Malaria

Fact sheet
Updated April 2017

Key facts

- Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected female *Anopheles* mosquitoes.
- In 2015, 91 countries and areas had ongoing malaria transmission.
- Malaria is preventable and curable, and increased efforts are dramatically reducing the malaria burden in many places.
- Between 2010 and 2015, malaria incidence among populations at risk (the rate of new cases) fell by 21% globally. In that same period, malaria mortality rates among populations at risk fell by 29% globally among all age groups, and by 35% among children under 5.
- The WHO African Region carries a disproportionately high share of the global malaria burden. In 2015, the region was home to 90% of malaria cases and 92% of malaria deaths.

Malaria is caused by Plasmodium parasites. The parasites are spread to people through the bites of infected female *Anopheles* mosquitoes, called "malaria vectors." There are 5 parasite species that cause malaria in humans, and 2 of these species – *P. falciparum* and *P. vivax* – pose the greatest threat.

- *P. falciparum* is the most prevalent malaria parasite on the African continent. It is responsible for most malaria-related deaths globally.
- *P. vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa.

Symptoms

Malaria is an acute febrile illness. In a non-immune individual, symptoms usually appear 10–15 days after the infective mosquito bite. The first symptoms – fever, headache, and chills– may be mild and difficult to recognize as malaria. If not treated within 24 hours, *P. falciparum* malaria can progress to severe illness, often leading to death. Children with severe malaria frequently develop one or more of the following symptoms: severe anaemia, respiratory distress in relation to metabolic acidosis, or cerebral malaria. In adults, multi-organ involvement is also frequent. In malaria endemic areas, people may develop partial immunity, allowing asymptomatic infections to occur.

Who is at risk?

In 2015, nearly half of the world's population was at risk of malaria. Most malaria cases and deaths occur in sub-Saharan Africa. However, South-East Asia, Latin America and the Middle East are also at risk. In 2015, 91 countries and areas had ongoing malaria transmission.

Some population groups are at considerably higher risk of contracting malaria, and developing severe disease, than others. These include infants, children under 5 years of age, pregnant women and patients with HIV/AIDS, as well as non-immune migrants, mobile populations and travellers. National malaria control programmes need to take special measures to protect these population groups from malaria infection, taking into consideration their specific circumstances.

Disease burden

According to the latest WHO estimates, released in December 2016, there were 212 million cases of malaria in 2015 and 429 000 deaths.

Between 2010 and 2015, malaria incidence among populations at risk fell by 21% globally; during the same period, malaria mortality rates among populations at risk decreased by 29%. An estimated 6.8 million malaria deaths have been averted globally since 2001.

The WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2015, the region was home to 90% of malaria cases and 92% of malaria deaths. Some 13 countries – mainly in sub-Saharan Africa – account for 76% of malaria cases and 75% deaths globally.

In areas with high transmission of malaria, children under 5 are particularly susceptible to infection, illness and death; more than two thirds (70%) of all malaria deaths occur in this age group. Between 2010 and 2015, the under-5 malaria death rate fell by 29% globally. However malaria remains a major killer of children under five years old, taking the life of a child every two minutes.

Transmission

In most cases, malaria is transmitted through the bites of female *Anopheles* mosquitoes. There are more than 400 different species of *Anopheles* mosquito; around 30 are malaria vectors of major importance. All of the important vector species bite between dusk and dawn. The intensity of transmission depends on factors related to the parasite, the vector, the human host, and the environment.

Anopheles mosquitoes lay their eggs in water, which hatch into larvae, eventually emerging as adult mosquitoes. The female mosquitoes seek a blood meal to nurture their eggs. Each species of *Anopheles* mosquito has its own preferred aquatic habitat; for example, some prefer small, shallow collections of fresh water, such as puddles and hoof prints, which are abundant during the rainy season in tropical countries.

Transmission is more intense in places where the mosquito lifespan is longer (so that the parasite has time to complete its development inside the mosquito) and where it prefers to bite humans rather than other animals. The long lifespan and strong human-biting habit of the African vector species is the main reason why nearly 90% of the world's malaria cases are in Africa.

Transmission also depends on climatic conditions that may affect the number and survival of mosquitoes, such as rainfall patterns, temperature and humidity. In many places, transmission is seasonal, with the peak during and just after the rainy season. Malaria epidemics can occur when climate and other conditions suddenly favour transmission in areas where people have little or no immunity to malaria. They can also occur when people with low immunity move into areas with intense malaria transmission, for instance to find work, or as refugees.

Human immunity is another important factor, especially among adults in areas of moderate or intense transmission conditions. Partial immunity is developed over years of exposure, and while it never provides complete protection, it does reduce the risk that malaria infection will cause severe disease. For this reason, most malaria deaths in Africa occur in young children, whereas in areas with less transmission and low immunity, all age groups are at risk.

Prevention

Vector control is the main way to prevent and reduce malaria transmission. If coverage of vector control interventions within a specific area is high enough, then a measure of protection will be conferred across the community.

WHO recommends protection for all people at risk of malaria with effective malaria vector control. Two forms of vector control – insecticide-treated mosquito nets and indoor residual spraying – are effective in a wide range of circumstances.

Antimalarial drugs

Antimalarial medicines can also be used to prevent malaria. For travellers, malaria can be prevented through chemoprophylaxis, which suppresses the blood stage of malaria infections, thereby preventing malaria disease. For pregnant women living in moderate-to-high transmission areas, WHO recommends intermittent preventive treatment with sulfadoxine-pyrimethamine, at each scheduled antenatal visit after the first trimester. Similarly, for infants living in high-transmission areas of Africa, 3 doses of intermittent preventive treatment with sulfadoxine-pyrimethamine are recommended, delivered alongside routine vaccinations.

In 2012, WHO recommended Seasonal Malaria Chemoprevention as an additional malaria prevention strategy for areas of the Sahel sub-region of Africa. The strategy involves the administration of monthly courses of amodiaquine plus sulfadoxine-pyrimethamine to all children under 5 years of age during the high transmission season.

Diagnosis and treatment

Early diagnosis and treatment of malaria reduces disease and prevents deaths. It also contributes to reducing malaria transmission. The best available treatment, particularly for *P. falciparum* malaria, is artemisinin-based combination therapy (ACT).

WHO recommends that all cases of suspected malaria be confirmed using parasite-based diagnostic testing (either microscopy or rapid diagnostic test) before administering treatment. Results of parasitological confirmation can be available in 30 minutes or less. Treatment, solely on the basis of symptoms should only be considered when a parasitological diagnosis is not possible. More detailed recommendations are available in the *"WHO Guidelines for the treatment of malaria"*, third edition, published in April 2015.

Vaccines against malaria

RTS,S/AS01 (RTS,S) – also known as Mosquirix – is an injectable vaccine that provides partial protection against malaria in young children. The vaccine is being evaluated in sub-Saharan Africa as a complementary malaria control tool that potentially could be added to (and not replace) the core package of WHO-recommended preventive, diagnostic and treatment measures.

In July 2015, the vaccine received a positive opinion by the European Medicines Agency, a stringent medicines regulatory authority. In October 2015, two WHO advisory groups recommended pilot implementation of RTS, S/AS01 in a limited number of African countries. WHO adopted these recommendations and is strongly supportive of the need to proceed with the pilot programme as the next step for the world’s first malaria vaccine.

In November 2016, WHO announced that the RTS,S vaccine would be rolled out in pilot projects in 3 countries in sub-Saharan Africa. Funding is now secured for the initial phase of the programme and vaccinations are due to begin in 2018. These pilot projects could pave the way for wider deployment of the vaccine if safety and effectiveness are considered acceptable.

By Amy Hansen
Illustrated by Sabine Deviche

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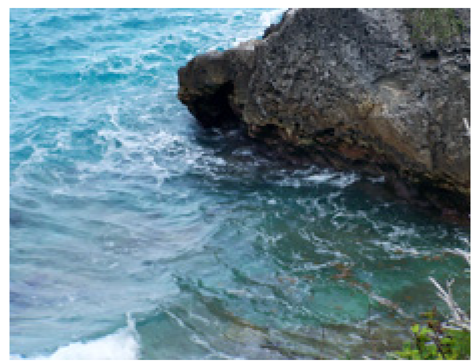
When you visit a pond or the beach, what kinds of living things do you see in the water? Depending on the environment, you might find fish, frogs, crabs, insects, seaweed, or lily pads. Don't let your eyes fool you, though… there's a hidden world in water that is full of creatures too small to be seen! When you go swimming in a lake or in the ocean, each stroke pushes you past billions upon billions of microscopic creatures called plankton.

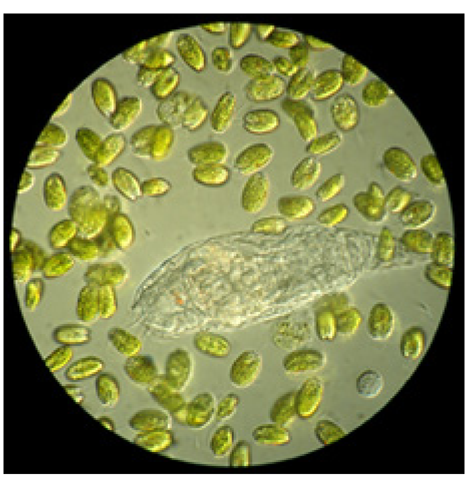


Tropical waters, like those here in Bermuda, are very clear because there are relatively few phytoplankton in the water. Plankton-rich waters are less clear and are usually green or brownish.

It was a German scientist named Viktor Hensen who gave plankton this name. If you wonder why he used this name, it helps to know your Greek and something about how these tiny life forms travel. Planktos in Greek means drifting or wandering. Plankton are too small to swim in water in the same way fish or whales do… they simply drift along. This is why they came to be known as plankton.

What Are the Different Kinds of Plankton?

There are two main kinds of plankton: phytoplankton, which are also called algae, and zooplankton.

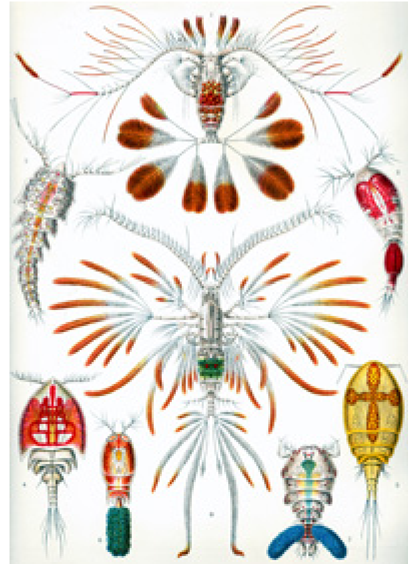


Phytoplankton are like plants. They use energy from sunlight to turn carbon dioxide, a gas in air and water, into sugars they can use to grow. Because they depend on the sun, phytoplankton can only live in the upper parts of a lake or the ocean. In deeper, darker waters, there just isn't enough light for these creatures to grow and survive.

Zooplankton, the other kind of plankton, are tiny, and in a few cases not so tiny, animals. They must eat to stay alive. Some zooplankton graze algae just like cows munch on grass. Some are hunters that catch other zooplankton. And some zooplankton eat detritus—that means they eat dead organisms and poop sinking through the water!

A rotifer (a type of zooplankton) swims through a group of phytoplankton cells in this microscope image.

How Small Are Plankton?



Copepods. Illustration published by E Haekel, in Kunstorm der Natur, 1904. (Source: Wikimedia) **Click on the image to see a larger version.**

Like all life on earth, plankton come in all sorts of shapes and sizes. The smallest are the bacteria, which are much too small to be seen without a powerful microscope. Most bacteria are only a few micrometers wide.

Next are the unicellular phytoplankton and zooplankton. “Unicellular” means their bodies are made up of only one cell, like a cabin with just one room. (Although, sometimes unicellular creatures can form chains with others of their same species). Even though they may be ten to 100 times larger than a bacterial cell, you would still need to look through a microscope to see these organisms.

Some plankton are big enough to be seen with the naked eye. Try this the next time you visit a pond or lake: scoop up a glass of water and hold it up to the light. Unless the water is very dirty, you should be able to see small specks swimming around. These specks—the largest no bigger than a few millimeters long—are zooplankton. They’re probably the smallest animals you’ve ever seen!

Did you know that there are giant plankton? Jellyfish are one type of megaplankton that you can see without a microscope.

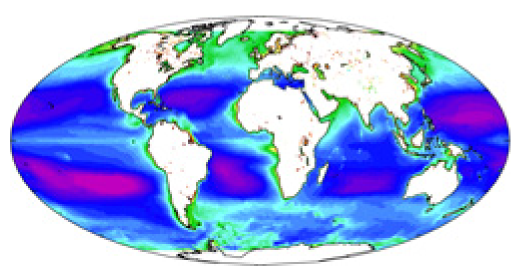
Copepods are one kind of zooplankton. These tiny creatures are the most abundant organisms on earth! They even outnumber all the insects in the world.

Giants of the Plankton World

There are also giants in the plankton world called macroplankton and megaplankton. Krill and jellyfish are examples of plankton big enough to see without a microscope. These large animals actively swim, but their movements are still mostly controlled by ocean currents.

Little Creatures With a Big Impact

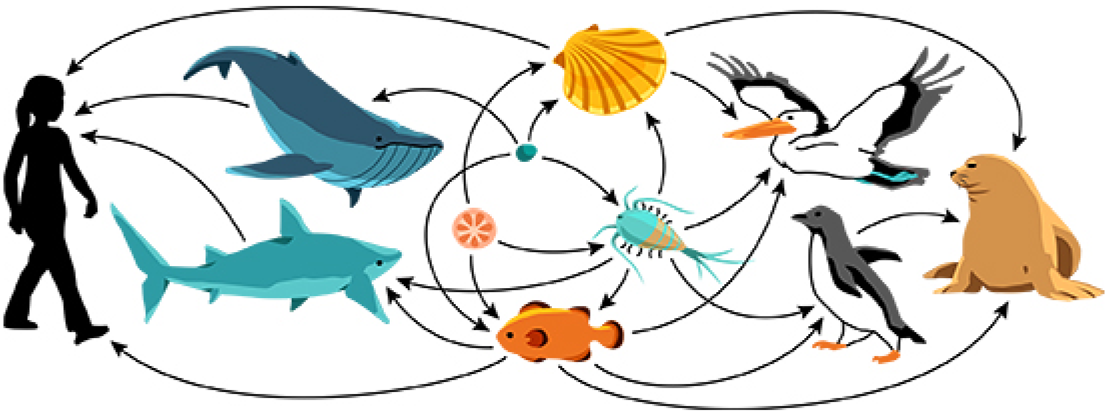
Even though there are giant plankton, most are microscopic. Without these tiny living organisms our world would be a very different place. Plankton can be found in almost any body of water. About 71% of our planet is covered by water. Since plankton are incredibly small, there are a lot of plankton on earth. In fact, you can find thousands of plankton in a single drop of water.



The colors of this map show chlorophyll concentration, which indicates photosynthesis and plankton levels as well. **Click on the image to see a larger version.** Image from NASA.

Like the plants you see around you, phytoplankton give off oxygen gas when they use sunlight to turn carbon dioxide into sugars. Half of the oxygen in our atmosphere was made by phytoplankton. Take a deep breath and think about how 50% of the oxygen you just inhaled was made by microscopic creatures.

Phytoplankton also form the base of aquatic food webs. In other words, all life in the ocean ultimately depends on algae for food. Because algae can use the sun’s energy to transform air into sugars, they provide a rich supply of food for the zooplankton and other creatures that eat them. Those zooplankton are eaten by larger zooplankton, by shellfish, by fish, and by baleen whales. Little fish are eaten by birds and bigger fish, and so on throughout the tangled food web. Sea lions, penguins, sharks, killer whales, dolphins… all of these animals ultimately depend on plankton to survive!



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