

# MOSQUITOES & DISEASES

THE RELATIONSHIP BETWEEN MOSQUITOES AND DISEASE

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MINISTRY OF  
HEALTH, NATURE & THE ENVIRONMENT

# AVOID

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# MOSQUITO BITES



People see mosquitoes as a nuisance, but the reality is that they can also be dangerous because they are responsible for a long list of infectious diseases. These vary from complaints similar to the flu up to life long or life threatening conditions.

## WHY DO MOSQUITOES BITE US

The female mosquito uses our blood to produce her eggs. The mosquito needs us for their reproduction

## WHAT HAPPENS WHEN YOU ARE BITTEN

The mosquito infected with a virus (Dengue, Chikungunya or Zika) will transmit this virus to you after which you will become ill.

Once you have the disease and you are bitten, the mosquito will take the virus and will pass it on to the next person and henceforth spread the disease.

## CLOTHING

Use clothing that covers all parts of your body when the mosquito is more active (at dawn and dusk). Use long sleeves and pants. Use light colored clothing since the mosquito is more attracted to dark colors.

## REPELLENTS

The use of repellents is one of the most effective ways to protect your family against mosquitoes. Use it on all exposed parts of the body. If you are using sun protection, apply this first and secondly the repellent.



**Important:** Choose a repellent containing the active ingredient: DEET. Products containing: **Picaridin, Oil of Lemon Eucalyptus or IR3535** are also effective. You can use a product containing 20% to 25% DEET which will protect you for 6 to 8 hours.

It is not necessary to buy a product with a higher concentration since it will not protect you better only slightly longer. Better choose one that fits your lifestyle, you can always re-apply if you feel the repellent becomes less effective. Repellents are available in all supermarkets and drugstores.



Avoid being bitten even if you have had Dengue or Chikungunya! If the mosquito cannot get to you it cannot make you ill. There are many different things one can do to prevent the mosquito to get close to us.

### PRECAUTIONS WITH REPELLENTS

Use a repellent as indicated on the label. When using repellent, do not spray directly on your face spray some in your hands and apply to your face. Do not use repellent close to the eyes and mouth. Spray the repellent and spread to every uncovered part of your body. Wash your hands thoroughly after handling repellents.

**Important:** Remember the ones that cannot protect themselves due to some disability. Help them with the use of repellents or use mosquito netting to protect them against mosquito bites.

### BABIES AND CHILDREN

Don't let children play with the repellent. Do not spray directly on your child, spray some in your hands and spread it on the child. Because children will put their hands in their mouths and eyes, **do not use repellent on their hands. Repellents (containing DEET, Picaridin or IR3535) can be used once the baby is older than 2 months.**

Repellents containing Oil of Lemon Eucalyptus can be used only after the child is 3 years of age.



### PREGNANT WOMEN

During pregnancy any disease can be a problem for the mother or the child. This is also true for diseases acquired from mosquito bites. The pregnant women must make every effort not to be bitten by mosquitoes. Based on available scientific information, the repellents recommended in this document are safe for use during pregnancy.

No extra precautions are indicated for the use of repellents during pregnancy.



## KEEP THE MOSQUITO OUTSIDE

Sleeping under mosquito netting is an effective way to keep mosquitoes separated from humans. Mosquito netting is especially helpful for baby's younger than 2 months on whom repellents can not yet be used.

The *Aedes aegypti* mosquito is most aggressive at dawn and dusk, nevertheless once it is in your house it will keep being active night and day. To keep them out, keep windows and doors closed till after the peak activity hours.

The use of screens on doors and windows, although a large investment, is the most effective way to keep mosquitoes away from your loved ones.

## WHAT IS ZIKA?

Zika is an infection caused by the Zika virus. This virus is transmitted by a mosquito bite from the *Aedes aegypti*. The same mosquito that transmits Dengue and Chikungunya is also responsible for the transmission of Zika. Scientists have also determined that Zika can be transmitted through sexual intercourse



fever



rash



very red eyes



headache



joint pain

### SYMPTOMS

Symptoms can appear after **3 to 12 days** of having been bitten by an infected mosquito. These are as follows:

- fever;
- rash;
- non-purulent conjunctivitis or very red eyes;
- headache, body ache and pain in the joints;
- weakness;
- swollen legs.

Less frequent symptoms are: pain behind the eyeball (like in dengue), loss of appetite, vomiting, diarrhea and bellyache. Symptoms can last from **2 to 7 days**.

Based on currently available information Zika is not considered a fatal disease. Patients with Zika present less severe symptoms compared to Dengue and Chikungunya.

There is no treatment to cure Zika and no vaccine to protect against Zika. Visit your doctor if you develop the symptoms described. Your doctor may prescribe something to help with the fever and pain.

## COMPLICATIONS WITH ZIKA

### Paralysis

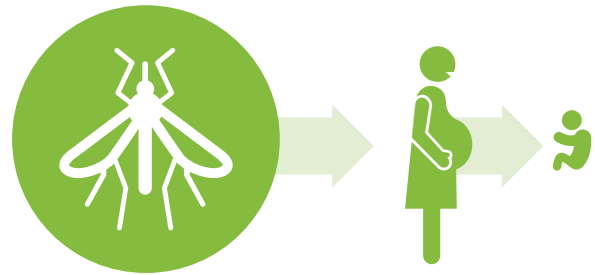
Information of epidemics in other countries indicates that Zika is related to an increase of Guillain-Barré Syndrome (GBS). GBS is a type of paralysis resulting after an infection (viral or bacterial). GBS can last for a short or long period; the patient can recover completely or partially; but sometimes GBS can end in death.

### Pregnancy

Information obtained from the current epidemic in Brazil indicates that Zika infection during pregnancy is related to miscarriage, death of the newborn and cases of microcephaly. Microcephaly is a condition in which the baby is born with a smaller head than is normal and is related to developmental problems and can lead to death.

## PREVENTION

Once there is someone in your household ill with Zika, it is important that neither the ill nor the healthy gets bitten by mosquitoes. The mosquito gets the virus from biting the ill and will after a while be able to give this virus to another person and hence spread the disease.



There are possible risks related to Zika infection during pregnancy

## PREGNANT WOMEN

Due to the risks related to Zika infection during pregnancy and the unborn child:

- It is of the utmost importance that pregnant women follow the recommendations to protect themselves against mosquito bites.
- Also, because the Zika virus is transmitted through sexual contact, the use of condoms is recommended throughout the whole pregnancy until the birth of the baby. This recommendation is relevant at all times, even if the man has not been ill with Zika.

Since 4 of every 5 persons infected with the Zika virus do not develop symptoms, it is thought that the man would be able to infect the pregnant women without knowing.

If you develop rash, red eyes or joint pain with or without fever visit your doctor, explain your symptoms and if necessary indicate that you are pregnant.





## WHAT IS DENGUE?

Dengue, also known in other parts of the world as break-bone fever, is an infectious disease that gives symptoms similar to the flu and to Chikungunya. There are 4 different viruses of the same family that causes Dengue, in other words you can get infected with Dengue 4 times. The person gets infected with the Dengue virus through the bite of the mosquito *Aedes aegypti*.

### SYMPTOMS

After **4 to 7 days** of having been bitten by the infected mosquito, the patient will start having symptoms. These can last from **3 days up to 10 days**. The symptoms of Dengue are:

- High fever and shivers;
- Severe headache;
- Pain behind the eyeball (retro-orbital pain);
- Pain in the joints, muscles and especially the bones;
- Rash with or without itchiness;
- Light bleeding (such as nosebleeds, bleeding gums and bruises).

Although the patient feels very ill with Dengue, he/she will recuperate without any problem. Nevertheless, 5% of patients with Dengue can develop Severe Dengue which could be life-threatening and would necessitate hospitalization. Children, pregnant women, the elderly are more at risk for complications from Dengue. People with chronic diseases such as diabetes, asthma, and sickle cell anemia are at greater risk as well as persons with a weak immune system.

# SYMPTOMS OF DENGUE



High Fever



Shivers



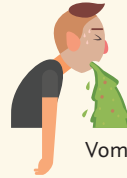
Severe headache



Rash



Pain behind the eyeball

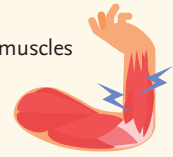


Vomit



Pain in joints

Pain in muscles



## TREATMENT

The first vaccines for the prevention of Dengue are in one or other phase of investigation, and are at this stage not commercially available. There is no treatment or drug to cure Dengue. The person infected with Dengue should rest and take plenty of fluids to prevent dehydration. Acetaminophen (also called paracetamol) can be taken to help control both the fever and the pain from Dengue.

## MEDICAL CARE

Visit your doctor promptly if you have Dengue and you start feeling any of the following:

- Sudden changes in temperature (from having fever to feeling cold to the touch with clammy skin and paleness);
- Very thirsty (dry mouth);
- Severe bellyache;
- Constant vomiting;
- Bleeding;
- Difficulty breathing;
- Or mood changes (bad mood, confusion, or listlessness).

## PREVENTION

Once there is someone in your household ill with Dengue, it is important that neither the ill nor the healthy gets bitten by mosquitoes. The mosquito gets the virus from biting the ill and will after a while be able to give this virus to another person and hence spread the disease.



## WHAT IS CHIKUNGUNYA?

Chikungunya is an infectious disease caused by a virus of the same name. Its symptoms are similar to those of Dengue and the flu. You can become infected with Chikungunya only once. Just as is the case with Dengue, the virus of Chikungunya is transmitted through the bite of an infected mosquito. The mosquito is, the same as with Dengue, the *Aedes aegypti*.

### SYMPTOMS

The symptoms of Chikungunya will start appearing around **4 to 7 days** after the mosquito bite. The symptoms in the first phase (acute phase) can last for **3 to 10 days**.

The symptoms of Chikungunya are:

- Sudden (high) fever and shivers;
- Very painful joints;
- Headache, backache and muscle pain;
- Nausea and sometimes vomiting;

- Arthritis, very painful and swollen joints, hot to the touch;
- Rash with or without itchiness. Babies can get blisters;
- Conjunctivitis (inflammation of the eye).

Complications, although uncommon, can develop with Chikungunya, these can be of the eyes, of the cardiovascular system, the nervous system, the renal system and the skin. People 65 years and older; people with chronic diseases such as: diabetes, heart disease, asthma and sickle cell





disease; and people with a weakened immune system due to illness or condition, treatment or medication are at greater risk for complications from Chikungunya.

### TREATMENT

There is NO vaccine to prevent Chikungunya; neither are there treatments or medication to cure Chikungunya. The patient has to rest, drink plenty of fluids to prevent dehydration. The doctor might prescribe medication for the pain and fever such as acetaminophen (also known as paracetamol) for the first days.

### DURATION

Most people will feel better after the first 10 days. Nevertheless, just when the patient starts to feel better, her/his condition can deteriorate with very painful and swollen joints (arthritis). In addition to these physical complaints he/she can experience depression, general fatigue and weakness. All these can last anywhere from 3 months to 3 years, this is considered the chronic phase of Chikungunya.

### MEDICAL CARE

The doctor might prescribe anti-inflammatory drugs for the heavy aches and pains and to decrease the inflammation. The doctor will wait with the prescription of these anti-inflammatory drugs till he/she is sure the patient has Chikungunya and **not Dengue** (e.g. thru a lab test). Anti-inflammatory drugs are not recommended in patients with Dengue to prevent worsening of possible complications and death.

**Some of the anti-inflammatory drugs your doctor might prescribe are e.g.:** ASPIRIN, IBUPROFEN, ADVIL, NAPROXEN, DICLOFENAC and DOLO-NEUROBION.



If your doctor prescribes an anti-inflammatory drug, follow the instructions of your doctor and pharmacist. Incorrect use of these types of drugs can have serious consequences as for instance bleeding of the stomach, stomach ulcers and perforation.

### PREVENTION

Once there is someone in your household ill with Chikungunya, it is important that neither the ill nor the healthy gets bitten by mosquitoes. The mosquito gets the virus from biting the ill and will after a while be able to give this virus to another person and hence spread the disease.



## DON'T GIVE MOSQUITOES A CHANCE!

### LARVICIDE

Larvicide is a product added to water to kill mosquito larva before they are able to develop further into adult mosquitoes. One of the known larvicides is for instance Abate®. The larvicide is added to for instance barrels used for the collection of rain water. The larvicide is available at the Public Health office from Monday to Friday **between 8am and 12pm**, at the Piscaderaweg 49 (Zakitó). Please follow the instructions. To effectively treat uncovered cisterns or other large water reservoirs, please call the Hygiene Department of the Public Health office for a consultation with one of the professionals or for an appointment.

### USE INSECTIDES RESPONSIBLY AND EFFECTIVELY

Insecticides can be used to eliminate mosquitoes in your home. The responsible way to use these is to ensure that:

- No people or pets are in the room when spraying an insecticide.
- Doors and windows are closed before spraying.
- Dark and quiet places such as underneath beds, on top of closets and room corners are sprayed.

- The room is left closed for 30 minutes and aired afterwards before entering.

### ELECTRIC RACQUET

With an electric racquet mosquitoes can be hunted down in those places where they like to hide, underneath furniture and other artifacts, in dark and quiet corners, in the ceiling and on top of closets among other places.





### LARGE SCALE FUMIGATION

Through the years we have learned that it is impossible to fight mosquitoes just by using insecticides.

- Indiscriminate use of insecticides creates resistance in the mosquito population, i.e. fewer mosquitoes are killed by the fumigation.
- Secondly, the use of insecticides will not only attack mosquitoes, but it will also eliminate insects vital to our ecosystem such as bees, butterflies, dragonflies, beetles and more.

For these reasons prevention is a much more valuable weapon against mosquitoes.

### WHAT TO DO WHEN YOUR NEIGHBORHOOD IS BEING FUMIGATED

Large scale fumigation is a last resort for the Ministry of Health, the Environment and Nature for the specific use in emergency situations and when the advantages of fumigation largely surpass the disadvantages.

Please follow the next recommendations:

- Cover all kitchen appliances, dinnerware and utensils, pots and pans.
- Cover all foods and other edible products. Cover pet (water) containers, or wash these thoroughly after the fumigation.
- The active ingredient of the fumigation may be harmful to pets such as fish and turtles once this substance makes contact with water. Cover their habitat (aquarium and bowls) during the fumigation.
- Keep doors and windows open when the fumigation truck passes your house, so that the product can penetrate every space in your home.
- Doors and windows can be closed again after one (1) hour.



# ELIMINATE MOSQUITO BREEDING PLACES

It's important to eliminate all breeding places of the mosquito inside and around your home. The mosquito *Aedes aegypti*, which transmits Dengue, Chikungunya and Zika, lives very close to people. She lays her eggs in clean and serene waters. She will use any container in or around the house that holds water. Even after the container in which she laid her eggs becomes empty, the eggs will keep for up to a year and once wet again will continue with their development. Walk around your garden and take notice of clutter lying around that has the potential of holding water.

## LIST OF THINGS TO MONITOR, CLEAR UP OR ELIMINATE INSIDE AND AROUND THE HOUSE:



To eliminate mosquito breeding places we have to follow these instructions every week:

- Put away, organize or get rid of every object that can catch and hold water.
- Clear away mosquito eggs (rim of black dots like dust) with a hard brush or coarse sponge if the object cannot be tidied up. The eggs can also be found on roots of plants or cuttings kept in water. It is recommended to change this water frequently or better yet plant these in soil.

**Keep tires in a covered area**, cover them or use them in some project. The main thing is to not leave them lying around collecting (rain) water.

Get rid of discarded appliances like **stoves, fridges, washing machines** as well as **old cars**. Take care that appliances in use do not become a container that collects water.

**Used (empty) bottles should be discarded.** Remember to fill with sand or cement the broken bottles used on fences.

**Cans, cups and foam containers**, thrown around and in our "mondi's" are of real concern. Remember that even a small bottle cap can become a breeding ground for mosquitoes!

**Put away toys that can hold water.** If there is a puddle that keeps water for longer than a week, fill it up with dirt or level the ground so the water will be able to drain.

**Vases and plant trays** should be cleaned weekly to eliminate mosquito eggs or you can fill the plant trays with sand, so that there won't be any water for the larva to swim in. The best solution is to plant these as soon as possible.

Keep decorative empty vases and pots around your garden filled with soil or sand, or drill holes on the bottom so they cannot hold water.

**Wash pet bowls frequently.** If you keep a **rain barrel** for the collection of rainwater you'll have to cover it tightly with either a piece of cloth or netting to keep the mosquito away from the water.

Fill up **hollow building blocks and hollow fence posts** with cement or soil. Put guppies or other larvae eating small fish in water tanks or reservoirs rather than larvicide. If you want to use a larvicide call and make an appointment with the Public Health Office to evaluate the product you can and the amount you should use.

**Kiddy pools, ponds and sandboxes not in use**, all have the potential to become a breeding spot, as well as an unused boat. Use it, clean it, treat it, put it away or turn it upside down, just make sure it doesn't keep water. **Clean gutters regularly.**

Flush a **not frequently used toilet** at least once a week. Make sure the tank cover is intact and fits properly.

**Cesspools and septic tanks** should be completely closed off, without even the smallest crack. A ventilation pipe should be covered with appropriate netting.

## ANTI-INFLAMMATORY DRUGS AND VECTOR BORNE DISEASES



The doctor sometimes prescribes anti-inflammatory drugs for heavy pains, as is the case for the severe joint aches of Chikungunya.

However if the patient has Dengue, anti-inflammatory drugs are NOT indicated because this type of drug can give a greater risk of hemorrhage (bleeding).

The doctor will determine the best medication for you once it is established that you have Chikungunya and not Dengue. Anti-inflammatory drugs reduce the inflammation, pain and fever.

**Some of the more known anti-inflammatory drugs are: ASPIRIN, IBUPROFEN, ADVIL, NAPROXEN, DICLOFENAC, DOLO-NEUROBION.** Some of these anti-inflammatory drugs can be obtained over the counter but for some a prescription is required.

If a doctor prescribes an anti-inflammatory drug, use it as prescribed by the physician and the pharmacist. Incorrect use of anti-inflammatory drugs can give serious complications like bleeding of the stomach, stomach ulcers and perforation.

### SOME PRECAUTIONS WHEN TAKING ANTI-INFLAMMATORY DRUGS:

- Use the anti-inflammatory drug always after a meal;
- Use the exact dosage prescribed by the physician;
- Use the anti-inflammatory drug during the period of time indicated by the physician;
- Sometimes the doctor may prescribe a drug to protect the stomach lining for the time you are using an anti-inflammatory drug. If this is not the case, ask the doctor if this is not necessary. If you are using anti-inflammatory drugs for other health conditions, whether it is on your own initiative or prescribed by (another) doctor, tell the physician when he prescribes you more anti-inflammatory drugs.

### GENERAL PRECAUTIONS WHEN USING MEDICATION:

- Read the instructions of the pharmacist on the label of the drugs.
- Memorize or make a note of the prescribed drugs you are using and keep this in a safe place.
- If you do not know, ask the physician or the pharmacist what the medication is for.
- Use exactly the dosage prescribed; you can find this on the label.
- Do not use any medication on your own; always tell your doctor.
- Do not quit the use of any prescribed medication without consulting your doctor.
- Do not share your medication;
- Do not take medication that others offer you; no matter how well it worked for them.
- Do not offer your medication to others; no matter how well it worked for you.



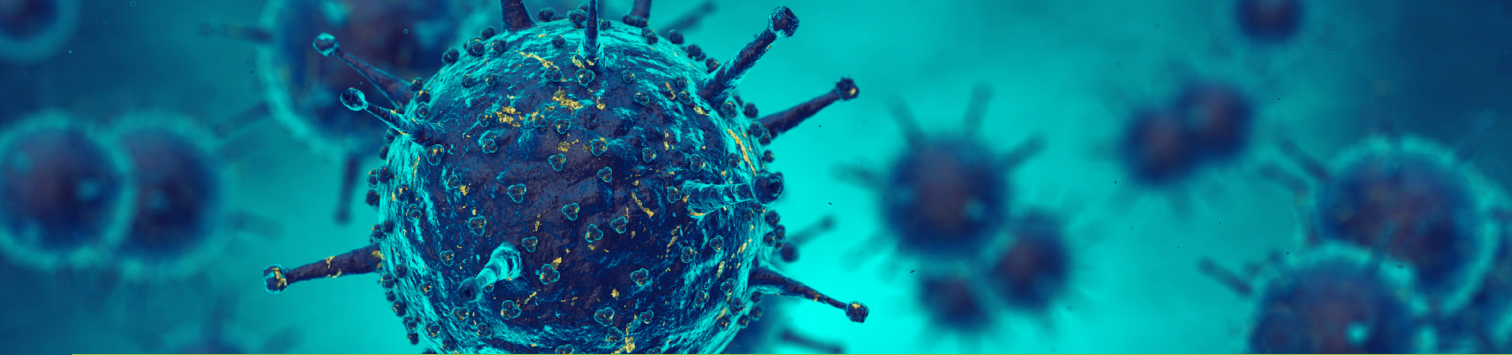
- If you decide to use any herbs or other “natural” remedies, inform your doctor about this, preferably before you start using it.

Hereafter you will find a table where the symptoms of Dengue Chikungunya and Zika are compared. As you can see the infections are quite similar. De main characteristics of each infection are:

- **Pain in the bones** is specific to **Dengue**. While light bleeding may be present in the common Dengue, the disease course can change all of a sudden and develop into a more serious hemorrhagic condition. In the case of Dengue, anti-inflammatory drugs are NOT prescribed because they might present a higher risk of bleeding.
- In **Chikungunya** the joints are the most vulnerable. It can take a very long time for all the symptoms of Chikungunya to disappear.
- **Zika** is characterized mostly by the rash it causes. Conjunctivitis (irritated red eyes) is also very common.

## SIMILARITIES AND DIFFERENCES: DENGUE, CHIKUNGUNYA AND ZIKA

SYMPTOMS	DENGUE	CHIKUNGUNYA	ZIKA
Fever	x	x	x
Headache	x	x	x
Muscle pain	x	x	x
Joint pain	x	x	x
Rash	x	x	x
Fatigue	x	x	x
Nausea (sometimes with vomiting)	x	x	x
Pain in the back of the eyeballs	x		x
Irritated (red) eyes		x	x
Pain in the bones	x		
Bleeding (nose, gums, bruises, or blood in stool or vomit)	x		
Arthritis (painful and swollen joints that feel warm)		x	
Painful and swollen wrists, ankles and foot soles		x	
Swollen legs and feet including the upper leg and knees			x



## SPECIFIC TO THE DISEASE

### DENGUE

The WHO estimates between 50 and 100 million cases of Dengue each year. This includes 500.000 cases of Severe (hemorrhagic) Dengue and 22.000 deaths yearly. One in every 4 people infected with the virus will develop the disease.

### CHIKUNGUNYA

In most cases of Chikungunya (varies per country 20%-50%) symptoms like arthritis, fatigue, depression and physical impairment can last from 3 months to up to 3 years. Most (varies from 72% to 93%) people infected with the virus will develop the disease.

### ZIKA

Zika is mostly characterized by the rash. One in every 5 persons infected with the virus will become ill. After an infection with Zika, there is a risk of developing a temporary paralysis called Guillain Barré. There is also a risk for damage to the unborn child if a woman gets infected with Zika during pregnancy.



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