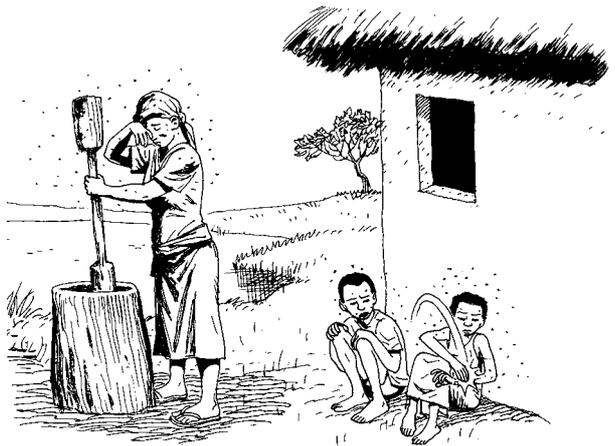


# Malaria, Dengue, and Other Illnesses from Mosquitoes

Mosquitoes carry many illnesses and spread them to people through their bites. Changes in climate are making weather warmer and wetter, conditions in which mosquitoes thrive.

There are many different types of mosquitoes—some breed in swampy water, others breed in rain and stored drinking water. Some bite at night and others during the day. Some give illnesses to people only, others can also make animals sick.



## Mosquitoes spread illness when they bite

**Viruses from mosquitoes.** Many illnesses that mosquito bites pass to people are caused by viruses. As with most viruses, once the person recovers, she is immune and will not get that same virus again. But some viruses, like dengue, have slightly different versions (called serotypes), so a person can get dengue more than once. Getting dengue a second time can make the illness more serious.

After many people in a community have already had a virus, they each are immune. Fewer people get sick and the illness seems to go away. But as children are born and people who never had the illness arrive, the virus can affect the community once again. So there may be years with an outbreak of illness and years with very little. This is also why many people get sick at once if a new virus reaches a region where no one has had it.

**Parasites from mosquitoes.** Malaria comes from very tiny parasites that enter and then stay alive inside the cells in our blood. The parasites get into our blood through an infected mosquito's bite. Once a mosquito passes the malaria parasites to a person's body, they cause illness off and on for many years unless the person takes medicines that kill the parasites. After many years of living where malaria is common, a person will no longer become so ill because his body has developed the ability to fight off the parasites. Pregnant women, babies and young children need protection because they can get malaria more easily and it is more harmful to them, causing fever, anemia, and dehydration.

**How illness spreads.** Illnesses from mosquitoes do not spread directly between people who live together or touch each other. But mosquitoes can get a virus or parasite by biting a person who has the parasite or virus in his blood and then pass it by biting another person, so family members and neighbors often get sick one after the other. Understanding how a mosquito spreads disease (page 19) will help community members understand how to protect themselves from illnesses carried by mosquitoes.



*Mosquitoes spread problems like dengue and malaria. But mosquitoes cannot spread HIV!*

Although Zika virus is mainly spread by mosquito bites, it can also be spread through sex. Zika is usually a mild illness, but if a pregnant woman gets Zika, it can greatly harm her developing baby. Protect women from Zika by preventing mosquito bites and by using condoms (pages 13 to 14).

## Signs of common illnesses spread by mosquitoes



Among the illnesses spread by mosquitoes are malaria, yellow fever, dengue, Zika, chikungunya, West Nile virus, and Japanese encephalitis. There are mild and severe forms of each. These diseases often cause fever, rashes, and aches. It is possible to be infected by more than one virus at the same time. Signs help point to one disease over another, but it is often difficult to tell them apart. Health officials usually know what mosquito illnesses are present in your region.

## Which mosquito illness is it?

---

- ?** Is there fever?
- ➔ First fever, then chills, then fever again. This is common in malaria. Dengue and yellow fever may give chills in addition to fever.
  - ➔ Fever comes on quickly, the head and body aches. Yellow fever, dengue and chikungunya often start this way. Japanese encephalitis can also start with a sudden fever.
  - ➔ The fever from dengue and chikungunya is usually high, 38.5° (101° F) or more. Fever from Zika is usually lower, less than 38.5° (101° F).
  - ➔ Fevers are common to many illnesses. See Examining a Sick Person (in development) to learn more about fever and see the Caring for Children chapter for information on childhood illnesses that cause fevers.
- 

- ?** Is there a rash?
- ➔ Rash is very likely with Zika and common with chikungunya, dengue, and West Nile fever. Rash is not likely with malaria, yellow fever, or Japanese encephalitis.
  - ➔ A rash can also be a sign of measles or other common illnesses that are not from mosquitoes.
- 

- ?** Are there aches in the bones and joints?
- ➔ Pain and aches in the body are common with dengue, chikungunya, and Zika. Aches are less likely with malaria. Pain felt in the bones or muscles is more likely dengue and painful, swollen joints are more likely to be chikungunya.
  - ➔ Joint pain can also be a sign of other problems that are not from mosquitoes, including viruses spread by ticks.
- 

- ?** Are eyes red and irritated?
- ➔ Irritated eyes are common as a sign of Zika and sometimes occur with chikungunya and yellow fever.
-

### **Danger signs from mosquito illnesses that need emergency help**

- Seizures and losing consciousness can result from severe malaria, severe West Nile virus or severe Japanese encephalitis.
- Bleeding inside the body or from the mouth, gums, nose, eyes, or skin can come from severe yellow fever or from severe dengue. Watch for signs of shock: the skin goes cold, blood pressure drops, and the pulse gets fast (see the First Aid chapter, page 11). A swollen stomach could also be a sign of internal bleeding.

If the fever is close to 40° (104°F), see a health worker soon. If it is higher, this is an emergency.

Be sure to see a health worker if you have signs of malaria and are pregnant, if you suspect an illness from mosquitoes in a baby, or there is illness in someone elderly or with serious health problems. If painful aches continue longer than 2 weeks or there is severe weakness, tingling, or no feeling in the legs, arms or face, see a health worker. These could be a sign of Guillain-Barré syndrome, a serious condition that can follow an illness from mosquitoes. It is best treated in a hospital.

### **Which mosquito illness do you have and what should you do?**

Because these illnesses have similar signs, it is difficult to be sure which a person has. If it might be malaria, getting a malaria test without delay allows a person to start malaria medicines quickly, especially important if she is pregnant, very young or old, or has HIV. A woman who might have Zika can delay trying to become pregnant until she is better. Zika during pregnancy can be dangerous (see page 13).

When the illness is mild, treat with rehydration, rest, and paracetamol (acetaminophen), even if you are not sure which illness it is (see page 10). If the person feels worse or is not getting better, check with a health worker.

Informing health workers and regional health officials about who and how many people are sick can help them know when to take community-wide measures to stop the mosquitoes (see the section starting on page 18).

### **Prevention of illnesses caused by mosquitoes**

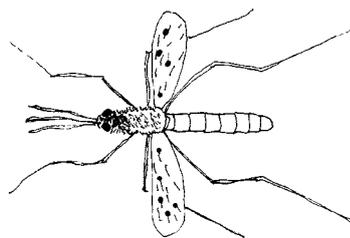
In areas where there is yellow fever (see page 12) or Japanese encephalitis (see page 17), vaccinating children and adults can prevent these diseases. Where insecticides are used to kill mosquitoes, be careful how you use them because insecticides can harm people and the environment (see pages 21 to 22). It may be safer and more effective to prevent mosquito bites (pages 19 and 20) and stop mosquitoes from breeding with other methods (page 23).



To help prevent illness, get rid of places where mosquitoes can breed and keep water containers tightly covered.

# Malaria

Malaria is caused by a parasite (called *Plasmodium*) passed to people by mosquitoes (called *Anopheles*) that bite mostly at night. For most cases of regular malaria (called uncomplicated malaria), the cycles of fever and chills are unpleasant but will go away in a few days with treatment. But untreated, malaria can become dangerous quickly. This is called severe malaria. In regions with malaria, people with unexplained fevers should go to a health center to get a blood test. If the test shows malaria, or if testing is not available but health workers think it is malaria, start treatment with medicines right away.



The malaria mosquito may have spotted wings.

Different parasites cause falciparum, vivax, and other malaria types. Health authorities know which types are present where you live and which medicines will work best (pages 29 to 44). Without medicines, malaria can come back many times because the parasites stay in the person's liver. Medicines help the person get better by killing the parasites.

Malaria is especially dangerous to babies, children under 5 years old, pregnant women, and people with HIV. When pregnancy or HIV or another illness make it hard for a person's body to fight off infections, getting malaria or developing severe malaria is more likely.

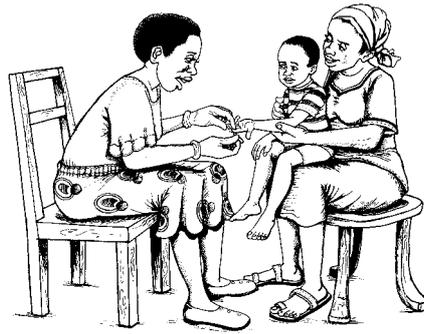
## Uncomplicated malaria

A common sign of malaria is a fever that comes and goes, followed each time by chills. Sometimes the person sweats as the fever goes down. However, many cases of malaria do not follow this pattern. The other signs are common but do not affect everyone and are signs of other illnesses too.

### SIGNS OF UNCOMPLICATED MALARIA

- Fever can be mild but is often high, 39° (102°F) or more
- Chills and sweats
- Headaches and body aches
- Nausea, vomiting, lack of appetite
- Paleness and weakness from anemia
- Mild jaundice (yellow in the white part of the eyes or skin of a light-colored person)
- Enlarged spleen (a health worker feels this by checking the belly)

A blood test confirms if a person has malaria. Some malaria tests require a microscope but many community-based health workers use rapid test kits that use only a single drop of blood. Because untreated malaria can cause fever and chills several times over a few years, ask if the person has had the same signs in recent months.



Rapid Diagnostic Tests (RDT) test for malaria using a drop of blood. If the person is already taking malaria medicine, the test may not give a correct result.

### **TREATMENT OF UNCOMPLICATED MALARIA**

Start malaria medicine (pages 29-44) as soon as possible after a positive blood test or if you have good reason to suspect malaria and a test is not available. In areas with *P. falciparum* malaria, it is especially important to begin treatment right away. Because mosquitoes pass malaria from person to person, treating a sick person protects others from getting infected.

Find out what medicines for malaria your local health authorities recommend. In many regions, malaria has developed resistance to some older medicines. This means that medicines that once worked to prevent or treat malaria no longer work. Medicines that cure malaria in one region may not cure the malaria found in a different place.

A person with malaria will need to rest and drink clean water, soups, and also rehydration drink if there is fever, vomiting, or diarrhea.

**IMPORTANT!** Take all of the medicine for all of the days recommended, even if you feel better. If you stop taking the medicine, the malaria may come back and the medicines may no longer work.



The woman who took all of her medicine got better.



The woman who did not finish all her medicine is still sick in bed.

### **Anemia from malaria during pregnancy and in children**

When malaria is not treated, it causes anemia (low iron in the blood). Tiredness, weakness, and shortness of breath are signs. Anemia is especially harmful during pregnancy and for small children. Anemia that comes with malaria during pregnancy can cause babies to be born too soon, too small, and can make bleeding during birth more dangerous.

Sometimes malaria causes no fever, chills, or other signs that the person is ill. But if a child or a pregnant woman has anemia and there is malaria in the area, also test for malaria. When anemia is caused by not eating enough foods with iron, then eating these foods will help with the anemia. If the cause is malaria, it is important to treat the malaria with medicines as soon as possible to prevent the anemia from getting worse and causing more harm.

In areas where there is a lot of malaria, pregnant women can take sulfadoxine + pyrimethamine to prevent malaria. This is often given during the regular health visits during the pregnancy. Do not use during the first 3 months of pregnancy, but after that, give at least 3 times during the pregnancy (see page 36).

#### **SIGNS OF ANEMIA**

- Pale gums and inner eyelids
- Weakness
- Tiredness
- Dizziness
- Trouble catching the breath
- Fast heartbeat

A blood test is used to check for anemia.



## Severe malaria

Severe malaria can develop when uncomplicated malaria is not treated or not treated soon enough. Severe malaria is more likely when the person's malaria is caused by the parasite "Plasmodium falciparum" (*P. falciparum*). The person with severe malaria needs advanced care in a hospital or clinic. Severe malaria can cause death within 1 or 2 days, especially if it spreads to the brain, a condition called "cerebral malaria."

### **DANGER SIGNS OF SEVERE MALARIA**

- Too weak to sit or stand, cannot stay awake
- Mental confusion, convulsions, or loss of consciousness
- Repeated vomiting, cannot drink or breastfeed
- Rapid breathing or difficulty breathing
- Low blood pressure or other signs of shock (see page 11 of the First Aid chapter).
- Dark urine, and less urine as kidneys begin to fail

Health workers will also test blood and urine for:

- Anemia (low iron in the blood)
- Hemoglobin in the urine
- Low blood sugar (glucose)

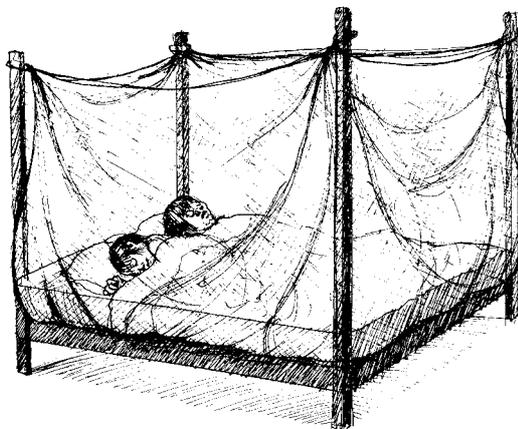
### **TREATMENT OF SEVERE MALARIA**

Adults and children with severe malaria need a health worker with advanced training to give artesunate in the vein or injected in the muscle, for 24 hours or more. If the hospital or the person who can give this treatment is not close, a local health worker may have the training and medicines to inject artesunate or quinine to help while you get to a hospital. Artesunate capsules in the rectum are used for children under 6 years old where injected artesunate is not available (see page 38). Emergency treatment does not cure the malaria; you will also need 3 or more days of additional medicines by mouth.

## PREVENTION OF MALARIA

There is no vaccine to prevent malaria. Medicines that treat malaria are sometimes used to prevent it, especially when people travel from one area to another. The prevention dose may be daily, weekly, or monthly. In some countries, it is important to use medicines to prevent malaria during the last 6 months of pregnancy (see sulfadoxine + pyrimethamine, page 36). In countries where malaria only appears in the rainy season, programs may give malaria prevention medicine to children a few months each year.

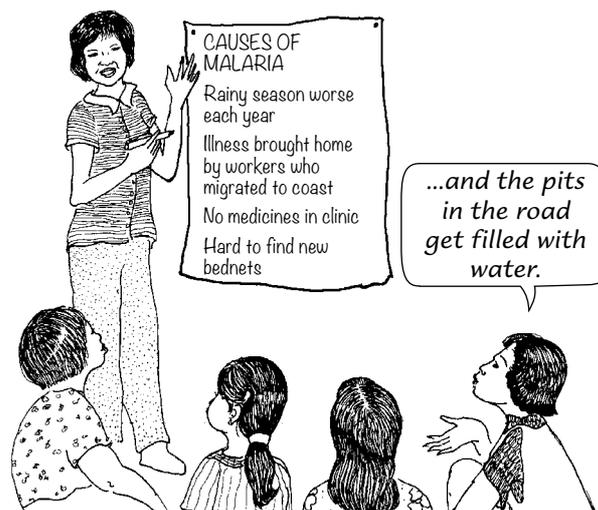
Sleeping under an insecticide-treated bednet is one of the best ways to prevent malaria. These bednets are treated with one or more insecticides, which are relatively safe, especially compared to getting malaria. Learn more about how bednets prevent malaria and other mosquito illness (page 20).



Malaria mosquitoes bite at night. To prevent malaria, sleep under an insecticide-treated bednet. Cover a baby's cradle with netting too.

Campaigns that distribute free insecticide-treated bednets and use trained workers to spray insecticides indoors (page 22) can stop malaria when enough homes in the community are involved.

You can prevent malaria mosquitoes from breeding or their eggs from hatching (see page 23). Avoiding mosquito bites will always help prevent the diseases they spread (pages 19 and 20).

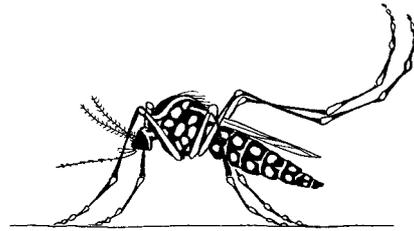


Malaria is most common where people cannot afford blood tests and medicines, and lack access to health services. As long as one person has malaria, the infection can spread to others through the local mosquitoes. For prevention campaigns to be successful, they must address the root causes of poverty and injustice, and make treatment available to all.

# Dengue, Yellow Fever, Zika, and Chikungunya

Dengue, yellow fever, Zika, and chikungunya are different diseases, each caused by a different virus. They are spread by black mosquitoes with bands of white or silver-colored dots and striped legs. Two of these are the yellow fever mosquito (*Aedes aegypti*) and the Asian tiger mosquito (*Aedes albopictus*). They usually bite during the day, especially in the early morning and late afternoon, and breed where people store water and anywhere water collects. These mosquitoes live in and close to houses and usually stay in shady, dark places, such as under tables or beds, or in dark corners. It can be hard to tell which virus a person has if Zika, dengue, and chikungunya are all present in your region.

Learn about the most common signs for dengue (page 11), yellow fever (page 12), Zika (page 13), and chikungunya (page 15). Any of these can give fever and body aches. But some people have no signs at all. Unless they have a blood test that shows they had the illness, they may not know they were sick. And even if you have no signs, getting new mosquito bites will spread these diseases to others when the mosquito bites someone else.



These mosquitoes cause many diseases. The legs are striped black and white.

## Treatment is similar for dengue, yellow fever, Zika, and chikungunya

Most often these 4 virus illnesses from mosquitoes are treated at home, but for babies, elderly people or people with HIV, or any danger sign including fever over 40° (104°F), see a health worker.

There is no medicine that cures dengue, yellow fever, Zika, or chikungunya. They are all treated with bed rest, drinking plenty of water and other liquids, and taking paracetamol (acetaminophen) to reduce pain and fever (see page 29). Paracetamol is safer to use than aspirin or ibuprofen, which can be dangerous if a person develops severe dengue (see page 11). If a woman might be pregnant, aspirin and ibuprofen could be harmful to her developing baby but paracetamol is safe.

## Prevention is the same for dengue, yellow fever, Zika, and chikungunya

To prevent these illnesses, avoid mosquito bites (see page 19) and prevent mosquitoes from breeding (see page 23). There is a vaccine to protect against yellow fever.

# Dengue Fever (Breakbone Fever)

Dengue usually occurs during the hot, rainy season. It is common in cities and places where people live close together. The mosquitoes breed where people store water and anywhere water collects, commonly in containers and on the ground where there is poor drainage.

The first time a person gets dengue, she can usually recover with rest and by drinking lots of liquids. When a person gets dengue a second time or any time after that, it is more dangerous.

The illness usually begins with sudden high fever along with body aches. After 3 to 4 days, the person may start to feel better but a rash begins on the hands and feet. The rash spreads to the arms, legs, and body (but usually not the face). Dengue can have other patterns but most people have the high fever and 2 or more of the other signs.

## **SIGNS OF DENGUE:**

- Sudden high fever, 39° (102°F) or higher
- Severe body aches in both the muscles and joints (this is why dengue is sometimes called breakbone fever)
- Headache, pain behind the eyes
- Rash
- Sore throat
- Nausea or vomiting
- Chills
- Extreme tiredness



**Treatment** (see page 10) can help you feel better. But watch for danger signs of severe dengue. If not treated right away, it can lead to death.

## **DANGER SIGNS OF SEVERE DENGUE**

- Tiny spots of blood on the skin or from the nose, ears, or mouth
- Swollen stomach or blood in vomit or feces (from bleeding in stomach)
- Unable to eat or drink
- Acts confused, pulse gets fast, the skin goes cold, or other signs of shock. Where a blood test is available, a high hematocrit or low platelets are signs that something is wrong.

Severe dengue can only be treated by giving fluids by IV quickly and treating blood loss. Go to a hospital immediately if there are danger signs.

## **PREVENTION**

Avoid mosquito bites (page 19) and prevent mosquitoes from breeding (page 23).

## Yellow Fever

Yellow fever is most common in Africa and South America. People in tropical rain forests can get *jungle* yellow fever, but the most common kind is called *urban* yellow fever.

Most people recover completely from yellow fever and develop immunity, which means they will not get yellow fever again. A small number of people get severe yellow fever, but with treatment they too usually recover.

### **SIGNS OF YELLOW FEVER**

- Fever
- Chills
- Muscle pain (especially backache)
- Headache
- Loss of appetite
- Nausea and vomiting
- Slow pulse
- Eyes sensitive to light
- Redness of skin, eyes, tongue



For most people, the illness goes away after 3 or 4 days.

**Treatment** (see page 10) can help you feel better. But watch for danger signs.

### **DANGER SIGNS OF SEVERE YELLOW FEVER**

In severe yellow fever, after a few hours or after the first day of feeling better, a high fever returns with some of these signs:

- Jaundice (white part of the eye or light colored skin is yellow)
- Abdominal pain
- Bleeding from the mouth, nose, or eyes
- Vomiting
- Blood in vomit or feces (from bleeding inside the stomach)

If any of these danger signs appear, go to a hospital immediately.

### **PREVENTION**

Vaccination prevents yellow fever (see the Vaccines chapter, page 11). Also avoid mosquito bites (page 19) and prevent mosquitoes from breeding (page 23).

# Zika Virus

Zika may cause a mild fever, rash, irritated eyes, and body aches, usually for a few days only. However, most people who get Zika virus have no signs.

## SIGNS OF ZIKA

- Low fever for 1 or 2 days, usually not over 38° (101°F)
- Rash
- Irritated or red eyes
- Joint pain
- Itching skin
- Muscle pain and headache

Zika is usually mild and lasts just a few days or up to 1 week. Usually a person with Zika virus is not sick enough to need to go to a hospital.

**Treatment** (see page 10) can help you feel better.

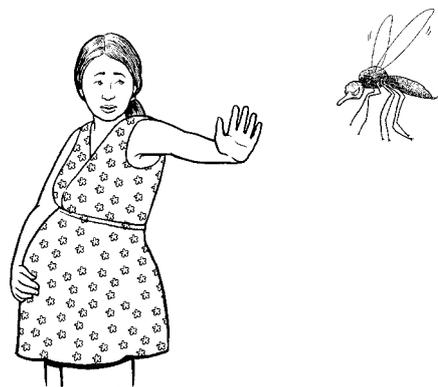
## PREVENTION

To prevent Zika, avoid mosquito bites (page 19) and practice community mosquito control (page 23). While most Zika comes from mosquito bites, it is possible for a man who has had Zika to pass it to a woman through sex. So in regions with Zika, using condoms during sex will help prevent it from spreading.



## Zika and pregnancy

Zika can be very dangerous for a baby growing in the womb. Zika can cause babies to be born with a serious condition called microcephaly, where the baby's head is too small. Babies born to women with Zika in pregnancy may die at birth or may have problems developing physically and mentally. Fortunately, most of these babies will not have problems. But all women, especially women who might be pregnant, should prevent mosquito bites—cover up with clothing, use mosquito repellents, and keep mosquitoes away by using screens and bednets in the home (pages 19 to 20).



If there is a Zika outbreak where you live and you want to get pregnant, you can consider waiting until the outbreak ends. Communities can ensure that birth control is made accessible to all women to limit harm from the Zika virus (see the chapter on Family Planning and the book *Health Actions for Women*).

Because Zika virus can be passed between men and women during sex, where there is Zika, use condoms to prevent passing Zika virus. If the woman is already pregnant, it is especially important that she either avoids sex or that she and her partner use condoms to prevent her from getting Zika while pregnant.

In an area with no Zika from mosquitoes, a woman can still get Zika from sex if her partner has traveled to an area with Zika. He should use condoms for at least 6 months after his return to prevent spreading Zika virus through sex.



*When we wanted a baby, we stopped using condoms. Now my wife is pregnant and because there is Zika here, we take care not to get mosquito bites and we are using condoms again to protect the baby!*

No babies have gotten Zika from breast milk. Even if you have had Zika, breastfeeding is the best way to nourish and protect your baby's health.

### **When a baby is born with birth defects from Zika**

The baby born with problems from Zika during pregnancy may have a small head and a small brain. He may develop vision, hearing, or other physical problems and be mentally slow. Health workers check a baby's eyes and vision at 3 months and can also look for problems by comparing the child's abilities and activities to what other children do, using a child development chart (see Appendix A in the chapter *Caring for Children*). Give the child all of his vaccines and regular care. If the baby is born with a small head or as soon as eye or other problems are noticed, help the family find the government or community programs that offer therapy or other resources they will need to help their child. Children who are developmentally slow need the same stimulation that any child needs from her parents and family, including talking to them, playing games and music, and showing love. But they need more. They need more help and repeated activities to learn to use their minds and their bodies. Hesperian's books *Disabled Village Children* (chapter 34) and *Helping Children Who Are Blind* have more information on helping children with these challenges.



# Chikungunya Virus

Although not usually a dangerous disease, chikungunya can be very uncomfortable because of the intense joint pain that can affect the hands, feet, knees, and back. It can be so painful that people stay bent over and cannot walk. Most people feel better within one week, but after the fever goes away, joint pain can last for several more weeks or even months. The pain may return later, even after a year or more.

Chikungunya can be more dangerous for infants. See a health worker if a baby has high fever, seizures, vomiting, or diarrhea.

## **SIGNS OF CHIKUNGUNYA**

- Fever is sudden and can be mild or high, often 38.5° (101°F) or higher
- Intense body aches, headache, neck pain and abdominal pain
- Nausea
- Rash
- Joint pain may continue for weeks or months

**Treatment** (see page 10) can help you feel better.



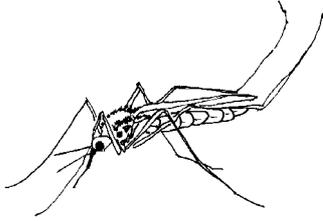
## **PREVENTION**

To prevent chikungunya, avoid mosquito bites (page 19) and prevent mosquitoes from breeding (page 23).



The mosquitoes that spread dengue, yellow fever, Zika, and chikungunya do not need much water to lay eggs. A bottle cap filled with water is big enough!

## West Nile Virus



This mosquito breeds in swamps or other stagnant or dirty water.

West Nile virus is spread by the *Culex* mosquito. These mosquitoes are medium-sized, brown, and have whitish markings on the abdomen. By day, they rest in and around homes and other structures and near plants and vegetation. Crows, other birds, and horses carry West Nile virus. The mosquito bites an infected animal and then bites a person, passing the virus and the illness.

### SIGNS OF WEST NILE VIRUS

Most people infected with West Nile virus do not get signs of illness and may not know they had it. But about 1 in every 5 people infected will feel sick and may have some of these signs:

- Fever
- Headache
- Feeling tired all the time (fatigue)
- Body aches
- Vomiting
- Rash on the body
- Swollen lymph nodes



**Treatment** (see page 10) can help you feel better.

Although it is not common, West Nile virus can become severe. This form of the disease affects the brain. Older people are more likely to develop severe West Nile virus than younger people. Get medical help quickly for any danger signs.

### DANGER SIGNS OF SEVERE WEST NILE VIRUS

- Neck stiffness
- Tremors (trembling)
- Paralysis (being unable to move)
- Becomes unconscious

### PREVENTION

Dead birds and sick horses in a region with West Nile virus are a warning that the illness may start in people. There is a vaccine for horses that prevents West Nile virus; so vaccinating horses protects people too. Avoid mosquito bites (page 19) and prevent mosquitoes from breeding (page 23).

# Japanese Encephalitis

Japanese encephalitis is spread by the *Culex* mosquito. These mosquitoes are medium-sized, brown, and have whitish markings on the abdomen. They usually bite at dusk and after dark. By day, they rest in and around homes and other structures and near plants and vegetation. Japanese encephalitis mostly affects people in Asia and the western Pacific. Most people do not become seriously ill, however severe cases of Japanese encephalitis can damage the brain and even cause death.

## **SIGNS OF JAPANESE ENCEPHALITIS**

A person with Japanese encephalitis may have no signs or may only have signs shared with many other illnesses, such as fever, diarrhea, vomiting, headache, or weakness.

**Treatment** (see page 10) can help you feel better. But take a person with any danger signs to a hospital quickly.

## **DANGER SIGNS OF SEVERE JAPANESE ENCEPHALITIS**

- Seizures
- Paralysis (being unable to move)
- Becomes unconscious

## **PREVENTION**

Vaccination prevents Japanese encephalitis. Also avoid mosquito bites (page 19) and prevent mosquitoes from breeding (page 23).

# Elephantiasis (lymphatic filiarisis)

Elephantiasis is caused by tiny worms (called “filiarisis”) that are spread by mosquitoes. Usually there are no signs until many years after infection. Where elephantiasis is a problem, the best way to prevent its spread is giving medicines to treat people who already have it. The medicines kill the parasites inside the person, so mosquitoes can’t spread them to others. Different mosquito types can carry the illness. Preventing mosquitoes from biting (page 19) and breeding (page 23) help keep it away.

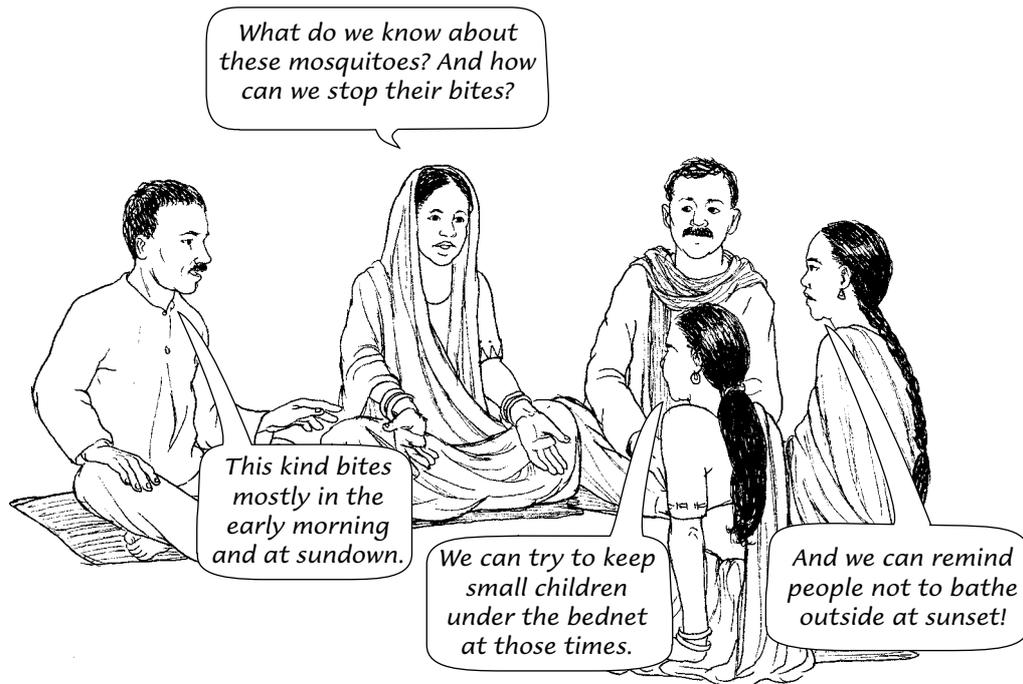
**Signs** of elephantiasis develop after an infected person has had it a long time. They include swelling of legs and arms, and in men, the scrotum. There are attacks with fever and severe pain.

**Treatment** includes antibiotic and anti-parasitic medicines to kill the parasites and stop the disease from getting worse. Pain relievers help reduce pain and fever. Sometimes a swollen part of the body can be treated with surgery. Talk to a health worker to get the medicines you need and learn exercises and other ways to help swollen legs and other problems.

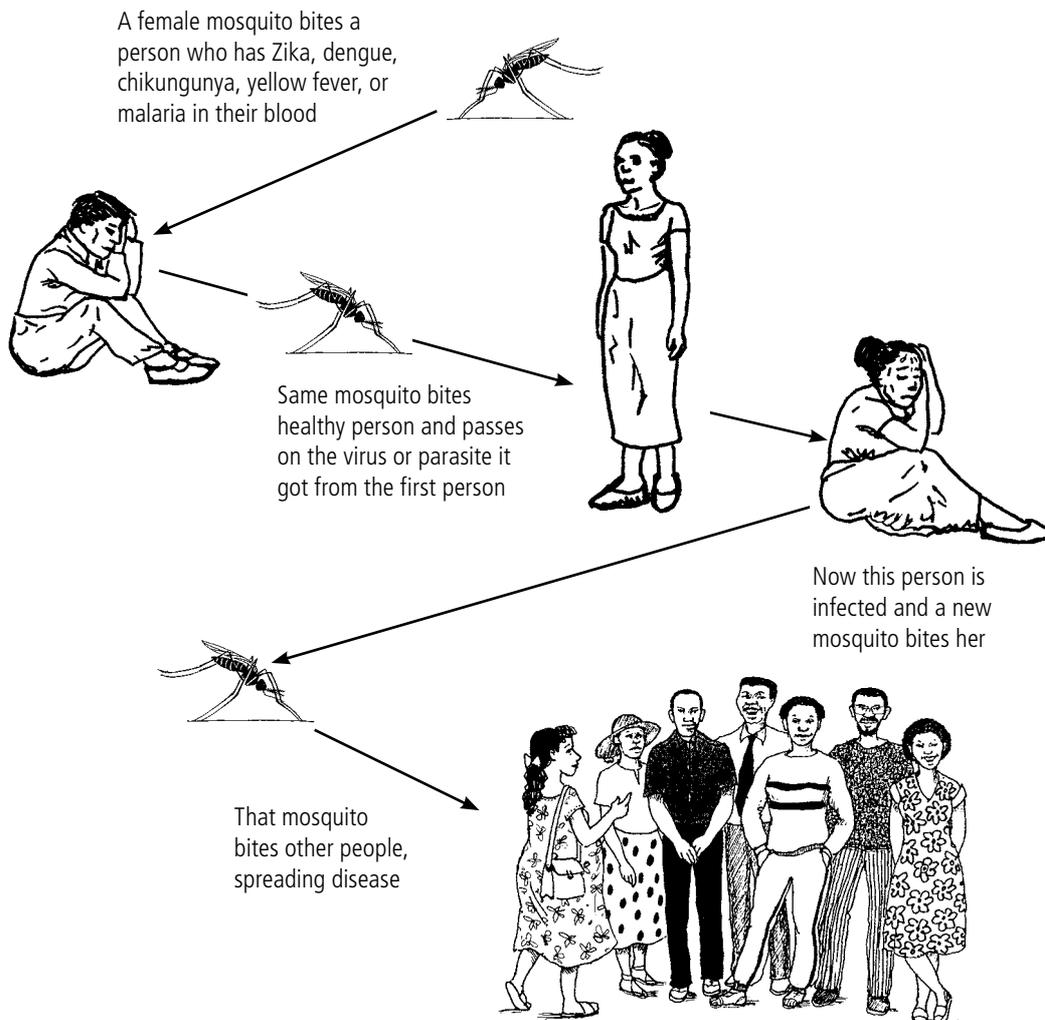
# Prevent Illness by Stopping Mosquitoes

You can stop illnesses carried by mosquitoes by preventing mosquito bites and preventing mosquitoes from breeding in the home and in the community.

To do this, you must know where different kinds of mosquitoes like to breed, where they like to rest, and when they bite. For example, malaria mosquitoes are most common in rural areas, and often breed in swamps and other still water. The dengue and yellow fever mosquitoes stay inside or near houses, where clean water collects or is stored, both in rural areas and in cities. In the house, many mosquitoes hide in shady, dark places, such as under tables or beds, or in corners. Outside, they find shady areas.



## How mosquitoes spread disease



## Avoid mosquito bites

- Wear clothes that cover the arms, legs, feet, neck, and head as much as possible (long sleeves and long pants or skirts, a head covering and closed shoes, or socks with sandals).
- Use wire mesh (screens) on windows, doors, and vents. Fill in any gaps around the windows and repair holes in the screens.
- With no screens, close doors and windows when mosquitoes are out.
- The moving air from a fan can keep mosquitos away.
- Use bednets at night and if resting during the day.
- Use a net to protect you from mosquitoes when sleeping outdoors.

## Bednets help stop mosquito bites

Bednets prevent mosquito illness in 2 ways. A bednet with no holes or openings keeps the mosquito from reaching someone under the net. And a bednet treated with insecticide kills the mosquitoes that land on the net. To lower the number of mosquitoes bringing illness to the community, use one for each bed in every home. Programs give away insecticide-treated bednets because when everyone uses them, mosquitoes are fewer and there is less malaria.

To keep mosquitoes from biting, always tuck the edges of the nets under the bed or sleeping mat so there are no openings. Bednets only work if holes or tears are quickly repaired.

Bednets that come treated with insecticide are meant to be long-lasting, which means that the insecticide can work well for a year or even a few years. If you buy or are given a bednet, find out how long the insecticide is meant to last and if washing the net too much makes it less effective.

With older bednets, the insecticide will eventually wear off. If the bednet is still in good condition, you can mix and apply new insecticide, but if the bednet has many rips or tears it is safer to replace it. When reapplying insecticide to the bednet, wear gloves and pay careful attention to the directions to stop the chemicals from getting on or inside your body.

For any bednet treated with insecticides, do not let children suck or chew on them and do not wash them in a river or water where the insecticide can harm fish, insects, animals, and people downstream.



The malaria mosquito mostly bites at night, making bednets especially helpful in preventing malaria and any other illness caused by the same mosquitoes. The mosquitoes that carry dengue, yellow fever, Zika, and chikungunya bite during the day. For small children or others sleeping or resting during the day, bednets will help prevent these illnesses too. Also, bednets will keep those who are already ill from being bitten by a mosquito that could then give the illness to others.



## Repellents and insecticides stop mosquito bites

Repellents are chemicals that mosquitoes do not like, so they stay away. Insecticides are chemicals that kill mosquitoes after they land on an insecticide-treated surface, such as a wall or bednet.

- For your skin, use natural repellents like citronella, neem oil, concentrate from lemongrass or basil leaf. Or use chemical repellents that have one of these ingredients: DEET, Picardin (KBR 3023, icaridin), IR3535, or PMD and other oil of lemon eucalyptus compounds. Repellents can be especially useful protecting children but read the label carefully to make sure the product is safe for children. The label will also say how often to reapply, usually every few hours.
- Where there is Zika, health authorities may provide repellents to women because Zika can harm a woman's pregnancy (see page 13).
- Permethrin is a chemical that should not be applied to the skin but can be sprayed on bednets, clothes or shoes to keep mosquitoes away. To keep the chemical off your skin, spray the clothes and let them dry before you put them on. Follow the instructions on the label.
- Only use mosquito coils until you can find a better repellent. The smoke from the mosquito coils and other methods to create smoke to repel mosquitoes can harm your breathing.

### Spraying insecticides to kill mosquitoes

Governments or other organizations may carry out programs to kill mosquitoes by spraying insecticides on inside walls at the time of year when there are most mosquitoes. This is called IRS or Indoor Residual Spraying. Anyone applying insecticides needs protection to prevent the insecticides from getting in the body by breathing or by touching the mouth or skin.



To stop malaria, this kind of spraying works best when all houses in the same area are sprayed. As with all chemicals including insecticides, keep children from getting the chemicals in their mouths or on their body.

### Insecticides kill mosquitoes but can harm people

Insecticides are poisons—that is why they kill mosquitoes. Almost all insecticides also harm people. That is why the best methods of mosquito control are community efforts that take away places where mosquitoes can breed. If those efforts are not enough and insecticides are used to kill mosquitoes, there are ways to reduce their harm to people:

- Make sure the insecticide you use is one that will kill the mosquitoes in your area. There are places where the mosquitoes have become resistant to some insecticides. This means that the insecticide no longer kills the mosquitoes.
- Use the least dangerous insecticide available, and use the least amount necessary. Read the directions on how to mix and apply it.
- Aerial spraying or spraying from trucks are the most dangerous ways to apply insecticides because it covers everything unnecessarily, harming people more than mosquitoes.
- Where they are available, use insecticides that kill larvae before they develop into mosquitoes. These kinds of insecticides, called larvicides, are almost always safer than the insecticides that kill adult mosquitoes. But do not use larvicides in drinking water.
- When handling chemicals, always use gloves, goggles or glasses, and clothing that covers you completely. Cover your mouth and nose with a protective mask. When you are done, wash yourself and your clothing. Wash your hands very carefully, especially before eating, drinking, or touching your face.



Make sure children are protected from insecticides. Compared to adults, their smaller, developing bodies are more likely to be harmed by insecticides.

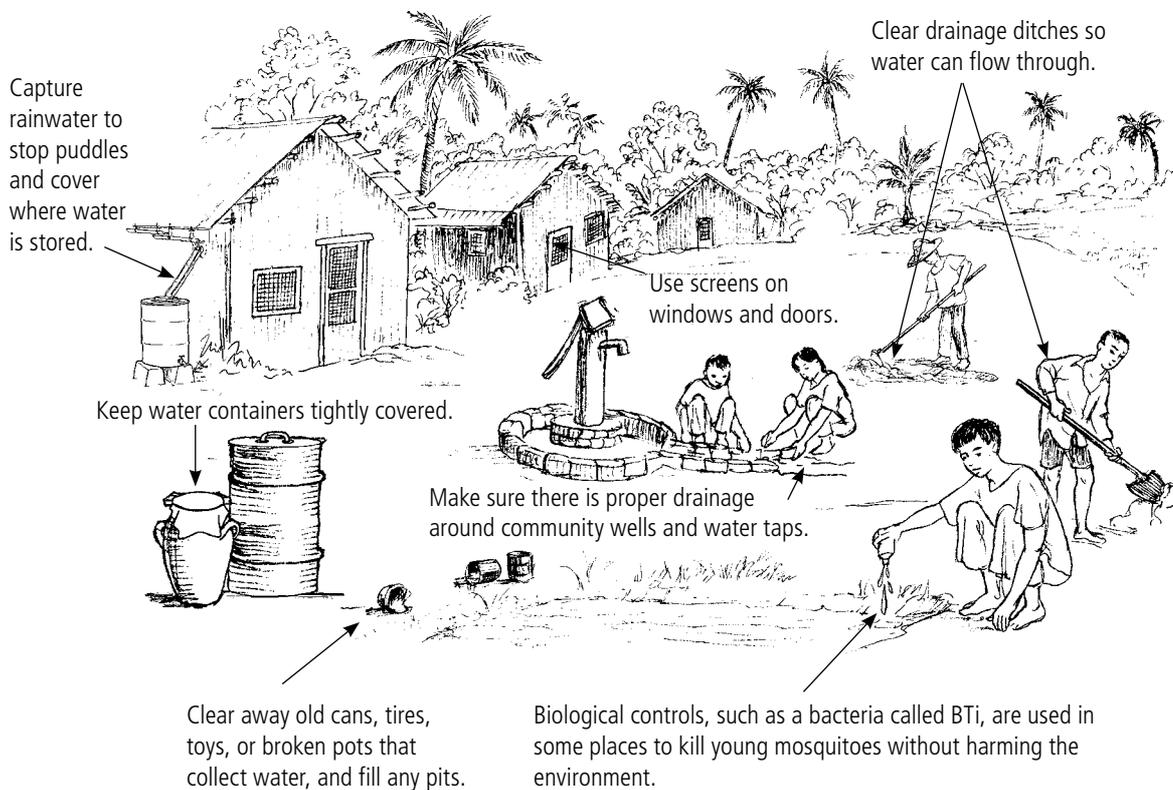
Some insecticides, such as DDT, are just too dangerous to people and the environment and should not be used at all.

# Prevent Mosquitoes From Breeding

Different kinds of mosquitoes breed in different kinds of water. Killing adult mosquitoes stops both their bite and their breeding, but killing the eggs or larvae that hatch in water, or taking away the water needed for mosquitoes to hatch the eggs, is most effective.

The mosquitoes that spread dengue, yellow fever, Zika, and chikungunya breed in clean standing water. If the mosquitoes find water, they lay eggs. After 2 days, the eggs hatch into larvae that live under the water surface. After 4 more days, the larvae begin to turn into mosquitoes with wings. In 2 more days, they can fly away. By getting rid of standing water once a week, mosquito breeding is interrupted because the eggs do not hatch.

The mosquitoes that spread malaria also lay eggs in water—sometimes in small amounts of fresh water in or near the home like the dengue mosquito but also in larger bodies of water that cannot be emptied out or filled in. If there are any kinds of mosquitoes in or near your house, it is always a good idea to take away, empty out, or tightly cover places where water collects or is stored.



### Remove mosquito breeding sites around the house and community

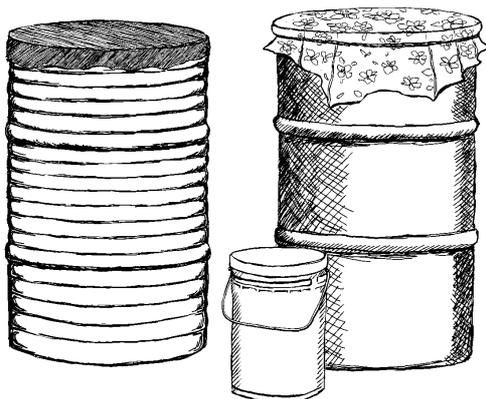
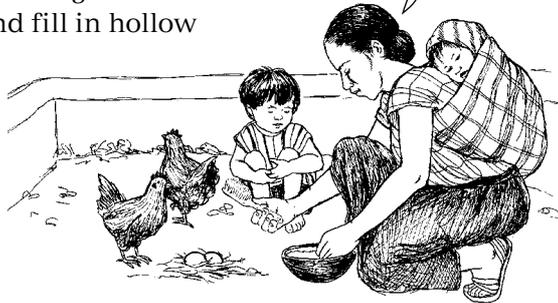
**Outside the home:** get rid of places where water collects such as old car tires, flower pots, oil drums, ditches, small plastic containers or toys and even bottle caps. Do this at least once a week. A sloped roof and a system that captures water that otherwise would form pools on the roof or the ground helps stop mosquito breeding. Fill holes in trees where water collects and fill in hollow fencing, especially bamboo.

Communities use many different materials to make mosquito traps that attract and kill mosquitoes and their eggs. One type of trap uses pieces of old tires that need to be cleared anyway for mosquito prevention.

**Inside the home:** Change the water in water dishes for animals and flower vases at least once a week. Unless containers are scrubbed clean, mosquito eggs can stick to the sides of the containers where they can live for months until there is water to make them hatch.

**Outside and inside the home:** Always tightly cover water storage containers so mosquitoes cannot get inside to lay eggs. If any eggs were laid, the cover will prevent hatched mosquitoes from flying away. If there are holes or gaps, the cover won't work. For containers, barrels, or water tanks with no lids, use screens or wire mesh with holes too small for a mosquito to enter, or cover with fabric that water will pass through and tie in place. Or use plastic lids that seal tightly. Make sure that rain cannot collect on top of the cover or mosquitoes will lay their eggs there!

*Now it is mosquito season so every week I scrub out the water dish so that mosquito eggs won't hatch.*



## Manage waterways and drain runoff from wells and taps

Where there is malaria, roadways and anywhere else water collects need attention to stop mosquitoes from breeding. Keeping natural waterways and rain water moving and flowing will keep water from collecting. Manage land so water soaks into the ground or runs off into streams. Clear streams blocked by eroded soil, leaves, or other debris. Hesperian's *Community Guide to Environmental Health* has more information on how to manage water and choose toilets and latrines that avoid pits of waste water.

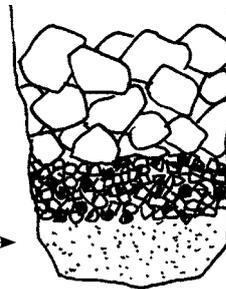


Wherever people collect water, water spills. When water collects in puddles, it becomes a breeding ground for mosquitoes that carry malaria and other illnesses. Wells, taps, outlets from storage tanks, and other water collection areas need good drainage to allow spilled water to flow away or to drain into the ground.

To take advantage of water that runs off, plant a tree or a vegetable garden where the water drains. If you cannot plant a tree or garden, make a hollow in the ground filled with rocks, gravel, and sand for the water to seep into. This is called a "soak pit." It will help prevent mosquitoes from breeding.



Community water tap with drainage



← Large rocks

← Gravel

← Sand

Soak pit

See if there are successful programs in your region using fish that eat mosquito larvae in ponds and lakes. Or find out if the bacteria called Bti is available because it can be used successfully to kill young mosquitoes before they breed and does not harm the environment.

## Communities Prevent Mosquito Illnesses

Community health workers or any community group can help neighbors keep their yards and homes free of standing water to prevent mosquitoes from breeding and infecting everyone in the community. Are there elderly people, people with disabilities, or families without enough money that need your help? Youth-led or adult teams can help inspect houses, make or repair screens, and tightly cover water storage containers. Involve school children as part of their learning of nature and science.

Community clean-up efforts target vacant lots to keep them free of trash and containers that collect water. Containers can be turned over, tightly covered, or removed.

Other ways community leaders can help:

- Improve living conditions: build piped water systems, manage trash and waste water, design community building roofs to prevent pooling of water, and see if latrines or sanitation systems can be improved.
- Make malaria treatment more easily available.
- Distribute bednets and organize events to repair holes and renew treatment of bednets.
- Work together with health authorities for safe community management of any fumigation or insecticide program.



Used tires can become planters or even stairways!

Involve everyone in understanding how mosquitoes spread illness, how to avoid bites, and how to stop mosquitoes from breeding. Where are old tires piled up? Discuss who is most affected by mosquitoes in your community and how to prevent bites and mosquito breeding. Are women, men, children, and small babies affected differently? Think about who works or spends time where there are many mosquitoes, for example:

- Places where people fetch water or wash clothes, especially if the water source is still, or spilled water forms puddles or pools
- Farmland or mining sites where holes, pits, or trenches fill with rain
- Inside and around the house, where women and small children spend much of the day, and mosquitoes hide on walls and in the shadows
- Schoolrooms with no screens where children sit still for classes



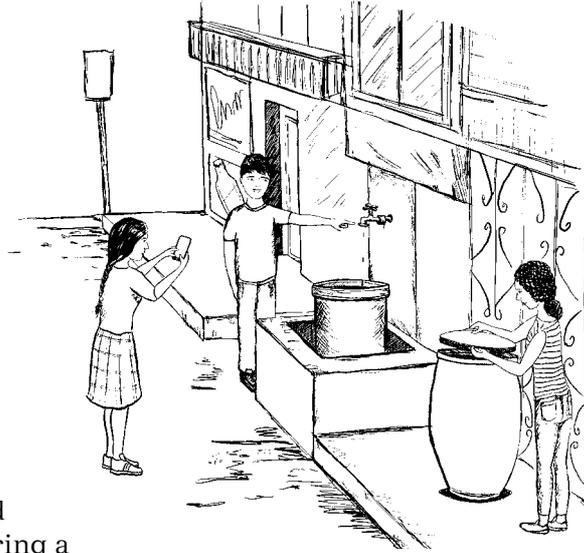
### **Cleaning out the mosquitoes!**

To fight dengue and other diseases, neighborhood groups in different Latin American countries organized youth and health brigades to go house-to-house and remove places where mosquitoes breed. Participants earn points when they take a photo of places where mosquito eggs or larvae can hide and they take another photo once they have fixed the problem, such as covering a

water storage barrel so mosquitoes cannot get in or turning over a bucket so water cannot collect. By adding the photo to a webpage with a community map, everyone can see their progress and where else to visit. They call their webpage DengueChat and they use cell phones to post the images and motivate each other with messages.

Health brigade members take water samples and check for mosquito larvae. They can show the family how to:

- Keep water storage containers covered all the time to prevent egg-laying and new mosquitoes from flying away to bite people.
- Scrub containers once a week to prevent eggs from hatching.



*These black spots are larvae that become mosquitoes. We must cover the water tank.*



Brigade members became experts on how local mosquitoes breed and how to stop them.

# Medicines

## Medicine for Pain and Fever

### Paracetamol, acetaminophen

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Paracetamol is a good, affordable medicine for the fever and pain that comes from many mosquito illnesses.

#### Important

Do not take more than the recommended amount. Too much is poisonous to the liver and can kill. Keep this medicine out of the reach of children, especially if you have it as a sweetened syrup.

Cold medicines often contain paracetamol, so do not give them if you are also giving paracetamol or you may give too much.

#### How to use

- Give 10 to 15 mg per kg, every 4 to 6 hours. Do not give more than 5 times in 24 hours. If you cannot weigh the person, dose by age:
  - Under 1 year:** give 62 mg ( $\frac{1}{8}$  of a 500 mg tablet), every 4 to 6 hours.
  - 1 to 2 years:** give 125 mg ( $\frac{1}{4}$  of a 500 mg tablet), every 4 to 6 hours.
  - 3 to 7 years:** give 250 mg ( $\frac{1}{2}$  of a 500 mg tablet), every 4 to 6 hours.
  - 8 to 12 years:** give 375 mg ( $\frac{3}{4}$  of a 500 mg tablet), every 4 to 6 hours.
  - Over 12 years:** give 500 mg to 1000 mg, every 4 to 6 hours, but do not give more than 4000 mg in a day.

## Medicines for Malaria

### About malaria medicines

There are many medicines to treat and prevent malaria. But malaria parasites can develop resistance to medicines, meaning some no longer kill the parasites. Health workers, local health centers, or the government health authority know what medicines will work best in your area.

**Medicines used to prevent malaria**

Mefloquine (page 34), chloroquine (page 38), chloroquine and proguanil (page 40), atovoquone + proguanil (page 41), and doxycycline (page 44), are medicines used for prevention when people travel to regions with malaria from an area without malaria.

Primaquine (page 40) is used to prevent repeat attacks of some types of malaria after the malaria has been treated.

Monthly doses of amodiaquine with sulfadoxine + pyrimethamine are used in some Sahel region countries in Africa during the rainy season to prevent malaria in children under 5.

2 doses of sulfadoxine + pyrimethamine given with the second and third rounds of common vaccinations are used in other countries in Africa to prevent malaria in infants.

**Medicines to treat severe malaria**

Severe malaria (page 7) needs emergency treatment with IV or injectable artesunate in a hospital or clinic. Once the person has been treated and stopped vomiting, they will also need 3 days of artemisinin-based combination (ACT) medicines by mouth (see below).

If emergency artesunate by injection is not available, a child with severe malaria who is vomiting can be given artesunate capsule suppositories (in the rectum) on the way to a health center (page 38). This can save the child's life.

**Medicines to treat uncomplicated malaria from *P. falciparum***

The parasite *P. falciparum* causes malaria that is more likely to become severe (page 7). Depending on the region, chloroquine or other malaria medicines no longer work to treat falciparum malaria. Instead, use ACT (Artemisinin-based Combination Therapy) medicines. Use only the medicines that work in your area. Take ACT medicines for 3 days. See Using ACT medicines (page 31). Common ACT combinations are:

- **Artemether + lumefantrine (page 32)**
- **Artesunate + amodiaquine (page 32)**
- **Artesunate + mefloquine (page 33)**
- **Artesunate with sulfadoxine + pyrimethamine (page 35)**
- **Dihydroartemisinin + piperaquine (page 36)**

**Medicines to treat uncomplicated malaria that is not from *P. falciparum***

Several malaria parasites cause uncomplicated malaria. Use ACT (Artemisinin-based Combination Therapy) if you don't know which type of malaria it is, or if the person could have 2 types of malaria at once. If the malaria where you live is resistant to chloroquine, you will need to find out which ACT will work instead.

If chloroquine still works to treat non-falciparum uncomplicated malaria where you live, it may be more available than ACT. Chloroquine (page 38) is often used together with primaquine (page 40) to cure the malaria more completely.

## Medicines to treat malaria in pregnant women

For severe malaria, pregnant women need emergency treatment in a hospital or clinic with the same medicines used for any other adult.

To treat uncomplicated malaria in the first 3 months of pregnancy, use quinine and clindamycin (page 42). If a malaria test shows the uncomplicated malaria is caused by the vivax parasite, or if you do not have clindamycin, use only quinine.

To treat uncomplicated malaria for a woman whose pregnancy is more than 3 months, use the ACT or other medicines that work well in your area.

Do not use primaquine during pregnancy. Quinine, chloroquine, clindamycin, and proguanil are safe during pregnancy.

In some regions, pregnant women take sulfadoxine + pyrimethamine starting at week 13 of the pregnancy (page 36). Taking one dose per month for the rest of the pregnancy is called intermittent preventive treatment. This will stop malaria before it causes harm to the pregnancy or to the mother.

## For all malaria medicines

Malaria may cause vomiting. Repeat the dose of medicine if you vomit within 60 minutes of taking it.

Take the malaria medicines for the full number of days, even if you already feel better. This is needed to kill all the malaria parasites. If the treatment is causing vomiting or if it is hard to give a child the medicine, talk to a health worker.

Even after starting treatment with medicines, watch for danger signs of severe malaria (page 7), especially in children and in women who are pregnant or have just given birth.

## Artemisinin-based Combination Therapy (ACT)

### Using ACT medicines

Some ACT come as single tablets combining 2 medicines (called fixed-dose combination tablets or coformulated tablets). Or they may come in a blister pack with 2 different tablets for each dose.

- Do not remove the tablets from the blister packaging until ready to use. Once a tablet is taken from the blister, use right away.
- If the 3-day treatment of ACT does not stop the malaria attack, try a different combination ACT. However, if the fevers and other signs return after 4 weeks, it is probably a new case of malaria.
- In regions where malaria transmission is low, health authorities may recommend a single dose of primaquine (page 40) together with the 3-day treatment of ACT.

## Artemether + lumefantrine

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Artemether and lumefantrine come as a fixed-dose combination tablet or are given as separate tablets at the same time.

It is used to treat uncomplicated falciparum malaria, for other malaria types, and following emergency treatment of severe malaria.

This ACT combination medicine is not used to prevent malaria.

### Side effects

Can cause nausea, stomach upset, dizziness, headache.

### Important

To treat women for uncomplicated malaria in the first 3 months of pregnancy, give quinine and clindamycin where available instead of ACT combinations.

If you have heart problems, talk to an experienced health worker before taking this medicine.

### How to use

Take with a full meal or with milk. Fat in the food helps the body use the medicine.

Tablets contain:

20 mg of artemether + 120 mg of lumefantrine

40 mg of artemether + 240 mg of lumefantrine

### To treat uncomplicated malaria

Dose by body weight.

→ Using tablets of 20 mg of artemether and 120 mg of lumefantrine, give:

**5 kg to 14 kg:** 1 tablet, 2 times a day, for 3 days

**15 kg to 24 kg:** 2 tablets, 2 times a day, for 3 days

**25 kg to 34 kg:** 3 tablets, 2 times a day, for 3 days

**35 kg and over:** 4 tablets, 2 times a day, for 3 days

## Artesunate + amodiaquine

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Artesunate and amodiaquine come as a fixed-dose combination tablet or are given as separate tablets at the same time.

It is used to treat uncomplicated falciparum malaria, other malaria types, and following emergency treatment of severe malaria.

This ACT combination medicine is not used to prevent malaria.

## Side effects

Can cause itchy skin, upset stomach, headache, dizziness.

## Important

To treat women for uncomplicated malaria in the first 3 months of pregnancy, give quinine and clindamycin where available instead of ACT combinations.

Avoid giving to people with HIV or others taking zidovudine, efavirenz, or cotrimoxazole.

## How to use

Tablets contain:

25 mg of artesunate + 67.5 mg of amodiaquine

50 mg of artesunate + 135 mg amodiaquine

100 mg of artesunate + 270 mg amodiaquine

## To treat uncomplicated malaria

Dose by body weight.

- ➔ Using tablets of 25 mg of artemether and 67.5 mg of amodiaquine, give:
  - 4.5 kg to 8 kg:** 1 tablet each day, for 3 days.
  - 9 kg to 17 kg:** 2 tablets each day, for 3 days
- ➔ Using tablets of 100 mg of artesunate + 270 mg amodiaquine, give:
  - 18 kg to 35 kg:** 1 tablet each day, for 3 days.
  - 36 kg and over:** 2 tablets each day, for 3 days

## Artesunate + mefloquine

---

Artesunate and mefloquine come as a fixed-dose combination tablet or are given as separate tablets at the same time.

It is used to treat uncomplicated falciparum malaria and other malaria types.

Mefloquine by itself can be used for malaria prevention for people who travel to malaria regions from an area without malaria.

## Side effects

Can cause dizziness, stomach upset, headache, and sleeping and vision problems when used to treat malaria.

Pregnant women may have more nausea with artesunate + mefloquine, so if available, use a different ACT.

### Important

To treat women for uncomplicated malaria in the first 3 months of pregnancy, give quinine and clindamycin where available instead of ACT combinations.

Do not use mefloquine for infants under 3 months or weighing less than 5 kg.

Mefloquine should not be taken by persons with epilepsy or mental illness or severe kidney problems.

If you have heart problems, talk to an experienced health worker before taking this medicine.

Mefloquine sometimes causes strange behavior, confusion, anxiety, seizures or unconsciousness. If any of these signs develop, stop taking mefloquine immediately. If mefloquine had this effect on a person once, choose a different treatment if they get malaria again.

### How to use

Take with food.

Tablets contain:

25 mg of artesunate + 55 mg of mefloquine (for children)

100 mg of artesunate + 220 mg of mefloquine (for adults)

### To treat uncomplicated malaria

Dose by body weight.

- Using tablets with 25 mg of artesunate + 55 mg of mefloquine, give:
  - 5 kg to 8 kg:** 1 tablet each day, for 3 days
  - 9 kg to 17 kg:** 2 tablets each day, for 3 days
- Using tablets with 100 mg of artesunate + 220 mg of mefloquine, give:
  - 18 kg to 29 kg:** 1 tablet each day, for 3 days
  - 30 kg and over:** 2 tablets each day, for 3 days

### Mefloquine to prevent malaria:

Comes in 250 mg mefloquine tablet

Take the dose once a week beginning 2 to 3 weeks before travel. Continue one dose each week while you are there and for 4 weeks after leaving the malaria region.

Mefloquine is not recommended for infants under 5 kg.

- Using 250 mg tablets, give:
  - 5 to 19 kg:** ¼ tablet (63 mg) one time each week
  - 20 to 29 kg:** ½ tablet (125 mg) one time each week
  - 30 to 44 kg:** ¾ tablet (188 mg) one time each week
  - 45 kg and over:** 1 tablet (250 mg) one time each week

## Artesunate with sulfadoxine + pyrimethamine

Sulfadoxine and pyrimethamine come as a fixed-dose combination tablet and is used together with artesunate to treat uncomplicated falciparum malaria and other malaria types.

Sulfadoxine + pyrimethamine is no longer recommended for treatment in some areas where it no longer works well. Check with your government health authority before using.

In countries where sulfadoxine + pyrimethamine tablets are used to prevent malaria in pregnant women, monthly doses start at 3 months of pregnancy (page 36).

### Side effects



Can cause stomach upset and skin rash.

### Important

To treat women for uncomplicated malaria in the first 3 months of pregnancy, give quinine and clindamycin where available instead of ACT combinations.

For infants, use a different ACT.

Do not use sulfadoxine + pyrimethamine if you are already taking cotrimoxazole.

Sulfadoxine + pyrimethamine should not be taken by anyone who has ever had a reaction to a sulfa medicine. If the medicine causes a rash or itching, drink lots of water and do not take it again.

### How to use



The sulfadoxine + pyrimethamine combination tablet comes in different strengths of each of the 2 medicines it contains.

#### To treat uncomplicated malaria

This ACT is a 3-day treatment as follows: on days 1, 2, and 3, give the dose of artesunate. Also on day 1, give 1 dose of sulfadoxine + pyrimethamine.

Dose by body weight.

- ➔ Using tablets with 50 mg of artesunate tablet, give:
  - 5 kg to 9 kg:** ½ tablet, 1 time each day, for 3 days
  - 10 kg to 24 kg:** 1 tablet, 1 time each day, for 3 days
  - 25 kg to 50 kg:** 2 tablets, 1 time each day, for 3 days
  - 50 kg or over:** 4 tablets, 1 time each day, for 3 days
- ➔ Using tablets with 500 mg of sulfadoxine + 25 mg of pyrimethamine also give:
  - 5 kg to 9 kg:** ½ tablet the first day only
  - 10 kg to 24 kg:** 1 tablet the first day only
  - 25 kg to 50 kg:** 2 tablets the first day only
  - 50 kg or over:** 3 tablets the first day only

Women who are pregnant and are being treated with this ACT combination should stop taking folic acid for the 3 days of treatment and for the next 2 weeks. Too much folic acid interferes with the malaria medicine.

### **Sulfadoxine + pyrimethamine is used to prevent malaria in pregnancy**

In some African countries, all pregnant women are given monthly doses of sulfadoxine + pyrimethamine because malaria is so common and so dangerous for the mother and for developing child. The monthly doses begin when the woman is 3 months pregnant. Bednets (page 20) also help prevent malaria during pregnancy and after the baby is born.

- ➔ Using tablets with 500 mg of sulfadoxine + 25 mg of pyrimethamine:  
 During week 13 to 16 of the pregnancy, give the first dose of 3 tablets. One month later, give a second dose of 3 tablets. After another month, give a third dose of 3 tablets. Repeat each month until the 6th dose is reached or the child is born. Always wait at least one month between each dose.

When pregnant women take sulfadoxine + pyrimethamine, nausea, vomiting, and dizziness can occur, especially with the first dose. But most women have only mild side effects or none at all.

Pregnant women also need iron and folic acid to keep the baby well and prevent anemia. If taking sulfadoxine + pyrimethamine each month for malaria prevention, take a daily dose of 0.4 mg (400 mcg) of folic acid but not higher. Too much folic acid interferes with the malaria medicine.

## **Dihydroartemisinin + piperaquine**

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Dihydroartemisinin and piperaquine come as a fixed-dose combination tablet.

It is used to treat uncomplicated falciparum malaria, other malaria types, and following emergency treatment of severe malaria.

This ACT combination medicine is not used to prevent malaria.

### **Side effects**



May cause a fast heartbeat, upset stomach, itching.

### **Important**

To treat women for uncomplicated malaria in the first 3 months of pregnancy, give quinine and clindamycin where available instead of ACT combinations.

Do not use when taking erythromycin.

Use with caution with people over 60 years old, people with HIV taking antiretroviral medicines, or people with heart, kidney or liver problems.

### **How to use**



Take between meals with a full cup of water. Do not take with milk or food that has fat because this changes how well the medicine works.

Tablets contain:

20 mg of dihydroartemisinin + 160 mg of piperaquine (for children)

40 mg of dihydroartemisinin + 320 mg of piperaquine (for adults)

Children that weigh less than 25 kg receive a dose based on 2.5 mg/kg for dihydroartemisinin and 20 mg/kg for piperazine. This is a higher dose per kg than used with older children and adults.

### To treat uncomplicated malaria

Dose by body weight.

- ➔ Using tablets with 20 mg of dihydroartemisinin + 160 mg of piperazine, give:
  - 5 kg to 7 kg:** 1 tablet each day, for 3 days
  - 8 kg to 10 kg:** 1 ½ tablets each day, for 3 days
- ➔ Using tablets with 40 mg of dihydroartemisinin + 320 mg of piperazine, give:
  - 11 kg to 16 kg:** 1 tablet each day, for 3 days
  - 17 kg to 24 kg:** 1 ½ tablets each day, for 3 days
  - 25 kg to 35 kg:** 2 tablets each day, for 3 days
  - 36 kg to 59 kg:** 3 tablets each day, for 3 days
  - 60 kg to 79 kg:** 4 tablets each day, for 3 days
  - 80 kg and over:** 5 tablets each day, for 3 days

## Artesunate

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Artesunate is a medicine of the artemisinin family. To treat uncomplicated falciparum malaria, artesunate in tablet form is used in combination with one of these: amodiaquine (page 32), mefloquine (page 33), or sulfadoxine + pyrimethamine (page 35). Combining these medicines is called Artemisinin Combination Therapy (ACT), see page 31.

For emergency treatment with severe malaria, health workers with advanced training use intravenous (IV) artesunate or artesunate injections in the muscle (IM) to treat severe malaria. After at least 24 hours of this treatment, and when the person is no longer vomiting, she will also need 3 days of ACT treatment taken by mouth.

Artesunate injections are also for trained health workers to treat adults and children before transfer to a hospital that is far away. Artesunate also comes as suppositories that go in the rectum for children under 6 years old on the way to medical help (page 38).

Artesunate is not used to prevent malaria.

### Side effects



Artesunate can cause dizziness, headaches and stomach upset.

### How to use



**For uncomplicated falciparum malaria use with another medicine as part of ACT:**

Artesunate comes in 50 mg tablets. See page 35 for the dose of artesunate and sulfadoxine + pyrimethamine when used as a part of ACT. For other ACT combinations, the artesunate is combined with the other medicine into a single tablet or comes in a blister package with the 2 tablets that are taken together.

### **How to use artesunate suppositories for children with severe malaria:**

When a child 6 years or younger has signs of severe malaria, is vomiting, and is far from a health center that can treat her, use artesunate gelatin capsules (called suppositories) in the rectum on the way to get help. This can save her life. After putting the capsule in the rectum, hold the child's buttocks together for about 10 minutes to make sure the capsule does not fall out. If it does come out within the first 30 minutes, repeat the dose.

If the child weighs 5 to 10 kg, use one suppository of 100 mg, and if 10 kg or more, use 2 of the 100 mg capsules. If 50 mg suppository capsules are available, use only 1 for a baby that weighs under 5 kg.

Emergency treatment does not cure malaria. The child will need more treatment by an experienced health worker.

## More medicines used for malaria

### Chloroquine

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In most of the world, malaria is now resistant to chloroquine. Find out which medications work best in your area. If you do not know which type of malaria a person has, it is best to treat with Artemisinin Combination Therapy (ACT).

When treating malaria with chloroquine, you will also need primaquine (page 40) to prevent the malaria from coming back.

In a few countries where malaria is not resistant to it, chloroquine by itself is used to prevent malaria. In countries where the resistance is low, chloroquine combined with proguanil (page 41) is sometimes used to prevent malaria.

Chloroquine is safe for women who are pregnant or breastfeeding for both prevention and treatment of malaria.

#### Side effects

May cause mild dizziness, nausea, vomiting, abdominal pain, itching.

#### Important

If the dose is too high, chloroquine is very dangerous, especially to children.

Do not use if the person has epilepsy.

Use with caution if the person has diabetes.

#### How to use

Take with food.

Chloroquine comes in two forms, chloroquine phosphate and chloroquine sulfate. The active part of the chloroquine is called the base.

Dose by body weight. The total of chloroquine base given over 3 days is 25 mg/kg as follows:

- Day 1: 10 mg chloroquine base per kg
- Day 2: 10 mg chloroquine base per kg
- Day 3: 5 mg chloroquine base per kg

Chloroquine phosphate tablets usually come in 250 mg tablets (with 150 mg chloroquine base).

Chloroquine sulfate tablets usually come in 200 mg tablets (with 155 mg chloroquine base).

Be sure you know which type of chloroquine you have and how much chloroquine base is in it (tablet strength).

### **To treat uncomplicated malaria that is not resistant to chloroquine**

Using chloroquine phosphate 250 mg tablets (150 mg chloroquine base) OR using chloroquine sulfate 200 mg tablets (155 mg chloroquine base):

- Give one dose on day 1 and again on day 2:

**Less than 10 kg:** ½ tablet

**11 kg to 19 kg:** 1 tablet

**20 kg to 30 kg:** 2 tablets

**31 kg to 44 kg:** 3 tablets

**45 kg and over:** 4 tablets

- On day 3, give half of the day 1 dose:

**Less than 10 kg:** ¼ tablet

**10 kg to 19 kg:** ½ tablet

**20 kg to 30 kg:** 1 tablet

**31 kg to 44 kg:** 1½ tablets

**45 kg and over:** 2 tablets

### **To prevent vivax malaria where it is not resistant to chloroquine**

For prevention, take chloroquine once a week beginning 1 or 2 weeks before travel. Continue one dose each week while you are there and for 4 weeks after leaving the malaria region. Give the dose used for day 3 of treatment shown above. For example, for prevention an adult takes weekly either 2 tablets of chloroquine phosphate with 150 mg chloroquine base or 2 tablets of chloroquine sulfate with 155 mg chloroquine base.

### To prevent falciparum malaria where resistance to chloroquine is low

For travelers to countries where there is some resistance to chloroquine but the medicine still works, chloroquine is taken once a week while also taking proguanil once a day to prevent malaria. Start both medicines 1 week before travel. Continue one dose each week while you are there and for 4 weeks after leaving the malaria region. Take the chloroquine the same day each week and the proguanil the same time each day. Take with food.

- Using chloroquine tablets with either 155 mg or 150 mg chloroquine base and proguanil tablets with 100 mg of proguanil hydrochloride:
  - 1 to 4 years old:** ½ tablet proguanil each day and ½ tablet chloroquine each week
  - 5 to 8 years old:** 1 tablet proguanil each day and 1 tablet chloroquine each week
  - 9 to 14 years old:** 1 and ½ tablet proguanil each day and 1 and ½ tablet chloroquine each week
  - 15 years and older:** 2 tablets proguanil each day and 2 tablets chloroquine each week

## Primaquine

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Primaquine is used for 14 days along with or right after treatment with chloroquine to prevent returning fever attacks from malaria types that are not falciparum.

In some regions, a single dose of primaquine is given on the first day of the 3-day ACT treatment for falciparum malaria. This helps keep falciparum from spreading to others.

### Important

Primaquine is not given to women who are pregnant or breastfeeding a baby 6 months or younger.

Primaquine is usually not given to children younger than 1 year old.

For people with a blood condition called G6PD deficiency (favism), an experienced health worker uses a lower dose of primaquine, spread out over many weeks.

### Side effects

Upset stomach and stomach pain.

### How to use

Take with food.

Primaquine phosphate is a common form of primaquine. Often tablets contain 15 mg of primaquine base, the active part of the medicine.

### To keep non-falciparum malaria from returning in the same person, use with or right after treatment with chloroquine

Dose by weight or if you cannot weigh the child, dose by age.

- Using tablets with 15 mg primaquine base, give:
  - 10 kg to 24 kg (3 to 7 years):** ¼ tablet each day for 14 days
  - 25 kg to 49 kg (8 to 11 years):** ½ tablet each day for 14 days
  - 50 kg and over (12 years and older):** 1 tablet each day for 14 days

### To keep falciparum malaria from spreading, where falciparum is not common

In some regions, adding a single dose of primaquine to ACT treatment is recommended to keep malaria from spreading.

- ➔ On the first day of the 3-day ACT treatment, and using tablets with 15 mg primaquine base, give:
  - 10 kg to 24 kg (3 to 7 years):** ¼ tablet one time
  - 25 kg to 49 kg (8 to 11 years):** ½ tablet one time
  - 50 kg and over (12 years and older):** 1 tablet one time

## Proguanil and Atovaquone + proguanil

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Proguanil is usually for malaria prevention by travelers. Proguanil is always used with another malaria medicine.

### Side effects

Can cause headache, cough, diarrhea, and mild upset stomach.

### Important

People with serious kidney problems should not use proguanil.

### How to use

Take with food.

Proguanil and chloroquine together (page 40) are used to prevent malaria in areas where there is low resistance to chloroquine.

Atovaquone and proguanil come as a fixed-dose combination tablet. It is mostly used to prevent malaria but in countries where ACT and other malaria medicines no longer work, it is sometimes used to treat malaria in combination with artesunate and primaquine.

Tablets contain:

62.5 mg atovaquone + 25 mg proguanil (for children)

250 mg atovaquone + 100 mg proguanil (for adults)

### To prevent malaria

Both adults and children take one dose each day beginning 1 or 2 days before travel. Continue one dose each day while you are there and for 7 days after leaving the malaria region.

- ➔ Using tablets made for children with 62.5 mg atovaquone + 25 mg proguanil, give:
  - 5 kg to 7 kg:** ½ tablet each day
  - 8 kg to 9 kg:** ¾ tablet each day
  - 10 to 19 kg:** 1 tablet each day
  - 20 kg to 29 kg:** 2 tablets each day
  - 30 kg to 39 kg:** 3 tablets each day
  - 40 kg and over:** 4 children's tablets OR 1 adult tablet each day.

## Quinine, injections

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Severe malaria is a medical emergency. A quinine injection into the muscle is sometimes used to treat a person before sending her to the hospital. Quinine injections should only be given by an experienced health worker who knows the correct dose and how to give it. For children with severe malaria, if injectable artesunate is not available, it is safer to use artesunate suppositories instead of quinine on the way to get treatment (see page 39).

## Quinine sulfate, tablets

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Quinine tablets by mouth are used to treat uncomplicated malaria where chloroquine does not work.

For women in the first 3 months of pregnancy, use both quinine and clindamycin to treat falciparum malaria. For vivax malaria that is resistant to chloroquine, use quinine alone.

The combination of quinine and either clindamycin or doxycycline is sometimes used if an ACT is not available to finish treating the person following emergency care for severe malaria.

Quinine is not used to prevent malaria.

### Side effects

Quinine sometimes causes sweaty skin, ringing of the ears or problems with hearing, blurred vision, dizziness, nausea and vomiting, and diarrhea.

If the person is vomiting up the quinine, an anti-nausea medicine such as promethazine may help.

### Important

Taking too much quinine is dangerous. Quinine can cause blood sugar levels to drop too low. Get medical help for danger signs such as dizziness, confusion, loss of consciousness, or the heart beating too fast or too slow.

Do not use quinine if taking chloroquine or mefloquine.

### How to use

Treat with quinine for 3 or 7 days, depending on the region. Clindamycin or doxycycline may also be needed.

Quinine sulfate, quinine hydrochloride, and quinine dihydrochloride come in tablets of 300 mg and their dose is the same. By body weight, the dose is 10 mg of quinine sulfate per kg taken 3 times a day. Quinine bisulfate tablets, however, have a different dose: 14 mg per kg taken 3 times a day.

**To treat uncomplicated chloroquine-resistant falciparum malaria**

Depending on where you live, treatment will be for 3 or 7 days.

Dose by body weight.

- ➔ Using quinine sulfate, quinine hydrochloride, and quinine dihydrochloride tablets of 300 mg, give:
  - 7 to 11 kg:** ¼ tablet, 3 times a day
  - 12 to 24 kg:** ½ tablet, 3 times a day
  - 25 to 34 kg:** 1 tablet, 3 times a day
  - 35 to 49 kg:** 1½ tablets, 3 times a day
  - 50 kg and over:** 2 tablets, 3 times a day

Also take **clindamycin or doxycycline** for 7 days starting on day 2 or day 3 after starting the quinine, when the person is less likely to vomit the medicines. For dosing of doxycycline, see page 44. For clindamycin, the dose each day is 20 mg per kg of body weight for 7 days, divided into 2 or 3 doses per day. For adults:

- ➔ Using clindamycin capsules of 300 mg, give:
  - 45 kg and over:** 1 capsule, 4 times a day, for 7 days

**Important **

If you develop watery or bloody diarrhea, stop taking clindamycin immediately.

Because the drug can pass through breast milk to a baby, avoid giving clindamycin to breastfeeding women.

Do not take antacids for 2 hours before or after taking clindamycin. They make the medicine less effective.

**To treat uncomplicated chloroquine-resistant vivax malaria**

- ➔ Use quinine sulfate and either clindamycin or doxycycline as for chloroquine-resistant falciparum malaria (see above). After that treatment, add 14 days of primaquine (see page 40). But do not add primaquine for a pregnant woman.

## Doxycycline

Doxycycline is an antibiotic with many uses. It can be used to treat malaria when combined with quinine. Doxycycline is also used to prevent malaria for travelers.

### Side effects

Heartburn, stomach cramps, diarrhea, and yeast infections are common.

### Important

Pregnant women and children under 8 years old should avoid doxycycline or tetracycline because these medicines can damage or stain teeth and bones.

Use with caution for a person with kidney, liver, stomach diseases or with gastritis.

Avoid iron pills and antacids for 2 hours before or after taking doxycycline. They will make the medicine less effective.

Avoid spending time in the sun while taking doxycycline to prevent sunburn and skin rash.

Doxycycline may make birth control pills less effective. If possible use another birth control method (such as condoms) while taking this medicine.

### How to use

Take doxycycline with a full cup of water. Take with food if it upsets your stomach.

#### To use with quinine to treat uncomplicated chloroquine-resistant malaria

→ For uncomplicated falciparum malaria, start doxycycline 1 or 2 days after starting the quinine or as soon as the person can take the medicine without vomiting:

**Child over 8 years but under 40 kg:** 50 mg, 2 times each day, for 7 days

**Child over 40 kg and adults:** 100 mg, 2 times each day, for 7 days

Also give quinine (page 43).

#### To use with quinine to treat uncomplicated vivax malaria

→ Give the doxycycline and quinine as above, and when finished, also take primaquine for 14 days (page 40).

#### To prevent malaria for travel to areas with malaria:

→ Both adults and children take one dose of doxycycline each day beginning a day or two before travel. Continue one dose each day while you are there and for 28 days after leaving the malaria region.

**Child over 8 years but under 40 kg:** 50 mg one time each day

**Child over 40 kg and adults:** 100 mg one time each day