

MALARIA *and the Armed Forces*

Malaria is a disease caused by minute parasites which destroy human blood cells. It occurs in two phases — the clinical phase, during which parasites rupture the red blood cells, causing chills, fevers and severe headaches; and the tissue phase, during which the parasites are harbored in cells of the liver and other organs of the body and no symptoms are evident.

The normal course of the disease is marked by recurring attacks, representing the clinical phase of malaria, which alternate with gradually lengthening tissue phases. Even without treatment, the patient is acutely ill only a small part of the time, although the disease may last for several years. Death is exceptional with benign tertian malaria, the type most frequently encountered in this country and in Korea.

The two phases of the disease represent a major complication in the successful cure of malaria. The cure of the clinical phase is accomplished by several drugs that remove the malarial parasites from the blood stream. Until recently, however, no effective agent against the parasites harbored in the tissue had been discovered.

Three factors are necessary for the propagation of malaria: The presence of malaria cases, a supply of malaria-transmitting mosquitoes, and a temperature which permits the mosquitoes to reproduce and remain active.

For all practical purposes, the only way to prevent malaria is either to destroy the *Anopheles* mosquito, the principal transmitter of the disease, or to prevent them from biting human beings. There is no vaccine or drug that will prevent the introduction of malaria parasites into the blood stream. Consequently, effective preventive measures are dependent on insect control measures and the use of insect repellents. How effective these are depends on the discipline of troops, the tactical situation, and the geography of the area involved.

It is possible, however, to suppress the

symptoms of malaria through the use of several drugs. This suppression enables a soldier to continue his combat mission without any symptoms of malaria and without any ill effects to his health, and it permits the eventual treatment of the soldier from the malarious area where he can be cared for most expeditiously.

The relapse, or clinical phase of all types of malaria can be treated effectively by drugs now in use. Several drugs now available will completely cure the most severe forms of malaria. The permanent cure of the temperate zone variety which is most common in Korea, however, still depends on an effective agent to combat the tissue phase of the parasite. Successful completion of tests now underway may make this cure possible.

The Military Problem

Despite the developments in recent years, both in the fields of insect control and effective suppressants, malaria remains a military problem. This is primarily true because while an army in garrison can do much to control its environment, its efforts in combat must always be limited — and the prevention of malaria is entirely dependent on this environmental control.

Malaria was a major factor during the Spanish-American War and unquestionably would have had a serious effect on the campaigns of that period if they had lasted longer. During World War I, American troops serving in temperate areas had little malaria, but Allied and Central Powers troops in Macedonia were immobilized because of the disease.

During World War II

Malaria during World War II posed one of the most serious health problems ever faced by the American Army. Much of the fighting was in the most malarious areas in the world, and the Japanese capture of Java had sealed off much of the world's supply of quinine, which had been the standard malaria suppressant and treatment since early in the nineteenth century. In addition, neither insecticides

nor repellents were effective enough at the outbreak of the war to combat jungle mosquitoes, although they were reasonably effective for domestic use.

The early phase of the war reflected a decreased incidence of malaria among troops in the United States because of intensified control measures. At the same time, however, the rate was rising dramatically in overseas areas because of inexperienced troops and inadequate weapons to combat the disease. This was particularly notable in New Guinea where the initial onslaught on the disease was almost catastrophic and caused many more casualties than Japanese bullets.

Malaria remained a problem throughout the war in the Southwest Pacific, Africa, India, and the Carribean; but the development of new materials and methods soon resulted in declining rates throughout the world where American troops were stationed.

The materials included DDT, aerosol sprays, improved repellents, and the standardization of atabrine to replace quinine as a malaria suppressant. An intensive education program among troops which emphasized the necessity for closely adhering to control rules was also launched. Soon the number of cases of malaria in an organization became a criterion of the unit's discipline.

Post-war Advances

When the war ended, the Army had in atabrine an effective suppressant that had proved as effective as quinine in many ways and superior in others. Both atabrine and quinine had certain disadvantages, however, and neither provided a cure or even a wholly satisfactory treatment for malaria. Consequently, the Army Medical Service and other government agencies continued intensive research for more effective antimalarial agents.

A major victory was achieved in 1947 with the standardization of chloroquine after tests involving thousands of malaria cases. Chloroquine proved to have these advantages over atabrine and quinine:

1. As a suppressant it had to be taken only once a week instead of every day.
2. It did not discolor the skin.
3. It produced fewer "side effects."
4. It was more effective in relieving

acute symptoms of the disease and eliminating malarial parasites from the blood stream in as little as 24 hours.

Malaria in Korea

Korea is a highly malarious country with much of the population infected with the disease. In addition, the work of combating the Anopheles mosquito has been complicated both by the innumerable breeding grounds provided in rice paddies and by the frequently harrassing tactical situation. However, with the use of chloroquine, which became available throughout the entire combat area late in the summer of 1950, the incidence of malaria in Korea has been kept low compared with World War II rates.

Chloroquine is an excellent suppressant; but, like atabrine and quinine, it is neither a preventive nor a complete cure for malaria. Numerous cases may be expected therefore among returnees from Korea who have not previously experienced symptoms of the disease. All returners have been warned at west coast ports of debarkation that if they develop chills, fevers and severe headaches while on leave, they are to inform their physicians that they have been serving in a malarious area.

Present Anti-malaria Research

Since the standardization of chloroquine in 1947, the U.S. Army Medical Service has concentrated much of its research on a new drug, primaquine, which seems to offer much promise in the treatment of malaria. Primaquine appears particularly effective against the tissue phase of the disease because it attacks the stubborn parasites in the liver cells. It may thus be possible to effect rapid cures for malaria and prevent numerous relapses by simultaneously treating the parasites in the blood stream with chloroquine and those in the liver with primaquine. If primaquine proves successful, it will not replace chloroquine as a suppressant, but it may be possible to administer it routinely to all persons returning from malaria-ridden areas and, in effect, cure the disease before the returnee knows he had contracted it.

Research is also continuing on the developing of improved insecticides and insect repellents that will aid in the equally essential fight against the disease-carrying mosquitoes. A number of these items are already being field-tested in Korea.