far more than during the last major outbreak in 2007.

As a precaution, the health ministry has expanded production of vaccines and administered 3.3m doses in Minas Gerais, where the outbreak is concentrated.

So far, it has been spread by Haemagogus and Sabethes mosquitoes in rural areas.

Monkeys have also suffered. More than 400 were found dead in Espírito Santo after farmers reported an unusual silence in the forest. Biologists warn that endangered species, such as the muriqui, could be wiped out as the vaccination only works on humans. Pedro Tauil, an epidemiologist at the University of Brasília, said the latest spread of yellow fever was different from the past both in terms of the number of cases and the range.

In a letter to the health ministry, doctors, researchers and academics described the possibility of an urban epidemic as "frightening" and warned that it may already be under way. They urged the authorities to expand the vaccination campaign, improve sanitation and enhance monitoring systems.

But views are mixed. The health ministry insists there is no need for people in the cities to rush to clinics and hospitals for a shot.

This response is in a sharp contrast to that last year for Zika, which was then a new and relatively unknown health threat that was spreading rapidly, associated with birth deformities and for which there was no vaccination.
After Zika was declared a health emergency, the government mobilised more than 100,000 troops and medical personnel to destroy mosquito breeding centres. Worldwide, hundreds of millions of dollars were committed to the search for a vaccine.
However, the worst fears have not been realised, and despite predictions of a second wave of Zika this year, the health ministry said the disease is ebbing.
Last year it killed six people, compared with 629 deaths attributed to dengue and 159 for chikungunya. In November, the World Health Organisation dropped the emergency alert for Zika

VACCINATION AND DRUG NEWS

Malaria in Africa

Mosquitoes in Africa may be growing resistant to anti-malarial drug
Drug failed to work on four patients who contracted malaria in Africa
Tuesday, January 31, 2017, 16:07 by Reuters Times of Malta
A drug widely used to cure malaria has failed for the first time in patients being treated in Britain, raising questions over whether the parasite is becoming resistant to drugs, researchers said today.
Four patients who contracted malaria in Angola, Liberia and Uganda had to seek alternative medicines after the drug they were given to combat the mosquito-borne disease failed, the London School of Hygiene and Tropical Medicine (LSHTM) said in a study.
"This is concerning and may indicate that there's a bigger story beginning to emerge in Africa," Colin Sutherland, a medical researcher from the LSHTM, told the Thomson Reuters Foundation.
"It may be an early warning that we need to change a few things," he said, calling for more research into the efficacy of the Artemether-lumefantrine drug.
Sutherland said he had heard anecdotes from colleagues in Africa who had also seen resistance by parasites to the drug, saying the cases seem to be developing in different parts of the continent slowly.
Sub-Saharan Africa carries a disproportionately high share of the global malaria burden and in 2015 was home to 90 per cent of malaria cases and 92 per cent of malaria deaths. While deaths from the disease have fallen dramatically in the past 15 years - since 2000 malaria deaths in Africa have dropped by 62 per cent - to 429,000 in 2015, there are big gaps in progress, with the poorest countries faring the worst.

Chikunguya

Drug combination effective against chikungunya arthritis in mice
February 1, 2017 Science daily
Combining a drug for rheumatoid arthritis with one that targets the chikungunya virus can eliminate the signs of chikungunya arthritis in mice in the disease's earliest stage, according to researchers at Washington University School of Medicine in St. Louis.
The findings could lead to a drug therapy for the painful, debilitating condition for which there currently is no treatment.
"We found that combining these two drugs could abolish the signs of arthritis in mice during the acute phase," said Deborah Lenschow, MD, PhD, an associate professor of medicine and the study's co-senior author, referring to the phase in the first weeks after infection.

The study is published Feb. 1 in Science Translational Medicine.

Until about a decade ago, chikungunya virus, which is transmitted by mosquitoes, mainly was restricted to East Africa and South Asia. But in recent years the virus has spread around the world. The first case originating in the Western Hemisphere was reported in late 2013, and by the end of 2015, the virus had infected an estimated 1.8 million people in the Americas.

Lenschow, co-senior author Michael Diamond, MD, PhD, and colleagues tested a panel of six rheumatoid arthritis drugs -- all approved by the Food and Drug Administration for use in patients -- on mice infected with chikungunya virus.

All six drugs work by suppressing the activity of the immune system. Although different in many ways, rheumatoid arthritis and chikungunya arthritis both involve out-of-control immune activity in the joints.

The researchers injected seven groups of mice with the virus and three days later administered one of the six arthritis drugs or a placebo to each group of mice. A week after infection -- when the mice's arthritis signs were at their peak -- the researchers measured the amount of swelling around the joints as well as the numbers of immune cells and molecules in the affected areas.

Two of the drugs -- abatacept and tofacitinib -- significantly reduced the swelling and the levels of immune cells and molecules. Importantly, the levels of live virus did not increase in the animals given the immunosuppressive arthritis drugs.

The treatment was only partially successful at resolving the arthritis, however, which led the researchers to test whether adding a human antibody against chikungunya virus could improve the effectiveness.

As before, the researchers infected mice with the virus and three days later dosed them with the arthritis drug abatacept, the antiviral drug or both. Each drug individually reduced joint swelling a week after infection. But when abatacept and the antiviral drug were used together, the joint swelling and the infectious virus in the animals' joints were eliminated.

In humans, the chronic phase of chikungunya arthritis starts three weeks after initial infection and lasts as long as the patient continues to experience joint pain, which can be three or four years. During the chronic phase, infectious virus is no longer detectable in the joints, but viral genetic material persists and may be sufficient to trigger an ongoing immune response, causing the tissue damage that patients perceive as arthritis.

The researchers found a similar pattern in the mice treated with the drug combination: By four weeks after infection, live virus was no longer present in the animals' joints, but viral genetic material remained, suggesting that the drugs had not eliminated the chronic phase of the disease.

It is possible that a treatment that reduces arthritis symptoms in the first weeks after infection could lower the chance that the disease becomes chronic, but no data has yet been published for or against the possibility. Still, any effective treatment, even if short-lived, would be a boon for chikungunya patients, who currently have no proven treatment options. Lenschow has discussed beginning a human study with colleagues in Brazil, but plans are not yet finalized.

MOSQUITO DISCUSSION AND LAW

Anti-GM mosquito group launches new campaign

By James Whittaker -January 31, 2017 Cayman Compass

After a judge rejected their bid to halt the release of genetically modified mosquitoes in Grand Cayman, a group of protesters are now seeking to fight their case in the court of

public opinion.

Kerrie Cox, an attorney with HSM Chambers, held a presentation Tuesday morning, organized by Tower Marketing, in the boardroom of the Caribbean Club.

Mr. Cox, who argued the judicial review application in the Grand Court last year, said his clients, now principally a California-based advocacy group called the Institute for Responsible Technology, remains concerned about the release of genetically modified mosquitoes in West Bay and the potential for the project to be rolled out nationally.

He said they have no plans to appeal the Grand Court decision but would instead launch a public information campaign in the hopes of persuading Cayman's leaders to take a different approach.

"This is about whether the GM technology is the most effective, the most safe alternative. That is a point for considered debate," he said.

"What we see is that there are alternative methods out there that are safer, that are more proven, that are more utilized in the world. Why shouldn't we be using them here?"

He said there were unanswered questions about the cost of the technology being used by Cayman's Mosquito Research and Control Unit in partnership with British bio-tech company Oxitec, as well as why alternatives, which worked in other countries, had not been considered.

He highlighted the "Eliminate Dengue" program, a not-for-profit international collaboration, which infects mosquitoes with a naturally occurring bacteria, Wolbachia, reducing their ability to spread disease, as a viable, safer alternative to GM mosquitoes.

Bill Petrie, the director of the MRCU, said the unit had looked at the Wolbachia technique, which he said was also a bio-technology method.

"Both are very interesting from a biological point of view. They are using modern biological methods and are fairly similar in concept."

He said the Wolbachia method had drawbacks because it involved the release of females rather than just males, which do not bite, and was not "self limiting" in the same way as the genetically modified mosquito method, where the progeny of the adapted mosquitoes don't survive to adulthood.

He acknowledged that there had been subsequent trials with the bacteria, which had eliminated some of those problems, and said it was a technique that could potentially be reconsidered for Cayman in the future. He said he was not aware of any other proven method of targeting disease-spreading mosquitoes.

"I'd like to know what these techniques are that the negative campaign is talking about, because if it is just Wolbachia, then there are a number of problems with that and it is certainly not proven and tested to the same extent [as GM mosquitoes]."

Mr. Cox said various groups, including concerned local residents and Friends of the Earth, backed the information campaign. The principal client is the Institute for Responsible Technology.

The organization is an advocacy group which has campaigned against genetically modified organisms for decades. Its founder is Jeffrey Smith, the author of two books on the alleged risks associated with genetically engineered food.

Mr. Cox said the objective of the group is not to contest the current genetically modified mosquito release, which he acknowledged is already well under way and showing positive results.

He said the aim is to put information in the public domain in the hope that government could be persuaded to consider alternative options before expanding the project.

The group has launched a website, www.gmmfree.com, which includes statistics on Zika and microcephaly, as well as information about the Eliminate Dengue program used in other countries.

Mr. Cox questioned why Cayman and Brazil were the only countries to proceed "beyond first trials" with genetically modified mosquitoes.
He said it is worth trying it before taking that "next step" of becoming the "first country in the world" to roll out the GM technology nationally.
Mr. Petrie said Brazil's rollout of the technology was far more advanced than anything that was happening in Grand Cayman. He added that Cayman had advantages compared to other jurisdictions in implementing new techniques because of its long-established mosquito unit, as well as the more manageable size of the territory.
He said the technology was proven to be safe and effective.
"It is simply a public health issue. These mosquitoes carry several different diseases, most of which have no cure, vaccines or treatment …
"This [technique] is old enough, tested enough in the lab and in the field for us to know that it is safe. The Federal Drug Administration in the U.S. has said that it is safe. This is an opportunity for us to use a relatively novel but tested technique against these mosquitoes."
The group is also seeking to persuade Cayman's lawmakers to sign up to the Cartagena protocol on bio-safety, an international treaty governing movement of GMOs between different countries.
He said the Cayman Islands is one of only 25 countries in the world currently not signed up to the treaty.

India

GM mosquito trials in India

The Hindu R. Prasad CHENNAI: JANUARY 25, 2017

Outdoor caged trials to demonstrate the efficiency of genetically modified mosquitoes to suppress wild female Aedes aegypti mosquito populations that transmit dengue, chikungunya and Zika were launched on January 23 in Dawalwadi, Badnapur, in Maharashtra's Jalna district.
Based on the results of the trials, which use the Release of Insects carrying Dominant Lethal genes (RIDL) technology, and permission from Indian regulatory authorities, Gangabishan Bhikulal Investment and Trading Limited (GBIT) and Oxitec, plan to conduct open field trials in the country.
Laboratory-based studies have already been carried out in India since 2012 by GBIT and Oxitec and these studies have demonstrated the compatibility of Aedes aegypti mosquitoes.
"The efficiency to kill offspring was over 99% and male mosquitoes imported from the U.K were able to mate with locally available wild female mosquitoes and the longevity of imported mosquitoes was the same as the wild ones," says Dr. Shaibal Dasgupta, Project Leader, GBIT, Delhi.
Since male mosquitoes do not bite humans, the release of GM males will not increase the risk of dengue, chikungunya and Zika.
"There are practical problems of raising a large number of mosquitoes needed for vector control – 100-150 [GM] mosquitoes are needed per person for months together," says Dr. Swaminathan.
Large numbers of GM male mosquitoes have to be released at regular intervals to compete with wild normal males for mating. Since the larvae die before reaching adulthood, the technology is a "self-limiting approach".
"India is looking at another alternative. We are about to sign a memorandum of understanding next month with Monash University for vector control using Wolbachia-infected A. aegypti mosquitoes," Dr. Swaminathan says.

Vector control using *A. aegypti* infected with the bacterium Wolbachia is achieved by using the life-shortening bacteria strain in both male and female mosquitoes. Uninfected wild female mosquito embryos fertilised by Wolbachia-infected males fail to develop, while embryos from infected females fertilised by infected or uninfected wild males survive. As Wolbachia is maternally inherited, the bacteria are anyway passed on to offspring. Dengue, Zika or chikunguya viruses cannot replicate when mosquitoes have Wolbachia. Unlike the RIDL technology, a feature of Wolbachia is that it is self-sustaining, making it a low-cost intervention.
The downside is that the release of even a single female mosquito infected with Wolbachia could "potentially lead to the alien bacteria spreading in the target population," says a June 2013 report in Pathogens and Global Health.

PUBLIC IMPACT

Merced students learn about mosquitoes and the diseases they carry
Merced sun star 31.1.2017
Students at Peterson Elementary School in Merced enjoyed a special science lesson Tuesday morning. Representatives from the Merced County Mosquito Abatement District visited three classrooms to teach third graders all about mosquitoes. They spoke about the diseases the insects can spread, their life cycle, and how our immune systems respond to being bitten.
Students at Peterson Elementary School in Merced received a science lesson Tuesday from the Merced County Mosquito Abatement District, which visited three classrooms to teach third-graders all about mosquitoes, according to a news release.
District representatives talked about the diseases the insects can spread, their life cycle and how human immune systems respond to being bitten, the release said.
Students had a chance to see a mosquito under a microscope and to examine samples of the pests' life stages, including the egg rafts, larvae and pupae, the release said. The presentation included an animated movie about mosquitoes in the central San Joaquin Valley, along with a booklet of puzzles and other games related to the lesson.
WE HOPE BY EDUCATING THE STUDENTS, THEY WILL SHARE THAT MESSAGE WITH THEIR FAMILIES TO HELP PREVENT THE SPREAD OF WEST NILE VIRUS AND OTHER MOSQUITO-BORNE DISEASES.

Biologist Jason Bakken on mosquitoes
Biologist Jason Bakken gave the presentation for the Merced students. He travels to schools across the county.
"Backyards are the most difficult areas for us to reach," he said. "We hope, by educating the students, they will share that message with their families to help prevent the spread of West Nile virus and other mosquito-borne diseases."
The Merced County Mosquito Abatement District has been collaborating with school districts throughout the area since 1992, according to the news release, and the members expect to reach their 100,000th student later this year.
A goal of the ongoing educational program is to spread awareness about the importance of removing standing water around homes to keep insects from laying eggs in those areas, the release said.

FDA wants public comment on mosquito regulation

BY KATIE ATKINS FEBRUARY 1, 2017 FL Keys News

The U.S. Food and Drug Administration is seeking the public's opinion on the regulation of mosquito-related products going forward.

A 30-day comment period began Jan. 19 asking about which mosquito products the FDA regulates and which ones the Environmental Protection Agency regulates.

The document open for public comment is titled "Draft Guidance for Industry 236." According to the FDA, the document "describes the FDA's understanding that mosquito-related products intended to function as pesticides by preventing, destroying, repelling or mitigating mosquitoes for population control purposes are not drugs" under federal law.

When the guidance is finalized, it continues, those products would "be regulated by EPA.... Under the draft guidance, FDA would continue to have jurisdiction over mosquito-related products ... such as those intended to prevent, treat or cure a disease."

If the "guidance" is adopted, genetically modified bugs like those produced by British biotech company Oxitec apparently would be regulated by the EPA, not the FDA as is the case now.

Oxitec says the offspring of its GM mosquitoes die almost immediately, resulting in a smaller population of Aedes aegypti, which carry Zika and other viruses.

Nimmo said Oxitec's mosquitoes are intended to control the mosquito population, not specifically prevent disease. Oxitec's proposed trial GM bug release with the Florida Keys Mosquito Control District has been regulated by the Centers for Disease Control, the EPA and the FDA Center for Veterinary Medicine, he said.

The three agencies in August 2016 together released an environmental assessment about Oxitec releasing mosquitoes in the Florida Keys that said there would be no significant impact on people, animals or the environment.

Norris has been vocal about wanting the GM bugs to be swabbed for antibiotic resistant germs before they're released. The mosquitoes are genetically engineered to need the antibiotic tetracycline to survive, he said. Since bacteria develop resistance to antibiotics after exposure to too much or too little, the surviving bacteria could become even more powerful and resistant to medicine down the road.

Wolbachia-infected mosquitoes like those created by biotech company MosquitoMate Inc., working through the University of Kentucky, are regulated by the EPA.

Aedes aegypti mosquitoes are not naturally infected with the Wolbachia bacteria. So if a female Aedes aegypti mates with a male that has Wolbachia, her eggs will not hatch, according to Dr. Stephen Dobson, founder and CEO of MosquitoMate. MosquitoMate was approved to try to reduce the population of *Aedes aegypti* mosquitoes in the Florida Keys with a trial in March.

MOSQUITO TECHNOLOGY – MICROSOFT NEWS

Project Premonition by Microsoft is recruiting mosquitoes as field biologists to predict disease outbreaks

By tech2 News Staff 31 Jan 2017

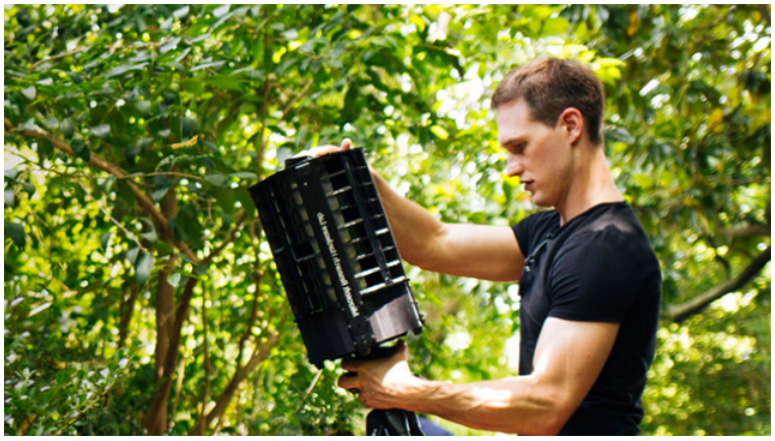
Microsoft and partners are working on an initiative known as Project Premonition to predict the outbreaks of emerging infectious diseases such as Zika, Ebola, Chikungunya and MERS.

Drones fly over areas to identify hotspots of mosquitoes. These mosquitoes are captured by robots, that extract the blood sucked by mosquitoes, which are analysed by cloud scale gene sequencers that use machine learning to identify known and unknown

diseases.

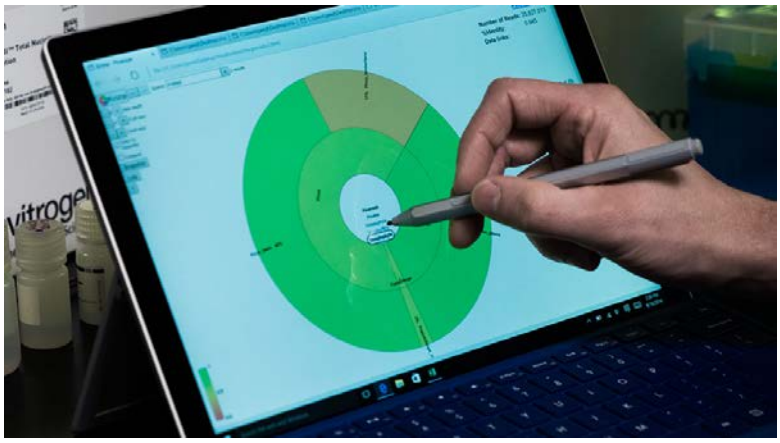
The mosquitoes suck out blood from animals which contain genetic information about the bitten animals, as well as the viruses in their blood. By automatically sampling a large number of mosquitoes, it is possible to detect pathogens before they cause the outbreaks.

Ethan Jackson, the Microsoft researcher who is heading the project says the system is providing "a plethora of data we never had before about the behavior of the insects. If we can detect these new viruses before they spread, we may someday prevent outbreaks before they begin."



The robotic smart traps. Image: Microsoft.

Mosquito hotspots change according to the weather and the population may move daily. Current methods of identifying mosquito hotspots involve satellite imagery, which does not provide data granular enough to be useful for effectively distinguishing sites with a high concentration of mosquitoes. Drones can see around structures, and their closer proximity to the service allows them to better identify hotspots. The experiments have shown that drones have great potential for other public health applications.



The genetic mixture can be explored. Image: Microsoft.

The robotic traps are automatic and smart. The wing patterns of an insect is analysed and matched with the known wing patterns of mosquitoes. If there is a match, the trapdoor closes, capturing the mosquito. The smart traps can learn over time to avoid repeating mistakes.

Capturing a large number of mosquitoes was so far a labour intensive task. Each captured mosquito is tagged with additional information, such as time, temperature and light levels at the time of capture. Gene sequencing converts the captured mosquitoes into hundreds of gigabytes of genetic data. The traps contain non genetic data about the mosquitoes as well. Image: Microsoft.

The data shows the species of mosquitoes, the animals that they have bitten and the pathogens they have encountered in the wild. New algorithms need to be developed to quickly find viruses and microbes in the data, which is similar to finding needles in a haystack. Microsoft Cloud can perform trillions of comparisons of genetic material in a period of 12 hours, an operation that previously lasted 30 days.
The Premonition Project brings together a number of cutting edge technologies including machine learning, gene sequencing, cloud computing, artificial intelligence and drones to attempt to predict outbreaks of infectious diseases before they happen.
Microsoft plans to make the data sets from the Project Premonition available to biologists, epidemiologists and computer scientists.

Malaria

Mathematical models can effectively predict and track malaria transmission
Published on January 24, 2017 at 10:00 AM · News-Medical.Net
One of the most common infectious diseases in the world, malaria causes public health problems and depresses the economy of infected areas. When untreated or treated improperly, the disease can result in fatalities. Despite impressive control measures and increased prevention techniques, which have reduced the global malaria mortality rate by 29% over the last six years, 3.3 billion people throughout 97 countries and territories still face a risk of infection. According to the World Health Organization, there were 212 million cases of malaria in 2015; approximately 429,000 resulted in death. Sub-Saharan Africa continues to exhibit a disproportionately high number of outbreaks and fatalities.
Mathematical models can effectively predict and track malaria transmission trends, ultimately quantifying the efficiency of various treatment and eradication strategies in high-risk regions. In a paper publishing in the SIAM Journal on Applied Mathematics on January 24th, Xiunan Wang and Xiao-Qiang Zhao explain a malaria transmission model that considers three distinct factors: climate, the extrinsic incubation period (EIP), and the vector-bias effect. Using data from Maputo Province, Mozambique to simulate transmission trends, the authors ultimately present a possible way to limit the disease's transmission.
Female *Anopheles* mosquitoes are responsible for the transmission of malaria, which is caused by the one-celled Plasmodium parasite. A variety of environmental factors -- including temperature, rainfall, humidity, and wind patterns -- significantly impact the maturity, reproduction, and longevity of mosquitoes. The mosquito life cycle, in turn, directly affects the parasite's survival. "Climate factors have great impact on mosquito life cycle and parasite development," Wang said. "It becomes particularly important to consider climate impact on malaria transmission in light of global climate change." For example, an increase in temperature lessens the number of days necessary for breeding and quickens formation of spores in the parasites. Both of these occurrences can increase transmission.
The EIP is the length of time a parasite needs to fully develop in a mosquito and migrate to its salivary glands in preparation for transmission. Female mosquitoes live anywhere from three to 100 days, and a typical EIP ranges from 10 to 30 days. "Only those mosquitoes that live long enough to survive the EIP can transmit malaria," Wang said. They are infectious for the rest of their lives. Additionally, previous research confirmed that malaria-infected humans attract more mosquitoes due to chemical substances emitted by the parasite. Therefore, it seems that mosquitoes prefer infected hosts rather than susceptible ones -- a skewed probability of infection known as "vector bias."
Wang and Zhao adopt prior malaria transmission models in their own vector-bias model, which utilizes the basic reproduction ratio R0 and incorporates the aforementioned three

factors. "The basic reproduction ratio serves as a threshold parameter in determining the global stability of either disease-free or endemic periodic solutions for this period and time-delayed system," Wang said. She and Zhao treat all parameters related to humans as constants but assume that mosquito-related parameters are periodic functions, thus incorporating seasonality into the model. Two additional parameters quantify the vector-bias effect, the probability of a mosquito biting an infected or susceptible human. And a constant time delay represents the EIP. The authors apply their model to published data from Maputo Province and simulate transmission trends in the area; the simulated curve matches the real-data curve for transmission. "The numerical simulations for monthly new malaria cases are well consistent with the real data from Maputo Province," Wang said. "This suggests that such a model may give a more accurate prediction of the disease transmission."

Based on their findings of the model's global dynamics, Wang and Zhao discover that malaria will continue to exhibit seasonal fluctuation in Maputo Province in the coming years. More importantly, they show that a shorter EIP directly corresponds with increased malaria transmission. Thus, extending the EIP of mosquitoes could help control the disease and limit its spread. Although this is currently not easy, especially as climate change causes global temperatures to slowly rise, it is certainly possible. "Medical researchers may develop some drugs with such an effect that once a mosquito bites a malaria-infected patient who takes the drugs, the EIP of parasites in that mosquito will be prolonged," Wang said. The development of these EIP-extending drugs could lead to a decrease in the spread of malaria and its dire effects.

MOSQUITO SCIENCE

Zika

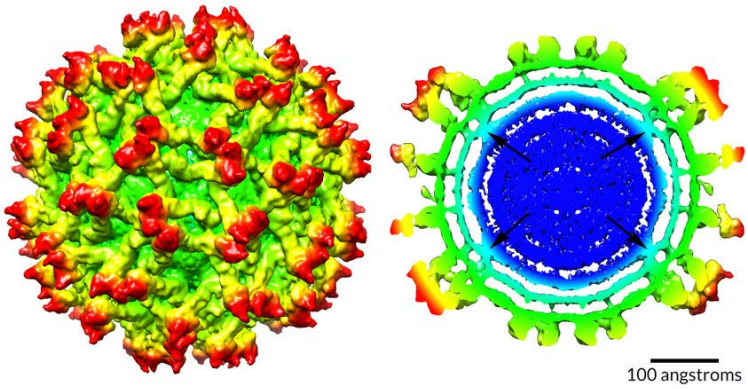
Map of Zika virus reveals how it shifts as it matures

New look at the immature virus could hint at how Zika becomes infectious

BY MEGHAN ROSEN 7:00AM, JANUARY 31, 2017 Science News

Cryo-electron microscopy map of immature zika virus

ZIKA PEEK Inside an immature Zika virus (interior shown at right), the protein and RNA core (dark blue) contacts the inner layer of the viral membrane (aqua, see arrows). A surface view (left) shows proteins that make up the exterior (red, yellow and green). V. PRASAD ET AL/NATURE STRUCTURAL & MOLECULAR BIOLOGY 2017



Before an immature Zika virus becomes infectious, it does some major remodeling.

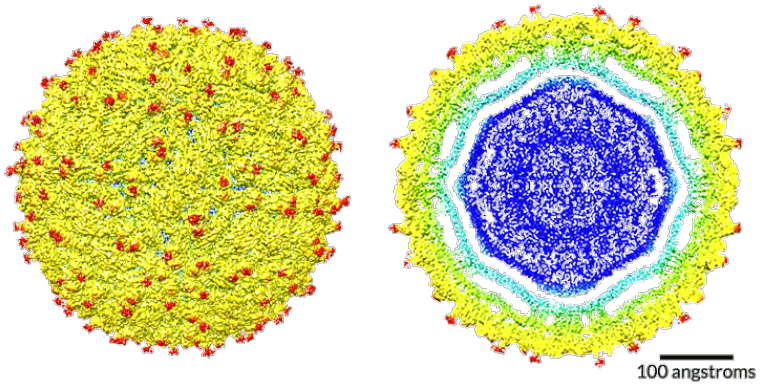
In a fledgling virus particle, the inner protein and RNA core (shown in dark blue above, right) forms bridges to the membrane layer that surrounds it. As the virus matures, the core shuffles around and the bridges melt away (below, right).

It's the first time scientists have seen such rearrangement in the core of a flavivirus, the group that also includes the viruses that cause dengue, West Nile and yellow fever, says virologist Richard Kuhn of Purdue University in West Lafayette, Ind.

Scientists don't know why the immature Zika virus reshuffles its insides, Kuhn says — perhaps it helps the maturing virus become infectious. But that's the next big question to answer, he says. If blocking the reorganization somehow made mature viruses

harmless, scientists would have a new clue about preventing Zika infection. Kuhn and colleagues' map of the immature virus's structure, published online January 9 in Nature Structural & Molecular Biology, could offer other hints for thwarting Zika.

With a technique called cryo-electron microscopy, the team could see three-headed protein spikes (shown in red) studding the surface like some kind of medieval weapon, and could even distinguish the separate layers of the membrane (aqua) that encloses the core. (The maps are radially colored; colors change as distance from the core increases.) Outside the membrane lie surface proteins called envelope, or E, proteins (green and yellow) that help the virus sneak into cells.



OUTER VIEW The core (dark blue, right) of a mature Zika virus is completely separated from the inner membrane (aqua), indicating that the virus reshuffles its insides as it matures. V. PRASAD ET AL/NATURE STRUCTURAL & MOLECULAR BIOLOGY 2017

Last year, Kuhn's team reported the structure of the mature Zika virus (SN: 4/30/16, p. 10). The new work offers another illuminating peek at Zika — a baby picture, of sorts.

Chikungunya

Johns Hopkins researchers uncover mechanism in chikungunya virus that controls disease severity

Published on January 31, News-Medical.Net

Researchers led by the Johns Hopkins Bloomberg School of Public Health have identified a mechanism by which the chikungunya virus infects healthy cells and controls how severe the disease it causes will be, a mechanism they believe can be found in a number of other related viruses for which there are no treatments or licensed vaccines.

The findings, published Jan. 30 in the Proceedings of the National Academy of Sciences, could be a first step toward developing drugs to treat or prevent diseases caused by alphaviruses (such as chikungunya) and coronaviruses (such as SARS).

"We feel we have now identified a fundamental mechanism which the chikungunya virus uses during infection that determines how dangerous the chikungunya infection will be," says study leader Anthony K. L. Leung, PhD, an assistant professor in the Department of Biochemistry and Molecular Biology at the Bloomberg School. "Now we need to use this information to help us find drugs or develop vaccines to stop the virus."

"The results of these studies open a whole new area of investigation into how cells control virus infection and how viruses that cause severe disease can circumvent that control," says Diane E. Griffin, a professor in W. Harry Feinstone Department of Molecular Microbiology and Immunology at the Bloomberg School. "We will now be working to identify the proteins targeted, how they work and how we might interfere with these mechanisms."

For the research, Leung, Griffin and their colleagues, using neuronal cells and mouse models, uncovered a fundamental mechanism that determines how dangerous the chikungunya infection will be. This mechanism depends on a class of conserved protein domains -- called macrodomains -- that are found in several viruses that cause human disease, such as hepatitis E virus, rubella virus, all coronaviruses and all alphaviruses.

They discovered an activity in the macrodomain that breaks the bond between proteins and a chemical group called ADP-ribose, which is believed to have antiviral properties. This bond-breaking ability is critical to enabling viruses to replicate in infected cells.
To learn this, the researchers created versions of the chikungunya virus with mutations that prevent the virus from being able to remove ADP-ribose groups from proteins. Without this ability, the virus did not replicate and could not cause an infection. If a different mutation was made that allowed for some, but not a lot of, enzymatic activity, the virus would replicate less well in the neuronal cells and in the mice. For example, the mice that were infected with the standard virus died in three days. When the researchers dialed back the enzymatic activity in the virus and then infected the mice, the rodents were still alive by the end of the experiments (10 days). Therefore, the less bond-breaking ability the macrodomain contains, the less infectious the virus. Anything that can interfere with the bond-breaking ability of the macrodomain may ultimately be a target for a drug to fight the virus.
"This shows us that the virus must break the bond between protein and ADP-ribose to cause infection - which gives us a road map for how to keep infected cells intact and healthy," Leung says.
Leung says the virus only removes the ADP-ribose groups from two categories of protein amino acids: aspartate and glutamate. This suggests that those amino acids originally linked to ADP-ribose may have some antiviral properties, he says.
The macrodomain in the chikungunya virus is similar in all alphaviruses, which encompass several viruses that have no cure or treatment such as Venezuelan equine encephalitis virus (which U.S. officials consider a potential bioterrorist threat) and the Mayaro virus, which some scientists have called the "next Zika." It is also similar in all coronaviruses, which includes severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome Coronavirus (MERS). Finding a treatment for one, could greatly improve the ability to treat or prevent the others. It could also assist with outbreaks of new pandemics that could be from one of these or related viruses.

Malaria

Why mosquitoes don't die of malaria

Cosmos 23.1.17

The insect's red blood cell equivalent fights off the disease-causing parasites. Finding out how could help develop new malaria drugs, writes Anthea Batsakis.
The risk of malaria looms over nearly half the world's population and kills hundreds of thousands of people each year. But how do mosquitoes – which transmit the parasites that cause the disease – survive?
A team from the National Institute of Allergy and Infectious Diseases in the US has found how. They uncovered a component of a mosquito's immune system that allows the insect to withstand malaria-causing parasites.

Their work, published in Science Immunology, could lead to new ways of combating malaria transmission – and even help better understand chronic inflammatory diseases.
"The exciting thing about studies of this nature is that they start to delve into the complexity of the relationship between parasites and mosquitoes," Cameron Webb, a clinical entomologist from the University of Sydney in Australia and who was not involved in the study, says.
"When we get into these really fine details, that's when we start to identify weaknesses that can be exploited."

Malaria is caused by single-celled Plasmodium parasites. When a person is bitten by an infected mosquito, the microbe makes its way through the host's bloodstream to the liver where it replicates, returns to the blood and infects red blood cells.
But mosquitoes don't have red blood cells – their blood is a somewhat colourless fluid containing the blood cell equivalent called haemocytes – so the parasites instead escape to the mosquito's saliva from the gut.
In an interview with the American Association for the Advancement of Science, study co-author Carolina Barillas-Mury says she and her colleagues knew from indirect evidence that haemocytes were somehow involved in the battle against the parasites.
But details were few and far between.
So she and her team took Anopheles gambiae, a sub-group of mosquitoes responsible for most malaria cases in Africa, and, using a fluorescent dye, tracked their behaviour in the presence of Plasmodium.
They saw the haemocytes shed specks of plasma membrane known as microvesicles. This activated a cascade of proteins which targeted and destroyed the infection-causing microbes.

'PARASITES ARE MASTERS OF DECOY. WE CAN TAKE ADVANTAGE OF A SYSTEM ALREADY IN PLACE.'
So how does this information help us?
First of all, the researchers noticed that the haemocytes behaved similarly to the vertebrate immune system when under threat. For instance, they triggered inflammation, just like our cells do.
And when the process is chronically activated in humans, it can lead to inflammatory diseases such as atherosclerosis and rheumatoid arthritis.
Barillas-Mury says these findings will help better understand how chronic inflammatory diseases occur, perhaps leading to new prevention therapies that target the source of the problem.
Secondly, by learning what keeps the mosquitoes blind to a parasite invasion, the researchers can develop what's known as a "transmission blocking vaccine".
Barillas-Mury says malaria parasites harbour a gene that renders them invisible to mosquitoes.
"Parasites are masters of decoy. We can take advantage of a system already in place – the mosquito has all the tools to kill the parasite, but the parasite is blocking the mosquito."
Genetic modification can make the parasite visible to the mosquitoes' immune system, allowing them to kill the parasites once infected instead of spreading it to humans.
Webb says malaria is primarily tackled by eradicating malaria-carrying mosquitoes, but this could have consequences on the wider food web.
Genetically modifying mosquitoes, though, might work on a larger scale.
"You can avoid that debate if you don't actually eradicate the mosquito, but change them to a point where they're no longer transmitting those parasites," Webb says.

MOSQUITO ECOMOMY

EXASOL and PATH collaborate to support Zambian government's campaign to eliminate malaria

News-Medical.Net February 2, 2017

Exasol, a high-performance in memory analytic database developer, and PATH, an international nonprofit organization and global leader in health and innovation, today

announced a partnership to support the Zambian government's ambitious campaign to eliminate malaria by 2020.

"Data analytics is often discussed as a way for business to derive value from the data they hold, whether that is to increase profitability or serve customers better," said Aaron Auld, CEO, EXASOL. "But data can also unlock important information that can help organizations such as PATH improve the way they address Malaria. This ultimately shows the value of data in saving lives."

EXASOL joins a transformative partnership—Visualize No Malaria—between the Zambian Ministry of Health, PATH, Tableau, and technical partners including Alteryx, Mapbox, DataBlick, Twilio, DigitalGlobe, and Slalom.

EXASOL's contribution—access to the EXASOL database in the cloud on Amazon Web Services—enables the Visualize No Malaria team to perform highly complex queries of not just "big data" but truly "massive data" with speed that enables almost instant rendering, allowing for real-time analysis.

Allan Walker, a volunteer with expertise in data analytics and visualization, is helping PATH's#visualizenomalaria team create analyses that estimate where malaria cases will be more likely to occur. The analyses aim to find the relationship between the mosquito vector and the human carriers of the disease.

The team's current project involves loading complex geospatial data into the EXASOL database to model geological features in Zambia's Southern Province such as elevation and slope and hydrological features such as topographic wetness and stream power. This shows whether the land is dry or wet, and if water is still or moving.

The team also regresses time-series models of population density and mobility, and meteorological models of precipitation and temperature, to establish a relationship with the epidemiological data. Once honed, the analyses could be used by Zambian decision-makers to focus on probable malaria outbreak areas and quickly respond to new cases.

"EXASOL simply puts the 'snap' and 'zing' back into Tableau projects, regardless of scale, effortlessly returning queries of billions of rows of data," Walker said. "It has back-end database power and speed that Tableau developers require and users in the field will appreciate."

Jeff Bernson, senior director of PATH's Results Management, Measurement and Learning Department, said:

If you're trying to inspire data use among counterparts and decision-makers, watching a spinning wheel and waiting for dashboards to render can often be a deal breaker. Partnering with EXASOL and Tableau is helping us tackle challenges with data access and speed. It truly aligns with our focus to develop and apply transformative innovation in low-resource settings.

"It has been a great pleasure to support PATH in this fantastic initiative," Auld continued. "Furthermore, we have an enormous amount of respect for Allan and his team for their dedication and hard work around the program. We are grateful to Jeff and the PATH organization for their decision to engage with us, and we look forward to continuing to make a contribution towards supporting PATH and the Zambian government in their efforts."

For 40 years, PATH has partnered with the private sector, governments, and civil-society institutions to create market-based solutions that change the course of disease, transform health, and save lives. By convening strategic partnerships, PATH touches 150 million lives a year around the globe through projects including this one supporting Zambia's plan to eliminate malaria.

DID YOU KNOW?

The plant that smells like 'sweaty socks': Unusual orchid mimics human body odor to attract mosquitoes

By Richard Gray for MailOnline 31 January 2017

A species of orchid has been found to produce a smell like sweaty socks to trick mosquitoes into pollinating it - and it could lead to new ways of protecting humans from the biting insects.

Biologists have discovered the plant, known as the small northern bog orchid, mimics the scent of human body odour to attract the mosquitoes to its flowers.

This makes the tiger mosquitoes - the ravenous Asian species that has invaded much of Europe and North America - into thinking they have found a tasty snack.

Researchers have found this orchid produces a smell like sweaty socks to trick mosquitoes into pollinating it

When the insect follows its nose into the plant is emerges with a blob of orange pollen on its head.

The trick cheats the mosquito of a bloody meal but means the orchid's pollen is carried to the next plant the hungry mosquito visits. Mosquitoes are normally considered to be poor pollinators for most plants, but a few orchids seem to rely on them to spread their pollen around. Just 200 of the 3,500 species of mosquitoes on the planet feed on human blood. Only the females bite when they are developing eggs while males feed exclusively on nectar.

A mosquito feeding on a small Northern Bog Orchid (Platanthera obtusata) (Mark Moffett/Minden Pictures/Corbis)

Dr Jeff Riffell, a biologist at the University of Washington who has led the research, said the discovery has allowed his team to identify specific scent molecules that attract the biting mosquitoes and could lead to new ways of protecting people from the insects.

He said: 'These orchids are inconspicuous and blend with the surrounding foliage.

'Despite being relatively cryptic, these orchids attract a diversity of tiger mosquitoes, raising the question of how the orchids attract the mosquitoes.

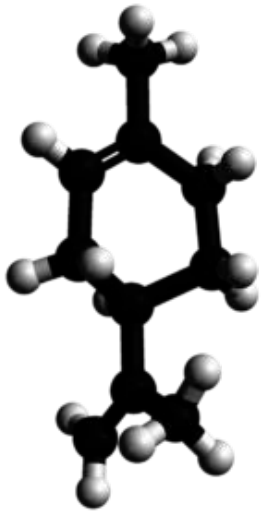
'We found that the orchids emit a scent comprised of common blood-host volatiles. Smell your armpit - these plants are emitting that same chemical.' Dr Riffell and his colleagues presented their findings at the annual meeting of the Society of Integrative and Comparative Biology in New Orleans earlier this month.

Sweetcorn – amaizing attraction for malaria mosquitoes

Srimathy Sriskantharajah 27 Jan 2017 BugBitten

Maize pollen, an important food source for mosquito larvae, produces chemicals that encourage egg- carrying Anopheles arabiensis to lay their eggs in maize fields. Pollen from maize or sweetcorn is known to be an important food source for the larvae of Anopheles arabiensis, and consequently cultivation of the crop can increase malaria transmission in endemic areas. However, maize is an economically important food crop and farmers cannot just stop growing the crop because of the malaria risk. Therefore, it is important to understand how the interaction between maize and the mosquito works…and then disrupt it.

Mosquitoes take olfactory cues from plants and microbes when determining where they lay their eggs (oviposition). In 2016, Betelehem Wondwosen and colleagues identified volatiles produced by rice plants that are involved in attracting gravid (egg-carrying) mosquitoes to rice fields. They found rice headspace (the air immediately above the rice plant) extracts, which included compounds such as ß-caryophyllene, decanal, sulcatone and limonene, attracted mosquitoes but only at medium doses. High doses of the headspace extract put the mosquitoes off.



Limonene structure

In their paper published in Malaria Journal this week, Betelehem Wondwosen and colleagues from Ethiopia and Sweden, looked specifically at how gravid mosquitoes are able to detect where the maize fields are. They found that the gravid mosquitoes took their oviposition cues from headspace volatiles made by the pollen. The volatiles specifically attract gravid mosquitoes through
smell to them and then stimulate them to lay their eggs. They identified five biological compounds in the headspace extract: benzaldehyde, nonanal, p-cymene, limonene and α-pinene.

Now that we know what the mosquitoes use to hone in on breeding sites, we can use this information against the mosquito. The five-compound extract identified by Betelehem Wondwosen in the Malaria Journal paper can be synthetically produced. At the very least, using the synthetic odours would confuse gravid mosquitoes, so they don't lay their eggs in maize fields (and a ready source of food for their larvae) but potentially the synthetic compound can be used in malaria elimination programmes. The synthetic compound can be used to lure gravid mosquitoes to traps. Whats more, farmers can continue to grow maize for food.