NEW ZEALAND BIOSECURE

BORDER HEALTH NEWSLETTER – November 2015

WELCOME!

Hi everybody,

Last week 35 New Zealand events kicked off the message around the world with 785,000 People in 175 Countries at 2300 Events to show world leaders and delegates in Paris that the world is paying attention just before the 21 Annual Conference of the Parties COP21 to the United Nations Framework Convention on Climate Change (UNFCCC), being held in Le Bourget, from November 30 to December 11.

PEOPLE'S CLIMATE MARCH NZ 2015

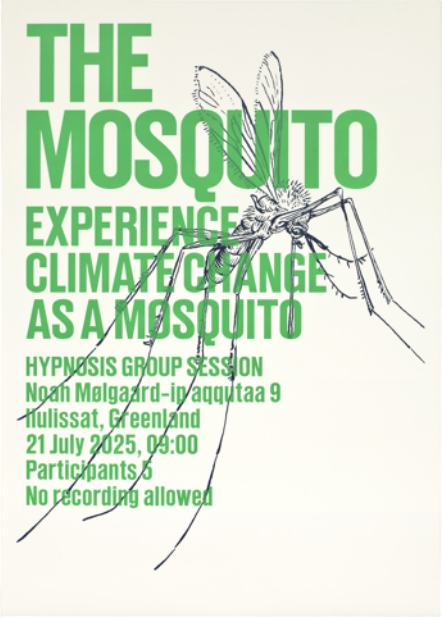
What's that got to do with our favourite bloodsucker?

Simply this: The existence and activity of mosquitoes and mosquito-borne diseases is strongly linked to temperature. In Zimbabwe, for example, the prevalence of malaria is determined by altitude, which in turn determines temperature.

But global warming may not just cause mosquitoes to proliferate; it may also allow malaria to spread. The malaria parasites cannot develop below the 16 degree C winter isotherm (line on a map connecting points with the same temperature). But if, as predicted, global warming raises winter temperatures more than summer ones, we could see a dramatic expansion of range for malaria.

The effect of global warming on dengue is no more encouraging, according to a recent journal article: "Slightly higher temperatures within the range of mosquito viability lead to more infectious mosquitoes that bite more frequently"

PICTURES OF THE MONTH



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

SAMPLES

During November 658 samples were collected by staff from 12 DHBs with144 positive. Numbers are increasing rapidly with the temperature. Especially *Culex pervigilans* has been recorded twice as much as last month. But also compared to last year the occurrence of our local mosquito is impressive. While *Opifex fuscus* is always stable *Aedes notoscriptus* shows an upward trend too. Looks as if we'll get a busy season.

Species	Adults		Larvae	
New Zealand Mozzies	**Nov15**	**Nov 14**	**Nov 15**	**Nov 14**
Aedes antipodeus (winter mosquito)	4	Nil	Nil	Nil
Ae. australis (saltwater mosquito)	Nil	Nil	Nil	4
Ae. notoscriptus (striped mosquito)	54	1	2002	1225
Coquilletidea iracunda	3	Nil	Nil	Nil
Coq. tennuipalpis	Nil	2	Nil	Nil
Cx pervigilans (vigilant mosquito)	47	2	2405	1050
Cx. quinquefasciatus (southern house mosquito)	4	7	72	34
Opifex fuscus (rockpool mosquito)	Nil	Nil	17	30
Total	**112**	**12**	**4496**	**2343**

INCURSIONS/INTERCEPTIONS

We have had three interceptions in November,:

2.11.2015: One live chironomid was found in a container of rolled oats at Hubbards foods Auckland.

5.11.2015: One live *Culex pervigilans* was found at AIAL airport, ITB, MPI desk.

26.11.15: Two dead *Culex quinquefasciatus* were found in a container with melons from Brisbane at Turners & Growers, Auckland.

NZBEL XMAS OPENING HOURS

The lab is open throughout the December and January, however it will be **closed** on following Stat days days:

25 and 28th December 2015 Christmas and Boxing Day

1st and 4th January 2016 New Year's day and News Years Holiday

The **oncall entomologist will be available** as usual 24/7 over the festive period including statutory days above: 021 522 476. We hope you have a Merry Xmas and Happy New Year!

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MOSQUITOES AND CLIMATE CHANGE DISCUSSION

Arctic

Rudolph the mosquito-bitten reindeer and climate change

World real matters WNG.org

By JULIE BORG Posted Dec. 1, 2015,

Santa's reindeer may be in big global warming trouble if the predictions of researchers at Dartmouth's Institute of Arctic Studies prove true. According to the study, warming arctic temperatures will produce increasing swarms of blood-thirsty mosquitoes earlier in the season, allowing them more time to feast and flourish, especially on vulnerable caribou calves.

In the arctic, mosquitoes typically hatch in May, become adults in mid June and die by late July. But, according to computer models, the researchers predict global warming will cause the cycle to begin earlier, creating a longer overlap between mosquito biting season and reindeer calving, which usually takes place around June 3. The immobility of the herd during calving time, coupled with more days to feast on baby reindeer will result in mosquito proliferation, they warn. And, mosquito-harassed reindeer likely would seek insect-free places, such as snow patches at higher elevations. But such areas offer a more limited food supply, which may result in decreased calf production and increased reindeer mortality, the researchers said.

Creative Commons/Gary McNair A mother reindeer and calf.

This bad news would affect far more Arctic residents than just the "jolly old elf." According to a 2013 British parliamentary report, indigenous Arctic people often rely on reindeer for food, clothing, and income. Declining herds would present "serious challenges to human health and food security and possibly the survival of some cultures."

But expert opinions about what is happening in the arctic differ widely. Scientists use the sea ice extent, the surface area covered by ice, as one barometer to measure global warming. But while some experts claim the arctic sea ice extent is the fourth lowest in the past 36 years, others say it is expanding.

"Everybody thinks [measuring ice] is very simple: 'Oh, you take a satellite image and measure the area.' It doesn't work that way. You can have water on top of the ice, and the satellite doesn't see that as ice, it sees it as water," Tim Ball, former climatology professor at the University of Winnepeg, told Dateline.

Satellite systems also can't distinguish what percent of measurements are water and what percent are ice if the ice is broken up, Ball explained.

NASA satellite instruments reveal polar ice caps have not receded at all since scientists began measuring them in 1979, James Taylor, senior fellow for environment and energy policy at the Heartland Institute, wrote in a Forbes op-ed.

Africa

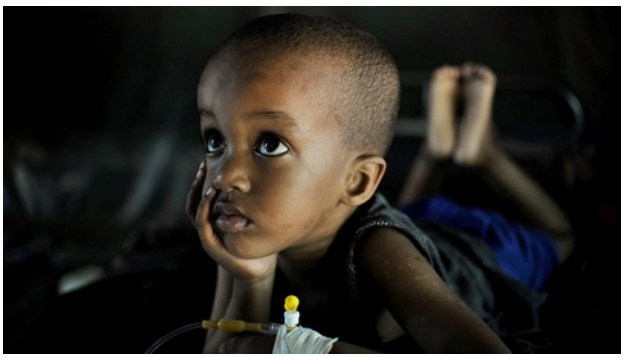
Pope Francis said 'more worried about mosquitoes' than terrorists in Africa—here's why he's right

29 NOV 2015 M&G AFRICA REPORTER

The mosquito, already the world's deadliest, is set to further thrive if global warming is not reined in. A deal in Paris could yet save the day.

POPE Francis is on a six-day tour of Africa, which Western media rushed to dub the riskiest of his papacy so far. Their justification was that this trip takes him to Kenya and Uganda, which have suffered attacks from Islamist militants Al-Shabaab, and to the Central African Republic which has struggled to come to grips with sectarian conflict.

Francis however shrugged off the safety fears, joking that he was "more worried about the mosquitoes".



He was also very serious: the mosquito, despite its tiny frame, belongs to the deadliest animal family in the world. It has had more impact on African history than many realise. It was instrumental in defining mass movements of groups in Africa, and indeed the story of colonialism would have been markedly different today had colonisers been able to come to terms with malaria.

Mohammed, suffering from malaria, recovers in clinic in Somalia's capital, Mogadishu. (Photo/AMISOM/Tobin Jones/Flickr).

But Francis' quip also comes at a particularly apt time—a major meeting on climate change opens next week in Paris, and the pope has made the environment a major pillar of his papacy. In Kenya he delivered a stark message warning it would be "catastrophic" if an agreement is not reached at the UN climate summit which opens on Monday.

Mosquito-borne diseases are expected to increase with climate change, and could between 2030 and 2050 result in an additional 60,000 deaths per year, according to the World Health Organisation (WHO), contributing to the total of additional 250,000 deaths a year expected to be caused by global warming.

Malaria already kills around 800,000 people per year.

Global warming could also facilitate the spread of infectious diseases which depend on carriers such as mosquitoes, according to interviews carried out by news agency AFP.

WHO said that climate change is likely to lengthen the transmission seasons of these "vector-borne" diseases—which are spread by a vector, or carrier—and to alter their geographic range.

Mosquitoes also spread the deadly dengue fever, and some studies suggest that global warming could lead to two billion more people being at risk from the disease by 2080.

Ahead of the COP 21, as the UN meeting is called, there are other grim health impacts—both direct and indirect— that climate change could cause.

Patrice Halimi, the secretary general of France's environmental health association, said it is a multi-faceted issue.

"Like any other slow-onset disaster, there is not one cause that leads to one effect," he said. "It's a series of events."

Halimi said it is not necessarily global warming itself that would lead to a cholera epidemic, but warmer temperatures conducive to deadly outbreaks.

USA

Climate change spurs disease fears

Warmer winters increase risk of disease

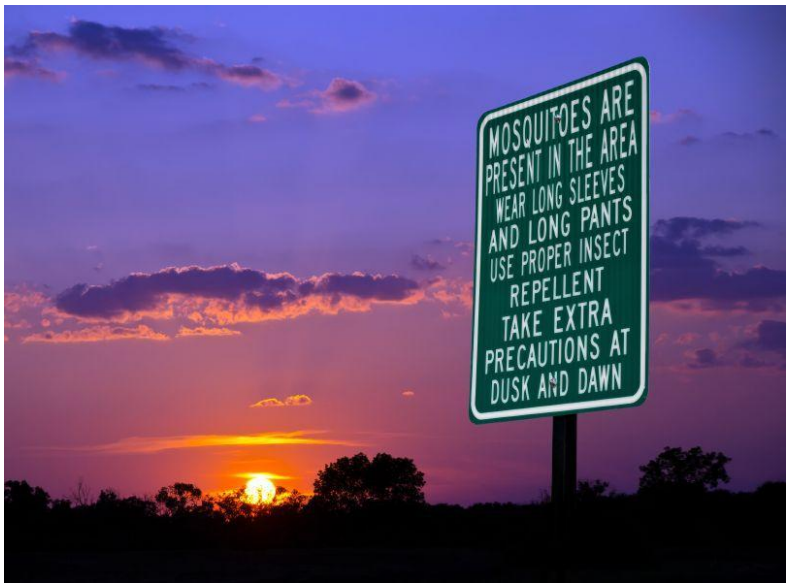
By Joby Warrick WASINGTON POST NOVEMBER 28, 2015

DALLAS — Winter was oddly mild in northern Texas in 2012, a year that saw few snowflakes and barely any ice. When the cold failed to show up, the spring mosquitoes arrived in droves, carrying disease.

The insects multiplied during an unusually muggy May, when temperatures hit the 90s and then stayed there. On June 20, Dallas recorded the season's first case of West Nile virus. By late August, there were nearly 400.

Nineteen people would die in the greater Dallas area in the worst West Nile outbreak in US history. The 2012 epidemic alarmed health officials and triggered multiple inquiries into the possible causes. One finding would ring ominously in a region grappling with impacts of climate change: When it comes to insect-borne disease, warmer is worse.

"With warmer weather, mosquitoes fly more and bite more. And warmth amplifies the infectivity and replication of the virus," said Robert Haley, director of epidemiology at the University of Texas Southwestern Medical Center and co-author of a major study on the 2012 outbreak.



LEENA ROBINSON

The Dallas epidemic underscored long-held concerns about a facet of climate change that strikes closest to home for millions of people across the US heartland. Many of the predicted consequences of global warming — such as rising sea levels and more powerful storms — can seem remote, separated by time and geography from the daily concerns of most Americans.

But scientists say even a relatively modest rise in temperatures can trigger substantial changes within the invisible ecosystems in which pathogens and hosts interact. The results can be extraordinarily difficult to predict, but a preponderance of evidence suggests that a warmer United States will see greater numbers of insect pests and new waves of insect-borne disease.

Emissions treaty

Starting Monday, negotiators from more than 190 countries will meet in Paris in hopes of cementing a treaty that will reduce emissions of greenhouse gases blamed for climate change. The ultimate goal is to prevent temperatures from rising by more than two degrees Celsius (3.6 degrees Fahrenheit) above historical norms, a level that some scientists believe is the maximum that Earth can sustain without major ecological disruption.

But warming temperatures already appear to be bringing new disease threats as pests and

pathogens normally associated with the tropics march steadily northward. Some, like the mosquito-borne chikungunya virus and dengue fever, had rarely been seen on the US mainland. Others, such as the now-endemic West Nile virus, are showing up earlier in the year and lingering longer as winters grow steadily milder.

Health departments throughout the United States are already preparing for the onslaught, stepping up monitoring of insect carriers, or vectors, for the presence of West Nile and other viruses. Major Southern cities such as Dallas have introduced community-wide pesticide spraying for the first time in nearly half a century.

US officials and scientists say the United States is well equipped to respond to new disease outbreaks compared with other parts of the world. But many also acknowledge the possibility of surprises, even at relatively modest levels of warming.

‘‘Biology is notoriously nonlinear and full of thresholds beyond which all hell breaks loose, at least for a while,’’ said Daniel Brooks, an evolutionary biologist and senior research fellow at the University of Nebraska’s Manter Laboratory of Parasitology.

Taking precautions

Each week, Dallas County health workers set out scores of small traps in neighborhoods across the city and its suburbs, looking for infected mosquitoes that could offer an early warning about a possible disease risk.

The small traps are baited with a homemade broth called ‘‘stinkwater’’ that replicates the odors of the fetid swamps preferred by females for laying eggs. A small fan sucks the insects into the trap’s mesh net, which in a week’s time will catch scores or even hundreds of live insects.

At the lab, the mosquitoes are killed and then segregated by species. Then vials of dead mosquitoes are ground up and tested genetically for traces of West Nile virus. If mosquitoes from any neighborhood test positive, county officials return in their white pickup trucks and unleash a fog of pesticides to kill any insects nearby.

The spray trucks were initially controversial; some Dallas residents feared the chemicals more than the disease. But after 19 people died of West Nile in a single season, county officials felt compelled to act. Budgets were adjusted to accommodate dramatically higher levels of insect monitoring, and spray trucks returned to county streets for the first time since the 1960s.

Local officials believe they are better equipped to detect and prevent a potential outbreak than they were three years ago, but they also acknowledge that the battlefield is changing. Long-term climatic data shows that Dallas, like the rest of the country, is warming, with shorter and generally milder winters. Fewer hard freezes means virus-infected mosquitoes have a greater chance of surviving the winter. And West Nile itself, which passes from birds to mosquitoes and then to humans, can begin to replicate and spread early in the season.

Whether a major outbreak occurs depends on multiple factors beyond weather. But studies have shown that the 2012 epidemic was enhanced by a warm-weather pattern that was ideal for the spread of the virus.

‘‘We had a very warm winter — the fewest freeze days — and a period of drought punctuated by major rainstorms that filled up the culverts,’’ said Haley, the UT-Southwestern epidemiologist whose 2013 study on the causes of the epidemic was published in the Journal of the American Medical Association. ‘‘So, droughts alternating with rain, forcing the mosquitoes and birds to congregate, then warm temperatures and a hot, early summer — those were perfect conditions.’’

‘‘Climate change is broadening the tropical latitudes, and Texas is going to be tropical eventually,’’ Haley said. While the widespread return of major killers such as malaria are

unlikely in an advanced Western country, he said, ‘‘you can roughly predict that tropical diseases will be part of our future.’’

Mosquitoes and more

But mosquitoes are not the only pests that thrive in warmer climates. Numerous recent studies have documented shifts in the habitats of other disease carriers.

Ticks, notorious for spreading Lyme disease as well as Rocky Mountain spotted fever, are expanding their range into parts of Canada. In the United States, milder winters mean shorter hibernations and booming tick populations in the spring and summer.

Southern states are seeing a resurgence of Chagas disease, a sometimes fatal parasitic infection spread by the beetlelike Rhodnius prolixus.

Behind each new disease occurrence is a multitude of contributing factors. Disease-carrying pests also can be spread through international travel and immigration. And climate change can sometimes limit, rather than expand, the ranges and life spans of certain insects and the microbes they carry, epidemiologists say.

But there is little doubt that a warmer climate will introduce new disease threats, said the University of Nebraska’s Brooks, and even a country with a sophisticated health-care system cannot expect to be immune.

‘‘The warmer the planet gets, the more pathogens and vectors from the tropics and sub-tropics are going to move into the temperate zones,’’ Brooks said. ‘‘Countries such as the United States tend to have a false sense of security, but vectors and pathogens don’t understand international boundaries. You can’t just put a fence to keep them out.’’

India

India ponders using GM mosquitoes to fight dengue – and climate change could make this necessary…

…But releasing genetically modified mosquitoes into habitations is an ethical issue that requires a serious debate, apart from biosafety regulations. The first part in a series on the challenges India faces from climate change.

Mridula Chari, Nov 28, 2015

In October, soon after a vicious dengue outbreak in Delhi had subsided, a small commission headed by Ashish Khetan of the state's ruling Aam Aadmi Party set out for Guangzhou, China. Their goal? To see whether genetically modified mosquitoes could possibly prevent a similar dengue outbreak next year.

A few hundred kilometres away from the small district headquarters in the heart of Maharashtra, a group of scientists is in initial stages of testing genetically modified mosquitoes that aim to control the dengue virus by directly attacking the Aedes aegypti mosquitoes that carry it. The testing site is owned by Mahyco, an Indian company perhaps best known for its joint venture with Monsanto Company that manufactures and tests genetically-modified seeds.

The technology being tested in Jalna was developed in the early 2000s by Oxitec, a company partly owned by the University of Oxford that worked on converting academic research into marketable products. In August, it was bought over by Intrexon Corporation, a leading global synthetic biology firm.

In theory, it is simple. Male mosquitoes of the *Aedes aegypti* species are engineered – or "modified" – with a lethal gene that is programmed to cause the death of their progeny before they reach adulthood. When these mosquitoes are released into the wild and procreate with untreated female mosquitoes, their offspring will not grow to carry the dengue virus and, over

time, the population of *Aedes aegypti* will itself decline.

The effects of this gene can be reversed with tetracycline – also a key component of certain antibiotics for malaria. This is how Oxitec manages to sustain its initial population of mosquitoes and can continue to release more modified mosquitoes into the wild.

The Chinese mosquitoes that the Delhi government has considered using are genetically modified to be unable to carry the dengue virus at all. Their mosquitoes also have a shorter lifespan.

Oxitec has conducted tests at a small scale in four countries – Brazil, the Cayman Islands, Malaysia and Panama – and its technology has been cleared for commercial use in Brazil.

Its tests have been underway in India for at least seven years. Reports first emerged of initial stages of testing in 2008 from Tamil Nadu, when Oxitec announced that it was working in collaboration with the International Institute of Biotechnology and Toxicology near Chennai.

Oxitec returned to the news in 2011, when it formally announced its partnership with the elaborately named Gangabishan Bhikulal Investment and Trading Corporation, better known as GBIT. While the Oxitec partnership is formally with GBIT, the actual testing is taking place in the facility of GBIT's subsidiary Mahyco.

At present, GBIT has "successfully conducted laboratory level studies required for the application of technology in India", a spokesperson for the company said. The Review Committee of Genetic Manipulation under the Department of Biotechnology in the Ministry of Science and Technology, is considering their proposal for an open field trial at a limited scale.

Innovations such as these are important aspects of the ongoing fight to reduce disease incidence and mortality. But they become even more relevant because of climate change and rising temperatures in India.

Vector-borne diseases such as dengue and malaria are perhaps the most sensitive indicators of the impact of climate change on health. Mosquitoes also respond directly to changing temperatures.

In 2003-'04, Sikkim recorded its first case of dengue. From there, the disease moved to Bhutan. Dengue and Japanese encephalitis, a disease transmitted by the Culex mosquito, have been reported from the Terai region of Uttar Pradesh and Bihar.

These populations, particularly in Sikkim and Bhutan, have never been exposed to dengue before and so have little resistance to them.

There are other early signs of changing vector patterns. In its State Action Plan for Climate Change released in 2012, Madhya Pradesh pointed not only to an increase in the number of dengue and malaria cases but also that outbreaks of these diseases in urban areas were lasting longer.

If, as scientists have been predicting for decades now, global temperatures do indeed rise two degrees above the average recorded during last 150 years, mosquitoes will tend to have a longer life span over a larger area for a longer period of time.

Purely from the human perspective, that spells trouble for people in tropical regions such as India. It also means that plans must be made for long-term solutions, whether by addressing the pathogens that cause these diseases, as Oxitec and the Chinese company are doing, or by strengthening the public health system.

Ramesh Dhiman, a scientist at the National Institute of Malaria Research in Delhi, explained the precise mechanism of how malaria incidence might change in India.

The body temperatures of mosquitoes respond to the climate and are not internally maintained. What is more, the pace of their development directly corresponds to outside temperatures. At cooler temperatures, their development slows, while the reverse happens

at higher temperatures. The ideal temperature range for the Anopheles mosquito that transmits the malaria parasite ranges roughly from 16 to 32 degrees centigrade for various subspecies.

Mosquitoes live for an average of two weeks. When temperatures rise above 32 degrees centigrade, it is possible for a single mosquito to breed two generations in a single month, instead of one.

"At increased temperatures, the development of mosquitoes' life cycle will be faster and the development of [malaria] pathogen in their body will also be faster," he said. "However, there is an upper limit also beyond which a mosquito cannot survive."

Aedes mosquitoes that transmit the dengue virus are sturdier than Anopheles ones, with a survival range of 11.9 to 42 degrees. However, there has been negligible work done on them in India, let alone on the impact of fluctuating temperatures on them.

North India is more at risk of increased malaria incidence than south India, Dhiman observed in a paper for the World Health Organisation in 2012, as temperatures there were more likely to increase. On the other hand, if temperatures in south India cross the 40-degree threshold, that region might see a great reduction in malaria cases as Anopheles mosquitoes cannot survive beyond that.

It is not possible to directly link every unusual occurrence of these diseases to climate change, scientists say. For instance, the severe dengue outbreak in Delhi this July might not necessarily have been linked to climate change, but to a more prolonged and scattered rainfall that enabled *Aedes* mosquitoes to breed for a longer period.

"Climate change does not work in isolation, but has to be linked to the social transition and impacts of phenomena like urbanisation, migration and globalisation," wrote Anant Bhan, an independent researcher of global health and bioethics, in an email to Scroll.in. "Madhya Pradesh for example is undergoing urbanisation in many parts – this leads to water collection at construction sites, influx of migrant labour – [and] a part of this population might be carriers of infection (malaria and dengue).

The conducive environment due to climate change including warm, humid conditions or excessive rainfall, he added, could then lead to outbreaks of infections.

On November 23, researchers at the University of California in the United States published a paper stating that they had created a genetically modified mosquito that can combat the malaria parasite. Their mosquitoes have genes with malaria antibodies that will immunise them to the parasites and make them unable to carry malaria. They will also be able to spread this to other mosquitoes during intercourse. Oxitec, on the other hand, wants to eliminate mosquitoes altogether, an approach that is quite different from that suggested by the University of California or the Chinese company the Delhi government approached.

That said, the fact that genetically modified mosquitoes are being considered at all opens the debate for how diseases such as this might be tackled in the future. Apart from confronting the vectors of such diseases, as companies seek to do with genetically modified mosquitoes, it is still important to strengthen existing public health systems.

"It might be nearly impossible to avert all environmental impacts of climate change in the present scenario – but we can have better health system foresight and take preventive steps to prevent impacts on public health, and possibility of disease outbreaks," Bhan wrote.

The Delhi government might be searching for answers in China, but they will not find it as simple as buying a box of pumped-up mosquitoes and releasing them in the open. As with any other genetically modified mechanism, the government will have to bring back this technology to India and then subject it to rigorous testing.

"The release of GM mosquitoes into habitations would be an ethical issue and requires

regulation of biosafety," said Dhiman. "In India, this still needs to be debated."
The questions here are not just of practicality or "make in India" but of ethics. There has as yet been little debate in India on the implications of aiming to eradicate an entire species of insects that has become inconvenient to humans, or whether this reasoning might extend to other species. The warmer India becomes, the more urgent it will be for intellectual debate on these issues as well.

CHIKUNGUNYA

South Pacific

Pacific syndromic surveillance report
Week 45, ending 8 November, 2015
Chikungunya: An outbreak is ongoing in Tuvalu, laboratory samples were confirmed by the Institut Louis Malardé, French Polynesia.

ESR - MONTHLY NOTIFIABLE DISEASE SURVEILLANCE REPORT - September2015
Chikungunya: One confirmed case was notified in October 2015 compared to three confirmed and two probable cases notified during the same month of the previous year. Forty-six cases have been notified in the year to date compared to 19 at the same time in the previous year. The case reported overseas travel to the Cook Islands during the incubation period.

DENGUE

Hawaii

Dengue Fever Outbreak Hits Hawaii — Will It Last?
By Laura Geggel November 05, 2015
Four more people were diagnosed with dengue fever on Hawaii's Big Island today (Nov. 5), raising the number of locally transmitted cases to 19 people, according to the Hawaii State Department of Health.
Health officials say these "locally transmitted" cases are concerning because, although dengue has popped up sporadically in Hawaii before, in most previous cases, the disease was imported, meaning travelers brought it to the islands from elsewhere. In the new cases, people are contracting dengue from the bites of local mosquitoes.
"Although dengue is not endemic to Hawaii, we do have the mosquito species capable of transmitting the disease," Dr. Sarah Park, the state epidemiologist for Hawaii, said in a statement last week. It's likely an infected traveler was bit by a mosquito and infected the local mosquito population, which led to this cluster of cases, Park said. "We want the public to be aware of this mosquito-borne disease and the steps they can take to prevent infection," she added.
he outbreak likely started in mid-September, and has infected people on all sides of the Big Island, meaning there are multiple hotspots, Park said. It's unclear who brought the illness to Hawaii, but a pending genetic analysis of the virus will tell researchers where in the world the virus originated, Park said.
This is Hawaii's third outbreak of locally transmitted dengue in the past 14 years. The largest

of these struck in 2001, when 122 people contracted dengue, mostly on the island of Maui, according to the Centers for Disease Control and Prevention. In 2011, a small outbreak sickened five people on Oahu, the state's most populated island.

Hawaii has a handful of dengue cases every year, but these cases are typically diagnosed in travelers who got the virus elsewhere, not from local Hawaii mosquitoes. This year, 13 infected travelers have been diagnosed with dengue, but these cases are separate from the current outbreak, Park said.

Will dengue become endemic in Hawaii?

Dengue fever is endemic, or permanently established in the human population, in a number of tropical places around the world, including Puerto Rico and popular tourism spots in Latin America and Southeast Asia, according to the CDC.

However, the virus is unlikely to become endemic in Hawaii, said Jonathan Day, a professor of medical entomology at the University of Florida.

Dengue is different from other mosquito-transmitted viruses that have become endemic in recent years in parts of the U.S., he said. For instance, West Nile virus is carried by birds, and mosquitoes can spread the disease from birds to people because they bite both. But dengue doesn't have such an animal "reservoir," except for monkeys in Africa and Southeast Asia, the CDC said. Therefore, the virus is unlikely to persist in the mosquito population for long, once the human outbreak ends.

Other dengue outbreaks in the United States have typically lasted a year or two. In an outbreak in Brownsville, Texas, 25 people became ill with dengue in 2005, and in Key West, Florida, 90 people got dengue from 2009 to 2011, according to the CDC. [7 Devastating Infectious Diseases]

These outbreaks usually end with the help of public education campaigns and mosquito control measures. People in these areas also typically have air conditioning in their homes, which removes the humidity mosquitoes need in order to live, Day said.

But in places like Puerto Rico, dengue is likely there to stay, he said.

"There's a constant dengue problem in Puerto Rico," Day said. "You go to downtown San Juan in Puerto Rico, and the houses are all open — they have bars on the windows, but no screens, the front doors are open [and there's] no air conditioning. Every house has a population *of Aedes aegypti* that live right inside the house."

For Hawaii, however, dry weather is in the near-term forecast, which should help abate mosquito transmission of the virus, Park said. Nonetheless, it's unclear how long the outbreak will last.

"I think the only question about Hawaii right now is, are we looking at the beginning of a large transmission event, where there might be 50 or 100 cases, or are we looking at something that has been going on during September and October, and is essentially over?" Day said. "At this point, I don't think we know the answer to that."

DOH continues dengue testing as cases hold at 107

By COLIN M. STEWART Hawaii Tribune-Herald

According to the latest Department of Health numbers, Big Island's dengue fever total remains at 107.

In all, 93 isle residents and 14 visitors have been confirmed as being infected with the mosquito-borne virus. The onset of symptoms among people infected on the Big Island ranges from Sept. 11-Nov. 18.

"DOH's laboratory on Oahu has been receiving dengue fever samples each day and completing testing routinely within 24 hours Monday through Friday," reads a Hawaii

County update sent Friday afternoon. “All confirmed cases to date have recovered or are recovering.”

Meanwhile, the DOH revealed investigating 238 reported potential cases which were excluded “based on test results and/or not meeting case criteria,” reads the Friday afternoon update on the DOH website.

“DOH Vector Control has been performing assessment and taking precautionary actions by spraying at case residences and other areas that have been specifically identified by the investigation as potential areas of interest,” reads the county update. “To date, 167 mosquito abatement sprayings have been conducted since the beginning of the outbreak.”

DOH Environmental Health staff has been supplemented by Hawaii County Parks &Recreation and Public Works, as well as state highways crews. Next week, additional staff from the Department of Accounting and General Services, Hawaii Health Systemps Corp. and University of Hawaii will be trained to further supplement those crews.

As Hawaii County Civil Defense continues to lead the response to the outbreak, three more community information meetings are scheduled to update the public and educate them in ways to avoid infection.

The county also reported that in addition to a visit next week from Lyle Petersen, the director of the Centers for Disease Control and Prevention’s Division of Vector-Borne Diseases, the island also will welcome a CDC entomologist and technician, who will arrive to provide consultation and assistance on mosquito surveillance strategies.

ZIKA

Brazil

Dengue-Like Virus linked to Birth Defects

The Associated Press

Nine states with Zika infections see surge in babies born with small heads

The Zika virus is spread by Aedes aegypti mosquitoes, like the one shown here. Zika has been known as a mild version of dengue with symptoms such as fever, rash and joint pain.

RIO DE JANEIRO—The dengue-like Zika virus has been linked for the first time to cases of babies being born with small heads, or microcephaly, Brazil’s government said.

Scientists studying a surge of such cases in northeastern Brazil found the presence of the virus in the blood of a baby born with birth defects in Ceara state, the government said. The girl died.

The link to Zika “is an unprecedented situation in the global scientific community,” the Health Ministry said in a statement released Saturday.

Researchers with the U.S. Centers for Disease Control and Prevention will soon travel to Brazil at the government’s request to study the link between the rare neurological condition and the virus.

Brazilian health officials believe pregnant women are more vulnerable to developing fetuses with microcephaly if they are infected with Zika in their first trimester. This year, the ministry has reported 739 cases of babies born with microcephaly in nine states that have been hit by Zika infections, while last year the same region reported only 45.

“Research on the subject should continue to clarify issues such as how it is transmitted, what it does to the body, how the fetus gets infected and the time of greatest vulnerability for pregnant women,” the ministry’s statement said.

Microcephaly "usually reflects an underlying reduction in the size of the brain," according to the CDC. The disorder can affect motor skills and cause mental retardation.
The same mosquito that carries the dengue virus, Aedes aegypti, is also responsible for spreading Zika, a disease that until now was known as a mild version of dengue with symptoms such as fever, rash and joint pain.
Outbreaks of Zika have occurred in Africa, Southeast Asia and the Pacific Islands. The virus isn't found in the U.S., but cases of Zika have been reported in returning travelers, according to the CDC.
In its statement, Brazil's Health Ministry reported two other deaths associated with the Zika virus not involving microcephaly. The victims were an adult male who suffered from lupus and a 16-year-old girl.

WEST NILE

USA

California reports record number of West Nile virus deaths

Los Angeles Daily News

By Susan Abram, Friday, Nov. 6, 2015

Mosquitoes spread West Nile virus to humans. Deaths from West Nile virus in California in 2015 have already set a record for one year in the state. Almost half of those deaths have occurred in Los Angeles County, according to health data released.
Deaths from West Nile virus in California in 2015 have already set a record for one year in the state, and almost half of those deaths have occurred in Los Angeles County, according to health data released Friday.
Thirty-two people have died of the virus so far this year. Thirty-one died in all of last year, the most since the California Department of Public Health began recording cases in 2003, and the most in any U.S. state.
The state number is expected to still rise through November, health officials warned.
Infection rates too were high, though not as high as last year. So far, there are 512 cases compared to 642 in the same period.
Health officials said they have no solid explanation yet for why this year's West Nile virus activity seems so severe, although the record-breaking drought may have something to do with it.
"At this point, it is difficult to determine the reasons for the higher proportion of fatal cases to date in 2015," Dr. Gil F. Chavez, state epidemiologist and deputy director for infectious diseases, said in a statement. "An analysis of the severity of the 2015 West Nile virus season will be done when reporting for the year is complete."
The average age among those who died statewide was 75 years old, and ranged in age from 50 to 98 years old, he said.
"In general, elderly individuals and those with underlying medical conditions, such as diabetes and hypertension, are more likely to develop West Nile neuroinvasive disease and potentially die from the infection," Chavez said.
In Los Angeles County, 13 deaths were reported including one in Long Beach, and some in the San Fernando and San Gabriel valleys. A third of all residents who were infected with West Nile virus this year suffered from encephalitis, said Dr. Rachel Civen, medical epidemiologist for the Los Angeles County Department of Public Health.
"That's a bad situation," Civen said. "Many of our patients are elders with other conditions on board. Their prognosis with encephalitis is not good. At least 50 to 70 percent will have to go to a nursing homes to rehabilitate."
Civen said the unusually warm September and October combined with intermittent rain meant

more people were out and about, while mosquitoes were likely breeding more, too. Most of those who were sickened were men.

Even as cooler temperatures are expected this month, more West Nile virus cases will likely be reported because of the warm weather through Halloween. It can take up to 21 days to become symptomatic, Civen said.

She said the department of public health plans to push more education about West Nile virus because of the threat of the El Niño storm system, which may encourage mosquito breeding next summer.

"It's just a really tough sell for people to wear mosquito repellent, because we don't see (mosquitoes)," Civen said. "It's a challenging message. People don't perceive these mosquitoes as a threat."

West Nile virus is spread to humans by the bite of an infected mosquito and can be carried by birds. In rare cases, a person can be become ill through a blood transfusion. Most people infected with the virus don't become seriously ill. Some experience flu-like symptoms. About 1 percent can develop serious neurologic illnesses.

Public health officials have said the record breaking drought may be to blame for the spread of the disease because of limited sources of water for birds and mosquitoes. The lack of water could have caused puddles and other sources in storm drains to stagnate, making it more attractive for mosquitoes to lay eggs in. As birds and mosquitoes seek water, they come into closer contact, which recharges the disease.

Of the 1,650 clinical cases reported in almost all 50 states, California had the most West Nile virus activity, and the most deaths, according to recent figures from the federal Centers for Disease Control and Prevention.

NOT ONLY MOSQUITOES

USA

***Triatomines*, also known as kissing bugs, are responsible for transmitting the parasite that causes Chagas disease.**

PHOTOGRAPH VIA THE NATURAL HISTORY MUSEUM / ALAMY

If Thomas Cropper, a public-health veterinarian at Lackland Air Force Base, in San Antonio, Texas, thought about Chagas disease at all, he thought about it as a Central and South American problem. Named after the Brazilian physician who described it, in 1909, Chagas is a classic—one might say egregious—example of a neglected tropical disease. It is caused by the protozoan parasite *Trypanosoma cruzi*, which is delivered to its host by kissing bugs, known formally as *Triatomines*. The bugs are bloodsuckers—their nickname comes from their penchant for biting near the eyes or mouth—and they can swell to the size of grapes as they feed, causing them to defecate and leave the parasite behind to make its way into the host's bloodstream. A gross and not particularly efficient mode of transmission, it's still good enough to have kept Chagas going since pre-Columbian times. According to the World Health Organization's shifting estimates, between six and seven million people in Latin America are currently infected. If you're infected but don't have symptoms, you're likely to find out only after donating blood. If you do have

symptoms, you're probably in trouble. About a third of Chagas patients develop a chronic form that leads to heart damage and failure.

Cropper specializes mainly in zoonoses—diseases transmissible from animals to humans—and in keeping service members away from them. Not long after he arrived at Lackland, in 2008, he learned that a military working dog had developed heart problems while deployed in Kuwait. The dog was returned to Lackland, the home of the Department of Defense's canine school, and confirmed positive for Chagas. A study of all the working dogs on base, in fact, found that about eight per cent had antibodies against *T. cruzi.* Many never developed symptoms at all, but young pups would sometimes drop dead without warning. Cropper began asking about Chagas and what the risks might be for humans. "What else are these stupid bugs feeding on?" he wondered. This turned out to be a somewhat urgent question, because Lackland is where about thirty-five thousand Air Force and National Guard recruits are trained every year, often outdoors. The base encompasses a vast, cactus-strewn wilderness with populations of wood rats, armadillos, skunks, opossums, and other easy targets for a kissing bug.

Cropper called in an entomologist, Walter Roachell, and a microbiologist, Candelaria Daniels, from the Army Public Health Command at Joint Base San Antonio. Roachell found five species of kissing bug at Lackland, some in the nests dug by wood rats in the bottoms of cacti. A training instructor who accompanied Roachell claimed that he'd never before seen one of the bugs, even though certain species are distinctive—pretty, even—with their folded wings encircled by what could be described as a striped skirt. "I looked down and pointed out one crawling between his feet," Roachell told me.

Daniels, meanwhile, sought to determine the bugs' infection rates. More than half of them, her analysis revealed, carried *T. cruzi.* They were eating a lot of things—wood rats, armadillos, even rattlesnakes. And, more alarmingly, nearly thirty per cent tested positive for human blood. "They were indeed feeding on people," she said. Cropper had vegetation cut back, insecticide sprayed, and treated bed nets installed where trainees slept, and similar measures were taken around the kennels. At one point, a routine blood donation by an airman, who had neither a history of travel to Latin America nor a mother likely to have transmitted the disease to him in utero, turned up positive. He remembered suffering a swelling around his eye—one early sign of a Chagas infection—which he blamed on dirt. It "may have been feces from the kissing bug," Cropper said, but no one was really sure.

Even among vector-borne tropical diseases, Chagas remains a redheaded stepchild. It's slower to kill than dengue or malaria, and therefore easier to ignore. Chagas scientists are used to incremental progress, low recognition, and poor funding; they sometimes must scream for attention. (In 2012, one group raised eyebrows after calling Chagas "the new H.I.V.") Benznidazole, the principal drug that is used to treat the disease, was developed more than forty years ago, and another, nifurtimox, is even older. Both kill the parasite, although a large clinical trial, published last month in the New England Journal of Medicine, found that benznidazole could not halt heart deterioration already in progress.

Military science has tightly defined parameters; when it comes to parasitology, only research with practical applications gets funded. In San Antonio, the spectre of risk to personnel—and expensively trained working dogs—meant that a lot of money and attention could be directed toward Chagas. When I visited the lab at Public Health Command Central, Roachell and a microbiologist were designing a pesticide-impregnated mammal food, not unlike the anti-tick treatments that are given orally to dogs, to kill the feeding kissing bugs and interrupt the transmission cycle. In addition, Daniels is working with Cropper and a physician at Lackland on what, to the military, may be the most important of the Chagas studies under way:

screening in recent trainees. Three thousand service members are being asked to volunteer blood samples. The researchers have no baseline infection rates to refer to within that group, but so far, with a little more than a tenth of the samples in, no one has tested positive, a sign that the preventive measures have helped. In dogs, only two per cent now have antibodies.

Military scientists aren't the only ones working with Chagas in Texas, even if they may be the best funded. In the past few years, state health officials, entomologists, and academic veterinarians have all launched local studies. This has created the popular impression of Chagas as a new threat, with some articles in the press linking it to climate change or illegal immigration. But what is striking to researchers is how everyone missed Chagas for so long, when the literature shows that Texas—along with much of the rest of the Southwest—has been an endemic Chagas region since people began looking. Local transmission has been documented since 1955 in people, and since 1972 in dogs. Roachell even learned that an exhaustive study on kissing bugs and T. cruzi had been conducted at Lackland and published in 1970. That study reported that the bugs hung out in wood-rat nests and were heavily infected with the parasite—not so different from what he and Daniels found.

Still, the idea of Chagas as a foreign illness persisted for half a century. When blood banks nationwide started screening for the disease, in 2007, it was generally assumed that immigrants and their children were the only people at risk. Our native kissing bugs weren't as effective as vectors as the species in Latin America, it was believed; housing was better here and could not harbor the bugs in the way that mud walls and thatched roofs were known to; the strain of parasite in local bugs caused a milder form of the disease, one that didn't involve the heart. All myths, it turns out. Two years ago, Sarah Hamer, a veterinarian and assistant professor at Texas A&M University, began asking Texans to scoop up kissing bugs in plastic baggies and mail them to her lab. People sent more than twenty-five hundred samples, often from immediately around their homes. More than half were carriers of T. cruzi. Blood meals from human and canine hosts were not uncommon. A couple of bugs, collected at a zoo, had been feeding on tigers.

That same year, 2013, Chagas was added to the list of infectious diseases that had to be reported to the Texas Department of State Health Services. This allowed for closer scrutiny of human cases. Thirty-nine were picked up through last year, half of them locally acquired. "That's one out of every sixty-five hundred blood donors screened," Melissa Garcia, a research associate at Baylor College of Medicine, in Houston, told me. "Pretty high for a rare disease." In a follow-up study, Garcia found that forty-one per cent of blood donors in southeastern Texas who had acquired Chagas had cardiac abnormalities consistent with the disease, suggesting that local parasite strains are no more benign than tropical ones. "A lot of theories that have sounded comforting to us in the past will not bear out," she predicted.

This year, Cropper prodded Paula Stigler Granados, a public-health specialist with the University of Texas Health Science Center at Houston, to apply for a grant from the U.S. Centers for Disease Control and Prevention to keep all the researchers talking to one another, and to get the word out about Chagas. Stigler Granados, who used to live in Chile and is no stranger to the illness, now has five years and a little more than half a million dollars with which to canvass Texas's military hospitals, cardiologists, obstetricians, primary-care clinics, hunters, campers, and veterinarians. Health-care providers are her main concern, for now. "Chagas has a different face than we originally thought it did," she said. "What we're finding is, a person goes and gives blood, gets a positive result for Chagas, and the doc tells them, 'It's usually a false positive. We don't have Chagas here.' "

WORLD OF MOSQUITO SCIENCE

'Gene drive' mosquitoes engineered to fight malaria
Mutant mozzies could rapidly spread through wild populations.
Heidi Ledford & Ewen Callaway
23 November 2015

The *Anopheles stephensi* mosquito can spread the malaria parasite to humans.

Mutant mosquitoes engineered to resist the parasite that causes malaria could wipe out the disease in some regions — for good.

Humans contract malaria from mosquitoes that are infected by parasites from the genus Plasmodium. Previous work had shown that mosquitoes could be engineered to rebuff the parasite P. falciparum1, but researchers lacked a way to ensure that the resistance genes would spread rapidly through a wild population.

In work published on 23 November in the Proceedings of the National Academy of Sciences, researchers used a controversial method called 'gene drive' to ensure that an engineered mosquito would pass on its new resistance genes to nearly all of its offspring2 — not just half, as would normally be the case.

The result: a gene that could spread through a wild population like wildfire.

"This work suggests that we're a hop, skip and jump away from actual gene-drive candidates for eventual release," says Kevin Esvelt, an evolutionary engineer at Harvard University in Cambridge, Massachusetts, who studies gene drive in yeast and nematodes.

For Anthony James, a molecular biologist at the University of California, Irvine, and an author of the paper, such a release would spell the end of a 30-year quest to use mozzie genetics to squash malaria.

James and his laboratory have painstakingly built up the molecular tools to reach this goal. They have worked out techniques for creating transgenic mosquitoes — a notoriously challenging endeavour — and isolated genes that could confer resistance to P. falciparum. But James lacked a way to ensure that those genes would take hold in a wild population.

The concept of engineering a gene drive has been around for about a decade, and James's laboratory had tried to produce them in the past. The process was agonizingly slow.

Then, in January, developmental biologists Ethan Bier and Valentino Gantz at the University of California, San Diego, contacted James with a stunning finding: they had engineered a gene drive in fruit flies, and wondered whether the same system might work in mosquitoes. James jumped at the opportunity to find out.

Bier and Gantz had used a gene-editing system called CRISPR–Cas9 to engineer a gene drive. They inserted genes encoding the components of the system that were designed to insert a specific mutation in their fruit flies. The CRISPR–Cas9 system then copied that mutation from one chromosome to the other 3. James used that system in mosquitoes to introduce two genes that his past work showed would cause resistance to the malaria pathogen.

The resulting mosquitoes passed on the modified genes to more than 99% of their offspring. Although the researchers stopped short of confirming that all the insects were resistant to the parasite, they did show that the offspring expressed the genes.

"It's a very significant development," says Kenneth Oye, a political scientist who studies emerging technologies at the Massachusetts Institute of Technology in Cambridge. "Things are moving rapidly in this field."

Other teams are developing gene drives that could control malaria. A team at Imperial College London has developed a CRISPR-based gene drive in Anopheles gambiae, the

mosquito species that transmits malaria in sub-Saharan Africa. The group's gene drive inactivates genes involved in egg production in female mosquitoes, which could be used to reduce mosquito populations, according to team member Austin Burt, an evolutionary geneticist. Their results will be published in Nature Biotechnology next month, Burt says.

Oye notes that such technological advances are outpacing the regulatory and policy discussions that surround the use of gene drive to engineer wild populations. Gene drives are controversial because of the potential that they hold for altering entire ecosystems.

Before testing gene drive in the field, Oye hopes that researchers will study the long-term consequences of the changes, such as their stability and potential to spread to other species, as well as methods to control them. “I’m less worried about malevolence than getting something wrong,” he says.

Esvelt says that the US-based researchers made a wise decision in selecting a non-native mosquito species for their experiments. (The team worked with Anopheles stephensi, which is native to the Indian subcontinent.) “Even if they escaped the lab, there’d be no one to mate with and spread the drive,” Esvelt says.

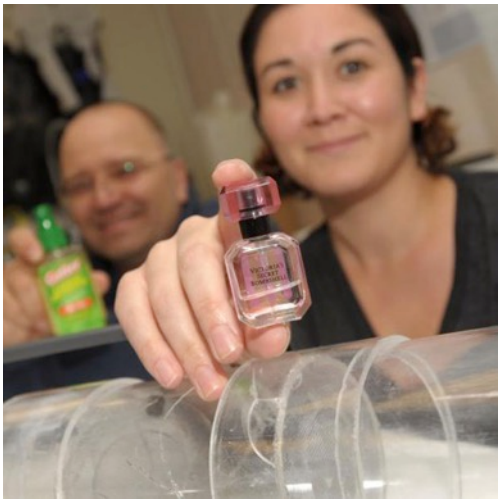
James predicts that it will take his team less than a year to prepare mosquitoes that would be suitable for field tests, but he is in no rush to release them. “It’s not going to go anywhere until the social science advances to the point where we can handle it,” he says. “We’re not about to do anything foolish.”

DID YOU KNOW?

Victoria’s Secret perfume kept mosquitoes at bay in study

Horsetalk.co.nz / 1 December

University researchers have dropped a bombshell about Bombshell – a perfume sold by Victoria’s Secret. A study team set about assessing how mosquitoes react to different household products, finding that Bombshell actually outperformed some commercial repellents.



But don’t think you can start dabbing perfume on your beloved horse any time soon to keep the mozzies at bay. Firstly, the study was conducted on humans and, second, there is absolutely no research to suggest horses would benefit from smelling better than their owners. The cost is likely to be prohibitive and there is no evidence to indicate how a horse’s delicate skin might react to such top-shelf pampering.

However, it transpires that if you want to keep the blood-sucking insects away from your own skin, DEET products are your best bet, according to the New Mexico State University study team.

Professor Immo Hansen, left, and research assistant Stacy Rodriguez display household products they tested to measure mosquito repellent effectiveness. Cutter brand repellents as well as Victoria’s Secret Bombshell perfume, right, were among some of the products they tested. Photo: Darren Phillips

“Not all repellents are created equal – unfortunately they’re advertised as such,” said Stacy Rodriguez, research assistant in the university’s Molecular Vector Physiology Lab. “It’s important to let consumers know what is actually effective.”

Rodriguez and other researchers in the university’s College of Arts and Sciences tested the

effectiveness of 10 commercially available products intended to repel mosquitoes. Their findings were published last month in the Journal of Insect Science.

The products were tested against two common mosquito species: the yellow fever mosquito and the Asian tiger mosquito, both known to transmit dengue fever, chikungunya, yellow fever and other diseases. “People need to protect themselves, especially if they travel to the tropics,” said Immo Hansen, an associate professor of biology involved in the study. “Insect repellents can be highly efficient, but you need to find out which work.”

Of the repellents tested, three of the sprays contained DEET as the active ingredient (Repel 100 Insect Repellent, OFF Deep Woods Insect Repellent VIII and Cutter Skinsations Insect Repellent), while four were DEET-free (Cutter Natural Insect Repellent, EcoSmart Organic Insect Repellent, Cutter Lemon Eucalyptus Insect Repellent and Avon Skin So Soft Bug Guard).

The team also tested two fragrances, Avon Skin So Soft Bath Oil and Victoria’s Secret Bombshell perfume, and a vitamin B1-based Mosquito Skin Patch.

For the experiment, a volunteer’s bare hand served as the attractant. The researchers used a fan to push the volunteer’s scent through a Y-shaped tube toward a holding chamber containing roughly 20 mosquitoes. Upon release, the mosquitoes flew toward the hand if they were attracted to the scent; if repelled, they either flew to the opposite tube or did not move.

The tests concluded that DEET products strongly repel both species of mosquito. The other products produced varied results. The non-DEET repellents had little to no effect on the yellow fever mosquito, with one exception: Cutter Lemon Eucalyptus Insect Repellent was found to be as effective as the DEET repellents. Surprisingly, the bath oil and perfume repelled this species for roughly two hours.

Rodriquez said: “There was some previous literature that said fruity, floral scents attracted mosquitoes, and to not wear those.

“It was interesting to see that the mosquitoes weren’t actually attracted to the person that was wearing the Victoria’s Secret perfume – they were repelled by it.”

The fragrance may provide a temporary masking effect, the researchers explained. They also clarified that there were high concentrations of perfume applied to the volunteer’s hand, and that lower concentrations may produce different results.

The study found that Asian tiger mosquitoes were also repelled by the perfume. For this species, however, the DEET-free repellents produced mixed reactions, with the Avon Skin So Soft Bug Guard significantly reducing attraction for 120 minutes and the bath oil having no effect.

The skin patch, which claims to repel mosquitoes for up to 36 hours, did not repel either species in this study.

To further this research, Rodriquez and Hansen are in the process of testing mosquito repellent bracelets and clip-on repellent devices, and intend to publish their results in time for next mosquito season.