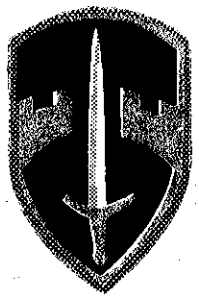
US ARMY MEDICAL FIELD SERVICE SCHOOL
DEPARTMENT OF PREVENTIVE MEDICINE

VIETNAM PREVENTIVE MEDICINE ORIENTATION



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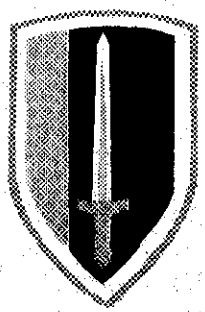

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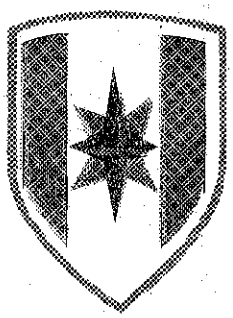
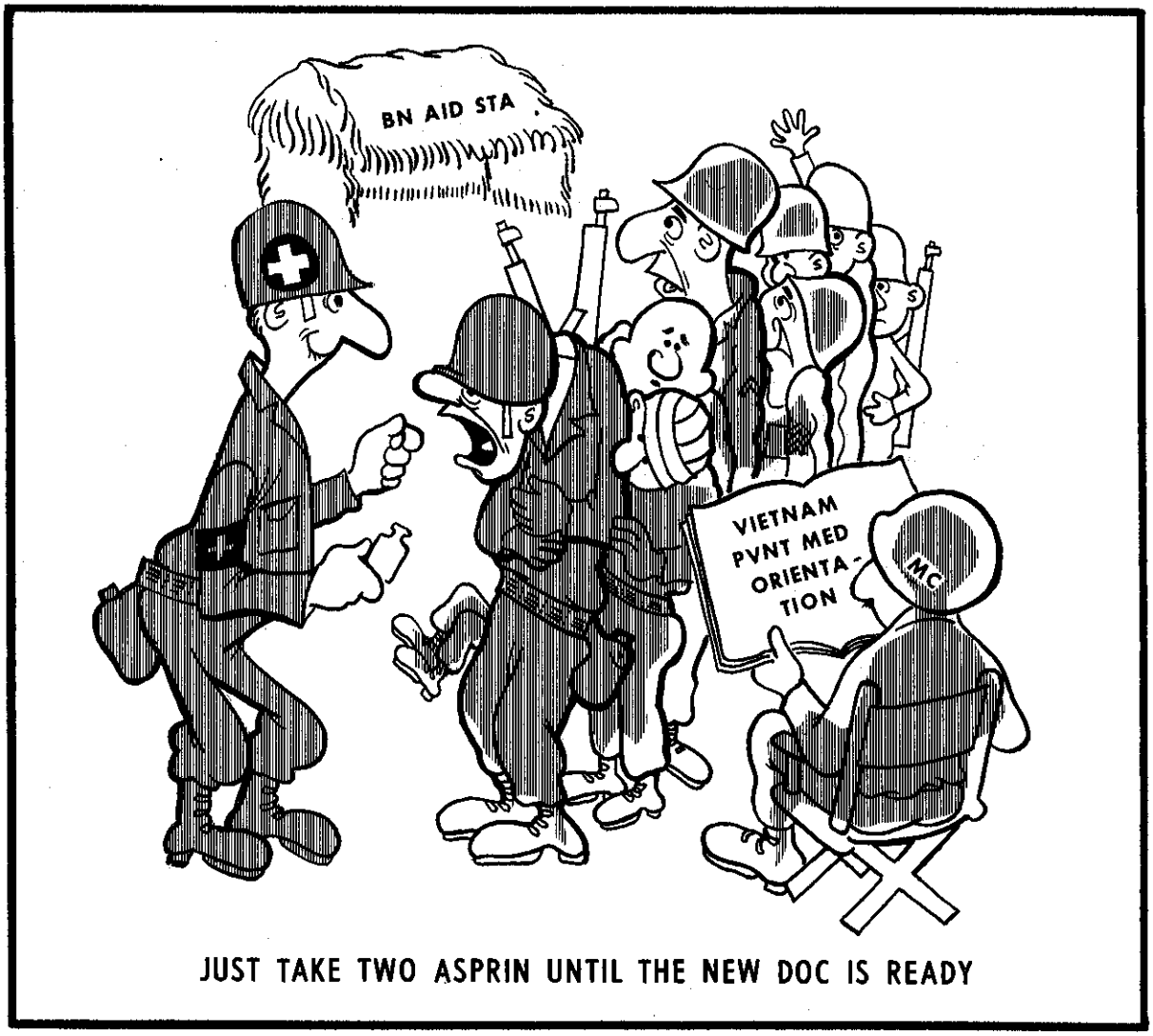


44th Medical Brigade

VIETNAM PREVENTIVE MEDICINE ORIENTATION



*This general reference supersedes GR 70-200-1-1, 107.

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INTRODUCTION

As Army Medical Department officers you are interested in South Vietnam, especially those of you who will soon serve there. This orientation is an introduction to the country and a resumé of the disease problems we face there. We hope that you all will find it informative and that those of you going to Vietnam will find it a handy carry-it-with-you reference. If you are going to Thailand or another tropical country, you may find much information here which applies to your assignment as well.

In war the importance of military preventive medicine lies in the age-old fact that disease casualties always outnumber battle casualties. For example, in Vietnam now, as was true during the Korean Conflict and World War II, over 2/3 of all hospital admissions are due to disease while less than 1/3 are due to injury from either hostile action or accidents. Most of these disease casualties are preventable, and this is the object of the Army preventive medicine program. All medical personnel have a role in this program.

To adequately fulfill this role in Vietnam, we must acquaint ourselves with at least 3 subjects which receive very little attention in our professional training in the United States. These subjects are (1) the nature of environmental problems existing in a war-torn, tropical, underdeveloped country such as Vietnam, (2) some diseases not routinely encountered in the US and (3) the basic practices of field sanitation. Therefore in Sections I and II we will describe the country, people, sanitation situation and Vietnamese health services. With this necessary background we can then discuss in Section III diseases affecting US troops: the "exotic" ones like malaria, scrub typhus, melioidosis and chikungunya, and also the decidedly "unexotic" ones like VD, common diarrheas and hepatitis. In Section IV we will touch on other diseases prevalent among the Vietnamese which have had relatively little impact on our troops. Finally, in Section V a short discussion of battalion-level preventive medicine is followed by an outline of disease prevention measures which apply equally to a unit program and to you as an individual.

We strive to keep this orientation timely by regular revisions based on technical reports, articles, letters and personal accounts of individuals returning from Vietnam. In this regard we will welcome your comments too. (Department of Preventive Medicine, USA MFSS, BAMC, FSH, Texas 78234).

References, some of which are footnoted in the text, are arranged by topics; their number is limited with emphasis on those providing additional information and literature reviews of general interest. Disease rates ("cases/1000 men/year") are frequently quoted to allow you to quantify and compare information on different diseases; they are summarized and explained in Appendix I.

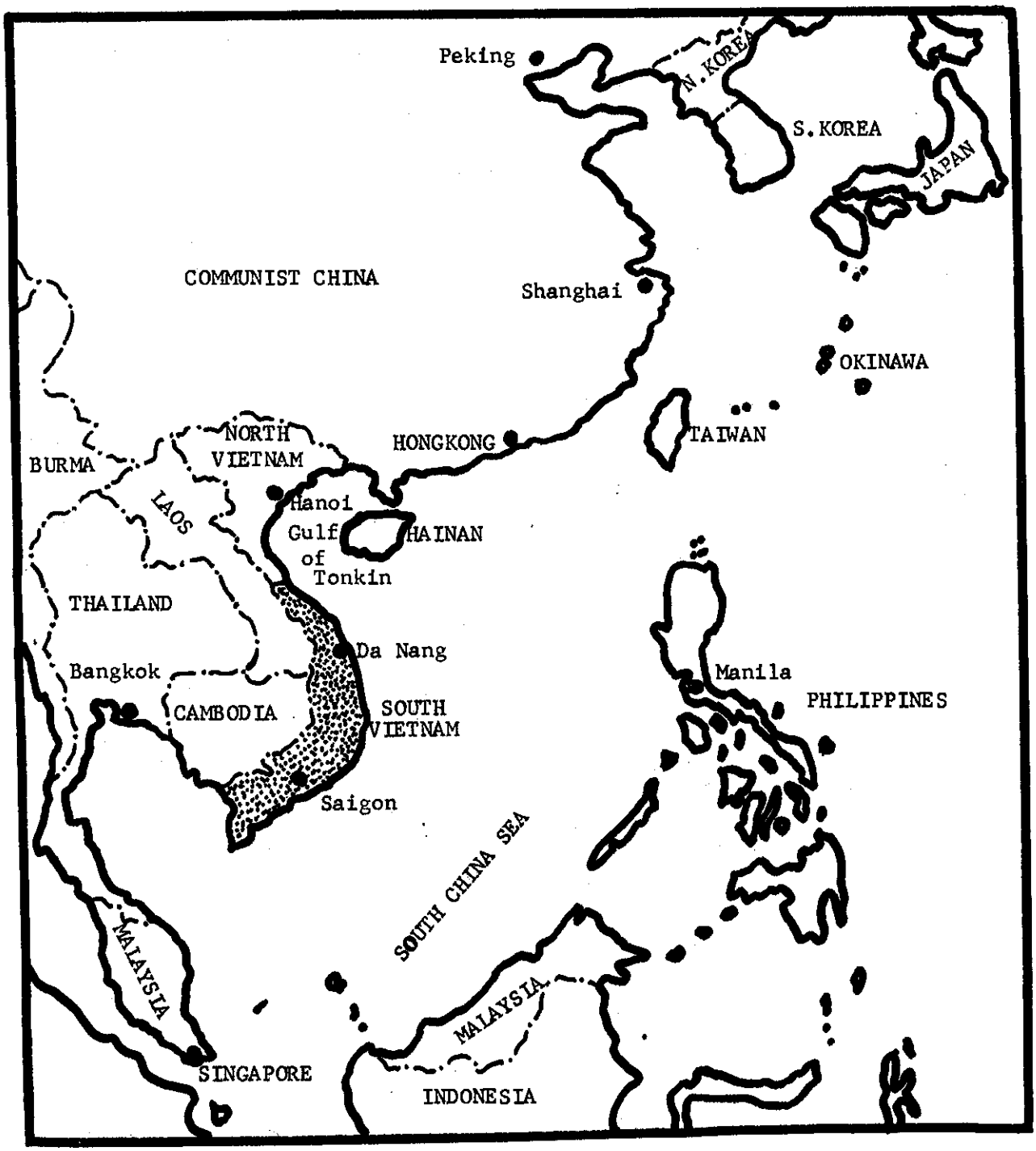


Figure 1. Southeast Asia

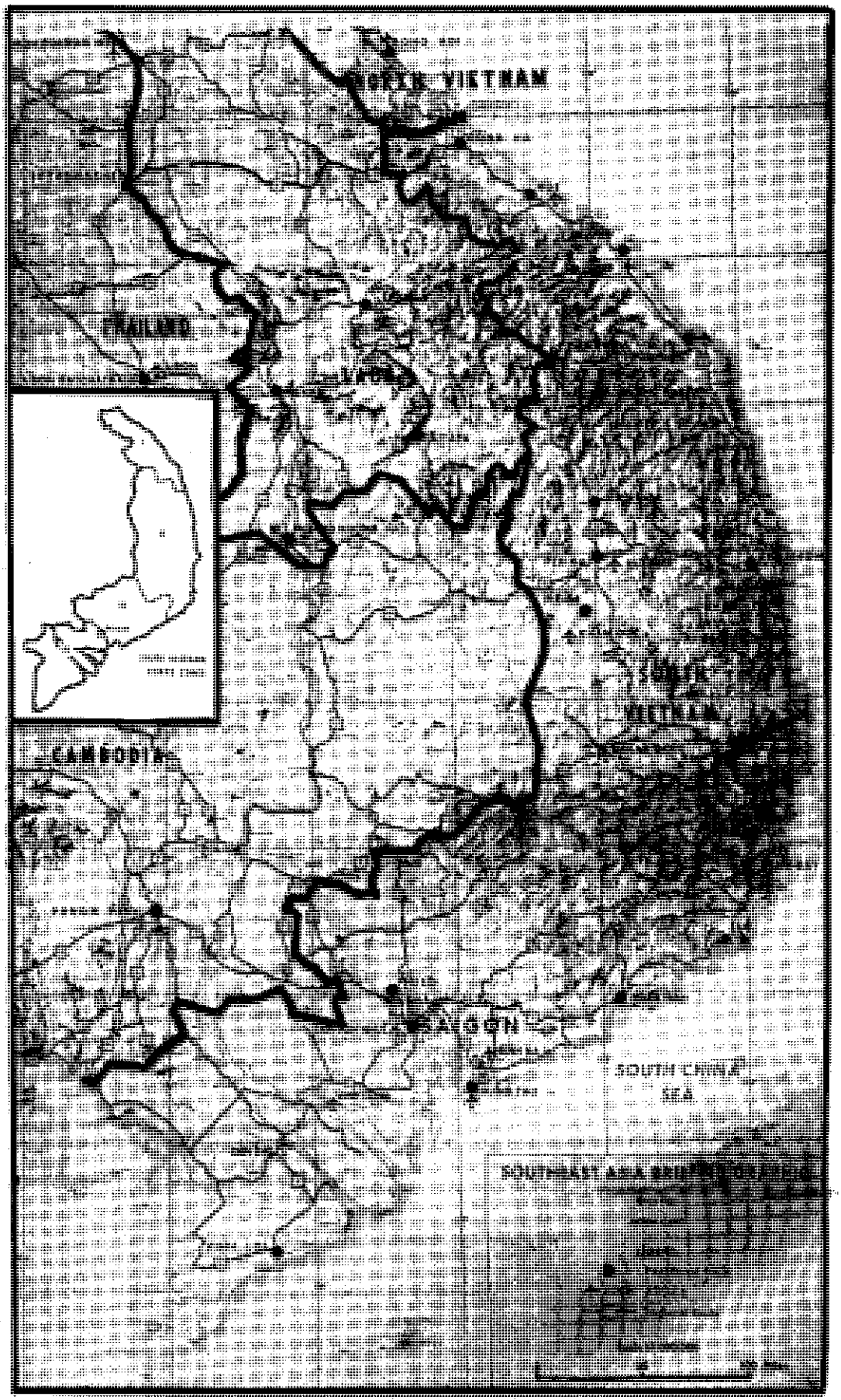


Figure 2. South Vietnam

SECTION I: BACKGROUND INFORMATION

The Republic of Vietnam is a long, narrow, mountainous, crescent-shaped country extending along the eastern edge of the Indo-China peninsula (see figure 1). The northern boundary at the 17th parallel was established by the Geneva Convention in 1954. The country is bounded on the east by the South China Sea, and on the west by Laos, Cambodia and the Gulf of Siam. South Vietnam is about 700 miles long with its width varying from 150 to 35 miles. The area is about 66,000 square miles, or somewhat smaller than the state of Washington.

The population was estimated in 1968 to be 17 million. Saigon, the capitol, is the principal city with about 3 million people. DaNang, Hue and other larger cities are noted on the map in figure 2.

The political subdivision is the province. There are 45 of these, each having roughly the same political role and geographic size as a county in the United States. Civil administration, including health care, is under the province chief. Military administration is based on four Corps Zones denoted by Roman numerals (see insert, figure 2). These zones are also used for tactical organization of US military forces.

Vietnam's historical-political background will not be discussed here. However, several good accounts are cited in the References.[6-9]

TERRAIN

The natural terrain features seen in figure 2 divide South Vietnam into three well-defined areas: Central Highlands, Coastal Plains and Delta Region. The largest area is the Central Highlands which covers about two-thirds of the country, extending from the 17th parallel down to 50 miles north of Saigon. Here there are hilly plateaus which are between 1,000 and 3,000 feet above sea level. The mountains are mostly under 5,000 feet but some reach as high as 8,000 feet. Much of the Highlands is sparsely settled by primitive tribal groups, collectively referred to as Montagnards. Much of the terrain is covered by thick tropical rain forest with many streams flowing beneath. Malaria is a major military problem in the Highlands, where vector mosquitoes breed heavily and chronically infected Montagnards provide a reservoir.

The second distinctive area, the narrow Coastal Plain squeezed between the mountains and the South China Sea, is about 20 miles wide in most places. It is densely populated and intensively cultivated.

The third distinctive area is the flat southern one-third of the country which is primarily the delta of the Mekong River and the valley of the Saigon River. The Mekong, incidentally, is one of 4 great rivers draining the Asian Continent into the Pacific Ocean. The Delta Region is extremely flat with elevation seldom over 20 feet above sea level and is under heavy rice cultivation. It is criss-crossed by streams and a network of canals used for small boat travel. During the rainy season the land area is greatly reduced by flooding. Construction of base camps and roadbeds in this region requires elevated earthen foundations.

CLIMATE

In general the climate of South Vietnam is hot and humid, and there are many cloudy days. The tropical climate is regulated by the fascinating monsoons - or "big winds" - of southern Asia. The Annamite mountain chain blocks the two monsoons and divides the country into two general climatic regions (see figure 3). Although there are local variations, the overall pattern is as follows.

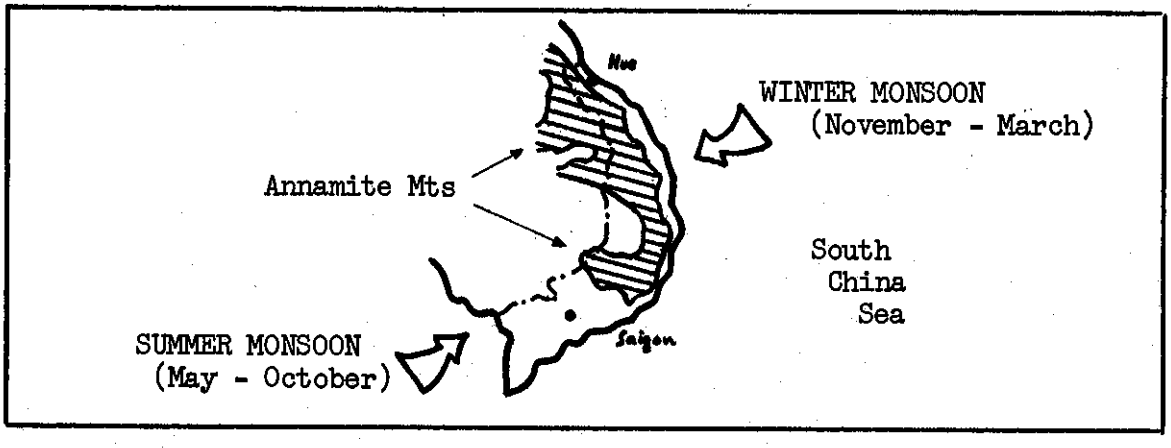


Figure 3. The Monsoons

In the southern region the summer monsoon blows from May to October bringing rain. This monsoon blows from the southwest bringing moisture-laden air out of the Indian Ocean. In Saigon it is quite wet with an average rainfall of 66 inches during these 6 months. Rainfall is also heavy in the Central Highlands at this time. During the winter monsoon, from November through March, it is relatively dry in Saigon with an average rainfall of only 8 inches during these 5 months. Saigon typifies

the yearly pattern in the Delta Region and the Highlands: much rain during the summer monsoon, a pleasant, relatively dry and cool period during the winter monsoon, and, finally, a most unpleasant, hot, dusty transitional period from March until the summer monsoon begins again in May.

In the Coastal Plain east of the mountains, climatic conditions are almost reversed. During the winter monsoon, when there is little rain in the south, the coast has heavy rains brought from the the China Sea to the northeast. At Hue rainfall is heavy - about 120 inches per year. Typhoons sometimes strike the coast, usually between the monsoons in October or November, and can cause much damage.

These monsoon climate patterns considerably influence certain diseases. For example, in the Central Highlands rainfall and temperature variations greatly influence mosquito populations and thus the intensity of malaria transmission. The Delta is flooded during the summer monsoon with concurrent increases in immersion foot and diarrheal diseases. Heat injury varies with the season and, of course, can at any time become epidemic in poorly supervised troops who are new arrivals in this hot and humid climate.

PEOPLE

Although influenced by the French, Chinese and other adjacent cultures, the Vietnamese have maintained a distinct culture. Eighty-five percent of the population are of the Vietnamese ethnic type. The other 15% represent various ethnic minorities including Chinese, Montagnard tribes, Cambodians, Indians and Pakistanis, and a few resident Europeans. The largest minority is the Chinese numbering over 1 million, most of whom are engaged in business in Saigon and the other larger cities.

The people of the Vietnamese ethnic majority are related to the Chinese physically and culturally. They predominate in the good agricultural lands of the Coastal Plains and the flat Delta Region. Their lives revolve around family, village, crops and religion. The typical rural village is an entity of a few miles' size composed of several scattered clusters of houses, called hamlets, and a patchwork of rice paddies and vegetable plots. Each day the people go out to tend their fields,which surround their hamlets. In rural areas the outlook of the people is pretty much limited to their families and village, with the cities and the national government seeming quite remote. This isolationist tendency is enhanced by the difficulties - and dangers - of transportation in the present war-time situation. One consequence of the dangers of traveling is limited opportunity to seek medical care, even within the same province.

Another consequence of the military situation is the pouring of refugees into the cities. Saigon and the other cities are now extremely crowded with much poor housing and sanitation. There were estimated to be 2 million refugees in 1967 - 1/8 of the total population!

The Vietnamese language is somewhat similar to Chinese in sound and vocabulary. However, the alphabet has been Romanized and Chinese characters are not used in writing. French and now English are the principal foreign languages. The largest religion is Buddhism. Catholicism is also important because it is followed by many in the small, but influential, educated upper class.

Very distinct from the Vietnamese, are the aborigine-like Montagnards of the Central Highlands. These people live as tribes in mutually independent villages, each village governed by its own council of old men and usually speaking a separate dialect. Their society, religion and agriculture are primitive. For example, they subsist on poor crops of rice, corn and sweet potatoes grown by the "slash and burn" method where they move into an area, cut down the jungle, allow the vegetation to dry and then burn it. They farm this land until it is depleted in a year or so. Then they move on to repeat the process in a new area. They suffer from many diseases, such as chronic malaria, protein malnutrition and all the infections prevalent in a primitive, unsanitary environment. They dislike the lowland Vietnamese whom they feel have alternately ignored and taken advantage of them in the past. Since the war spread to the Central Highlands, the central government has often found it difficult to enlist the Montagnards' support. There are about 600,000 Montagnards.

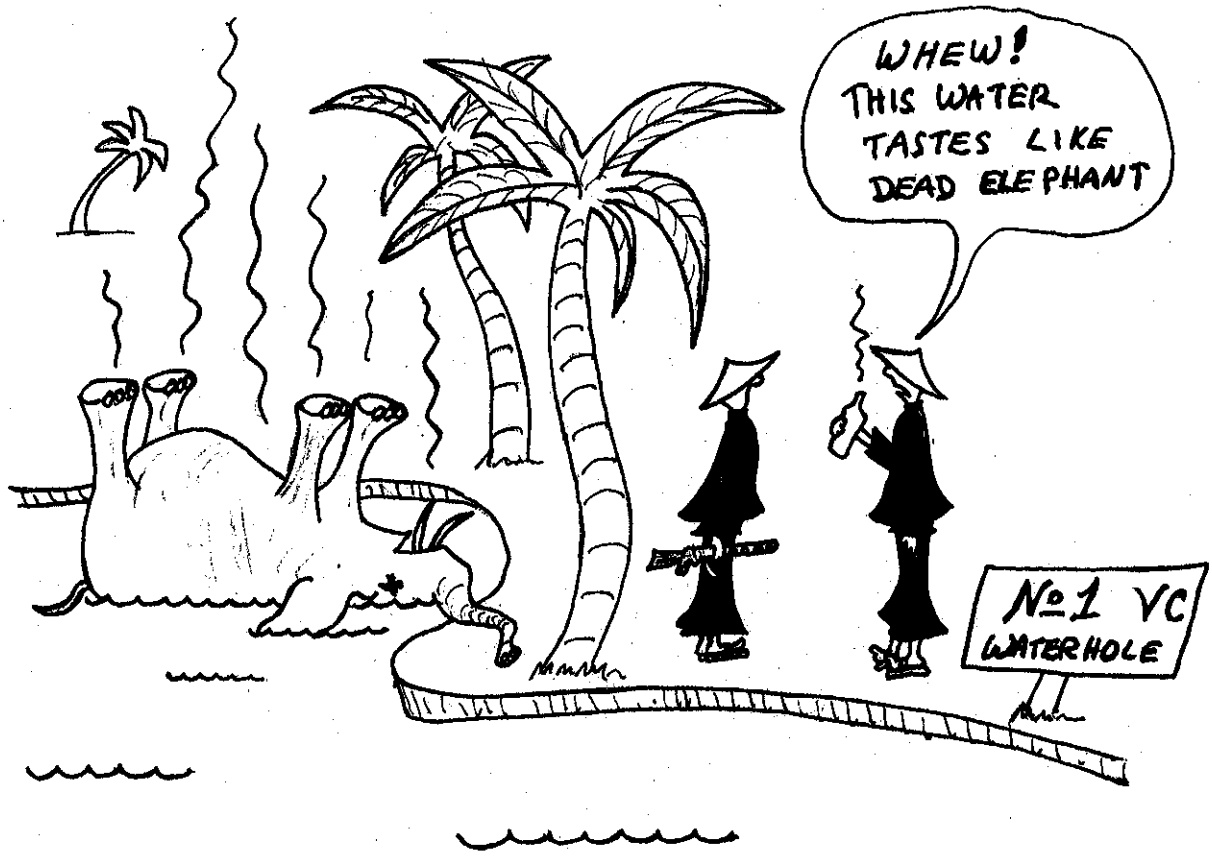
SOCIOECONOMIC FACTORS

The majority of the South Vietnamese population is rural, engaged in subsistence-level farming. The dominant segment of the population, however, is the small upper social class of landed aristocracy, professional people and political leaders. Business leaders have somewhat less prestige. In the cities there is a middle social class comprised of civil servants, tradesmen, school teachers and office workers.

Agriculture is the principal occupation, with rice by far the most important crop. Over 6 million acres are in rice cultivation and an estimated 5 million tons of rice are produced yearly. The Mekong Delta has been one of the leading rice exporting areas in the world. Rubber is also a major crop and, with rice, accounted for most of South Vietnam's exports, before a production decline around 1965 due to increasing communist military activity. Other crops include corn, tropical fruits, vegetables and tea. The port and economic center for the country is Saigon.

Fish and fish oil ("Nuoc Mam") are very important in the Vietnamese diet, and fishing an important occupation. Animal husbandry includes water buffalo and cattle (used chiefly as draft animals), plus swine and poultry.

Manufacturing at present has a minor role in the preponderantly agricultural economy. Many Vietnamese now make their living from goods and services offered to US personnel.



Adapted from "Charley" by DeFox (USARV Med. Bull., Oct - Dec 1966)

SECTION II: VIETNAMESE HEALTH RESOURCES

SANITATION

Poor environmental sanitation is probably the most overriding public health problem. Systems for sewage and waste disposal are only found in the larger cities. Most of the untreated sewage is discharged directly into the rivers and streams, contributing to the universal contamination of surface waters. In rural areas promiscuous defecation in villages, fields and streams promotes widespread contamination of soil, food and water. The government has devoted considerable effort to construction of privies in rural areas, but progress is slow. Night soil has never been used extensively in South Vietnam, so this form of feces dissemination is not prevalent as it is in other parts of Asia.

Provision for garbage collection exists in the larger cities, but it is haphazard. Garbage is placed in open containers, collected in open trucks and transported to large, open dumps. These practices support the growth of tremendous fly and rodent populations. One consequence is that plague is frequently a serious problem in the cities.

Although there are sanitary regulations governing markets and restaurants, these regulations are not strongly enforced. In the markets foods are uncovered and may stay for many hours at warm temperatures before purchase. Spoilage, food contamination and hordes of flies are common. The visitor who must eat in local restaurants should only eat well cooked food while it is still hot.

WATER

About one-third of the population is said to have access to a potable water supply. Only the larger cities have public water supply systems. Most communities obtain water from ponds, streams, canals and shallow wells, which are usually contaminated.[10] It is interesting that most Vietnamese drink tea and rarely plain water. This custom ensures boiling and thus a relatively safe water intake. Diarrhea is to be expected when US personnel drink untreated local water.

HEALTH SERVICES

Civilian health needs are very great in South Vietnam.[11] The common infectious diseases include tuberculosis, malaria and enteric infections. Among the commonest enteric infections are shigellosis, amebic dysentery, typhoid fever, infectious hepatitis and intestinal worms. In recent years epidemics of plague and cholera have appeared with thousands of cases yearly. Infant mortality is high due to such diseases as infectious diarrheas, malaria and undernutrition. Civilian war casualties have greatly increased since 1960 along with the tempo of military operations and communist terrorism. During 1967, there were 50,000 civilian casualties admitted to the hospitals and in the 1968 Tet offensive a particularly great surge of injured civilians flooded the hospitals.

It is not surprising that health facilities are overwhelmed by the vast medical needs of the population. The government recognizes this and is striving to increase personnel and facilities, with substantial aid from the US and other sources. Public Health and Preventive Medicine are among the health needs of the people which deserve considerably more attention than they now receive.

Structure of Provincial Health Services

Civilian medical services in each province (see figure 4) are administered by the provincial medical officer, or "Medecin Chef," who usually is a physician. In most provinces there is a hospital of 100 to 300 bed

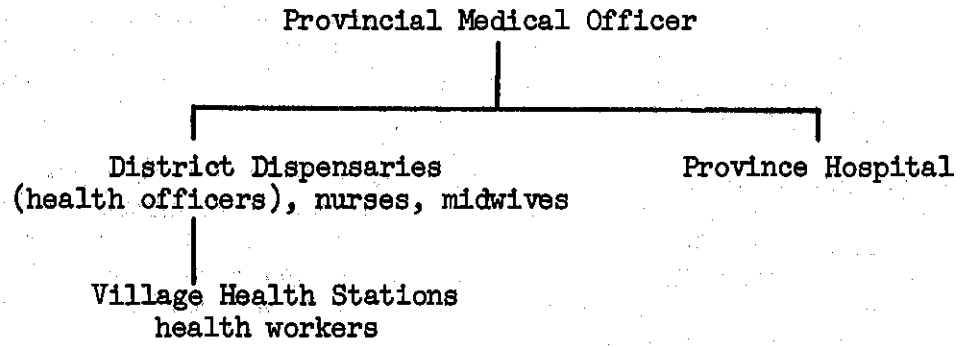


Figure 4. Structure of Provincial Health Services

capacity. These province hospitals vary in appearance from the few modern ones to the majority, which are old and primitive. Sanitary conditions range from good to miserably filthy. Nearly all the hospitals are overcrowded, often with 2 or 3 patients for each bed. In the rural provinces the Medecin Chef is the only physician; except for the 7 provinces which in 1968 had no physician.

Under the Medecin Chef's administration are the outpatient facilities in the 5-8 districts and roughly 70 villages in his province. Paramedical personnel, rather than physicians, give all medical care at these levels. The district health services are supposed to be administered by a district medical officer who has 4 years' training in public health and medical treatment. Unfortunately, the available number of these individuals is far too small to staff most districts. The district dispensary usually has 20 beds, half for obstetrics, and a staff of 1 or 2 midwives or nurses. When treatment cannot be rendered at the district dispensary, the patient is referred to the province hospital.

In each of the several villages of the district there are village health workers working out of their health stations, where they provide primary outpatient care. There are roughly 3,500 village health workers who have undergone brief training in first aid and the use of 13 basic drugs. However, like all paramedical personnel in rural areas, there are far too few village health workers and they too frequently disappear, especially through abduction and assassination by the enemy.

National Health Services

Besides the 43 province hospitals, there are 11 public hospitals in Saigon, including specialty centers for rehabilitation, communicable diseases, pediatrics and cancer, and a large mental hospital in Bien Hoa. There are also several privately-run leprosaria. Pasteur Institutes which manufacture vaccines and sera and provide laboratory services are located in Saigon, Nha Trang and Da Lat.

Among public health programs which have been relatively successful in Saigon and some provinces are mass immunization programs for smallpox, cholera and plague, DPT for school children, and BCG immunization of newborns. Programs for malaria eradication and mass treatment for trachoma were initially promising, though they are now greatly restricted by lack of military security.

Health Personnel

There is a shortage of all Vietnamese medical personnel. Recent figures indicate a total of 1,200 physicians, 3,100 nurses, 1,200 midwives, 75 dentists, and 4 sanitary engineers. Of the physicians, 800

are in military service and about 200 have exclusive practices in Saigon. This leaves only about 200 physicians really available to the general population, or about 1 physician for 80,000 people. Physicians are educated in 2 medical schools: a modern one in Saigon and a rather antiquated one in Hue. The Saigon school graduates about 120 physicians a year, most going directly into the army.

Shortage of other personnel is also a serious problem. In 1966-67 the total number of government medical personnel decreased from 16,000 to 12,000 because these trained individuals were quitting faster than the government could train new personnel. Poor pay and lack of military security seemed to be the main reasons for this attrition.

"Chinese doctors" and Montagnard witch doctors provide much private medical care. The Chinese doctor (who may be Chinese or Vietnamese) is much in evidence in the larger cities. He uses modern drugs plus herbs, acupuncture, cupping, and other traditional treatments going back countless years. Many patients consult him first, before considering western style medical care.

MEDCAP AND MILPHAP

US military services, State Department and other allied nations have a number of programs augmenting Vietnamese medical resources.[12-15] Two programs involving military medical personnel are MILPHAP and MEDCAP.

MILPHAP (Military Provincial Hospital Augmentation Program) involves teams of several physicians, an administrative officer and enlisted medical specialists assigned directly to province hospitals to bolster services to civilian patients. Besides the US military services, teams have been provided by other nations such as the Philippines and Korea.

MEDCAP (Medical Civic Action Program) is chiefly local civic action carried out by the medical personnel of regular US military units. This activity is done in the territory of military operations when time permits. Usually it amounts to a sick call held in a village either on a one-time or recurring basis. Its goals are to create a favorable image of the Vietnamese government and to augment local medical services. To this end, the participating medical officer should work with the local village health worker, nurse or midwife, and place this individual in the forefront as much as possible. After all, he continues to provide medical care there long after you leave.

SECTION III: MAJOR HEALTH PROBLEMS FOR AMERICAN TROOPS

Because there is such a multitude of diseases in Vietnam, it is convenient to differentiate between those that seriously threaten our troops and those that are a lesser threat. So, this Section will concentrate on current major health problems for our troops, realizing that these are also major health problems for the Vietnamese. Section IV, on the other hand, will consider other local diseases which have had relatively little impact on US troops, though they are important problems for the Vietnamese.

DISEASES OF HIGH INCIDENCE

The morbidity represented by the following 6 categories of disease has a very great influence upon the effectiveness and well-being of our soldiers.

MALARIA

Malaria is the greatest cause of manpower loss due to disease among US troops in Vietnam. It also still retains its dubious honor of being one of the commonest infections of the human race and one of the leading causes of death in the world. It has long been a military medical problem.[29] In World War II, for example, there were a half-million cases in US servicemen and in some parts of the Pacific theater malaria casualties outnumbered battle casualties 5 to 1. In 1943 General MacArthur complained, "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!"

Malaria reinstated itself as a military medical problem in 1965, when large numbers of our nonimmune troops were exposed as we initiated large-scale operations in the Central Highlands. Soon after, chloroquine-resistant Plasmodium falciparum infections emerged as a big problem when up to 80% of cases failed to be cured by the standard chloroquine therapy. In spite of improved therapy and heavy command emphasis on antimalaria measures, malaria remains the number one disease causing manpower loss, chiefly due to falciparum malaria from the Central Highlands.

Epidemiology

The malaria parasite species encountered in Vietnam are P. falciparum, P. vivax and, in a few localities, P. malariae. You must realize, however, that falciparum malaria is the main problem because of severity of disease and its high prevalence. Significant complications are exceedingly infrequent in vivax and malariae infections, but in falciparum infections the illness is very serious and can be fatal, especially for nonimmune individuals. Depending on the time of year, falciparum accounts for 50-75% of cases in USARV (US Army, Vietnam) personnel and vivax 25-50%. Mixed falciparum-vivax cases are rather common, too (see table 1). Malariae malaria is so rare in US personnel that it has no influence on the USARV malaria rates.

Table 1: Plasmodium Species Distribution in 1,143 Malaria Cases

Species	% of total cases
falciparum	66
vivax	25
mixed falciparum-vivax	9

Source: all malaria cases reported for the month of December 1967 by all Army hospitals in Vietnam (USARV Command Health Report, Dec 1967)

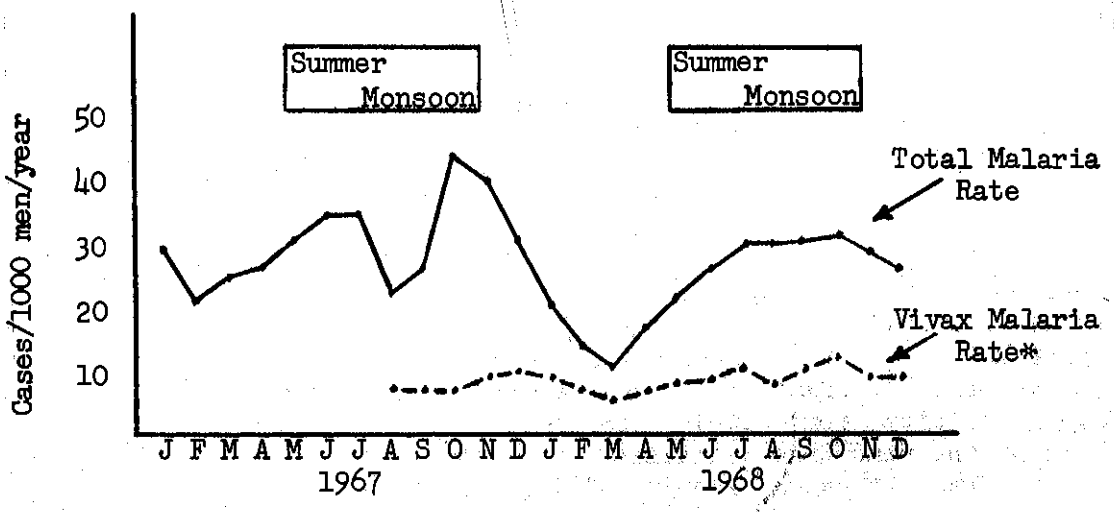
In 1968 a P. ovale case thought to originate in Vietnam was reported. If this species really is present in Vietnam it must be extremely rare since it was not previously reported.

Geography The principal malarious region is the Central Highlands where the majority of falciparum cases, and also many of the vivax cases, are contracted. Vivax predominates in the Coastal Plains and Delta Region but here the level of transmission is not high. Thus, location is a major determinant of malaria manpower loss: a division in the Saigon vicinity, for example, may have only 5-10 cases a month, mostly vivax, while at the same time a division operating in the Central Highlands can have hundreds of cases, mostly falciparum. Besides natural environmental factors, one reason advanced to explain the lower incidence of malaria in the populous Coastal Plains and Delta Region is the relatively effective malaria eradication program begun under WHO sponsorship in the 1950's. In recent years, however, this program was disrupted by Viet Cong terrorism, and it was never extended to remote areas, particularly in the Central Highlands.

Although the combat units can least afford manpower losses, they have most of the malaria. Combat operations necessitate entry into the hyperendemic jungle areas where most falciparum infections are acquired. The overall USARV malaria rate, which was 26 cases/1000 men/year in 1968, is much lower than rates seen in exposed combat units. This overall USARV rate is lowered by inclusion of many support units having lesser exposure to malaria. On the other hand, in individual combat units in the Central Highlands it is not too uncommon to see rates as high as 600 cases/1000 men/year and isolated outbreaks which can quickly reduce the strength of a company by 1/4 or more. In one study of several small combat units, the falciparum casualty rate averaged 1 man lost per 100 men per day of field operations.[32] This is a serious rate of manpower loss which steadily whittles down fighting strength, if allowed to continue.

Reservoir Natives are the principal reservoir. In the Central Highlands malaria rates are exceedingly high with 50-75% of Montagnards chronically infected. Another reservoir affecting our combat troops is the enemy. The effect of the enemy reservoir is seen in high malaria rates among US units in contact with the enemy or occupying recently captured enemy base camps. Mosquito populations in these areas are highly infective from feeding on the Viet Cong and North Vietnamese who have very high malaria rates themselves.

Climate Malaria epidemiology involves not only proximity of our soldiers to the reservoir of natives and enemy soldiers, but also factors which control viability of the female Anopheles vectors and development of the malaria parasites in these mosquitoes. The seasonal fluctuation in the USARV malaria rate seen in figure 5 represents a very



Source: USARV Command Health Reports
*Not available prior to Aug 1967

Figure 5: USARV Malaria Rates 1967-1968*

complex ecological relationship which cannot be thoroughly analyzed in the present tactical situation, although some generalizations can be made. One generalization is that most of the fluctuation in the total USARV malaria rate is due to seasonal variations in falciparum cases from the Central Highlands, while the vivax rate is relatively stable through the year. One determinant for this increase in falciparum cases seems to be the warm temperatures in the Highlands during the summer monsoon, for P. falciparum cannot complete its development in the mosquito when nighttime low temperatures fall below 59°F. The 1967 drop in falciparum malaria at the end of the summer monsoon fits in well with a fall in mean low temperature below 59° in the Highlands during November. P. vivax, on the other hand, is much less temperature sensitive, which may help explain the relative constancy in the vivax rate.

The abundance of Anopheles mosquitoes also increases in the Highlands during the summer monsoon. Environmental factors, particularly rainfall and temperature, and the availability of blood meals have much influence on how many mosquitoes survive and for how long. As for the distribution of vectors, they are just about everywhere in Vietnam. One or another of the several vector Anopheles[5] will be found breeding in nearly any type of habitat in the country: mountain streams, brackish water, epiphytic plants, stagnant rice paddy water, and even the small pool of water that collects in a footprint. Although the mosquito population falls at the end of the wet season, it never disappears in tropical Vietnam as it does during winter in the temperate zones, and malaria transmission continues all through the year in Vietnam.

Life Cycle As a review, the Plasmodium life cycle is summarized in figure 6. Knowing this life cycle is the key to understanding malaria transmission, clinical considerations, prevention and control. TB MED 164 covers the life cycle and its implications very well.

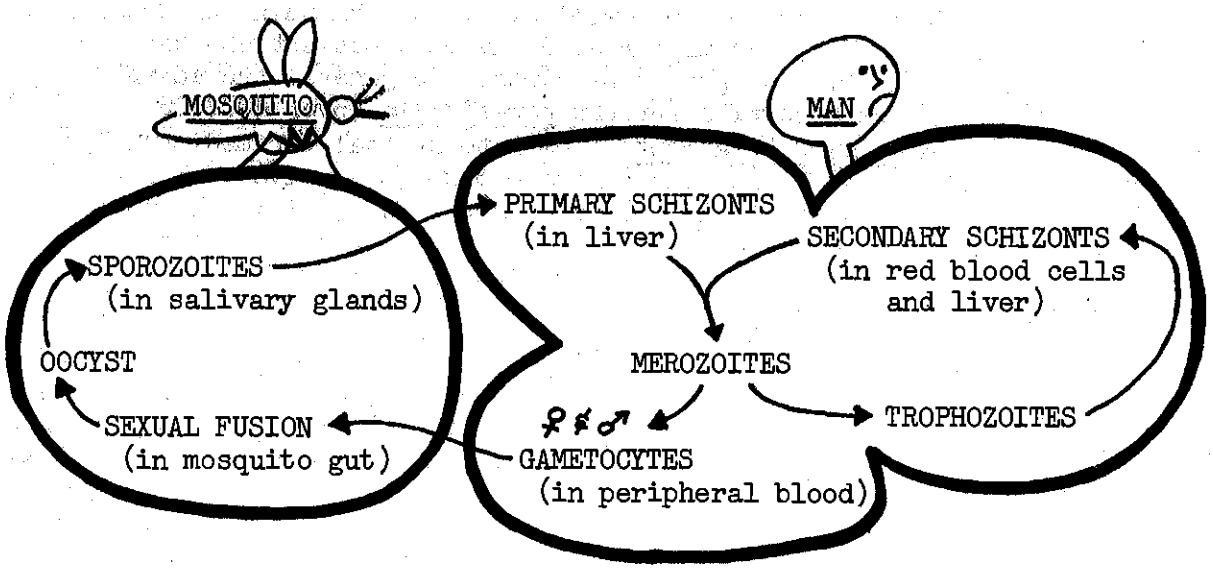


Figure 6. Life Cycle of Malaria Parasites

Clinical Considerations

Vivax and Malariae Malaria Vivax ("benign tertian malaria") and the occasional cases of malariae ("quartan malaria") infections most often present with the classical malarial patterns of periodic chills and fever. About 98% of the vivax and malariae cases will be cured by the standard chloroquine-primaquine regimen (see Appendices II and III). Since vivax and malariae are essentially without complications, they require 2 weeks' hospitalization only to complete the 14 days of primaquine therapy needed to eradicate the tissue phase parasites. When complications occur, such as poor chloroquine response or a drop in hematocrit over 5%, another explanation must be sought, especially unrecognized mixed infection with P. falciparum.

Falciparum Malaria Falciparum ("malignant tertian malaria") is extremely variable in its manner of presentation.[24] Frequently, it begins insidiously with gradually increasing fever, headache, backache and weakness. With equal frequency, it will start precipitously with high fever, abdominal pain, nausea and diarrhea. As a rule, the fever does not have a regular periodicity. Occasionally, it will be an undiagnosed, erratic fever for a week or more before blood smears become positive. Falciparum patients often appear toxic, while patients with simple vivax infections do not. Because falciparum malaria is notorious for its variable symptomatology, rapidly developing complications, and ability to co-exist with other illnesses, malaria smears need to be done in all significantly febrile patients in Vietnam. Whoever does these smears must be competent at (1) making thin and thick blood smears, (2) staining them with Giemsa stain and (3) differentiating parasites in both simple and mixed infections.[28,23,25]

The commonest complications of falciparum malaria are acute renal failure, cerebral malaria, severe intravascular hemolysis and pulmonary edema.[33-36] Sometimes complications will evolve to the point of death in just a few hours. They can appear suddenly in a patient who has received treatment and is thought to be cured. In general the advent of complications correlates with intense parasitemia (over 400,000 parasites/mm^3) and delayed treatment (from late arrival for medical attention, failure to do blood smears, smear misread as vivax, or lack of positive smear). Mortality in untreated acute falciparum malaria can be as high as 25%. Good patient management has kept the incidence of complications and death from falciparum malaria at a very low level in US personnel. In 3,300 cases in Vietnam during 1965-66, the complication rate was 1.1% and the fatality rate was 0.3% (9 deaths total).[39] This policy of good clinical management requires early diagnosis, mandatory hospitalization for treatment, prompt quinine therapy and frequent brief patient examinations for early detection of complications. In 1968 the malaria fatality rate was even lower; about 0.15%.

Since the recognition of chloroquine-resistant strains of P. falciparum in Vietnam a highly effective standard regimen has been adopted by the Army[37-42] using quinine, pyrimethamine and dapsone (see Appendices II and III). This will terminate the acute attack and will cure about 97% of infections. The 3% that relapse generally are cured by a second course of therapy. When patients cannot retain oral medication and whenever serious complications are anticipated, the quinine must be started intravenously (Appendix II) to insure prompt destruction of parasites.[33,38,39] In spite of many printed statements to the contrary,[43] carefully administered i.v. quinine is very rarely associated with serious complications, such as severe hemolysis. Mild quinine side effects of anorexia, tinnitis and orthostatic hypotension are common, however. Pyrimethamine and dapsone, which work synergistically to block folic acid synthesis in the parasite, sometimes cause significant megaloblastic bone marrow depression in the patient.[44,45] After the diagnosis is made, the average patient with uncomplicated falciparum malaria will be hospitalized for 20 days: 10 days to complete quinine therapy and then 10 days of convalescence.

Research to improve therapy of chloroquine-resistant falciparum infections will lead to new drug regimens, but each will have to match the established effectiveness and relatively low toxicity of the quinine-pyrimethamine-dapsone regimen. For example, the Navy in treating marines from I Corps Zone uses a different regimen consisting of chloroquine, pyrimethamine and sulfisoxazole in uncomplicated cases.[46] Nevertheless, they fall back on quinine at the earliest sign of complications. Both Army and Navy regimens retain potential sources of drug toxicity from the folic acid antagonists (pyrimethamine, dapsone and sulfa).

Prevention and Control

While great advances have been made in the diagnosis and treatment of malaria, a well disciplined malaria prevention and control program remains the best way of decreasing malaria losses in your unit. A good program hinges upon personal protective measures, chemoprophylaxis and area control measures.[24]

Personal Protective Measures There is, of course, a foolproof method of avoiding malaria in Vietnam: don't get bitten by Anopheles mosquitoes. It would be nearly impossible to spend a year in Southeast Asia under field conditions and never be bitten by a mosquito, but careful, persistent adherence to malaria personal protective measures can decrease bites enough to vastly reduce the chance of being fed upon by an infective mosquito.

These personal protective measures, as the first line of defense, are the most important means of preventing malaria, particularly in combat units: The liquid insect repellent, DEET, is extremely effective for preventing bites of mosquitoes and other arthropods when it is used correctly. Use DEET liberally and frequently on all exposed skin, especially during evening when the Anopheles females bite. Proper wearing of the uniform with sleeves rolled down at night decreases the area exposed to mosquitoes. The bednet and aerosol insecticide bomb effectively clear mosquitoes from sleeping areas. The headnet is valuable if field conditions prevent use of the bednet.

Adapted from "Charley" by DeFox (USARV Med. Bull., Jan - Feb 1967)

Chemoprophylaxis Chemoprophylaxis (see Appendices II and III), the second line of defense after the infected mosquito bites, depends on continuing presence of antimalarial drugs in the body. These drugs attack the parasites and eliminate them before they can cause symptomatic malaria. Marked reduction in systemic drug levels due to missing one or more chloroquine-primaquine tablets can allow the parasites to overcome the host (you) with disease. Since this invisible conflict of host and drug versus parasite is fought over many days' time, just one missed C-P tablet can be crucial for disease to be the outcome. Illustrating this slow action of chemoprophylaxis is a study of 396 ostensibly healthy American soldiers taking the C-P tablet among whom 10% were found harboring low-level falciparum parasitemia.[51] After one month of observation only 1/6 of these infected but asymptomatic individuals became ill with malaria; the remaining 5/6 were presumably cured of their subclinical infections by a combination of routine chemoprophylaxis and host resistance.

All personnel in Vietnam are required to take one C-P tablet every week. The necessity for not missing a dose also applies to R&R, leave and final departure from Vietnam. An attack of malaria really ruins an R&R or a homecoming. Take the orange C-P tablet every Monday including R&R, leave and for 8 weeks after departing for CONUS.

Combat units in the hyperendemic falciparum areas take a daily dapsone tablet in addition to the weekly C-P tablet. Dapsone must also be taken by members of these units when on R&R, leave and for 28 days after final departure from Vietnam.

How good is chemoprophylaxis? In the field the question is always clouded by a continuing and frustrating high incidence of failure to take the pills. The available data strongly indicates that the C-P tablet can eliminate practically all of the vivax malaria presently being experienced by our troops, provided that it is taken regularly once a week.[48] Thus, it can be assumed - and this is borne out by interviewing patients - that soldiers who get vivax malaria have probably been missing their C-P tablets. Falciparum malaria is a different problem, partly because of chloroquine resistance. The available data indicate that the combination of weekly chloroquine-primaquine and daily dapsone may reduce the incidence of falciparum malaria by up to 75%.[49]

Good chemoprophylaxis, insofar as it is conscientiously practiced, will greatly reduce the malaria rate but will not do the entire job by itself. A solid program of both personal protective measures and chemoprophylaxis, well supervised by medical personnel and commanders, is necessary to keep the malaria problem in hand. In many units this supervision now includes urine chloroquine testing with a simple turbidity test which was introduced in 1968. The test permits rapid screening of all personnel to establish the degree of adherence to C-P prophylaxis. Even though C-P tablets are administered under command supervision, initial urine chloroquine surveys of some units revealed that as many as 70% of the personnel were not ingesting their

C-P tablets. As urine testing continued, the percentage of negative urines fell very rapidly to essentially 0. Sensitivity of this test is high during the 5 days after ingesting the C-P tablet, but in fairness to the unfortunate soldier with a negative urine it seems reasonable that the test could give a false negative reading on rare occasions.

It also must be mentioned that the prophylactic C-P tablet should never be used for malaria treatment because it contains three times the daily therapeutic dose of primaquine and will be toxic if administered daily. In the proper prophylactic doses primaquine and dapsone rarely cause serious toxicity, such as severe hemolysis or methemoglobinemia, even in G-6-PD deficient individuals.[24,47,49]

Area Control Measures Area control measures for malaria can be implemented in any permanently-based, company-sized unit by a well-trained unit Field Sanitation Team (see Section V). Area control measures involve destruction of mosquito breeding sites, spraying of residual insecticides, and fogging with insecticides at night. Very often, area control measures cannot be employed by combat units in tactical situations; at such times personal protective measures and chemoprophylaxis are critically important.

Malaria and Vietnam Returnees

In 1968 nearly 2,400 cases of malaria occurring in soldiers from Vietnam after their return to CONUS demonstrated that malaria continues to be the greatest medical problem imported by Vietnam returnees.[17,18,52,53a] Because it tends to remain latent much longer than P. falciparum, P. vivax accounts for about 85% of all cases. However, falciparum is of far greater concern, because it can be fatal and is often missed by physicians who are not familiar with malaria. Many falciparum cases present in the first month after return and over 90% have become ill by the end of the second month. Vivax cases tend to present a bit later but over 90% have appeared by the end of the sixth month. Nearly all these vivax cases would be completely cured before they became ill if C-P tablets were taken for the full 8 weeks after departing Vietnam. Completing chemoprophylaxis after return to CONUS obviously needs continued emphasis (see Appendix IV).

A few individuals will harbor parasites for years. Although some of these individuals never become ill with malaria, they may transmit it in blood transfusions. Sporadic transfusion malaria in the US has increased along with the influx of Vietnam returnees.[53a] Transfusion cases due to P. falciparum have sometimes been fatal because they were not diagnosed.

Another problem is introduction of malarial parasites into our native Anopheles mosquitoes. This has happened on several occasions.[18,53,54]

DIARRHEAL DISEASES

Diarrhea is common in US troops. The monthly hospital admission rate for diarrheal diseases ranges 30-150 admissions/1000 men/year, which is generally 5-10% of all hospital admissions. Even this high rate does not fully depict the diarrhea problem, however, because most cases are not hospitalized. For example, in one study of diarrhea in an infantry brigade it was learned that (1) 45% of all personnel had 2 or more episodes of diarrhea in the preceding 3 months, (2) only 25% of those ill actually went on sick call and (3) only 1½% of those seen on sick call were hospitalized. Even though most stay on duty, soldiers with diarrhea cannot be fully effective. The potentially disasterous effect of a diarrhea outbreak was seen in the First Cavalry Division in May 1968 when poor waterpoint operation permitted nonpotable water to be distributed to most of the division. Within just a few days, 7,000 cases of shigellosis occurred, truly overwhelming medical and latrine facilities.

The high incidence of diarrhea in US soldiers has many causes: continual drinking of nonpotable water, frequent forays on the local economy for food and drink, the high prevalence of enteric diseases in the Vietnamese, unsanitary mess practices, primitive waste disposal and swarms of flies. The American GI is highly susceptible to gastroenteritis because he has no previous exposure to the many new agents, particularly viruses, he comes in contact with in Vietnam. Success in prevention and control of enteric infections depends directly on sanitation efforts (outlined in Section V).

Causative Agents

When careful studies are done, causative agents are found in only 10% of diarrhea cases. The remaining 90% are termed "nonspecific" and are presumably largely viral. Shigellosis is the most frequently identified bacterial diarrhea. Salmonella and Providence groups are sometimes found. Only 2 cases of typhoid and no cases of cholera have been reported in US personnel. Amebiasis is the most important parasitic disease, although helminthic infections are somewhat commoner.

The diseases that will be discussed further are the nonspecific diarrheas, shigellosis, amebiasis, intestinal helminths and tropical sprue.

Nonspecific Diarrheas

As stated the vast majority of cases will fall under this classification. A recent review[58] states that the typical picture of acute nonspecific diarrhea and gastroenteritis can be divided into febrile and nonfebrile varieties characterized by varying degrees of nausea, vomiting, abdominal cramps, weakness and diarrhea; all of short duration. The nonfebrile cases tend to be milder and usually respond to symptomatic therapy. The febrile cases tend to be more severe and seem to subside sooner with antibiotic therapy.

In more severe diarrheas there may be profuse diarrhea (to 30 per day), bloody stools, severe cramps, tenesmus and dehydration. These cases approach full-blown dysentery and require work-up with bacterial cultures, sigmoidoscopy and examination for amebae.

Shigellosis

Individual cases and small outbreaks of Shigella diarrhea[55] are common, but fortunately the 1968 First Cavalry water-borne epidemic is unique so far. Because antibiotic resistance is common in Vietnam, some cases may not respond to specific therapy.

Amebiasis

The incidence of amebiasis is low, around 2-3 cases/1000 men/year. Acute amebic colitis is the most commonly recognized form, but numerous amebic liver abscesses have also occurred.

The problem with amebiasis is diagnosis: both missed cases and overdiagnosis. Most medical officers and laboratory personnel lack enough experience to understand the diagnostic pitfalls of stool examination for amebae.[20] In acute amebic dysentery, for example, usually only trophozoites are present and they will not be found unless the stool is immediately examined or placed in an appropriate fixative (MIF or Schaudin's). In fresh preparations (one drop of stool + one drop of water under a cover slip) the most useful characteristics of E. histolytica trophs are the typical unidirectional movement and ingested red blood cells. Remember also that trophs will temporarily disappear from stools following oral antibiotics, purgatives, barium mixtures and other heavy metal preparations; therefore these must not be taken prior to examinations for amebae. Cysts, found in chronic amebiasis, are hardier than trophs and are more likely to be found by the often delayed "routine" stool exam. Still, it must be remembered that in intestinal and hepatic amebiasis stools will often be negative.

Sigmoidoscopy is frequently helpful by demonstrating the characteristic amebic ulcers and by providing better material for microscopic examination. The hemagglutination test, now available in the Army, is reasonably sensitive and may prove helpful in obscure cases.

Uncomplicated intestinal amebiasis is most often treated with diodoquin and tetracycline.[56] Severe amebic colitis and hepatic abscess require emetine or chloroquine. Recently, hepatic abscesses have been successfully treated without drainage using radiogold liver scans to follow resolution.[59]

Intestinal Helminths

Intestinal worms are fairly common in US personnel,[58] though usually the worm burden is small and causes no symptoms. About 10% of infantrymen have hookworms (both Ancylostoma and Necator species), but they are usually asymptomatic. Occasionally they do present with a heavy hookworm burden causing diarrhea, upper abdominal pain and vomiting. This represents a duodenitis, which is sometimes misdiagnosed as peptic ulcer.[60] The correct diagnosis is readily made with a stool examination for ova. The hookworm larvae apparently infect US soldiers by penetrating the forearm when it is laid on the ground, rather than the bare feet as in native populations. Tetrachlorethylene,[57] which is readily available, is effective in both Necator and Ancylostoma infections. The new agent, bephenium,[57] is more effective against Ancylostoma, but is not generally available. Since the routine stool exam cannot differentiate between Necator and Ancylostoma eggs, tetrachlorethylene will probably continue to be the agent most widely used by Army physicians.

Ascaris and Strongyloides are less common in US personnel. Ascaris responds very well to piperazine and should be treated in all cases because of rare, but serious, complications.[57] Heavy Strongyloides infections cause severe duodenitis, but this is rare in US soldiers. The new drug, thiabendazole (in dose of 25 mg/kg bid orally for 2 days), is highly effective in eradicating Strongyloides and has so far proven to have no serious toxicity.[62-64]

Tropical Sprue

Cases of overt intestinal malabsorption among personnel in and returning from Vietnam are rare (20 had been reported in 1967). However, screening selected groups of returnees with malabsorption tests and small bowel biopsies has demonstrated significant abnormalities in roughly 10%, indicating that subclinical tropical sprue may be quite common.[58] Since most cases in foreigners resident in the tropics occur in the second year of residence or later, the standard 1 year Vietnam tour may explain the few clinical cases seen in our troops.

This diagnosis should be considered in individuals with a history of residence in the tropics who complain of chronic diarrhea and weight loss. Treatment involves folic acid and tetracycline.[17]

VENEREAL DISEASES

Although VD is a considerable medical problem, the impact on military effectiveness is relatively minimal. The 1967-68 VD rate ranged from a high of 264 cases/1000 men/ year to a low of 148/1000/year in February, 1968, during the Tet offensive. Some units have exceeded 600/1000/year. However, less than 1% of individuals are removed from duty status during treatment.

The control of VD is always difficult with its complex human ecological and behavioral factors. In the present situation, without control of the female reservoir, effective control of infection is impossible. The present policy emphasizes troop instruction, recreational facilities to encourage abstinence, prophylactics and early diagnosis and treatment.[65,68]

Gonorrhea

The most frequent diagnosis is gonorrhea - about 70% of cases. A significant problem is the relative resistance of local gonococci to penicillin. At present USARV recommends a large dose of penicillin with probenicid: 2.4 million units procaine penicillin + 1 Gm oral probenecid, with 1/2 Gm probenecid at 6 and 12 hours thereafter. In other studies of relatively resistant gonorrhea tetracycline combined with penicillin has also been effective.

Other Venereal Diseases

Chancroid accounts for 10-20% of VD cases. It often requires hospitalization for pain and severe penile inflammatory lesions. Lymphogranuloma venereum (LGV) is not uncommon. LGV - and plague as well - should always be considered in patients presenting with fever and tender inguinal nodes. Syphilis is only about 1% of the total, but serves as a reminder to do serologies in all VD cases. Diagnosis and treatment of these diseases is discussed in TB MED 230.[65]

Crab lice and venereal warts are often seen. As these diseases indicate, the level of personal hygiene in the prostitutes is poor and intimate contact with them provides exposure to diseases other than VD, such as hepatitis, dysentery and TB.

RESPIRATORY DISEASES

The acute respiratory disease rates runs about 30-40/1000 men/year. Most cases are viral URI's and bronchitis, and the usual case is not different from that in the States. The rare, but serious, pneumonitis of melioidosis is discussed in the second part of this Section. Bronchial asthma may be seriously exacerbated during duty in Vietnam, and may require evacuation.

SKIN DISEASES

The types of skin disease seen in US troops in Vietnam[71] are similar to those seen in the States, except that the number and severity of cases are accentuated by heat, humidity and field conditions which limit good skin hygiene. For example, fungal infections - tinea corporis, pedis and versicolor - are common and often severe. Most respond to topical agents (undecylenic acid, vioform, tolnaftate) or oral griseofulvin. External ear infections are also common and are prevented by keeping the ear clean and dry. In this respect cotton tufts and dilute alcohol drops are useful after swimming and showering. Secondary bacterial infection often complicates minor lesions such as cuts and scratches, fungal infections and leech bites. Acne is often severely exacerbated, sometimes with scarring. Counselling soldiers with acne is very important to be sure they understand the need for thorough daily use of de-greasing and de-scaling agents (soap, scrub brush, sunlight) to prevent permanent scarring. Other common skin diseases are miliaria, warts, intertrigo and eczema. Molluscum contagiosum is common in some localties.

Immersion Foot

Tropical immersion foot - the "wet-foot syndrome of the harvest moon" or "paddy foot" - is frequently seen in soldiers who spend many hours in water.[72,73] After 24-48 hours of constant wetness, the skin becomes white, wrinkled, avascular and painful. When subjected to the trauma of prolonged walking, the feet swell with fissuring and maceration of the devitalized skin and the soldier, who now can no longer walk, must be evacuated. Treatment involves several days' bed rest with non-weightbearing, drying of the feet, and treatment of any secondary infection. Prevention requires periodic drying of the feet. The canvas tropical combat boot and water-repellent silicon foot grease have also helped reduce immersion foot injury.[74]

The 9th Division, operating in the Delta, has been one of the units "overwhelmed with skin diseases," particularly dermatophytosis, immersion foot and pyodermas. For example, each month 20% of infantrymen in this division have experienced significant foot disease. A

research study, called "operation safestep," has been established there to develop new preventive measures, such as the experimental use of prophylactic griseofulvin (500 mg q.d.) which in preliminary studies lowered the incidence of fungal foot disease.

'DON'T WORRY. IT WILL GO AWAY. IT MAY TAKE TEN YEARS-BUT IT WILL GO AWAY.'

ACCIDENTS

Nearly everyone who has served in Vietnam has seen the result of accidental burns, shooting, vehicular wrecks, drowning, air crashes or other serious accident. Many of these are fatal. The hospital admission rate for nonbattle injuries ranges around 60-100 cases/1000 men/year, often as high as the rate for injuries resulting from hostile action (IRHA) in the same month (see Appendix I). A detailed discussion of this diverse - and disturbing - problem is not feasible here, but you should keep in mind the serious accident hazard existing in the Combat Zone. Needless to say, medical personnel can often offer advice to help commanders deal with this pervasive problem.

DISEASES OF RELATIVELY LOW INCIDENCE

Though less frequent than the diseases discussed above, the following diseases require discussion because of substantial manpower losses, epidemic potential or capability of fatal disease in US soldiers.

HEPATITIS

The agent of infectious hepatitis is widespread in Vietnam with transmission through nonpotable water and ice, contact with civilians, and food a constant hazard. A huge reservoir exists in the Vietnamese population, particularly the children, where the infection is widespread and often subclinical. Though overall incidence is relatively low in US personnel (5-10/1000/year), the prolonged morbidity causes hepatitis to be the second greatest cause of man days lost (next to malaria) due to disease. Take for example an outbreak in the First Infantry Division attributable to nonpotable ice which resulted in 71 cases in April-May 1967.[77] If you multiply these 71 cases by the average period of hospitalization in Vietnam of 43 days, you can estimate about 3,000 man days were lost in this outbreak alone.

Analysis by the USARV Surgeon's office shows cases in all types of units, with a slightly higher incidence in combat units. Certainly, when you interview them, it is disturbing how commonly hepatitis patients tell of drinking from wells and streams, buying local ice, or eating in the native restaurants. They don't seem to realize the fecal contamination in these sources, and thus their risk of hepatitis exposure.

Prevention of outbreaks depends on good food and water sanitation, education, personal hygiene, and judicious use of gamma globulin.[75,78,79] In water chlorination the chlorine residual must be 5 ppm and only ice made from potable (chlorinated) water is to be used. Gamma globulin is given for prophylaxis and contacts under appropriate medical supervision. For prophylaxis, 5 ml is given every 5 months to "special risk groups" as determined by the area command.[76] For contacts of hepatitis cases, gamma globulin, 0.05 ml/lb, is given on the recommendation of the medical officer. Two typical situations where contacts are often treated are (1) all personnel using a mess hall where a food handler has come down with hepatitis and (2) units where there are hepatitis outbreaks. If given promptly, gamma globulin can substantially reduce manpower loss due to clinical disease, even though subclinical infection will still occur.[78]

FEBRILE ILLNESSES OFTEN REPORTED AS "FUO"

"FUO," or fever of undetermined origin, is a very useful label for the many soldiers who contract acute fevers, not readily diagnosed and usually of brief duration. In Vietnam the generally accepted definition of FUO is any febrile illness in which a specific diagnosis is not reached after the initial history, physical exam and lab tests, including a malaria smear. Most of these patients are discharged from quarters or hospital after a brief, uncomplicated course without any specific diagnosis having manifested itself through clinical findings. Statisically, the average hospitalization is 4.5 days with 85% of all cases back to duty by the end of 7 days. The estimated USARV hospitalization rate for FUO in 1967 was 20-35 cases/1000 men/year, or slightly less than the malaria rate.

To determine the causes of FUO in a tropical country is a fascinating challenge which requires the aid of specialized laboratory tests such as serologic procedures and special culture techniques. Two such studies employing the FUO criteria given above are presented in figure 7 and table 2. Both were done at the 93d Evacuation Hospital near Saigon and therefore reflect the situation in the surrounding III and IV Corps Zones. Between them they sample an 11 month period in 1966-67. The necessary specialized laboratory support was provided by research laboratories in Saigon and Bangkok. The April-August 1966 study, published by Deller and Russell,[80] gives an excellent clinical analysis of its cases. Even with rigorous investigation, however, these studies left 30% of the fevers undiagnosed.

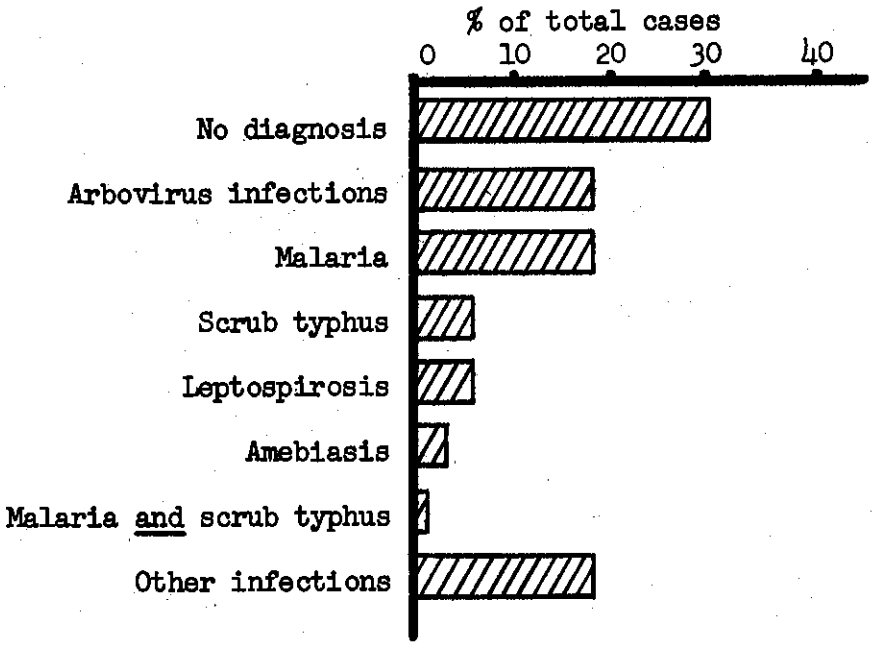


Figure 7: Diagnoses in 319 FUO Cases at 93d Evacuation Hospital (from Table 2)

In the various studies of FUO in US troops in Vietnam, the most common causative agents have been: arboviruses (chiefly dengue and chikungunya), malaria, scrub typhus and leptospirosis. Relatively uncommon causes have been: Shigella and other enteric bacteria, hepatitis, amebiasis, melioidosis, infectious mononucleosis, plague and streptococcal disease. Most of these agents are spread either by arthropod vectors or by contact with contaminated water, soil or food. Therefore, as expected, the FUO rate is much higher in combat troops, who have far greater exposure to arthropods, water and soil, than support troops.

Besides local troop deployments, other determinants of the causes of FUO coming to a given medical facility are the local terrain and weather. If you compare the two periods studied in table 2, for example, you can see marked seasonal differences in arbovirus and malaria incidence, reflecting the effect of changes in rainfall, temperature and troop deployments. The physician pondering the differential diagnosis of a soldier with FUO must ask (1) where has he been? (2) which diseases are likely to occur there? (3) what were his exposures to mosquitos, mud, nonpotable water, etc? and (4) what time of year is it?

Table 2. Results of Two Diagnostic Studies of FUO Patients at 93d Evacuation Hospital

DIAGNOSIS	NUMBER OF CASES		PERCENT INCIDENCE (in both series combined)
	APRIL - AUGUST 1966 80	SEPTEMBER 1966 - FEBRUARY 1967 81	
Arbovirus infections			18
Dengue	31	10	
Chikungunya	10	0	
Japanese encephalitis	1	5	
Malaria	8	51	18
Scrub typhus	9	11	6
Malaria and scrub typhus*	2	2	1
Leptospirosis	1	18	6
Amebiasis	1	8	3
Other causes			18
Melioidosis	2	1	
Enteric infections	10	0	
Others	6**	37***	
No diagnosis	29	66	30
Total	110	209	100

*concurrent infections in individual patients
**(includes gonococcal septicemia, drug sensitivity, salpingitis, pneumonia, prostatitis and pericarditis)
***(includes prostatitis, pneumonia, infectious mononucleosis, streptococcal pharyngitis, cellulitis/abscess, serum sickness, mumps, pyelonephritis, LGV, acute bronchitis and hemolytic disease)

In the 3 following sections these important causes of FUO are discussed: arbovirus infections, scrub typhus and leptospirosis. Although each of these may present a recognizable clinical picture, they frequently must be categorized simply as FUO. They usually are diagnosed by retrospective serologic tests, if available. The other common cause of

FUO, malaria, has already been discussed. Remember to repeat malaria smears in FUO cases since they often will not become positive for several days, or longer. As a word of caution, always observe FUO patients carefully, because many of them will be harboring diseases with potentially serious complications; falciparum malaria in particular.

ARBOVIRUS INFECTIONS

In the past arbovirus diseases have frequently been military medical problems. In 1900 Major Walter Reed and the Yellow Fever Commission in Havana took a monumental first step in this field when they demonstrated the mosquito transmission of yellow fever and then applied this discovery in an effective control program based on destruction of breeding places for the vector, Aedes aegypti. More recently, dengue and Japanese encephalitis caused extensive outbreaks among US troops in the Pacific during WW II and epidemic hemorrhagic fever has been a severe disease affecting allied troops in Korea. At present 3 arboviruses are known to cause disease in US troops in Vietnam: dengue, chikungunya and Japanese encephalitis.

For your reference table 3 lists several important arboviruses along with their serologic groups and principal geographic areas.

Table 3. Some Important Arboviruses Causing Disease in Man*

Serologic Group	Virus	Geographic Area
A	Chikungunya	SE Asia, India, Africa
	Eastern equine encephalitis	Americas
	Western equine encephalitis	
	Venezuelan equine encephalitis	
B	Dengue types 1 - 4	SE Asia, Pacific, India, Carribean
	Japanese encephalitis	All Asia
	Yellow Fever	Africa, Americas (but not Asia)
	St. Louis encephalitis	Americas
Unclassified	Epidemic hemorrhagic fever	Korea-Manchuria-Siberia

*All are mosquito-borne, except epidemic hemorrhagic fever which may be transmitted by mites.

The term, arbovirus, derives from the definition of this family of viruses as "arthropod-borne" by various biting arthropods, mainly mosquitoes, ticks and sandflies, feeding on a wide range of vertebrate hosts, including man.[86] The number of arboviruses known is now over 200 and there are at least 28 separate serologic groupings. Within the serologic groups, especially group B, there is a good deal of immunologic cross-reaction which can cause diagnostic difficulties. For example, in a febrile soldier who previously received yellow fever vaccine it may be difficult to prove dengue or other group B infection by serologic means because of pre-existing group B antibodies from the vaccination.

Only about 1/4 of the 200 or so arboviruses are known to cause disease in man. The clinical picture of arbovirus infection is highly variable. Many infections are inapparent. Of symptomatic infections many are manifested by fever only, as is brought out in table 2 of the FUO discussion where about 1/5 of all FUO's were caused by arboviruses. In fact, fever is the only consistent finding in symptomatic arbovirus infections. More serious cases are categorized in 3 general types of syndrome: (1) systemic fevers which may be accompanied by rash and arthritic manifestations, (2) hemorrhagic fevers usually with moderate or high fatality and (3) encephalitis. Even in a given locality, a given syndrome is often not diagnostic because there may be several local arboviruses causing this same syndrome, while an individual arbovirus may cause different clinical pictures in different individuals. Thus, an etiologic diagnosis usually must depend on special laboratory procedures, particularly hemagglutination inhibition, complement fixation and virus isolation.

At present there is no specific treatment. Considering the large number of arboviruses, there are very few vaccines. The attenuated yellow fever vaccines, including the 17-D strain used by the US Army, are presently the only arbovirus vaccines which are generally accepted as both highly protective and safe.

Epidemiology

The 3 arboviruses causing disease in our troops in Vietnam are all mosquito-borne. The cycle of transmission of dengue follows the relatively simple MAN ⟶ MOSQUITO ⟶ MAN pattern because the only established reservoir of infection is man. This is similar to urban yellow fever. On the other hand, Japanese encephalitis has a wide host range with wild birds and domestic swine known to be important reservoirs. In this respect Japanese encephalitis and the American encephalitides (table 3) are quite similar with a more complex ANIMAL ⟶ MOSQUITO ⟶ ANIMAL cycle in which Mosquito ⟶ Man transmission is an incidental or "dead end" happening since man is not an important reservoir for infecting new mosquitoes.

Like malaria, arboviruses grow in the arthropod vector as well as the vertebrate host, a phenomenon termed "biologic transmission." In tropical countries like Vietnam the incidence of mosquito-borne arbovirus disease tends to increase during the wet monsoon when the abundance of vectors like A. aegypti increases. This seems to apply to the seasonal variation of dengue and chikungunya FUO's among US troops in table 2. The complex subject of arbovirus ecology and its relationship to human disease is summarized well in several references.[4,22,88]

Dengue and Chikungunya

Even though they represent different serologic groups, there is much justification on clinical and epidemiological grounds to discuss dengue and chikungunya together. The clinical disease takes the form of the systemic febrile syndrome (see above) characterized by an abrupt febrile illness lasting only 3 - 8 days with practically zero mortality. The incubation period averages around 6 days. In American troops in Vietnam other findings included prominent headache and in many cases myalgia-arthralgia, adenopathy and a macular rash.[80] This causes temporary, but incapacitating illness - as was realized during several devastating, explosive dengue outbreaks which rendered large military units noneffective at critical times in the Pacific during WW II.

The relatively undifferentiated clinical picture noted above seems to be more typical of dengue virus infection than is textbook dengue, or "break-bone fever," in which there are excruciating pains and a "saddle back" fever curve.[85] Studies of outbreaks of both dengue and chikungunya indicate that a large proportion of the infections are too mild to bring the patient to medical attention. Chikungunya is most often clinically indistinguishable from dengue and the 30 or so other arboviruses causing the undifferentiated systemic febrile syndrome, but in many cases chikungunya does have one very distinctive manifestation: polyarthritis. In some African outbreaks of chikungunya this was so painful that patients would literally not move - in fact chikungunya means "doubled up" in an African dialect. In other outbreaks and in 8 out of 10 US soldiers with chikungunya the arthritis was much milder.[87] Fairly often those individuals having wrist and finger arthritis during the acute chikungunya attack will be left with residual inflammation that mimics acute rheumatoid arthritis before finally subsiding several weeks to 4 months later.

The principal vector of dengue and chikungunya is the urban-dwelling Aedes aegypti. This highly domestic mosquito has a strong preference for biting man, stays very close to human dwellings and breeds heavily

in any handy water collection such as water jars, tin cans and old automobile tires. Unlike Anopheles, A. aegypti bites during daytime in houses and in shady places outdoors. As discussed above, man is the principal reservoir for dengue. This may also be true for chikungunya, although the possible role of other animals has not yet been fully evaluated. It is not surprising that cases of dengue and chikungunya documented in US troops in Vietnam are acquired in urban areas and base camps, rather than open jungle. Besides A. aegypti, other mosquitoes which are widely distributed in SE Asia may also participate in transmission such as A. albopictus in both dengue and chikungunya and various Culex species in chikungunya.

Dengue and chikungunya viruses are also responsible for a hemorrhagic fever syndrome affecting children in SE Asia. This is discussed in Section IV.

Japanese Encephalitis

Japanese encephalitis (formerly called "Japanese B encephalitis") is endemic all over the Asian region and has probably caused the greatest number of encephalitis epidemics over the largest area of the world of any of the arbovirus encephalitides.[4] The vectors are various Culex mosquitoes, particularly C. tritaeniorhynchus, which are difficult to control because they breed heavily in rice paddies and many other types of water. Inapparent and mild febrile disease is very common in Japanese encephalitis virus infections, while encephalitis itself is rare. In US servicemen on Okinawa in 1960 it was estimated that 500 to 1000 subclinical infections occurred for each case of encephalitis.[93] When it does occur, however, the encephalitis has a high fatality rate and high incidence of permanent neurological damage.

In Vietnam the epidemiologic situation is the same. Several FUO's due to this virus are recorded in table 2. Only sporadic encephalitis cases have occurred in US servicemen. Recently a serologic study of an Australian military unit near Saigon indicated that 20% of the 200 unit members had become positive for Japanese encephalitis during their year's tour indicating subclinical infections. There were no encephalitis cases in this unit.

Prevention and Control

In Vietnam first priority must be given to personal protective measures against mosquitoes (see Malaria and Section V) with emphasis on the day-biting Aedes species as well as the night-biting Anopheles and Culex. In addition there must be active area control programs in all base camps and fixed installations. All possible breeding places

must be destroyed, sprayed or adequately covered. Whenever water collections like uncovered water barrels and unburied trash are ignored, A. aegypti and other mosquitoes will promptly appear in abundance. Spraying and well-maintained screening of tents and buildings are also essential.

SCRUB TYPHUS

The actual incidence of scrub typhus among US personnel is unknown, but it apparently is frequently diagnosed as FUO (see table 2). The agent is an arthropod-borne rickettsia, Rickettsia tsutsugamushi, found in trombiculid mites and small animals. The natural cycle is not fully understood, but it seems likely that R. tsutsugamushi is perpetuated by transovarial transmission in the mites while the small animals (rodents, birds, tree shrews) spread it geographically. It is known that man becomes infected when bitten by the parasitic larval stage of the mite, commonly called a "chigger." The foci of scrub typhus transmission are highly localized because mite infestations are localized, sometimes within only a few square feet of ground. Foci of transmission are found in a wide range of settings, including grassy fields, overgrown abandoned villages and plantations, and virgin jungle. The part of the world where scrub typhus occurs is bounded by a huge triangle made by lines running between Japan, India and northern Australia.

Clinical Considerations

In the typical, full-blown case there are (1) a characteristic "typhus fever" picture with progressive fever, severe headache and prostration, (2) an eschar, and (3) in some cases a macular rash. The eschar, which is not invariably present, is a tiny ulcer at the site of the chigger bite which heals slowly during the clinical course of the disease. Another characteristic is the truly dramatic response to tetracyclines or chloramphenicol marked by lysis of fever and great symptomatic improvement within 24 hours or so after starting therapy. During 1966-67 129 of these classic scrub typhus cases were reported.

In 1967 the fluorescent antibody test[96a] became available in Vietnam. This is the only practical test which has overcome the tremendous antigenic heterogeneity of strains of R. tsutsugamushi with a high degree of sensitivity and specificity. Use of the FA test in several samplings of FUO patients indicates that a thousand

or more cases of scrub typhus may actually occur each year, both as minor FUO's and as cases aborted by impirical tetracycline treatment. Definitive diagnosis now depends on acute and convalescent phase titres in the FA test. The old Weil-Felix reaction with Proteus OX-K antigen has poor sensitivity and specifity for scrub typhus and needs no longer to be used.

Currently recommended therapy is moderate doses of tetracycline or chloramphenicol.[95] One very satisfactory regimen is oral tetracycline, 2 gm daily in 4-6 divided doses, continued until the patient has been afebrile for 72 hours. Treatment has to be initiated on the basis of a clinical impression, because of the time lag inherent in the definitive serologic test. This fact, plus the dramatic response to therapy, make scrub typhus a gratifying disease to treat. Relapses occur occasionally and respond to a second course of tetracycline.

Prevention

Recognition of exposure is hampered by inability to detect bites because chiggers are practically microscopic in size and produce no irritation when they bite. Thus, a military unit is "blind" to its exposure until men fall ill about 10 days later. So far, cases in Vietnam have occurred sporadically, rather than in the large and catastrophic epidemics of WW II.

Prevention of scrub typhus[94] requires awareness of its potential presence, even though the vector will not normally be seen. Personal protection against chiggers includes proper blousing of trousers and liberal use of DEET repellent around openings in the clothing. Base camps will be cleared of mites by cutting vegetation, putting down residual insecticides and poisoning rodents. Though its use has not been necessary as yet, the M-1960 clothing impregnant is very effective, especially since it is miticidal.

Chloramphenicol prophylaxis, proven effective in Malaya in the 1950's, is not in use. Should chemoprophylaxis someday be deemed necessary then tetracycline would probably be equally as effective and more acceptable from the point of view of toxicity in prolonged administration.

LEPTOSPIROSIS

Although the true incidence of leptospirosis is unknown, mild cases are rather common. The French (1950-54) diagnosed it frequently. More recently, in 2 FUO series the incidence was 3% in 97 Special Forces personnel in 1965 and 6% in the 93d Evac Hospital series (table 2). As in the US, most cases are self-limited with prominent symptoms of fever, headache and myalgia.[96b] Some are coincident with malaria. Usually the diagnosis is retrospective, based on serologic tests. One US soldier died with the classic picture of Weil's disease after severe hepatic and renal damage occurred, but this form of leptospirosis is definitely rare.

Leptospirosis is primarily a disease of animals. Natural infection of rats, other rodents, cattle, swine and dogs leads to a renal carrier state and shedding of leptospires in the urine of these hosts. Transmission to man is commonly via water or mud contaminated by the urine of these animals. The organism penetrates broken skin or mucous membranes.

Most leptospiral infections are not severe and subside after 7-10 days without complications in the untreated patient. The value of penicillin and tetracycline is debatable. Their effectiveness may depend upon administration very early in the course of the disease.

RABIES

Rabies is a viral disease of all warm-blooded animals involving the brain and salivary glands. It is transmitted to man by bite, scratch or any other contact between infectious saliva and abraded skin. In most parts of the world the dog is still the main source of human rabies. The incubation period is long: about 50 days in man and up to 6 months in dogs. The rabies encephalitis is 100% fatal.

The long-established policy of quarantining a dog for 10 days after it bites a human to determine whether this oaused exposure to rabies has been substantiated in recent years by studies which show that the dog's saliva does not become infectious more than 3 days before the dog developes clinical signs of rabies. However, treatment of the person bitten must be started <u>immediately</u> if there is reasonable suspicion that the dog <u>may</u> be developing rabies. In this situation the veterinarian observing the dog will subsequently be able to tell the physician whether treatment with rabies vaccine must be continued or not.

In Vietnam there is a large population of stray dogs, many of which become rabid. The incidence of human rabies in the Vietnamese is not known, but the Saigon area alone reports about 200 cases each year. Rabies exposures among US personnel are common, although only one case of rabies has occurred (in a Marine). Each month around 80-100 Army personnel must be given a course of duck embryo rabies vaccine and around 10-15 must receive hyperimmune serum in addition. The "rabid mascot story" has now repeated itself many times: in January 1967, for example, exposure to a single pet dog that became rabid necessitated treatment of over 150 men. Pets, mainly dogs and monkeys, are the main source of bites in US personnel. Rat bites also occur and are usually treated with vaccine alone.

Rabies Treatment and Control

Management of cases of animal bite should follow these guidelines:[99,101]

1. Thoroughly cleanse and disinfect the wound. Usually it should not be sutured immediately. Administer tetanus toxoid.

2. If the offending animal is a dog, it should not be killed but should be locked up for a 10 day observation period. If the dog is dead or if another animal is involved, send the intact head and neck to the appropriate laboratory, packed in ice.

3. For treatment with antiserum and vaccine, Army physicians should follow the World Health Organization guidelines (Appendix V). The recommended treatment must be instituted within 24 hours. Normally there will be a locally designated Rabies Control Board to determine the proper treatment for each patient.

At present, proper control of the Vietnamese dog population is impossible. Furthermore, adequate registration and vaccination of pets is very difficult because GI's pick them up on an informal basis and pets have a high rate of turnover. Therefore, the unit surgeon and the preventive medicine officer must strongly emphasize to the troops that (1) their pets must be vaccinated and (2) anyone exposed to even mild animal bites and scratches must receive proper treatment. Also remember that even vaccinated animals have a chance of contracting rabies. If a rabid animal is discovered in a camp everyone potentially in contact with the animal must be sought out and each individual's exposure assessed for treatment indications.

There are now USARV regulations which specify limits on the number of pets which can be kept as well as registration, vaccination and other control measures.

"BUT SARGE, A GUY NEEDS A FEW PETS...."

PLAGUE

Bubonic plague is a bacterial disease of small mammals, rats particularly, and it is usually transmitted to man by the bite of the oriental rat flea, Xenopsylla cheopis. The individual infected in this way usually develops bubonic plague. If he should develop a focus of infection in his lungs (secondary pneumonic plague) he may then transmit the disease directly to someone else's respiratory tract by droplet inhalation (primary pneumonic plague). Primary pneumonic plague is one of the most highly contagious and fatal diseases known to man.

Plague has been recognized in Vietnam since 1898, but after the turn of the century only sporadic cases were reported. Since 1962, however, increasing numbers have been reported, reaching 5,700 cases in 1967. Many more cases still go unreported. Most provinces of Corps Zones I, II, III have had plague outbreaks, though the Delta region has been relatively spared so far. This large increase in cases may reflect better case reporting, as well as a spreading epidemic in the large, uncontrolled rodent-flea populations.[104]

Fortunately, few cases have occurred to date in the multitude of US civilian and military personnel in Vietnam. Only 6 cases were reported as of January, 1968. Considerable exposure does exist, as shown by surveys demonstrating infected rats and fleas in areas habited by US troops. One explanation for this paucity of cases is the plague vaccination. Although never given a large, thorough field study, the vaccine is thought to protect against typical bubonic plague, but not against primary pneumonic plague.

Army preventive medicine personnel devote much of their time to plague surveillance and control. Periodic rat collections and flea counts are made. When the "flea index" goes above 4 fleas per rat, or especially when Pasteurella pestis is isolated from the fleas and rats collected, then there is considerable risk of an outbreak.[105] High flea indexes are typically found during the relatively dry January-May period when the majority of plague cases occur. US personnel often carry out control programs in villages where there are actual or potential plague outbreaks. An interesting and new observation on plague made during such outbreaks is the isolation of plague bacilli from the throats of healthy contacts of plague cases.[106] The epidemiologic importance of this discovery is not yet known.

Treatment and Control of Plague

The diagnosis[103] should be suspected in anyone with high fever and tender lymph nodes. About 40% of clinical cases can be confirmed by bubo aspiration for culture and Gram stain. Carey-Blair holding medium is useful in the field. Treatment, however, must be started on clinical grounds since it cannot be delayed awaiting lab results.

Treatment in bubonic plague is usually satisfactory, but pneumonic plague cases must receive antibiotics within hours of onset for reasonable hope of survival. Generally speaking, treatment is given as follows: Streptomycin, 2-3 gm i.m. daily in divided doses, until temperature becomes normal. Then 1 gm daily for a total of 15 gm. Usually, chloramphenicol or tetracycline, 1-2 gm daily, is also given. However, TB MED 124[103] recommends tetracycline or chloramphenicol (loading dose + 4 gm p.o. daily) in preference to streptomycin. Since many strains of P. pestis in Vietnam are resistant to sulfonamides in vitro, they are not recommended for treatment.

Contacts of pneumonic plague cases need special attention with (1) quarantine, (2) close observation, including temperatures qid, and (3) drug prophylaxis when circumstances don't allow good clinical observation. TB MED 124 advises sulfonamides (3 gm daily for 6 days) for prophylaxis, although in practice tetracycline or streptomycin has often been used. Immunization of US personnel currently uses the killed vaccine mentioned above with boosters every 6 months.

Control of localized epidemics follows these guidelines:[103,109]

1. Cover the area with insecticide (Diazinon dust) to kill fleas.

2. Rodent poisoning after dusting. (If not killed first, fleas will desert dying rats and seek humans.)

3. Case finding and treatment.

4. Careful attention to contacts of pneumonic plague cases with close observation, quarantine (if possible) and consideration of drug prophylaxis.

5. Immunize all the local population.

HEAT INJURY

In Vietnam conditions of heat, humidity, exertion and fluid intake are particularly conducive to heat injury. Though most cases can be treated without evacuation, their occurrence during times of severe physical and environmental stress is often critical to the mission, as for example, during firefights or on long patrols.

The commonest form seen is heat exhaustion, characterized by prostration, rapid pulse, low blood pressure and cool moist skin. First aid is elevation of the legs, cooling and oral dilute saline solution.

The most severe form of heat injury is heat stroke, which classically presents as a triad of cerebral abnormalities, high body temperature (106-112°F) and hot, dry skin. This condition is a true medical emergency, since death frequently results from hemorrhages, pulmonary edema or anuria. Emergency measures are rapid cooling to a rectal temperature of 100-101° and i.v. medication for convulsions.

A mild form of heat injury often noted in Vietnam is the "salt depletion syndrome" in which there is fatigue, drowsiness, weakness and an apathetic attitude. It occurs in the afternoon as the body salt content dwindles from exertion and heat. Increased incidence of booby trap and land mine casualties are associated with this state of decreased alertness.

Commanders and medical personnel always have to insure judicious handling of troops in heat stress situations.[110] Primary measures for preventing heat injury are: (1) adequate water intake, which can go up to 13 quarts per man each day, and (2) adequate salt intake, as salt in food or salt tablets. Recent evidence cautions against overuse of salt tablets (over 4-6 tablets per day) which may delay acclimatization and even contribute to heat stroke.[111] Other preventive measures are establishment of appropriate exertion limits and respect for the minimal acclimatization period of about 2 weeks.

ENVENOMATION

Snakebite has been infrequent in Vietnam and as of September 1968 there were no deaths in Army personnel. (One Marine died of cobra bite). The majority of bites have been pit vipers, chiefly the Malayan pit viper (analogous to our water moccasin in toxicity) and the bamboo viper (which is less toxic).[112] Bites from the more dangerous kraits and cobras have been rare. Antivenins for the heavily envenomized patient are available. It must be remembered that many antivenins are specific

and therefore the offending snake must be identified. Medical officers should (1) know basic principles of management (Appendix VI), (2) keep available appropriate antivenins and (3) establish a capability, by use of keys, guides,[113,114] or local experts, to identify the local venomous snakes.

Arthropod envenomation[115] occurs frequently. The large (5 inch) scorpions and centipedes found in Vietnam are not thought to be deadly. "Blister beetles" may be an annoyance from severe blisters produced by their cantharidin-containing fluid. Large red ants are sometimes a nuisance. There have been sporadic epidemics of pruritis and rash from seasonal swarms of small, white moths.

MELIOIDOSIS

Although a relatively unknown entity in this country, melioidosis has recently attracted considerable interest in the American medical literature because of cases in servicemen from Vietnam.[17,126] The disease is widely distributed in tropical areas with Southeast Asia, including Vietnam and Thailand, a well known endemic region. Though the epidemiology is still unfolding, it is now clear that the organism, Pseudomonas pseudomallei, is extremely widespread in soil and water, such as rice paddies, and serologic evidence of infection is also widespread in indigenous people and domestic animals. It is presently thought that man is exposed to the organism through broken skin, inhalation and ingestion. Although the incubation period is unknown, it is clear that the disease occurs after a long dormant period in some individuals. From 1965 to 1968 there were 72 cases of melioidosis in US Army personnel, 10 occurring after return to CONUS while the remaining 62 were still in Vietnam when they became ill. In one serviceman disease did not occur until 5 years after he left the endemic region. Among the 72 cases there were 14 deaths.

Clinical Considerations

Several clinical forms of melioidosis are emphasized: subclinical, pulmonary, septicemic and localized extrapulmonary. The forms that have caused great concern are a highly fatal septicemia and an overwhelming pneumonia, both of which can cause death in a few hours or days even in spite of heroic antibiotic therapy. The septicemia can be an initial presentation or a fulminant complication of pneumonia, burns or localized extrapulmonary infections. The diverse extrapulmonary forms include wound infections, lymphangitis, septic arthritis, osteomyelitis and visceral abscesses.

A distinctive pulmonary syndrome, called melioidosis pneumonitis, has recently been differentiated.[127] Very often confused with tuberculosis, it is a subacute, localized pulmonary infection characterized by upper lobe infiltrates and cavitation, cough, blood-tinged sputum, fever and chest pain. It has a good prognosis with the recommended therapy of tetracycline 3 gm per day orally for at least one month.

The commonest form of infection, however, is subclinical, manifested only by positive serologic tests (hemagglutination and complement fixation). Several studies have shown 7-15% of native populations in endemic areas to be serologically positive, reflecting frequent exposure but infrequent clinical disease. Likewise, studies of GI's returning from Vietnam have shown 1-5% to be positive without other evidence of disease.

Diagnosis is based on a history of having been in the endemic area, culture of the organism and serologic tests.[125] P. pseudomallei is a motile gram negative bacillus which grows well, but relatively slowly on ordinary media. After prolonged incubation (3 days) it will assume a highly characteristic appearance with peculiar wrinkled colonies on agar, a hard wrinkled pellicle in liquid media and a distinctive earthy odor. However, laboratory personnel unfamiliar with this organism will frequently mistake it for other gram negatives such as P. aeruginosa and Klebsiella or discount it entirely as a contaminant.

Recommended treatment for the overwhelming septicemic and pneumonic forms is large parenteral doses of antibiotic combinations with tetracycline and chloramphenicol (e.g., tetracycline 4 gm, chloramphenicol 6 gm and kanamycin 2 gm daily).[125] However, some writers have failed to emphasize that many cases follow a less malignant course and need much more conservative therapy, as, for example, the subacute melioidosis pneumonitis (see above). When such massive doses are indicated, they should be tapered as rapidly as the situation allows to minimize toxicity. Early diagnosis, permitting early therapy, is the single most important consideration. Because melioidosis tends to abscess formation and relapses, therapy must be prolonged for at least one month, or much longer if necessary for lesions to resolve. Since sensitivity of P. pseudomallei varies and may change during treatment, antibiotic sensitivity testing must guide therapy. Usually the organism is sensitive only to tetracyclines, chloramphenicol, kanamycin, sulfonamides and novobiocin.

Since the organism is so widespread in the environment in SE Asia, it would seem that prevention of exposure is impossible. For the present accurate diagnosis and adequate therapy must be relied on to deal with this potentially fatal infection.

TOXIC AGENTS

Besides infectious diseases, accidents and enemy action, you also need to have an idea of the toxic agents to which the soldier in Vietnam is exposed. You may see foolish, unnecessary or even suicidal exposures which you can put a stop to.

For example, personnel handling the helicopter fuel, JP-4, must wear protective clothing since contact with it causes severe dermatitis and conjunctival burns.[129] The widely used plastic explosive, C-4, is occasionally deliberately ingested by foolish GI's who then develop acute encephalopathy and may die. Insecticides, such as malathion and diazinon, can cause nervous system poisoning through cholinesterase inactivation.[133]

Even local alcoholic beverages may be dangerous. Never consume locally obtained hard liquor, because it is often "doctored" with methanol. Local beer is usually said to be safe, but it occasionally contains formaldehyde. These chemicals can cause acidosis, convulsions, blindness and death.

When the proper once-weekly dose is exceeded, the CP tablet can be very toxic, since large doses of chloroquine may be rapidly fatal and primaquine may cause hemolysis.[24,132] The minimum lethal dose of CP tablets for an adult is about 12. A number of fatalities have been children, for whom the lethal dose is smaller.

Traumatic hearing loss due to noise is a problem, as you would expect, for artillerymen, infantrymen and helicopter pad workers. Ear plugs and ear covers are feasible, at least for artillerymen and helicopter workers, and need to be used more widely.[130]

Another exposure problem you may be involved with is excess ionizing radiation in medical X-ray facilities, which have often been set up in Vietnam with inadequate shielding, columnation and exposure monitoring.[128] Occasionally, microwave communications facilities are also sources of harmful radiation exposure.[131]

SECTION IV: OTHER HEALTH PROBLEMS IN SOUTH VIETNAM

The diseases discussed here are potential hazards to the US soldier. So far, however, they have not had a serious impact on our troops, even though they are responsible for widespread disease among the Vietnamese people.

TUBERCULOSIS

Along with malaria and enteric diseases, TB stands foremost among causes of debility and death in the Vietnamese. Surveys indicate 10-20% of the population have active cavitary pulmonary TB: "one of the highest prevalence rates in the world for active tuberculosis" (WHO). Tuberculous meningitis accounts for numerous childhood deaths. Sporadic cases of pulmonary TB occur in US personnel, frequently attributable to intimate contacts with the local population. All Vietnamese employed by US facilities must be screened with a chest film before they are accepted for employment.

NUTRITIONAL DISEASES

Dietary deficiency is not too uncommon in South Vietnam.[138-140] The most prevalent forms are due to protein and vitamin A and B deficiency. The clinical picture is likely to be an intermingling of the effects of dietary deficiency with various chronic infections such as malaria and intestinal worms. For example, small children may be seen suffering from severe anemia and some degree of protein malnutrition, associated with heavy burdens of hookworms. Frank cases of severe malnutrition, such as kwashiorkor, are sometimes found among the Montagnards but rarely among the lowland Vietnamese.

HEIMINTHIC INFECTIONS

Intestinal Roundworms

Hookworm is said to be almost universal among the rural population. The proportion of people infected with the roundworm, Ascaris lumbricoides, is also extremely high. Relatively common are Strongyloides stercoralis, and the pork tapeworm, Taenia solium. The whipworm, Trichuris trichiura, and the beef tapeworm, Taenia saginata, are less frequently encountered. There is a new TB MED on the treatment of these worms.[143]

Trematode Infections

Human schistosomiasis has never been demonstrated in South Vietnam. This is fortunate because, if it were present, operations in watery terrain would be seriously endangered.

Other tissue-flukes do occur in Vietnam. The liver-fluke, Clonorchis sinensis, and the lung-fluke, Paragonimus westermani, are present. They are transmitted to man by ingesting the encysted larvae in uncooked fresh water fish and crustacaeans. The intestinal fluke, Fasciolopsis buski, also occurs and is contracted by eating raw aquatic plants, such as the water chestnut.

Filariasis

Filariasis[141] due to the tissue roundworms, Wuchereria bancrofti and W. malayi, is endemic in some localities. The disease is transmitted when a mosquito bites an infected individual who is circulating the larvae, called microfilariae, in his blood. The microfilaria must undergo about two weeks' maturation in the mosquito before it can be transmitted to man when the infected mosquito bites again. Concern that transmission to US personnel may occur has recently been confirmed by a report of five cases in Navy personnel in I Corps. The classic chronic form with elephantiasis is well known,but fortunately not very common. The initial presentation with recurring fever and lymphadenitis can be quite confusing, and diagnosis by demonstrating microfilariae in the peripheral blood may not be possible until a year and a half after the infection is acquired. Therefore, this disease could be seen among soldiers after return from Vietnam. There are a number of mosquito vectors (Culex, Aedes and Anopheles species) and primary prevention obviously centers upon not being bitten by these.

CHOLERA

Cholera has been endemic in South Vietnam since 1964 when 20,000 cases occurred. The disease is cyclic, the last epidemic in Vietnam having been about 20 years ago. Since 1961 there have been major cholera outbreaks all over the Orient.

The absence of cholera in US troops has been attributed to emphasis on sanitation and vaccination. The killed vaccine has been shown to provide significant protection in controlled trials. However, there are also host factors, as yet not understood, which greatly affect susceptibility to cholera.

The cornerstone of therapy is rapid rehydration with i.v. electrolyte solutions to counter the enormous diarrheal fluid loss. Electrolyte therapy alone reduces deaths from over 60% to nearly 0.[145] Recently oral tetracycline[146] and oral glucose solutions[147,148] have been shown to be worthwhile adjuncts in that they can reduce the very large amounts of parenteral fluid needed. The References include good reviews of recent advances in cholera research.[149,150]

TRACHOMA

Eye infections are common. The trachoma agent[151] is widespread, particularly in the northern part of the country. An eradication program is under way with support by the US and WHO. Trachoma responds well to topical tetracycline; medical personnel involved with MEDCAP should keep this in mind.

MOSQUITO-BORNE HEMORRHAGIC FEVER

Epidemics of hemorrhagic fever in native Asian children have occurred all over SE Asia in the past 15 years.[85,89,90] They are a relatively infrequent manifestation of dengue and chikungunya viruses which cause concurrent, widespread epidemics of the benign febrile syndrome in other native children and foreigners of all ages.

Only dengue viruses cause severe and fatal cases of hemorrhagic fever. In these severe cases shock and/or hemorrhage appear precipitously about the 4th day of illness and may be fatal in 5-50% of these cases. In an individual child shock and hemorrhage can coexist or only one or the other may be present.[91] In severe shock cases, blood pressure is unobtainable and there are signs of generalized vascular damage (hemoconcentration, decreased blood volume, positive tourniquet test). The gastrointestinal tract and skin are the principal sites for hemorrhage. Thrombocytopenia and moderate clotting factor depression are common. Therapy during the shock phase is physiologic with i.v. fluids, colloid and blood. If this phase is survived, an uncomplicated rapid recovery is the rule.

In Saigon most cases have occurred during the wet summer monsoon correlating with increased abundance of the vector, Aedes aegypti. The highest attack rate was in the 2-5 year age group.[90] The same pattern has been seen in Thailand, the Philippines and elsewhere in the SE Asia - Western Pacific region.

Several theories are presently held to explain why hemorrhagic fever is largely restricted to native children when the causative viruses seem no different from those causing the benign febrile syndrome. One fascinating theory of the dengue hemorrhagic fever and shock syndromes holds that multiple infections with different dengue types produce an immunologic sensitization. This theory is supported in many, but not all, cases by a secondary infection pattern of antibody response. The absence of hemorrhagic fever in foreigners is attributed to infrequency of multiple dengue infections because of limited mosquito exposure and generally short residence in endemic areas. One case, which was fatal, has occurred in a 16 month old American boy.[92] He had lived in Thailand all his life and at the time of his illness he had an antibody response indicating a second dengue infection.

LEPROSY

There are an estimated 25,000 registered lepers in South Vietnam. There are many more unreported and unrecognized cases. WHO has estimated the prevalence of leprosy at 5 cases per 1000 of the general population. Although few cases are to be anticipated in US personnel (only 40 cases were contracted by US servicemen from WW II), the long incubation period will delay recognition until after return to CONUS. Treatment, if given before deformity occurs, is quite effective.[152,153]

OTHER COMMUNICABLE DISEASES

Other prevalent communicable diseases include diphtheria, mumps, measles, chickenpox, whooping cough, and streptococcal infections. A substantial part of the diphtheria is the cutaneous form. Smallpox vaccination is fairly widely practiced and no cases have been reported in recent years. Tetanus is said to be common, including neonatal tetanus.

Skin diseases are quite prevalent including fungus, bacterial and scabies infections. Infection tends to complicate any skin lesion in the tropics and is a much greater problem there than in temperate zones. A very common lesion is the tropical ulcer of the foot which seems to be a result of nonspecific infection of a minor skin lesion complicated by dirt and neglect. This quickly becomes a large ulcer several centimeters wide with a granulomatous, heaped-up edge. It usually responds very quickly to simple topical measures such as soap and water. Rarely, a skin graft is necessary for final healing.

The tropical ulcer may be confused with cutaneous leishmaniasis and yaws; but actually these two diseases are thought to be very uncommon in South Vietnam. A few foci of visceral leishmaniasis (Kala-Azar) are said to be present in the northern part of the country.

NARCOTICS

Narcotics usage is a significant problem in spite of a recent law outlawing it. Opium and its derivatives and marijuana are widely available. Marijuana smoking has become a frequent disciplinary problem in US troops.

Adapted from "Charley" by DeFox (USARV Med. Bull. Oct - Dec 1966)

SECTION V: PREVENTIVE MEDICINE PROGRAM

A detailed discussion of a specific preventive medicine program is not practical here. Rather, we will emphasize 3 aspects of such programs important to those of you preparing to go overseas. First is a discussion of the role of battalion surgeons and their assistants, important because most disease prevention activity is carried out at the individual and small unit level. Second, there is a brief discussion of preventive medicine officers and preventive medicine units, which exist to provide a specialized back-up to the battalion-level program. Finally there is a checklist of disease prevention measures useful to you as an individual for safeguarding your own health, as well as to those of you who must anticipate guiding a program for a unit.

The Battalion Surgeon and Battalion Surgeon's Assistant

This is a quote from a physician who recently was a battalion surgeon in Vietnam: "...For the most part, field units are organized in battalions of around 800 men, each battalion subdivided into 4 companies. The battalions directly deployed in combat (infantry, armor, artillery, engineers) have their own "organic" medical personnel: a Captain, MC, a Lieutenant, MSC, and about 30 enlisted medics. Each battalion commander must take care of most of his preventive medicine needs using his surgeon for guidance and his infantrymen for work force. Thus we battalion medics supervise most of the actual disease prevention activity that goes on in the division: individual water treatment, malaria protective measures, messhall inspection, prevention against heat injury, personal hygiene, immunizations, waste disposal, local control of the insect, rodent and pet problems, and so on.

"The company Field Sanitation Teams required by AR 40-5, when properly used, have proved very effective in maintaining at least minimum levels of field sanitation, malaria prophylaxis and personal hygiene among the GI's who are all too willing to forget these niceties. I think it best for the 2 team members to be the company senior medic (for the most intelligent direction of efforts) and a senior NCO (for authority). This team can do a good job of keeping an eye on the area and keeping after the troops.

"My job is mainly to monitor the effectiveness of current efforts, to look for potential problems, to instruct my medics in the principal

disease prevention measures and to advise the commander. My MSC officer does most of the work by coordinating things, visiting the Field Sanitation Teams, making inspections, and so forth. He knows more about the practical side of things than I do, and he has proved very competent. We find that this 'preventive medicine program' requires our constant attention (because of human inertia, mainly) and about as much of our time as we devote to medical treatment. We have enough malaria, shigellosis and hepatitis around here to continuously remind us - and the commander - that the effort is worthwhile."

Preventive Medicine Officers and Preventive Medicine Units

The division preventive medicine officer (PMO) is on the division surgeon's staff and covers the wide area in which the roughly 18,000 men of his division are deployed. His jobs include surveillance of disease incidence, analysis of outbreaks and being an advisor to the battalion surgeons and division surgeon in such diverse matters as water purification, arthropod and rodent control, immunizations, and rabies treatment. If, for example, you want to know the "big picture" of your local disease problems or if you need special technical assistance with some environmental problem, the PMO should be able to help you. The role of the PMO has become so expanded in Vietnam that he was recently given a staff of 1 sanitarian and 4 preventive medicine enlisted specialists to carry out his far-ranging program.

There are 2 preventive medicine units (PMU's) in Vietnam: the 20th PMU in the III-IV Corps Zones and the 172d PMU in the I-II Corps Zones. Like the PMO, the PMU's are spread thinly with about 100 men in each unit to cover roughly 1/2 of the country. They provide specialized services in surveillance, control and teaching with personnel trained in entomology, sanitary engineering, veterinary medicine, epidemiology and related laboratory procedures. One important job has been to send teaching teams out to divisions for training of the company Field Sanitation Teams. PMU's are often called in to control special problems such as plague outbreaks.

You should keep in mind that PMU personnel, as well as the local PMO, are available to help you with the wide range of problems confronting you in Vietnam.

Disease Prevention Measures Checklist

The following measures should be included in a unit preventive medicine program. They also serve as important considerations in personal disease prevention for the thoughtful individual.

1. Water: Troops must be made to understand that no water supply is safe until treated. Local ice is potable only if made from treated water. Calcium hypochlorite powder is the best agent for bulk water treatment, with the chlorine residual 5 ppm.[165] A simple chlorine test kit in the box with the calcium hypochlorite ampules will allow you to easily check chlorine residuals. Iodine tablets, to be effective, must be fresh (metallic grey tablet color) and used properly.[2,165] As a last recourse, water can be boiled. Native tea should be safe if consumed hot. It is a common misconception that alcohol will render the water or ice in cocktails potable; it won't.

2. Arthropods: Malaria is the biggest problem here. Troops need continuing instruction and close supervision in malaria protective measures including DEET insect repellent, bednets or headnets, rolled down sleeves at dusk and chemoprophylaxis.[24] The CP tablet must be started one day prior to entering Vietnam and continued with one tablet weekly until 8 weeks after leaving. Personnel on dapsone must continue one tablet daily until 28 days after leaving Vietnam. (See also Appendices II and IV). The measures that prevent mosquito bites also prevent encephalitis, dengue and filariasis.[82,83,85,141]

In Section III measures to prevent scrub typhus[94] and plague[103] are discussed. Flies also must be effectively controlled by good screening in messhalls and latrines, covered garbage cans, insecticides, etc.

3. Food: Periodic inspection of food supplies, mess facilities and food handler cleanliness is essential. If it is necessary to procure foods locally, be sure that vegetables and fruit are washed and peeled, and that leafy vegetables are dipped in boiling water or chlorine solution after washing. Anything eaten in a local restaurant should be thoroughly cooked and still hot when eaten.

Food handlers, especially Vietnamese food handlers, must be well supervised by mess sergeants[1] including (1) inspection every morning to exclude illness or poor personal hygiene, (2) proper use of latrines and handwashing facilities, and (3) maintenance of Food Handlers' Certificates which are required for each food handler indicating that he has had a satisfactory medical examination and chest X-ray.

4. Personal Hygiene: It is important to maintain personal cleanliness as much as possible. In field units this may be very difficult, but some of the following measures can help: (1) troop instruction (see FM 21-10), (2) standard and improvised field shower rigs, (3) command emphasis on adequate supplies of water, soap, etc., and (4) a good field laundry exchange service. Fungal and bacterial skin infections, external ear infections and severe acne are common when troops do not keep clean and dry. The incidence of the "fecal-oral" diseases like shigellosis and hepatitis also reflects the level of personal hygiene.

5. Waste disposal: Units must provide adequate disposal of excreta (e.g. burn-out latrines) and rubbish (e.g. sanitary land fills).

6. Immunizations: Routine immunizations must be kept up to date.[157,160] Tuberculin tine testing is now required[134] before assignment overseas and on rotation back to CONUS in individuals previously tuberculin negative. Note that special risk groups also receive gamma globulin prophylaxis[75,76] and rabies duck embryo vaccine.[160]

7. Heat Injury: Remember that it takes at least 2 weeks to acclimatize; troops must not be overworked during this critical period. At all times water and salt intake must be adequate for the level of exertion, temperature and humidity.[110]

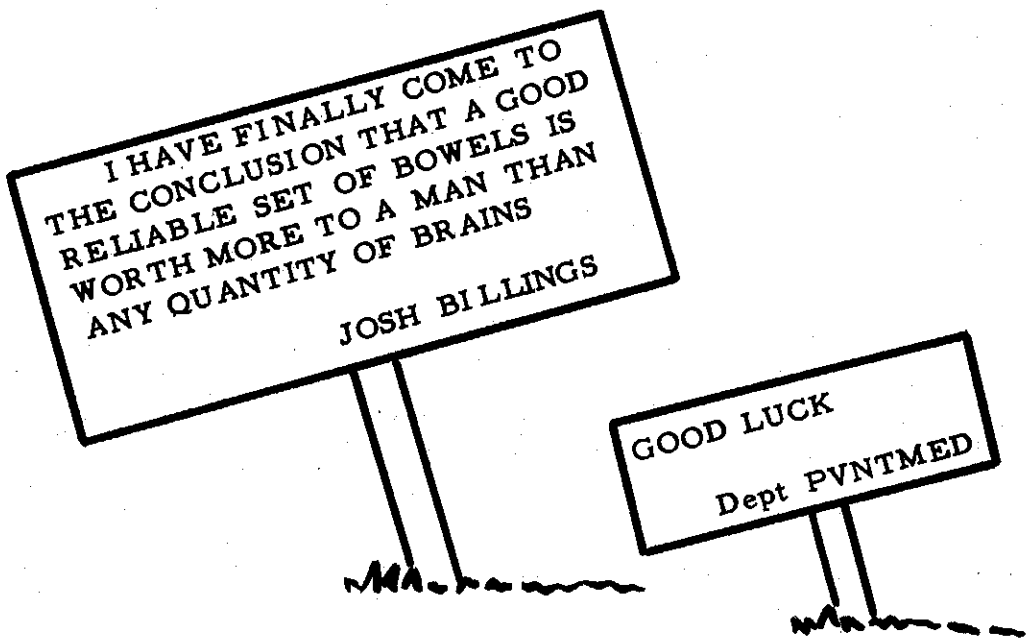
8. Animals: Since rabies is common, exposure to wild and domestic animals, especially dogs, should be avoided. Pets need to be immunized, registered and controlled.[158] Medical officers should know how to contact the local rabies control board and how to get patients quickly to treatment with hyperimmune serum and/or rabies vaccine when indicated (see Appendix V).

Snakebite treatment should be reviewed (see Appendix VI).[161] Rodent control is a ubiquitous problem which always needs attention.

9. Venereal Disease: Troop instruction in VD should be given, including preventive measures and emphasis on seeking early treatment.[65]

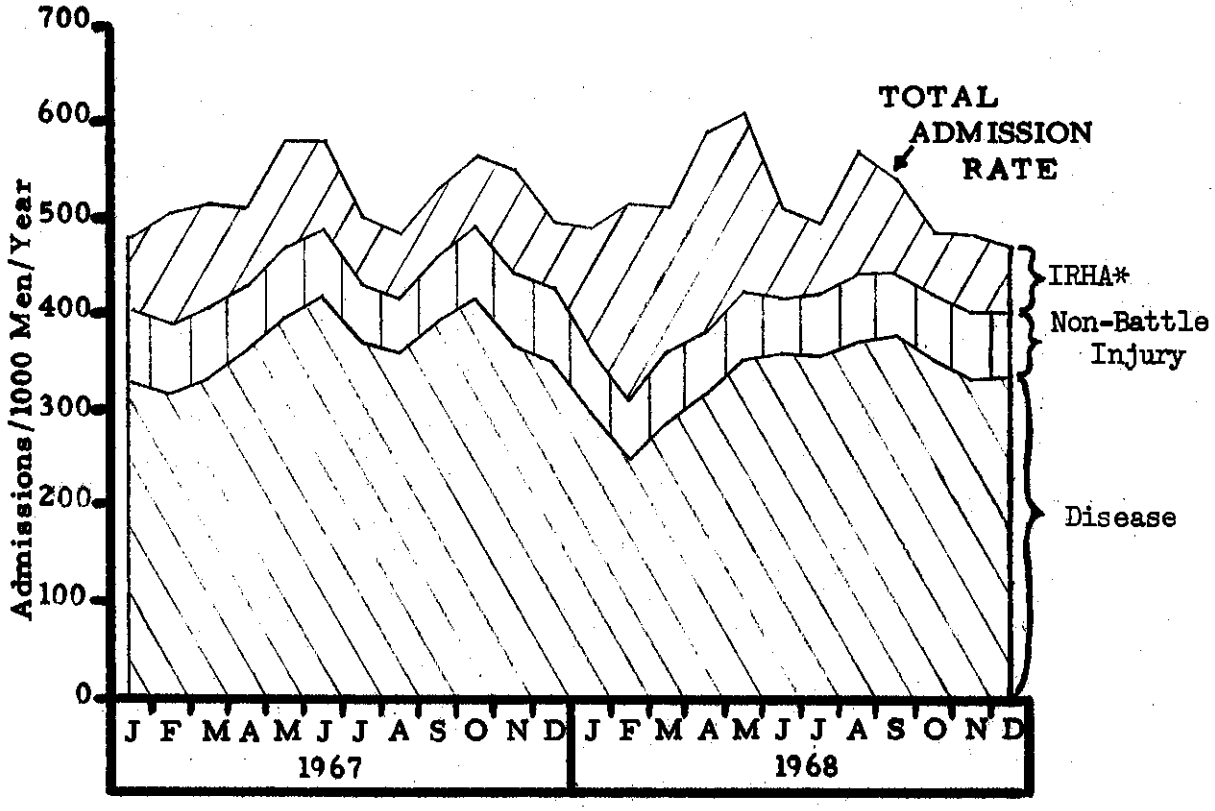
10. Field Sanitation Teams: It may be necessary to remind commanders to appoint, train and <u>use</u> these teams as required by AR 40-5.[1,166]

11. References: Publications distributed to USA MFSS students prove to be practical desk references, including AR 40-5, the book, <u>Control of Communicable Diseases in Man</u>, and this Orientation. Other general sources of information on preventive medicine and clinical medicine are listed in the References (pages 66, 67).



APPENDIX I:
MEDICAL STATISTICAL DATA - US ARMY, VIETNAM

This appendix summarizes selected information from monthly USARV (US Army, Vietnam) Command Health Reports. Figure 8 analyses the general causes of admission for USARV personnel, table 3 gives 1968 average monthly medical rates along with the highs and lows for the year, and figure 9 plots monthly admission rates for selected important diseases. Among the noteworthy facts depicted are: (1) disease causes considerably more admissions than does injury resulting from hostile action (figure 8), (2) on the average 9 men per 1000 men are absent from duty each day for medical reasons (Noneffective Rate, table 3), (3) about 520 admissions occurred per 1000 men in 1968 (Admission Rate, table 3), representing a tremendous loss of manpower, and (4) several diseases tend to follow seasonal patterns in their incidence (figure 9).



SOURCE: USARV Command Health Reports Jan 1967 - Dec 1968
Figure 8. Admission Rates
US Army, Vietnam, 1967-1968

*Injury Resulting from Hostile Action

All the rates given here, except venereal disease, are admission rates derived from all admissions to both quarters and hospitals. It must be kept in mind that admission rates may equal the overall incidence of diseases like malaria where all patients must be hospitalized, but not of diseases like diarrhea and skin conditions where relatively few of the patients are admitted. Rates, as "cases/1000 men/year," should be clearly understood because they are used throughout the Army to compare medical data from different units and commands. In the case of an admission rate for a specific disease, the number of new cases admitted is divided by the average personnel strength of the population from which the cases came during the month in question; this rate is then adjusted to 1000 men and one year. The actual formula is

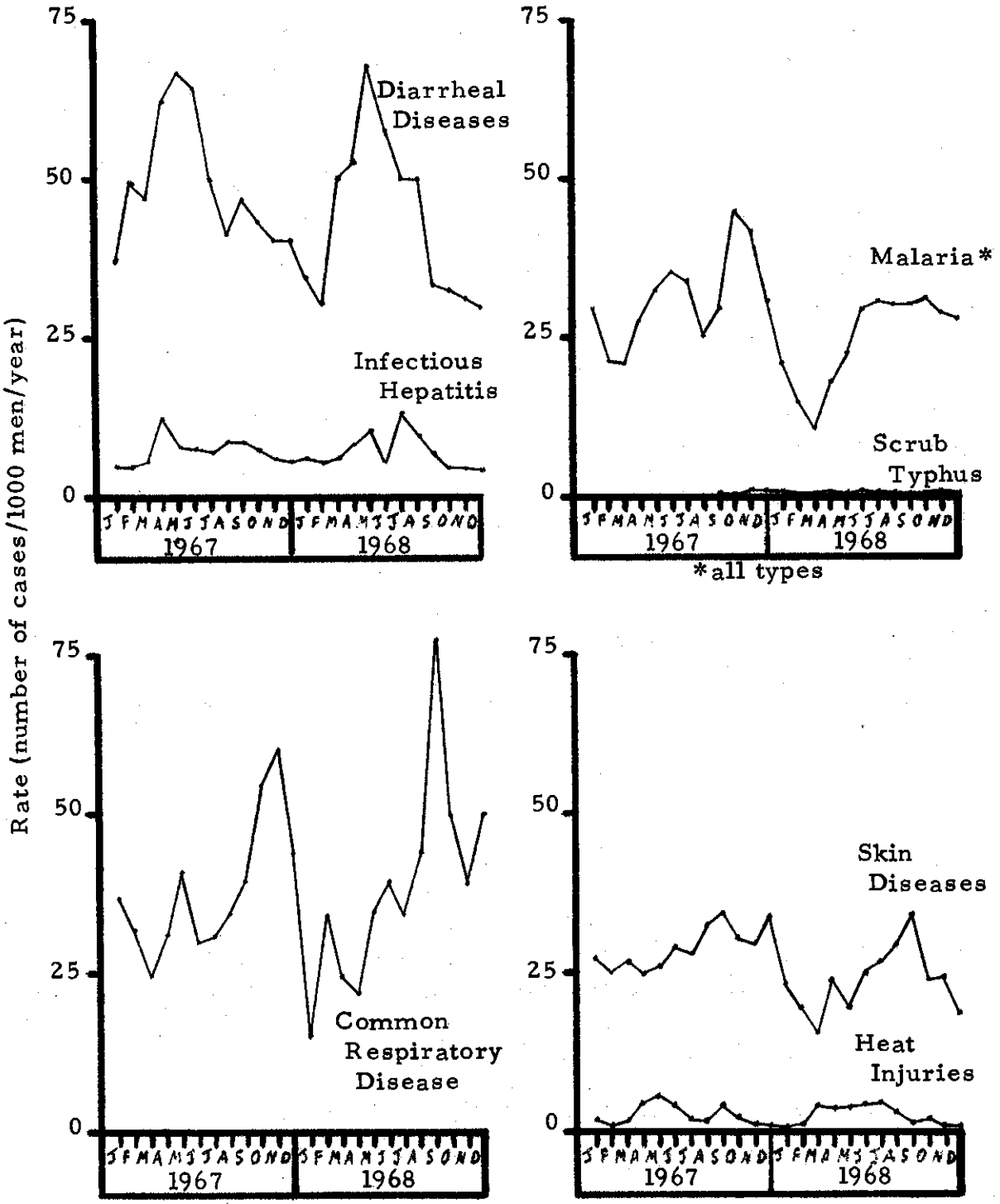
$$\text{rate} = \frac{\text{no. cases} \times 1000 \times 365}{\text{average strength} \times \text{no. days in month of report}}$$

Table 3. Summary of Monthly Medical Rates - US Army, Vietnam, 1968

Rate	Monthly Average	Range (highest - lowest month)
DAILY NONEFFECTIVENESS (patients in hospitals or quarters/1000 men/day)	9.2	10.3 - 8.1
HOSPITAL ADMISSIONS*(admissions/1000 men/year): Total	522.6	608.6 - 472.4
1. Disease	330.8	376.0 - 247.3
2. Injury Resulting from Hostile Action	121.7	205.5 - 64.4
3. Non-Battle Injury	69.9	82.7 - 61.8
SELECTED DISEASES (rate/1000 men/year)		
1. Enteric Diseases*		
Diarrheal diseases	43.3	67.5 - 29.5
Infectious hepatitis	7.2	13.0 - 5.5
2. Arthropod borne Diseases*		
Malaria (all types)	24.4	31.5 - 11.1
Scrub typhus	0.3	0.8 - 0.1
Dengue	0.03	0.2 - 0
Encephalitis, infectious	0.1	0.2 - 0
3. Common Respiratory Disease*	38.5	77.6 - 15.1
4. Skin Diseases*		
Diseases of the skin & cellular tissue	21.1	30.1 - 14.9
Dermatophytosis	2.0	4.2 - 0.6
Immersion foot	0.02	0.3 - 0
5. Heat Injuries*	2.5	4.8 - 0.6
6. Venereal Disease:** Total	193.9	250.0 - 142.2
Gonorrhea	173.3	234.4 - 127.4
Syphilis	1.9	0.5 - 2.9
Other VD	18.2	23.0 - 10.3

SOURCE: USARV Command Health Reports, Jan - Dec 1968
*Patients admitted to hospital or quarters
**Also includes outpatients (less than 1% of VD cases are admitted)

Figure 9. Selected Monthly Admission Rates
US Army, Vietnam, 1967-1968



SOURCE: USARV Command Health Reports, Jan 1967-Dec 1968 (admission rates)

APPENDIX II:
ANTIMALARIAL DRUGS AND TREATMENT SCHEDULES

1. STANDARD DRUG PREPARATIONS

	Drug Content of One Tablet
C-P Tablet*	
Chloroquine	300 mg**
Primaquine	45 mg**
Dapsone (DDS)***	25 mg
Quinine sulphate	325 mg
Chloroquine	300 mg**
Pyrimethamine	25 mg
Primaquine	15 mg**

*For prophylaxis only.

**With both chloroquine and primaquine dose is quoted either as "base" (as in table) or as "salt." This tends to be confusing unless you remember that both terms refer to the same drug preparation (i.e., chloroquine or primaquine phosphate) and that for chloroquine 300 mg base = 500 mg salt while for primaquine 15 mg base = 26 mg salt.

***For prophylaxis and therapy.

2. DOSAGE SCHEDULES[24,37]

a. PROPHYLAXIS

C-P Tablet: one weekly; start one day prior to arrival in Vietnam (or other malaria area) and continue for 8 weeks after return to CONUS

Dapsone: one daily; continue for 28 days after return to CONUS. (Only used by selected units in Vietnam.)

b. TREATMENT OF FALCIPARUM MALARIA (In chloroquine-resistance areas)

Triple therapy: quinine sulphate 650 mg orally tid for 10 days, pyrimethamine 25 mg bid for 6 doses, and dapsone 25 mg daily for 28 days.

Intravenous quinine: 650 mg q 8 hr by slow infusion. (Indicated for patients unable to retain oral medication and for very heavy parasitemias and complications.) (Urine output must be adequate; patient be kept in bed because of hypotension; in difficult cases monitor serum quinine level or serial EKG's.)

c. TREATMENT OF VIVAX, MALARIAE AND OVALE MALARIA

Chloroquine: 600 mg initially followed by 300 mg 6 hr later and 300 mg daily for 2 days (total of 1500 mg chloroquine base over about 48 hrs). (See TB MED 164 for i.m. administration and use of chloroquine for falciparum malaria in areas where chloroquine resistance is not encountered.)

Primaquine: 15 mg daily for 14 days, concurrent with chloroquine.

APPENDIX III:
ACTION OF ANTIMALARIAL DRUGS

DRUG	Action on Sporozoites in Man	Action on Primary Tissue Schizonts	Action on Erythrocytic Phase (Assuming Sensitive Strains) Schizontocidal	Gametocidal	Action on Secondary Tissue Schizonts	Affects Development of Gametocytes in Mosquito (Sporontocidal action)
Quinine	None	None	Fast Action	Limited Action against *P. vivax* and *malariae*. No direct action against *P. falciparum*	None	None
Quinacrine (Atabrine)	None	None	Faster Action	As with Quinine	None	None
Chloroquine	None	None	Fastest Action	As with Quinine	None	None
Primaquine	None	Chiefly against *P. falciparum*. Some action against *P. vivax*	Active only in toxic doses	Direct & fast action against all species	Highly Active	Some Action
Pyrimethamine (Daraprim)	None	As with Primaquine	Slowly Active	None	Some action against *P. vivax*	Very active against *P. falciparum* and *P. vivax*
DDS (Dapsone)	None	None	Active	None	None	None
Proguanil	None	As with Primaquine	Slowly Active	None	As with Pyrimethamine	Active against *P. falciparum* and *P. vivax*

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APPENDIX IV:
MALARIA CHEMOPROPHYLAXIS FOR VIETNAM RETURNEES

This message is quoted from DA Circular 40-55, 4 December 1968:

1. During 1967 there were over 2,000 malaria cases in Vietnam returnees. The intensification of surveillance, briefing and debriefing of returnees since October 1967 is resulting in lower rates of malaria in Vietnam returnees. The occurrence of over 1,000 cases of malaria in personnel returning to CONUS in 1968 emphasized the necessity to continue this essential part of the overall malaria eradication program.*

2. The following procedures are recommended to reduce this preventable manpower loss and to limit spread of malaria to susceptible personnel in CONUS and other areas receiving infected personnel:

a. Commanders should insure that personnel records of all Vietnam returnees are reviewed as soon as possible after arrival at their new duty station to make certain returnee has signed a "Malaria Debriefing" statement. This statement is MACV Form 270 and has been required for processing personnel departing from Vietnam since 15 July 1967.

b. Returnees should be interviewed as soon as possible by medical personnel to determine if the required course of eight consecutive weekly doses of chemoprophylactic drugs was completed.

c. Individuals who did not receive chemoprophylactic tablets or who failed to take the tablets as required should be given sufficient tablets for a complete 8-week course of chloroquine-primaquine prophylaxis. In addition, they should receive 28 days of Dapsone if they were taking Dapsone in Vietnam. Administrative control procedures to insure that the tablets are taken should be instituted at all installations.

d. An appropriate entry should be made in the individual's health record to document that an interview was conducted and to indicate the action taken.

*According to the National Communicable Disease Center, malaria cases among Vietnam returnees totaled 2669 in 1967 and approximately 2380 in 1968.

APPENDIX V:

WHO GUIDE FOR TREATMENT OF EXPOSURE TO RABIES

A. Local Treatment of Wounds Involving Possible Exposure to Rabies

(1) Recommended in all exposures

(a) ***First-aid treatment***

Immediate washing and flushing with soap and water, detergent or water alone (recommended procedure in all bite wounds including those unrelated to possible exposure to rabies).

(b) ***Treatment by or under direction of a physician***

(i) Adequate cleansing of the wound.

(ii) Thorough treatment with 20% soap solution and/or the application of a quaternary ammonium compound or other substance of proven lethal effect on the rabies virus.[1]

(iii) Topical application of antirabies serum or its liquid or powdered globulin preparation (optional).

(iv) Administration, where indicated, of antitetanus procedures and of antibiotics and drugs to control infections other than rabies.

(v) Suturing of wound not advised.

(2) Additional local treatment for severe exposures only

(a) Topical application of antirabies serum or its liquid or powdered globulin preparation.

(b) Infiltration of antirabies serum around the wound.

[1] Where soap has been used to clean wounds, all traces of it should be removed before the application of quaternary ammonium compounds because soap neutralizes the activity of such compounds.

B. Specific Systemic Treatment

Nature of exposure	Status of biting animal (irrespective of whether vaccinated or not)		Recommended treatment
	At time of exposure	During observation period of ten days	
I. No lesions; indirect contact	Rabid	—	None
II. Licks:			
(1) unabraded skin	Rabid	—	None
(2) abraded skin, scratches and unabraded or abraded mucosa	(a) healthy	Clinical signs of rabies or proven rabid (laboratory)	Start vaccine [1] at first signs of rabies in the biting animal
	(b) signs suggestive of rabies	Healthy	Start vaccine [1] immediately; stop treatment if animal is normal on fifth day after exposure
	(c) rabid, escaped, killed or unknown	—	Start vaccine [1] immediately
III. Bites:			
(1) mild exposure	(a) healthy	Clinical signs of rabies or proven rabid (laboratory)	Start vaccine [1, 2] at first signs of rabies in the biting animal
	(b) signs suggestive of rabies	Healthy	Start vaccine [1] immediately; stop treatment if animal is normal on fifth day after exposure
	(c) rabid, escaped, killed or unknown	—	Start vaccine [1, 2] immediately
	(d) wild (wolf, jackal, fox, bat, etc.)	—	Serum [2] immediately, followed by a course of vaccine [1]
(2) severe exposure (multiple, or face, head, finger or neck bites)	(a) healthy	Clinical signs of rabies or proven rabid (laboratory)	Serum [2] immediately; start vaccine [1] at first sign of rabies in the biting animal
	(b) signs suggestive of rabies	Healthy	Serum [2] immediately, followed by vaccine; vaccine may be stopped if animal is normal on fifth day after exposure
	(c) rabid, escaped, killed or unknown	—	Serum [2] immediately, followed by vaccine [1]
	(d) wild (wolf, jackal, perish dog, fox, bat, etc.)		

[1] Practice varies concerning the volume of vaccine per dose and the number of doses recommended in a given situation. In general, the equivalent of at least 2 ml of a 5% tissue emulsion should be given subcutaneously daily for 14 consecutive days. Many laboratories use 20 to 30 doses in severe exposures. To ensure the production and maintenance of high levels of serum-neutralizing antibodies, booster doses should be given at 10 days and at 20 or more days following the last daily dose of vaccine in *all* cases. This is especially important if antirabies serum has been used, in order to overcome the interference effect.

[2] In all severe exposures and in all cases of unprovoked wild animal bites, antirabies serum or its globulin fractions together with vaccine should be employed. This is considered by the Committee as the *best* specific treatment available for the post-exposure prophylaxis of rabies in man. Although experience indicates that vaccine alone is sufficient for mild exposures, there is no doubt that here also the combined serum-vaccine treatment will give the best protection. However, both the serum and the vaccine can cause deleterious reactions. Moreover, the combined therapy is more expensive; its use in mild exposures is therefore considered optional. As with vaccine alone, it is important to start combined serum and vaccine treatment as early as possible after exposure, but serum should still be used no matter what the time interval. Serum should be given in a single dose (40 IU per kg of body weight) and the first dose of vaccine inoculated at the same time. Sensitivity to the serum must be determined before its administration.

APPENDIX VI: SNAKEBITE TREATMENT GUIDELINES

1. There is considerable controversy in snakebite treatment. The following are main points digested from several authoritative sources,[116-120] and are offered only as a general guide to therapy.

2. FIRST AID: Untrained personnel and Medical Corpsmen* will restrict treatment to immobilization, application of a loose tourniquet proximal to the swelling, immediate mouth-to-mouth resusitation if breathing stops and prompt evacuation to a treatment facility (with the killed snake if possible) in accordance with The Surgeon General's policy.[121-123]

3. IMMEDIATE LABORATORY PROCEDURES: Blood typing and crossmatching, electrolytes and available clotting and organ function tests should be done as soon as possible on arrival at the treatment facility. (Note that viper toxins interfere with cross-matching tests). It is advisable to test for horse serum allergy immediately (see below) in case antiserum therapy becomes necessary later.

4. ANTIVENINS

a. INDICATIONS: Whether antivenins are polyvalent or univalent, the user should know their specifity and identify the offending snake to employ them. The commoner poisonous snakes in Vietnam are:

(1) Elapids: Asian cobra, king cobra, banded krait and many-banded krait

(2) Pit Vipers: Bamboo viper and Malayan pit viper

(3) Sea Snakes: Many species

Antivenins are indicated only when signs of envenomation are present, since many bites will fail to envenomize.[124] With viper bites ("hemotoxic") look for immediate local swelling and for hemorrhage. Early signs of elapid ("neurotoxic") envenomation are ptosis and glossopharyngeal palsy. Local pain after snakebite is extremely variable and no help in determining degree of envenomation.

b. ADMINISTRATION: A conjunctival or skin test for horse serum allergy must precede administration. The appropriate total dose of antivenin varies with each case. For initial dose consult the package literature. Most authorities advise administration in an i.v. saline infusion; the polyvalent Haffkine Institute serum (available in Vietnam), however, is not fully cleared for i.v. use since it has not passed pyrogenicity tests.

c. AVAILABILITY: Antivenins are available in Vietnam in standard supply channels, but are not standard items (one is from Haffkine Institute, India.) Therefore medical officers should know well the properties of the preparations they actually have in hand.

*Specially designated medical corpsmen who have received suitable training may also initiate treatment with incision, suction and antivenin in the absence of a medical officer.

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