NEW ZEALAND BIOSECURE

BORDER HEALTH NEWSLETTER – APRIL 2020

WELCOME!

Kia Ora Koutou,

On April the 25th World Malaria Day was observed. Although tremendous efforts are being made against the disease, there are more than 200 million new cases of malaria each year. Increasing resistance to the older generation drugs means the need for new treatments is increasingly urgent. At present many countries are very close to completely eradicating malaria. However rainy seasons still result in outbreaks in areas with otherwise next to zero cases.

This month we have prepared a special issue focused on malaria, including an infographic with key facts about the disease, the *Plasmodium* life cycle and of course, malaria-related news.

On a separate note, scroll down to find out the results of the Easter egg mozzie hunting.

SURVEILLANCE

During April 1028 samples were collected by staff from 11 DHBs (there were no samples from Waikato DHB this month). The samples included 124 positive larval samples and 55 positive adult samples, leading to a total of 372 adults and 6250 larvae identified over the past month (Table 1). The dominant larval species this month, this year and last year is *Culex quinquefasciatus*.

Compared to this same month last year, the total number of larvae has shown a decrease (49%), while the number of adult mosquitoes has shown a 29% increase (Table 1).

Table 1. Adult and larvae sampled by the New Zealand surveillance program during April 2019 & 2020

Species (common name)	Adults		Larvae	
	Apr 20	Apr 19	Apr 20	Apr 19
Aedes antipodeus (winter mosquito)	1	-	-	-
Ae notoscriptus (striped mosquito)	3	16	1803	2232
Ae subalbirostris (no common name)	-	-	6	-
Cx asteliae (no common name)	-	1	-	-
Culex pervigilans (vigilant mosquito)	43	20	463	624
Cx quinquefasciatus (southern house mosquito)	293	215	3960	6404
Culex sp. (missing their abdomens, likely to be *quinquefasciatus* or *pervigilans*)	32	11	-	-
Opifex fuscus (rock pool mosquito)	-	-	18	59
Total	**372**	**263**	**6250**	**9319**

In total, six mosquito species have been collected this month (Table 1), that is two less than last month.

Compared to last month, mosquito larval and adult numbers have shown a decrease (54% and 79% respectively) (Table 1).

The highest number of larvae sampled this month was obtained in Northland DHB (3549) followed by Community and Public Health (557 larvae) (Figure 1).

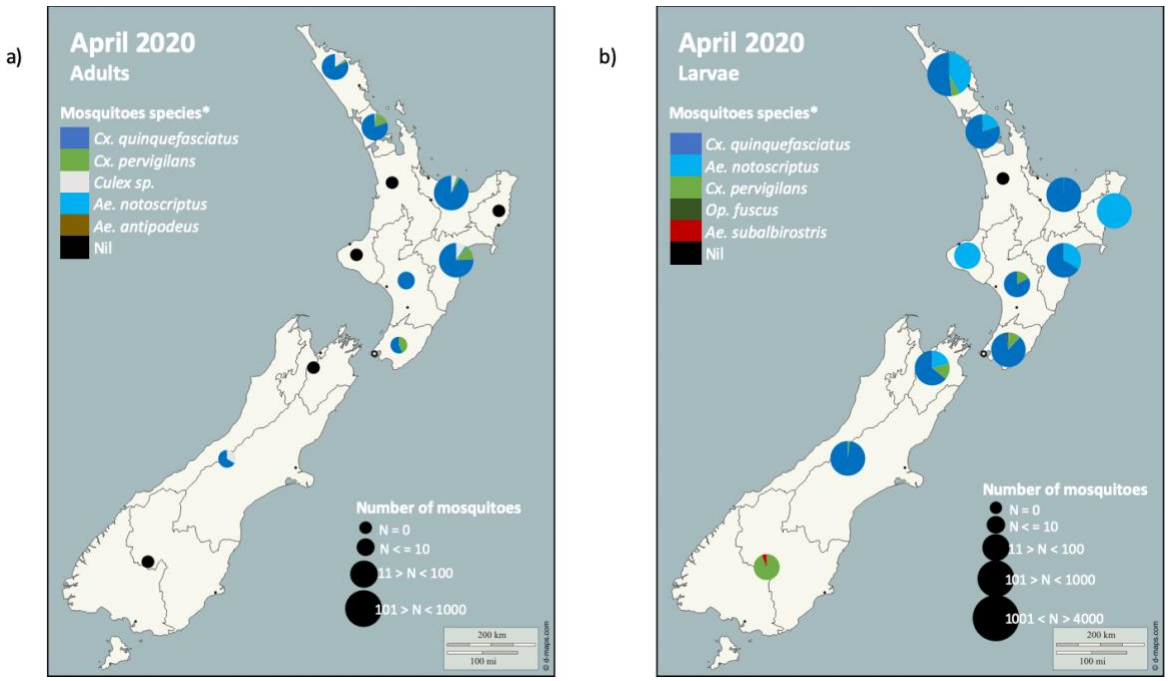


Figure 1. Total mosquito adults (a) and larvae (b) sampled in New Zealand during the April 2020 surveillance period.
* The mosquito species are listed in order from the most abundant to the least abundant.
Please note that the markers represent the DHBs and not the specific sites where the samples have been taken.

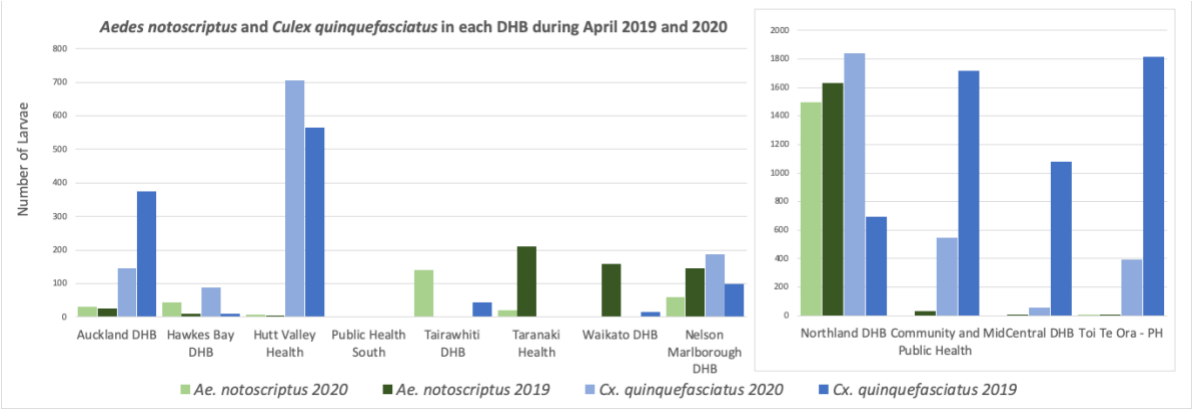


Figure 2. Comparison between introduced mosquitoes sampled in each DHB New Zealand during April 2019 and 2020.
*Please note the different scale for the number of larvae present in Northland DHB, Community and Public Health, MidCentral DHB and Toi Te Ora - PH in comparison to the other DHBs.

Culex quinquefasciatus larval numbers have shown an increase in four DHBs from this same month last year and a decrease in four DHBs (Figure 2).

As expected *Aedes notoscriptus* has not been recorded this month, this year or last year in Public Health South (Figure 2).

Aedes notoscriptus larval numbers have shown an increase in three DHBs from this same month last year and a decrease in four DHBs (Figure 2).

Disclaimer: Note that all comparisons made have not been statistically tested and can be due to sampling effort.

INCURSIONS AND INTERCEPTIONS

During April nil suspected interception have been recorded.

NEWS ARTICLES FROM AROUND THE WORLD

Study could bring malaria eradication efforts closer to fruition

Strategies that treat households in the broad vicinity of a recent malaria case with anti-malarial drugs, insecticides, or both could significantly reduce malaria in low-transmission settings, a challenge with approaches currently in use, a study led by UT Southwestern scientists suggests. The findings, published in the April 25, 2020, *The Lancet*, could bring efforts to eradicate malaria worldwide closer to fruition. Read more.

Malaria Mosquitoes Most Likely To Transmit Infection In Early Evening: Study

Malaria mosquitoes shifted their biting times to avoid contact with treated bed nets. Researchers investigated whether the time of bite affects mosquitoes' 'vector competence'. Results show that mosquitoes are most likely to become infectious in early evening. Read more.

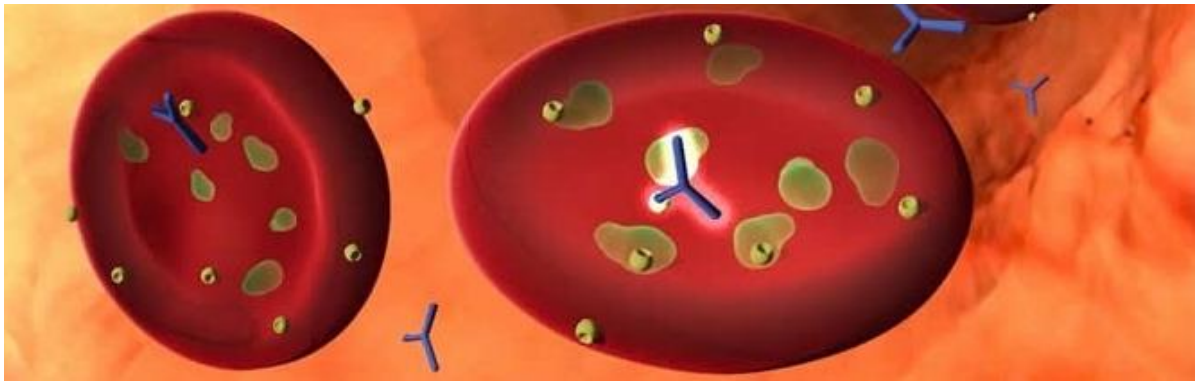
UBC discovery could pave way for developing new anti-malarial drugs

For the first time, UBC researchers have shown a key difference in the three-dimensional structures of a key metabolic enzyme in the parasite that causes malaria compared to its human counterpart. The finding, recently published in the *International Union of Crystallography Journal*, brings researchers one step closer to developing new therapies to combat drug-resistant malaria. Read more.

Malaria 'completely stopped' by microbe

Scientists have discovered a microbe that completely protects mosquitoes from being infected with malaria. The team in Kenya and the UK say the finding has "enormous potential" to control the disease. Malaria is spread by the bite of infected mosquitoes, so protecting them could in turn protect people. The researchers are now investigating whether they can release infected mosquitoes into the wild, or use spores to suppress the disease. The malaria-blocking bug, Microsporidia MB, was discovered by studying mosquitoes on the shores of Lake Victoria in Kenya. It lives in the gut and genitals of the insects. Read more. Access the original article.

Have we found a new malaria vaccine?

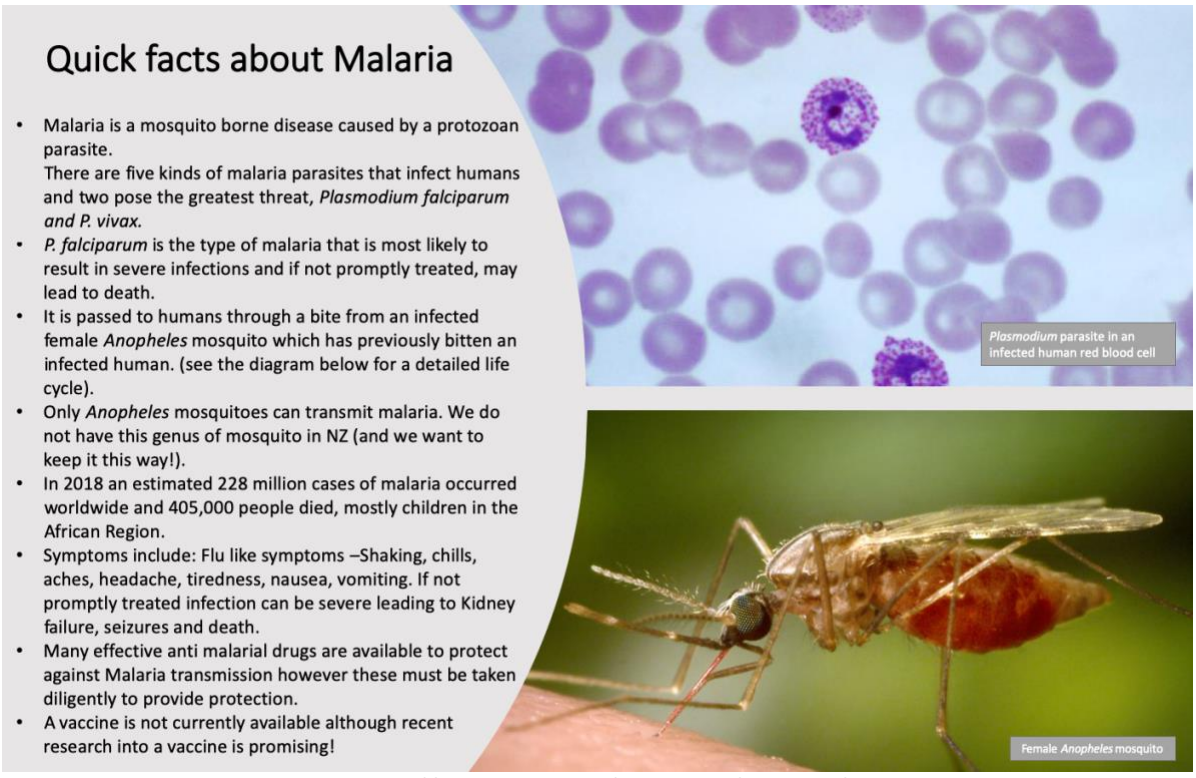


A new study published in the journal *Nature* in April 2020 reports on a malaria protein antibody that appears to protect resistant children from severe disease, showing promise in the fight against malaria, a new study found. Almost 500,000 people die of malaria every year. Read more.

Study identifies a promising new strategy for combating malaria

Researchers have discovered a promising new strategy for combating malaria, a mosquito-borne parasite that claims nearly a half-million lives each year. For a study reported in the journal *Nature*, researchers screened blood samples from children who had natural immune resistance to severe malaria infection. The study identified an antibody to a particular malaria protein, called PfGARP, that appears to protect resistant children from severe disease. Lab tests showed that antibodies to PfGARP seem to activate a malarial self-destruct mechanism, causing parasite cells living inside human red blood cells to undergo a form of programmed cell death. Read more. Check the original article.

WORLD MALARIA DAY



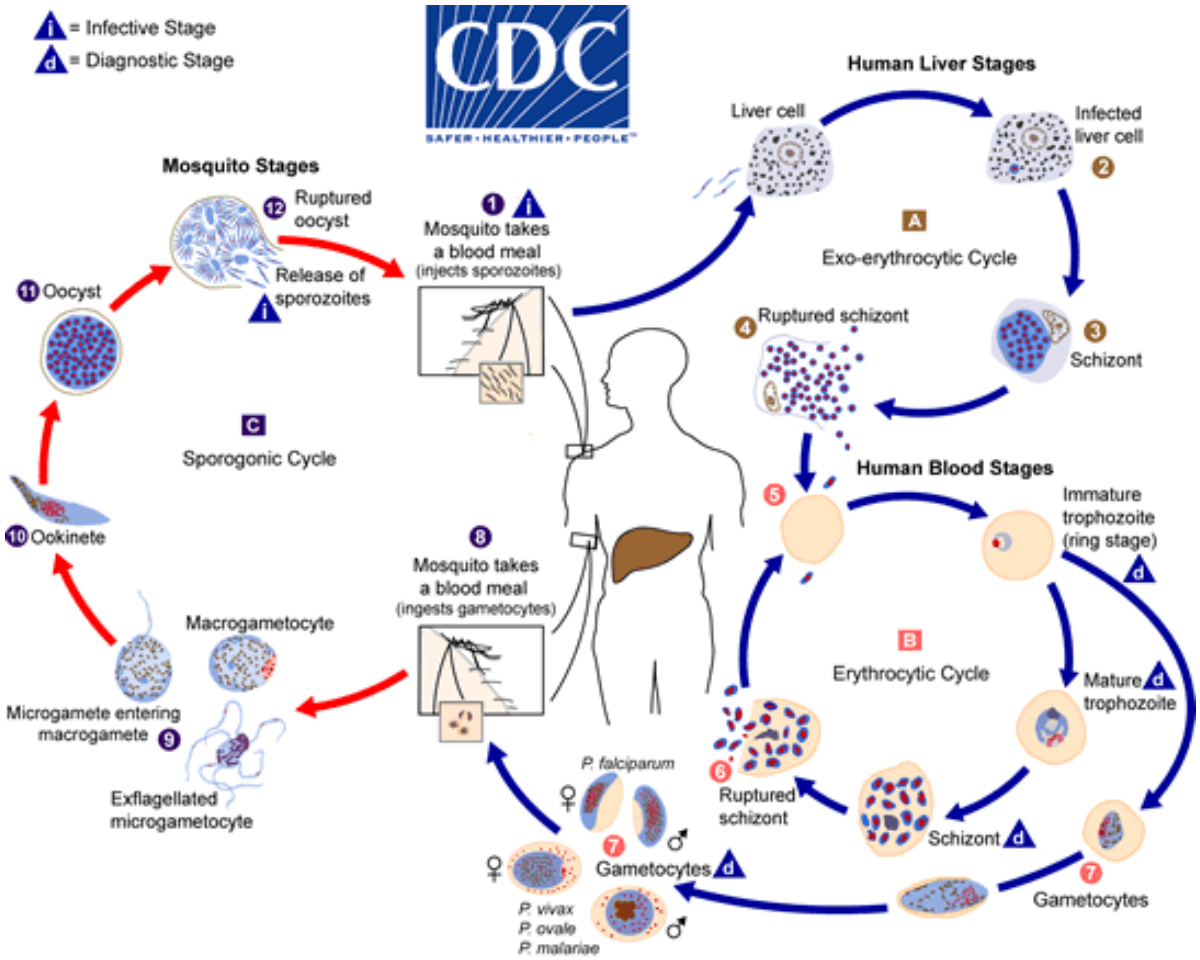
All information taken from https://www.cdc.gov/parasites/malaria/index.html

If you wish to find more information about Malaria follow these links:

World Health Organization

Centers for Disease Control and Prevention

MALARIA LIFE CYCLE



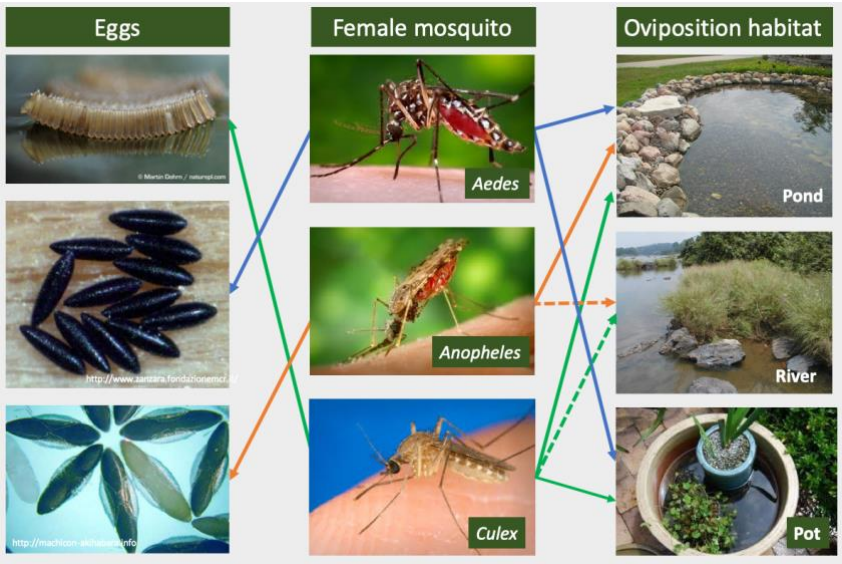
The malaria parasite life cycle involves two hosts. During a blood meal, a malaria-infected female *Anopheles* mosquito inoculates sporozoites into the human host 1. Sporozoites infect liver cells 2 and mature into schizonts 3, which rupture and release merozoites 4 (Of note, in *P. vivax* and *P. ovale* a dormant stage [hypnozoites] can persist in the liver (if untreated) and cause relapses by invading the bloodstream weeks, or even years later.) After this initial replication in the liver (exo-erythrocytic schizogony A), the parasites undergo asexual multiplication in the erythrocytes (erythrocytic schizogony B). Merozoites infect red blood cells 5. The ring stage trophozoites mature into schizonts, which rupture releasing merozoites 5. Some parasites differentiate into sexual erythrocytic stages (gametocytes) 7. Blood stage parasites are responsible for the clinical manifestations of the disease. The gametocytes, male (microgametocytes) and female (macrogametocytes), are ingested by an *Anopheles* mosquito during a blood meal 8. The parasites' multiplication in the mosquito is known as the sporogonic cycle C. While in the mosquito's stomach, the microgametes penetrate the macrogametes generating zygotes 9. The zygotes in turn

become motile and elongated (ookinetes) 10 which invade the midgut wall of the mosquito where they develop into oocysts 11. The oocysts grow, rupture, and release sporozoites 12, which make their way to the mosquito's salivary glands. Inoculation of the sporozoites 1 into a new human host perpetuates the malaria life cycle.

THE EASTER EGG MOZZIE HUNTING -RESULTS

The answer to the oviposition habitat is not that straightforward and is species specific. Species in the same genera have a range of different preferred habitats to lay eggs.

Here are some examples.
Aedes females will lay their eggs on different surfaces, humid or dry ones, in natural or artificial containers that are able to hold water. The eggs will hatch after the container is full of water. Some species can lay they eggs on the water surface. *Ae. antipodeus* breeds in freshwater ground pools. *Ae. camptorhychus* eggs are usually laid on a damp substrate, but are also laid on the water surface. *Ae notoscriptus* laid at the water level around the edges of containers. *Ae. aegypti* breeds in artificial containers including water drums, roof guttering, rain water tanks, pot plant saucers, tanks, tins, vases, tyres, subterranean waters and refuse filled by rain. This species will also breed in natural containers such tree holes and leaf axils of bromeliads.



Anopheles bancroftii breed in freshwater swamps, water holes and stream margins, *A. amictus* breeds in natural or human made ground pools, *A. annulipes* in ground and rock pools with clear and permanent water and *A. farauti* prefers swamps, lagoons and ponds. *A. gambiae* is restricted to the extensive alluvial areas along rivers.

Culex females lay their eggs on water surfaces in rafts. *Cx. annulirsotsis* breeds in fresh water swamps, lagoons and pools. *Cx. sitiens* prefers brackish saltmarsh pools. *Cx. gelidus* larvae are commonly found in freshwater ground pools, rivers, marshes, open drains and containers, and also in artificial containers. *Cx. quinquefasciatus* breeds in fresh to brackish water in artificial and natural containers.

DISEASE OUTBREAKS

To find out where the latest disease outbreaks have occurred visit:

Epidemic and emerging disease alerts in the Pacific region - Produced by the Pacific Community (SPC) for the Pacific Public Health Surveillance Network (PPHSN).

Disease Outbreak News - World Health Organization.

Public Health Surveillance - Institute of Environmental Science and Research (ESR) - Information for New Zealand Public Health Action.

Communicable disease threats report - European Centre for Disease Prevention and Control

RISK MAPS

Dengue Map – Centres for Disease Control and Prevention
Zika Map – Centres for Disease Control and Prevention
Malaria – Centres for Disease Control and Prevention