Men Against Mosquitoes: Malaria in War


By Mike Markowitz - February 27, 2013

A blood smear of Plasmodium falciparum, the organism that causes the most severe form of malaria. Centers for Disease Control and Prevention photo by Dr. Mae Melvin

Sections: Military History

Topics: Military Medicine


More than arrows, swords, bullets, or bombs, disease has been the biggest killer of soldiers until quite recently. Malaria was not the only illness that shaped the course of history, but it was one of the most tenacious. How did a fragile mosquito, laden with microscopic parasites, cripple mighty armies and repel great fleets?

“The history of malaria in war might almost be taken to be the history of war itself …”

– Col. C.H. Melville, Royal Army Medical College, London (1910)

It seemed to be worst in swampy places. People thought “bad air” caused it; the foul smells of decay rising from marshes. It starts with uncontrollable shivering. The sensation of cold soon gives way to fever and headache. Profuse sweating follows. There may be nausea and muscle pain. After a few days, the cycle repeats; leaving the patient exhausted.
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This poster prodded soldiers to keep their skin covered and use bug repellent. U.S. National Library of Medicine photo

In severe cases, convulsions follow, lapsing into coma, ending in death from kidney or liver failure. More commonly, the disease settles in for life, its victims anemic, weakened and vulnerable to other infections.

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Malaria is not a single disease; several species of the protozoan Plasmodium can infect humans, but only two are historically significant: P. falciparum, the most serious form of the disease, and P. vivax, more widely distributed but rarely fatal. There is still no vaccine, but drugs can prevent infection or reduce severity of symptoms.

Antiquity
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A malaria patient and with his mother in the Kibera area of Nairobi, Kenya. Young children in Africa are disproportionately affected by malaria, with 86 percent of malaria deaths occurring in children under the age of 5 years. Photo courtesy of Novartis AG

Malaria was here long before us. Like us, it originated in Africa. Malaria parasites have been found in mosquitoes preserved in amber 30 million years old. The spread of irrigated agriculture created ideal conditions for mosquitoes to multiply near people. In 2008 DNA from *P. falciparum* parasites was recovered from Egyptian mummies. The emergence of organized warfare, by gathering dense masses of men in the field during warm seasons, provided lavish buffet tables for hungry mosquitoes. Marshes around Rome produced recurring epidemics in Roman history whenever drainage canals fell into disrepair. When Alaric’s Visigoths and Attila’s Huns marched on Rome they were quickly decimated by sickness.

Although traditional Chinese medicine had an effective herbal treatment (*Artemisia annua*, or “sweet wormwood”) as early as the 4th century A.D., there was no remedy in the West until a Jesuit missionary pharmacist, Agostino Salumbrino (1561–1642,) noticed that native Quechua people of Peru used an infusion of the bitter bark of the *Cinchona* tree to prevent shivering. He discovered that the bark could treat and – in small daily doses – prevent malaria.

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Malaria was not native to the New World; it arrived in the blood of European settlers and African slaves. But the discovery of quinine extracted from cinchona bark gave military medics a weapon against malaria. In 1775, the Continental Congress, although strapped for cash, appropriated $300 to purchase precious quinine for Washington’s army.

Civil War

By one estimate, disease caused three-fifths of Union fatalities in the American Civil War and possibly two-thirds of Confederate deaths. There is no way to know how many deaths malaria caused. Record keeping was spotty and medics had no standard diagnostic categories; malaria might be confused with typhoid fever, or recorded as “intermittent fever,” “tertian ague,” or “swamp fever.” Regimental surgeons found that troops would only take their daily doses of quinine when mixed with whiskey.
A Civil War field hospital in Savage Station, Va. Twice as many men died of disease than of gunshot wounds in the Civil War. Measles, smallpox, yellow fever, and malaria proved to be the soldier’s greatest enemies. Library of Congress photo

Southern whites often had some acquired resistance, from surviving repeated attacks, while many African-Americans had genetic traits that provided protection against the disease, but Yankees were raw meat for the mosquito-borne parasites. Some generals argued against campaigning in swampy areas during the “sickly season.”

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In 1880, a French Army doctor in Algeria, Alphonse Laveran, first observed malaria parasites under the microscope in the blood of a patient. In 1897, a British Army doctor in India, Maj. Ronald Ross, proved that mosquitoes transmitted the parasite. Beginning in 1904, William Gorgas, a U.S. Army doctor, applied this knowledge to eradicate malaria and yellow fever in Panama, making construction of the Canal possible.
Wars of the 20th Century

This sign at a field hospital in Papua New Guinea exaggerates the consequences of not taking anti-malaria medicine. Despite its nasty side effects – like turning the skin yellow – atabrine was instrumental in getting a handle on the malaria problem for American troops during World War II. National Museum of Health & Medicine photo

In the Spanish American War, the U.S. Army suffered 332 battle deaths and 2,957 deaths from disease. Yellow fever and typhoid were the main killers, but malaria acquired in tropical Cuba, Puerto Rico, and the Philippines would sicken thousands of veterans for years afterward.

“Doctor, this will be a long war if for every division I have facing the enemy I must count on a second division in hospital with malaria and a third division convalescing from this debilitating disease!”


In World War II, in the South Pacific, American soldiers, sailors, and Marines suffered eight times as many casualties from malaria as from combat. In 1939, a Swiss chemist, Paul Müller, had discovered that DDT, a chemical first synthesized in 1874, had extraordinary insect-killing power. By 1944, the odorless powder was produced in sufficient quantity to suppress mosquitoes wherever U.S. forces campaigned.
An interior view of malaria patients in a patients' ward at the 7th Portable Surgical Hospital, Soputa, New Guinea, ca. 1943. In the South Pacific, American soldiers, sailors, and Marines suffered eight times as many casualties from malaria as from combat. National Library of Medicine

Since the war had cut off supplies of natural quinine from Dutch plantations in Indonesia, synthetic anti-malarial drugs such as atabrine and chloroquine were pressed into service. Many GIs resisted taking the drugs because of false rumors they caused impotence and sterility. By the 1950s, chloroquine-resistant malaria began to appear in Southeast Asia.

In Vietnam, both sides suffered severely from malaria, although there were relatively few American deaths. The U.S. Army reported more than 40,000 cases between 1970 and 1975. The Chinese communist regime was so concerned about the debilitating effects of malaria on the North Vietnamese war effort that Mao Zedong (1893-1976) established a top-secret research unit that rediscovered the traditional herbal drug, artemisia. The active ingredient, artemisinin, is still used in malaria treatment.

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Malaria is endemic to Somalia, Iraq, Afghanistan, and other countries where American forces have fought in recent years. While mefloquine (brand name Lariam), a synthetic analogue of quinine, has been generally effective in protecting troops, mefloquine-resistant malaria is emerging in Southeast Asia and Africa, and medics worry over psychiatric side effects of the drug, especially suicidal thoughts. Doxycycline is also commonly used, but measures must be taken to ensure a dose is taken daily.
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Today and Tomorrow

Far from being eradicated, malaria is resurgent in many parts of the world. War and chaos breed epidemics by disrupting mosquito control measures, and depressing the immunity of stressed and displaced populations.

Cpl. Timothy Dobson, a fire team leader with second platoon, Ground Combat Element, Security Cooperation Task Force Africa Partnership Station 2011, takes doxycycline once per day in addition to a weekly dosage of mefloquine to prevent the spread of Malaria. The daily routine was supervised to ensure that meds were taken each day. U.S. Marine Corps photo by Lance Cpl. Timothy L. Solano

As mosquitoes develop resistance to pesticides, and as parasites develop resistance to anti-malarial drugs, military planners face a classic “Guns vs. Armor” race: a struggle between the skill of biochemists and the relentless genetic reshuffling of our insect and protozoan foes.