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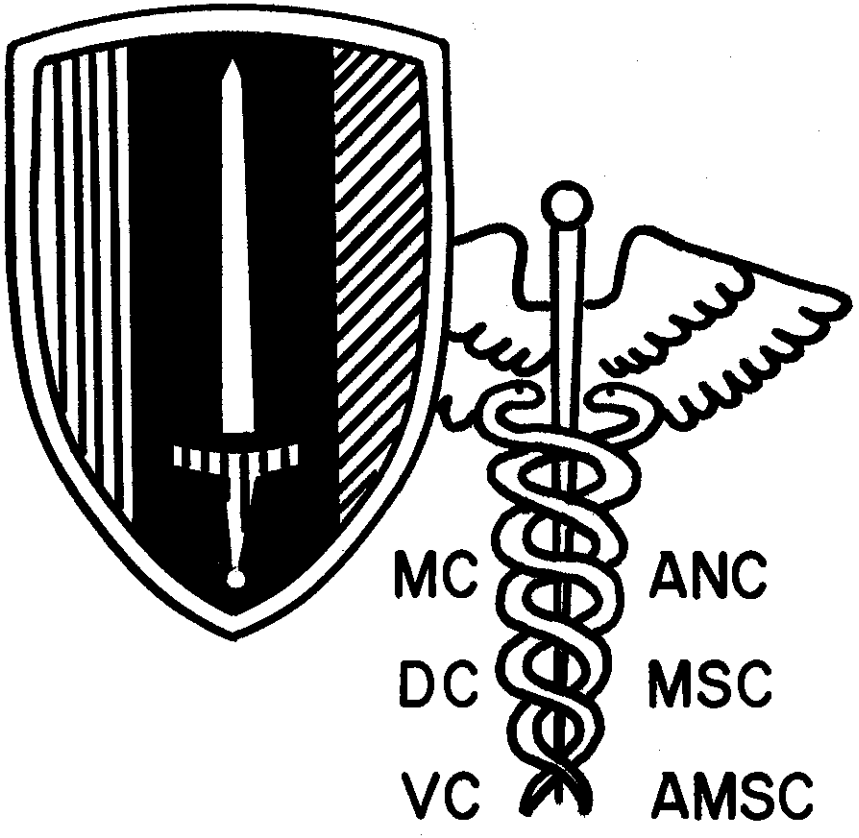

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CONTENTS

DUSTOFF*

GENERAL WILLIAM C. WESTMORELAND
Commander, United States Forces in Vietnam

Americans believe in freedom and the dignity of man. They back that belief with action.

The Americans in Vietnam know war at first hand. They see it for what it is. War is fear cloaked in courage. It is excitement overlaying boredom. It is close friendships, with loneliness only a thought away. It is compassion in the midst of destruction. It is dedication winning over weariness and frustration. War is paying a terrible price today for a better tomorrow.

In the span of his service, a military man is privileged to see, and sometimes to share, moments that show the greatness of the human spirit - the selfless dedication that gives hope that, in the end, man will attain the peace, freedom and equality for which he has paid so dearly for so long. I could choose any of a thousand examples. At random I choose an action involving a man of mercy on a mission in the flat, rich Mekong Delta region of South Vietnam.

In the summer of 1964, the United States had 16,500 men in the Republic of Vietnam, most of them serving as advisers in the field. It was during the first half of that year that Major Charles L. Kelly became a living legend. Major Kelly was commanding officer of the 57th Medical Detachment (Helicopter Ambulance). But he was more than that. To every American in the delta, he was the voice of mercy and a link with the outside world.

Lonely advisers scattered through the rice paddies and coconut groves of the delta learned to expect a call when Major Kelly flew by. The radio on the ground would crackle, and then would come the drawl: "This is ol' Dust-Off. Just passing over. Is everything okay? Good! Take it easy, now," and Major Kelly would windmill on by, on his mission of mercy. That much conversation could mean a lot to a man on the ground, particularly at night. And the days were not long enough for Major Kelly. He not only convinced his commanding officer that he and his men should be allowed to fly evacuation missions at night, as well as in the daytime, but that the safest way to fly at night was with a single helicopter completely blacked out. Naturally, the Vietnamese soldiers and civilians and the American advisers loved Major Kelly and his men, who always came when someone needed help - in the midst of battle, day or night, calm or storm.

Around noon on the first day of July came a call for help, and off flew Major Kelly to pick up an American sergeant who had been wounded by Viet Cong mortar fire while advising his unit.

Before long, over the beat of the rotor blades, the call came through the radio to the men on the ground. "Dragonfly Bravo, this is Dust-Off. Understand you have some business for me."

"This is Dragonfly Bravo. That's right. We'll mark the area with red smoke."

There had been no ground fire for some time when Major Kelly began to settle his helicopter in for a landing. The big bright red crosses on the top, bottom and each side were a welcome sight to those caring for the wounded sergeant.

As the ship was about to touch down, the Viet Cong opened up with a storm of small-arms fire aimed at the mercy craft.

"Dust-Off! Dust-Off! Take off! Take off! Small-arms fire!" radioed the men on the ground.

"When I have your wounded," the calm drawl came back.

Just as the ship settled in, a rifle slug found Major Kelly. In slow motion, the ship lifted, and before the copilot could take over the controls, it hit and rolled over on its side. The doctor's leg was broken. The copilot and crew chief were badly shaken.

Major Kelly was dead.

Later, another officer described the loss of his friend Major Kelly: "Dead was a soldier. But a different kind of soldier from the one who charges the enemy with fixed bayonet. But a soldier who was no less brave. And perhaps braver than most. For when he charged, it was to save, not take, human life. He always was there when a man needed help - needed it most - needed it now!"

The Major Kellys - and the Private Smiths and all the others - have given America more than they have taken from her. And they still are giving, for when the going gets rough and an extra ounce of effort is needed, Major Kelly's last words still shine brightly: "When I have your wounded."

* This article was published in the December, 1966 issue of McCall's Magazine as part of a series entitled "A Gift of Love." It is reprinted with the permission of the author and McCall's.

FAT EMBOLISM FOLLOWING SEVERE TRAUMA

Louis W. Meeks, CPT, MC and Joseph R. Rokous, MAJ, MC *

Introduction:

The clinical syndrome of fat embolism following trauma is rare in any orthopaedists' civilian practice. This is not true in a combat situation, where approximately sixty percent of battle casualties sustain trauma to the extremities. During the four month period July 5th to November 5th, 1966, the 93rd Evacuation Hospital has documented and successfully treated five cases of fat embolization, all with concurrent cerebral and pulmonary manifestations. It is the purpose of this paper to emphasize the importance of early diagnosis and treatment in this condition.

The Clinical Syndrome:

Fat embolism of some degree occurs in the majority of fractures of long bones and with crushing injuries of cancellous bone. In these cases it is possible to recover abnormal quantities of fat from the blood, urine, and sputum. It is, however, unusual for the amount of mobilized fat globules to be sufficient as to cause significant occlusion of the capillary system. When this phenomenon does occur one has the clinical syndrome of fat embolism. The signs and symptons are dictated by the organ system which is predominately involved.

In the cerebral type there is often a prodrome of restlessness and anxiety. This may continue on to delirium, twitching, and coma. Pupillary changes and pathologic reflexes are not uncommon. The development of coma is, of course, a poor prognostic sign.

The pulmonary form is characterized by signs of pulmonary edema with coarse rales throughout the chest, but normal resonance on percussion. There is dyspnea, tachypnea, and tachycardia with pallor followed by cyanosis. In our experience the arterial PO_2 has been decreased in all cases, ranging from 30 to 70 mm Hg.

The clinical findings of skin and kidney involvement strongly support the diagnosis. Focal lesions may occur in the renal glomeruli allowing fat globules to escape into the urine. Significant renal function impairment is rare in the absence of prolonged shock or lower nephron nephrosis. Peripheral capillary occlusion is manifested by petechiae. The classical areas are the bucial mucosa, conjuntival sacs, chest, anterior axillary fold and the flexor surfaces of the body. These may not become apparent until several days post injury, whereas the cerebral, pulmonary, and renal involvement usually becomes apparent between twelve and seventy-two hours.

Thus fat embolism is a clinical state, and the diagnosis is established by the recognition of multiple organ system involvement. The laboratory is of little or no help.

*Capt Meeks is Assistant Chief, Orthopedic Service, and Major Rokous is Chief, Dept of Surgery and Chief, Orthopedic Service, 93rd Evac Hospital.

Differential Diagnosis:

The chief conditions to be considered in the diagnosis of fat embolism are surgical shock, pulmonary embolism, pneumonia, and associated brain injury. The time element is an important factor in the differentiation of the first two of these four clinical entities. In surgical shock the signs and symptoms occur immediately after the injury. When venous thrombosis is the cause of pulmonary embolism the symptoms usually appear between the tenth and twentieth days following the trauma.

Pneumonia often can be ruled out because of the lack of signs of acute infection and impaired resonance. Brain involvement may be the result of fat embolism or head injury. The patient with fat embolism has diffuse brain damage with a predilection for the white matter and will not show localizing or unilateral signs.

CASE REPORTS

Case 1: J. G. 7096

A twenty-one year old PFC sustained a closed fracture (midshaft) of the right femur when he was struck by a road grader. Shortly after injury on 5 July, 1966 he presented in the E.R. with obvious fracture deformity and no external splint device. He was placed in balanced skeletal traction. Twelve hours post injury he became belligerent, disoriented and shortly thereafter comatose. He also developed acute cardiac and respiratory distress. A tracheostomy was performed, and the therapeutic regimen adopted at this hospital was instituted immediately. On the third day post injury he developed renal and skin involvement.

He remained in deep coma for seven days, and suddenly regained consciousness with no neurologic residual. On 15 July, 1966 (ten days post injury) he was evacuated to CONUS in excellent condition.

Case 2: R. L. 9398

A twenty-one year old PFC was involved in a jeep accident 28 August, 1966. He presented with a closed transverse fracture of the left femur without immobilization. He was placed in balanced suspension skeletal traction.

On the second day post injury the classical syndrome of fat embolization became apparent. There was pulmonary, cardiac, cerebral, renal, skin and eye ground involvement (white exudates). A tracheostomy was performed and treatment was instituted to include six units of whole blood.

He remained in coma for a total of five days and fully recovered in a period of a few hours. On 7 September, 1966 he was placed in a spica cast and was evacuated to CONUS twelve days post injury without sequellae.

Case 3: V. W. 10402

On 22 September, 1966 this twenty-four year old SP/4 sustained multiple fragment wounds of the entire left side of his body. When he arrived at the emergency room he was unresponsive and in severe hypovolemic shock. A tourniquet and a Thomas splint were in place. Initial physical examination revealed massive soft tissue loss from the left thigh with nerve and artery involvement. There were open, grossly comminuted fractures of the left femur, tibia and fibula.

The patient was resuscitated with twenty units of whole blood and then taken to the operating room. A high A.K. amputation was necessary. The other wounds were debrided. He was then taken to the recovery room where the thirty-first unit of whole blood was administered.

The post operative course was complicated by the following incidents. The first post op day there was hemorrhage from all wounds and laboratory tests revealed a platelet deficiency. He was transfused with eight units of fresh whole blood, and his condition improved. On the second post operative day he regained consciousness for several hours. Then became disoriented and would respond only to painful stimuli. Petechiae were observed and urine fat stains were positive. He became cyanotic and in acute respiratory distress. A tracheostomy was performed and appropriate treatment was instituted. The fourth post operative day he became alert and neurologic examination for the first time was normal.

DPC of all wounds were performed and on 4 October, 1966, twelve days post injury he was evacuated to CONUS in a stable condition.

Case 4: T.V.V. 01883

T.V.V. was a 39 year old ARVN Captain who was struck by a truck on 8 October, 1966. He presented to the emergency room with open comminuted fractures of the left mid femur, distal tibia and fibula. After appropriate resuscitative measures were carried out he was taken to the operating room. Debridement was performed and he was placed in balanced suspension skeletal traction.

On the fourth day following injury he was taken back to the operating room where DPC's and application of a hip spica were performed under general anesthesia. While on the operating table he had a cardiac arrest. Within moments he responded to closed cardiac massage. A tracheostomy was performed. Upon arriving in the recovery room he arrested once again. Spontaneous cardiac activity was not obtained for several minutes. The diagnosis of massive fat embolization was suspected and treatment instituted. The following day fat was demonstrated in both the urine and sputum. Two days later petechaie in the claseical areas were observed.

During his hospitalization ten units of whole blood were administered. On 28 October, 1966 (twenty days post injury) he was transferred to Cong

Hoa Hospital, Saigon in a semicomatose state. This could represent either cerebral fat embolism or cerebral anoxia following the cardiac arrests.

Case 5: W.M. 12032

A twenty year old PFC who was struck by an artillery round on 4 November, 1966. He sustained an incomplete traumatic amputation of the left foot. This was revised at a Surgical Hospital. Records state the patient never fully reacted from anesthesia. The following day he was transferred to the 93rd Evacuation Hospital. The diagnosis of fat embolism with cerebral involvement was made and treatment instituted. He remained markedly obtunded for the next thirty-six hours. At that time petechiae appeared in the conjunctival sacs, bucial mucosa and anterior chest. Fat stains of the urine and sputum were negative on two occasions.

He had an uneventful complete recovery, and was evacuated to CONUS on the ninth day post injury.

TREATMENT

The treatment of fat embolism has been the subject of considerable debate in recent years. The standard textbook of Medicine (Cecil and Loeb) states, "no specific therapy is available". The orthopedic staff is cognizant of the differences of opinions concerning the pharmacological and clinical efficacies of the several agents used at this hospital. It is not the purpose of this paper to enter into this discussion.

Adequate oxygenation at the tissue level is probably the most important aspect in the treatment of this condition. The brain and heart are especially susceptible to damage from hypoxia. Positive pressure oxygen is administered in all cases. Tracheostomy when indicated is performed without hesitation.

Sedation is often of benefit. This can be achieved satisfactorily with 1000cc of a 5% ethanol mixture administered intravenously every eight hours. We also use benadryl 50 Mgm. I. M. every eight hours. This also takes advantage of the hypothesis that ethanol has a demulsifying effect on the chylomicrons. The supposition that a histamine state exists at the terminal bronchiolar and alveolar level influences the use of an anti-histamine for sedation.

All patients with a suspected diagnosis of fat embolism have been placed on I.V. heparin 30 Mgm. every eight hours. This dosage has no significant effect on the clotting mechanism. Some writers feel heparin has an emulsifying effect on plasma lipids, thus reducing the size of the fat globules in the bloodstream. This reduces the degree of arteriolar and capillary obstruction. Other investigators feel heparin has a spasmolytic effect at the pulmonary level. Some feel heparin has no place in the treatment of fat embolism.

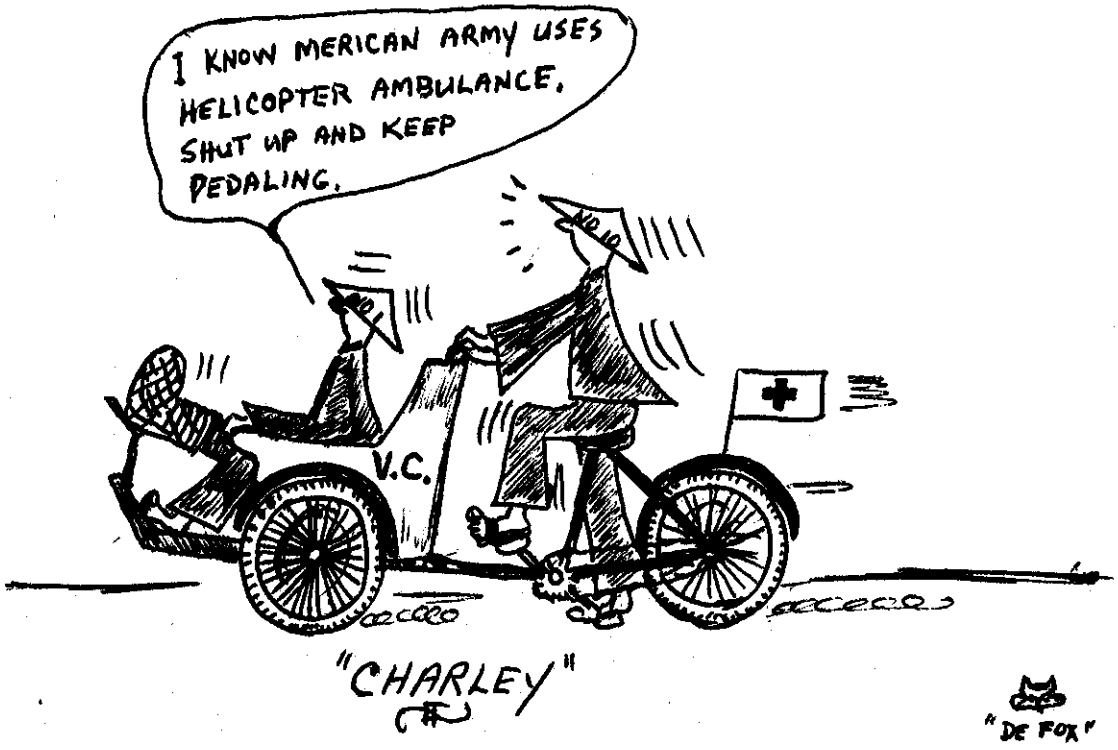
Other supportive measures such as blood replacement and fluid and electrolyte balance are carried out according to the needs of the patient.

Proper and immediate immobilization should be performed with as little manipulation as possible. Where the diagnosis of fat embolism is suspected the patients probably should be allowed a longer recovery period before casts are applied or definitive survery is carried out.

SUMMARY

Fat embolism is a clinical state following severe trauma, usually to the extremities. The physician must have a high level of suspicion in order to establish the diagnosis and institute early treatment according to the principles outlined.

Five consecutive cases of fat embolism are presented. The clinical features of the syndrome are emphasized as well as the method of treatment presently used at the 93rd Evacuation Hospital.



A STUDY OF 500 PATIENTS WITH MALARIA

Lieutenant Colonel Edward R. Murray, MSC *

In August 1966, an on-going study of Malaria patients was initiated at the 6th Medical Center (Convalescent), APO 96377, Cam Ranh Bay, Vietnam. This study, conducted under the direction of the Center Commander, LTC S.E. Dalberg, was designed to evaluate the use of Dapsone by American troops in a Combat Zone, and to study the time interval between illness of patients who had been previously treated for Malaria. The period under investigation in reference to Dapsone and Malaria control was the 30-day period immediately preceding hospitalization. The study was limited to combat troops of First Field Force, Vietnam, all of whom are on a program of malaria prophylaxis consisting of one chloraquine primaquin tablet weekly and one dapsone tablet daily.

The method utilized in the study was indivicual and group interview in small groups of from seven to 10 patients conducted in an informal and relaxed manner. These interviews were conducted by the Social Work staff, Medical Section of the 6th Medical Center (Conv). Each month from August through December, 100 patients were interviewed and the results quickly tabulated to be made available to applicable unit Commanders and to higher Medical Headquarters. Only patients to whom Dapsone was provided for at least 30 days prior to hospitalization were included in the study. Thus, a few 101st Airborne Division patients were not included initially but were included after Dapsone was available for the designated period of time.

Specifically, we wanted to learn the methods used in supplying the daily Dapsone tablet to the individual soldier, his response to a daily prophylaxis measure, his attitude and action toward mosquito nets and insect repellant, and finally to study the time interval between relapse or reinfection for the patients being treated for a second or more time.

The 500 patients for whom Dapsone was available during the entire 30-day period were from four different units; 201 individuals were from the 25th Inf Div, 194 were from the 1st Cav Div (Air), 76 were from the 4th Inf Div, and 29 were from the 101st Abn Div. Included in the total group of 500 patients were 13 Commissioned Officers, 96 Non-commissioned Officers, 123 Specialists, and 268 Privates.

TABLE I

Composition of 500 patients by organization and rank.

	1st Cav Div	25th Inf Div	4th Inf Div	101st Abn Div	TOTAL
OFFICERS	7	3	2	1	13
W/OFFICERS	0	0	0	0	0
NCOs	30	50	11	5	96
SPECIALISTS	40	56	22	5	123
PRIVATES	117	92	41	18	268
TOTAL	194	201	76	29	500

* Social Work Consultant to the Surgeon, USARV, and Chief, Social Work Service, 6th Convalescent Center

Table I shows the composition of the group by organization and rank. Members of the 25th Inf Div and the 1st Cav Div (Air) were included in all five groups, whereas members of the 4th Inf Div did not appear in our study until Group III (The division started to arrive in Vietnam in July). Members of the 101st Abn Div were represented in Group V. The 1st Cav Div (Air) had 56 members in Group II, which was the largest number of patients in any of the five groups. In Group V, which had all four divisions represented, the 4th Inf Div had the largest number of patients, 35 out of the 100. 54 per cent of the 500 patients were Privates, 24.5 per cent were Specialists, 19 per cent were Non-commissioned Officers, and 2.5 per cent were Commissioned Officers.

TABLE II

DAPSONE: Number of days missed during a 30-day period.

None	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-29	30	TOTAL
162	112	84	41	39	30	5	10	2	4	0	11	500

Table II shows the number of days during the 30-day period preceding hospitalization that the 500 patients missed taking Dapsone. 32 per cent reported no misses, 22 per cent from one to three misses, 17 per cent missed four to six times and the remaining 29 per cent missed from seven to 30 times. Reasons for missing the tablet included R and R, ordinary leave, hospitalization, TDY at base camp, forgetfulness, and small unit operations of a few days duration which did not include the Medic. It would seem that a prophylaxis measure which requires daily consumption of a tablet under combat conditions will require determination on the part of a number of people in order for it to be effective.

TABLE III

DAPSONE: Number of days missed during a 10-day period.

None	1-3	4-6	7-9	10	TOTAL
289	100	50	17	44	500

Table III shows the number of misses during the 10-day period immediately preceding hospitalization. 58 per cent reported no misses, 20 per cent reported from one to three misses, and the remaining 22 per cent missed from four to ten times. Perhaps the most revealing factor in this 10-day study is that 61 individuals, or nearly 12 per cent, missed from seven to 10 days. As previously suggested, little attention is given to R and R orientation and to the transient in Base camp. At least one R and R center was without Dapsone, mosquito nets and with insect repellant often being in short supply. An attempt was made to determine the critical number of misses in reference to Malaria break-through but we were not successful. Age, weight loss, physical condition, time in a known Malaria area, time without mosquito protection, number of times exposed, and frequency of exposure would

have to be studied very intensively in direct relation to successive days without Dapsone. Many individuals missed one day "or maybe two" from time to time but found it difficult to accurately recall successive misses unless the misses were related to a specific event such as R and R or hospitalization. We did learn that successive misses due to R and R ranged from six to nine days in most cases. A one day miss seemed not too critical, consequently the critical successive missed days may range from two to five and upward. We had many conscientious individuals who claimed no missed Dapsone for a period even longer than the 30-day period under investigation, thus it would seem that Dapsone, as presently formulated, is only an aid in the prevention of Malaria.

TABLE IV

Number of times contracted Malaria.

Group	1st	2nd	3rd	4th	TOTAL
I	81	17	2	0	100
II	78	20	2	0	100
III	80	15	5	0	100
IV	81	13	4	2	100
V	82	14	4	0	100
TOTAL	402	79	17	2	500

Table IV shows that 402 of the 500 patients were being treated for their first case of Malaria. 79 were second-time cases, 17 were third-time cases, and 2 were being treated for the fourth time. The repeat rate for the entire group of 500 is 19.6 per cent. This included relapsed patients who had returned to their organization prior to re-hospitalization, and those patients who were considered re-infections. It does not include patients who had an in-hospital relapse. As the table indicates, the ratio between first-time cases and repeat cases for all five groups is extremely close.

TABLE V

Patients with first case of Malaria.*
Length of time in Vietnam (Months)

Group	1	2	3	4	5	6	7	8	9	over 9	TOTAL
II	0	2	3	10	10	3	4	14	15	17	78
III	0	4	15	7	7	13	4	2	8	20	80
IV	0	4	10	26	7	3	6	2	2	21	81
V	0	5	8	13	19	8	7	8	8	6	82
TOTAL	0	15	36	56	43	27	21	26	33	64	321

*Statistics not tabulated for Group I.

Table V shows the length of time that first-time Malaria patients have served in Vietnam. Of the 321 patients tabulated, 30 per cent were in their ninth month or more of service and a like 30 per cent were in their fourth through sixth month. A trend can be observed within the table which indicates that recent admissions are patients who have served less months in country than those included in Groups I through III. Group I, though not tabulated was known to have a majority of "old timers". The 4th Inf Div has a steady flow of Malaria patients at this time and replacements are reporting regularly to the 25th Inf Div and the 1st Cav Div (Air).

TABLE VI

Patients with second, third, and fourth cases.*

	Length of time in Vietnam (months)										
Group	1	2	3	4	5	6	7	8	9	over 9	TOTAL
II	0	0	0	2	1	2	0	4	9	4	22
III	0	0	0	0	2	3	0	0	3	12	20
IV	0	0	0	1	0	2	5	5	2	4	19
V	0	0	0	2	6	2	2	3	0	3	18
TOTAL	0	0	0	5	9	9	7	12	14	23	79

*Statistics not tabulated for Group I.

Table VI shows the length of time that patients reporting prior treatment have served in Vietnam. Of the 79 patients tabulated, 43 per cent were serving in their ninth month or more and 80 per cent were in their sixth month or more. This 80 per cent is contrasted with a 53 per cent figure for the first-time patients and tend to point up that the longer one remains in Vietnam the greater are his chances of becoming ill with Malaria. A disturbing factor is present in this table also. Group V shows a distinct trend toward less time in theater for repeat cases of Malaria. It is noted that 55 per cent of this group were in their sixth month or less which compares to a 30 per cent figure for the four groups which were tabulated.

TABLE VII

Interval between attacks of Malaria by number of days.

Group	1-14	15-30	31-60	over 60	TOTAL
I	0	7	1	11	19
II	1	5	8*	8	22
III	3	1	3	13	20
IV	2	6	2	9	19
V	4	4	6	4	18
TOTAL	10	23	20	45	98**

*4 of these reported 32 and 33 days.

** Includes a number of mixed infections.

Table VII shows the time interval between attacks of Malaria as measured by the total number of days. This time interval was measured from the date of discharge from the hospital which treated the previous case of Malaria and the onset of symptoms leading to a confirmed diagnosis of Malaria. This study will not present a true relapse rate (treatment failure as evidenced by return of symptoms within 30 days) since a number of patients, particularly in Groups IV and V, were admitted to the 6th Medical Center (Conv) with an admitting diagnosis of Vivax Malaria, received treatment, returned to their organizations and a few days later became ill with Falciparum Malaria. It is felt that these patients had mixed Malaria from the beginning. They were included in the repeat group because re-hospitalization was necessary just as in the case of a re-infection. The 19.6 per cent repeat rate was consistent for all five groups and seems to be a valid figure on which to base future medical requirements unless a major change takes place in anti-Malaria control.

TABLE VIII

Use of Mosquito Nets.

	Has item in field	Consistently uses net
Mosquito Net, Bed	54	40
Mosquito Net, Head	43	16

Table VIII shows the response of Group V to the use of mosquito nets in the field. We had discussed this subject of mosquito nets and repellant with the four previous groups but did not tabulate our findings. It is felt that the statistics compiled for these 100 patients would correspond closely to the experiences of the preceding 400 individuals. The head net is most unpopular to use at night and many who are required to take the head net into the field do not actually use it. Reduced vision is the typical answer received as to why the net is not used. The Mosquito Net, Bed (bar) is used more often but still it is used by less than 50 per cent of the patients. Many feel that it is too bulky to carry on their pack, it catches on trees and bushes, tears and becomes non-effective, and, generally, fast-moving infantry do not like to take it on repeated sweeps. However, it was reported to us that several units are now required by higher headquarters to take and use the mosquito nets in the field.

TABLE IX

Use of repellant.

Times applied nightly							
one	two	three	four	five	six	seven	TOTAL
26	33	20	4	0	0	1	84

Number of bottles per week								
None	one-half	one	two	three	four	five	six	TOTAL
13	7	22	24	25	5	1	3	100

	YES	NO
Use regularly	84	16
Supply problems	17	83

Table IX shows that 84 of the 100 patients used repellant regularly. They applied the repellant from one to three times nightly, as required. Many applied it before going to sleep and then again when they went on guard. Two or three bottles weekly seemed to be the amount required. 83 reported no supply problems but 17 indicated that they had at times been completely out of repellant for several days at a time. The majority of the patients used repellant in fixed positions but a few felt that the odor could be detected by the enemy and thus was risky to use. Many agreed that the odor of the repellant was strong enough so that it was advisable not to use it in night assaults or night ambush. Long-range patrols seldom used repellant at night unless the mosquitoes were extremely thick. Several patients commented that the repellant now seems to contain more alcohol and is effective for a shorter period of time.

CONCLUSIONS:

1. Responsibility to actually pass out the Dapsone tablets to the individual is delegated to the Medic in some units and to the Squad leader in other units. There seems to be a trend, however, to remove the responsibility from the Medic and delegate it to the Platoon Sergeant and Squad leader. Supply problems seem to occur very infrequently.

2. Daily consumption of any tablet on a sustained basis will require strict supervision at squad and platoon level. Relying on the individual to take a daily tablet in the mess-hall or at meal time will not be effective.

3. Individual responsibility to faithfully follow a daily prophylaxis measure corresponds closely to rank and position.

4. Some units include a supply of Dapsone as a part of R and R processing but this is far from being 100 per cent.

5. The suppressive quality of Dapsone is repeatedly demonstrated by the number of patients who become ill shortly after returning from R and R. However, it cannot be considered that Dapsone, as now formulated, is effective for all individuals. Fatigue, weight loss, and lowered natural resistence often seem to be factors which permit a Malaria break-through.

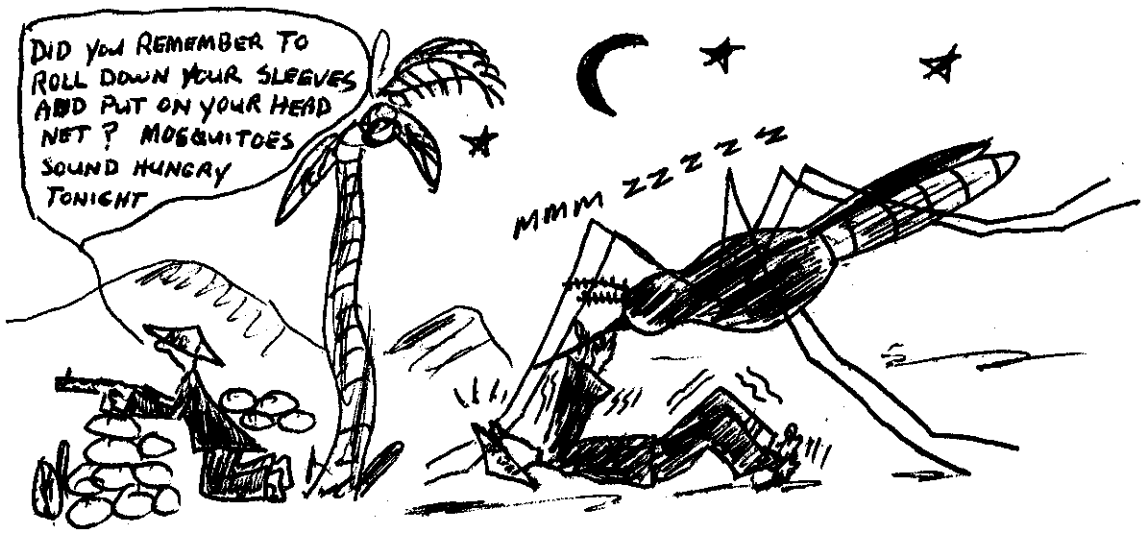
6. The majority of patients re-hospitalized because of reoccurring Malaria were re-infections rather than relapses.

7. The oversite of not providing Dapsone for patients in forward

Hospitals should be corrected.

8. First line defenses against Malaria, i.e., mosquito nets and repellant, are very unpopular with army troops. Many of our patients volunteered that nets are never used while on guard (which occurs at least once nightly for many men) and a majority of the infantry troops agreed that repellant is frequently not used on night patrol and on ambush operations. The Majority of the patients felt that the odor of the repellant was not a detection risk when in fixed position.

Appreciation is extended to Sp6 Donald McCardle and Sp5 Robert Harris who assisted with all aspects of this study.



"CHARLEY"

"DE FOX"

LABORATORY DIAGNOSIS OF MALARIA - OBSERVATIONS AND RECOMMENDATIONS

Major Duane G. Erickson MSC*

Since October 1966 the Parasitology Section of the 9th Medical Laboratory has been reviewing malaria blood smears accompanying malaria patients admitted to the 6th Convalescent Center from other U.S. Military hospitals in Vietnam. The first 300 of these slides reviewed have been used for base-line observations on the status of laboratory diagnosis of malaria in Vietnam, frequency of errors and sources of errors. This report describes these observations, with inferences therefrom, and provides recommendations to laboratory officers and technicians.

Materials and Methods:

All slides received had been stained at the hospital referring the patient to the 6th Convalescent Center. Each slide was first examined by one or more experienced technicians and then by the author. Because of the poor quality of staining and consequent abundance of artifacts in many slides, it was necessary to painstakingly examine these for periods of time far in excess of that normally expended. It was not unusual to spend two hours examining any one of the worst of these slides before being able to give a critical evaluation of the original diagnosis. Very few of the slides received included thick blood smears, and many of those which did were worthless because the technician failed to lyse the erythrocytes. Most of the slides received had been stained with Wright's stain. While fading after staining with Wright's stain is a problem at times, careful evaluation of this group of slides demonstrated that it was not the faded slides which we found to have no parasites, but rather, it was darkly stained slides containing numerous artifacts.

Observations:

Among the 300 admission slides reviewed, there were 42 (14%) false positives, ie. no parasites were present. Incorrect identification was made on 14 (4.6%) slides and infections by more than one species of malaria parasite were missed on 15 (4.6%) slides.

Table I summarizes the frequency of occurrence of various species of malaria in this sample. While Falciparum malaria represented 83.7% of the cases where only one species was present, it was also present in double and triple species infections in 17 cases. Thus, Plasmodium falciparum was present in 90.3% of the positive smears. Plasmodium vivax and Plasmodium malariae in single infections, or together, represented 9.7% (25) of the infections.

*Parasitology Consultant to the USARV Surgeon and Chief, Parasitology, 9th Medical Laboratory

TABLE I

Frequency of occurrence of species of malaria in 258 positive blood smears:

Plasmodium						
falciparum	vivax	malariae	falciparum & vivax	falciparum & malariae	vivax & malariae	falciparum & vivax & malariae
216 (83.7%)	23 (8.9%)	1 (0.4%)	14 (5.4%)	1 (0.4%)	1 (0.4%)	2 (0.8%)

Discussion:

Experience to date indicates that chloroquine is an effective suppressant for Plasmodium vivax and Plasmodium malariae infections; therefore, most of these 25 (9.7%) cases observed in this sample should not have occurred. From the standpoint of the Medical Service personnel, we can only continue to stress to commanders that these cases are preventable only if their individual attention insures that the weekly chloroquine-primaquine tablet is ingested by all personnel. Although we can not yet prevent infections with P. falciparum as easily as those with the other species, emphasis on individual protective measures will greatly reduce the number of cases occurring.

The observations made in this study indicate that a really significant reduction in the number of "cases" of malaria hospitalized can be attained by measures employed within the hospitals and dispensaries themselves. Our observation that 14% of the admission slides contained no parasites indicates the occurrence of misdiagnoses far in excess of acceptable technician error. The majority of the false positive reports were directly attributable to the use of Wright's stain rather than Giemsa. This was not because the Wright's stain had faded so that we were unable to see the parasites, but was the result of the erroneous identification of artifacts as parasites. Other sources of error observed were improper preparation of blood smears, failure to lyse erythrocytes in thick blood smears and the use of buffer containing protozoa and debris.

Wright's stain under ideal conditions gives a suitable preparation for examination for malaria parasites. However, as noted by Wintrobe, (1) Wright's staining procedure is subject to so many variables that even careful use sometimes yields unacceptable results. The concentration of the dye is continually changing due to oxidation in the presence of alkali remaining from its manufacture and evaporation of the alcohol solvent. The dilution of the stain and subsequent washing on the slides are too often accomplished carelessly. The Wright's-stained slides examined in this group frequently were stained very blue; the result of insufficient washing, too prolonged staining or too alkaline stain. (1) Other slides were very red because of an acid stain. A frequent artifact seen was the deposition of numerous red crystals and scum on the blood films due to instability of the stain and improper washing, respectively. Often the erythrocytes in Wright's-stained smears were "pock-marked" as a result of the presence of water in the stain during the fixation phase. In moist

climates such as that of Vietnam extreme care must be exercised to prevent the contamination of absolute alcohols with water. Stains containing these alcohols will absorb sufficient water from humid atmospheres to make a significant change in the dye content. Some of the critical azure dyes will precipitate out, producing a stain of inferior quality. (2) While this is certainly undesirable in the case of Giemsa stain, it is totally unacceptable with Wright's stain because this stain is used for fixation as well as staining. The presence of water in the fixation phase results in partial lysis of some of the red cells and produces a spotted or pock-marked appearance. These artifacts obscure or distort parasites and require that the smear be examined very slowly and painstakingly in order to assure that parasites are detected and accurately identified. Since Wright's stain is subject to so many variables contributing to inconsistent results, its use for malaria smears in Vietnam should be strongly discouraged.

In those rare instances where speed of diagnosis is essential, the following modification of Giemsa stain may be used to stain thick blood films after one hour's drying: (3) Giemsa stock stain 4 cc., acetone 3 cc., Giemsa buffer 33 cc.; stain 5-10 minutes, rinse in buffered water, allow to dry and examine. This technique avoids the loss of thick films usual with brief drying periods, but will not produce a stain with a quality equal to that of the routine Giemsa staining technique. The Hartman-Leddon standard item stock Giemsa stain (6505-153-9968) will produce excellent results if the directions supplied are followed closely. We have found that this stock stain will retain its staining quality for long periods after opening if extreme care is taken to prevent contamination by water. The bottle should always be kept tightly stoppered when not in use, and pipettes should never be put into the stock bottle. In addition, we store the stock bottle currently in use in a desiccator containing calcium chloride (anhydrous) or commercial desiccant. A suitable container for use as a desiccator is any jar which can be tightly closed to exclude moisture and which has a mouth large enough to allow convenient passage of the Giemsa bottle. An inch or more of anhydrous calcium chloride can be placed in the bottom of the container. When tightly closed, this will provide adequate protection against contamination of the stock Giemsa with water from the atmosphere.

The use of a methylene blue phosphate buffer pre-rinse for malaria thick films preserves cellular elements without interfering with dehemoglobinization. (2) After using this pre-rinse, thick smears can be stained with Giemsa in 10-15 minutes by doubling the concentration of the staining solution. The methylene blue phosphate buffer procedure is as follows: (2) methylene blue, medicinal (6505-261-7254) 1 gram, sodium phosphate dibasic anhydrous (6810-299-8153) 3 grams, potassium phosphate monobasic (6810-137-5000) 1 gram. Mix these in a dry container. One gram quantities are weighed out and placed in separate tightly stoppered vials. The contents of one vial are dissolved in 250-350 cc. of distilled water for use. To use: allow the thick film to dry in an area protected from dust and insects for 8-12 hours, then dip the thick film into this solution for <u>one second</u> (no longer!). Rinse the slide by dipping quickly 5-10 times into standard issue Giemsa buffer solution (6505-153-9968).

Replace this solution when it becomes markedly blue. Place the slide in the staining container with Giemsa solution prepared fresh just before use with the concentration of stain double that specified in the enclosed directions. Stain for 10-15 minutes. Dip briefly (about 1 minute) into Giemsa buffer solution to remove excess stain; drain and allow to dry. Examine with an oil-immersion objective lens. This simple procedure will give excellent results and produce slides which will retain vivid coloration for years. Each lot of Giemsa stain varies somewhat from others and adjustment of the staining time may be required depending on the results obtained.

The failure of many technicians to employ thick films for malaria diagnosis is difficult to comprehend. Examination of the specimen can be completed in about one-sixth the time required to examine a thin film. The thick film has been estimated to be 25 times better than the thin film for diagnosis. (2) Its use by all technicians engaged in laboratory diagnosis of malaria in Vietnam can not be encouraged too strongly. At times technicians fail to lyse the erythrocytes and thereby produce an unsuitable thick film. It must be remembered that any contact with alcohol (or even its vapors at times) will fix the red cells and result in failure to dehemoglobinize in the buffer solution. Alcohol used to cleanse the skin surface before making the puncture will fix the red cells if not removed or evaporated before making the puncture. If excessive heat is applied to hasten the drying of blood films, the erythrocytes will be fixed and fail to lyse. Preparation of good thick films is a simple procedure requiring only a little practice. Technicians failing to achieve suitable smears should examine every phase of their technique in order to discover the source of their trouble. If through inexperience, technicians have difficulty in identifying parasites on thick films, thin films can be made of the same specimen and can be used to determine species present based on the indications seen in the thick film. With increasing experience with thick films, they will need to refer to the thin films for identification only infrequently. A good general rule is not to consider anything a parasite that may be interpreted as an artifact. Thick smears should not be diagnosed as positive on what <u>appears to be</u> only one parasite. The parasite should be unmistakable or search should be continued until others are found. If this is impossible, later smears should be made. (4) Occasionally, thick films acquire a background blue color which is too intense for ease of examination. Rinsing these smears with distilled water (usually somewhat acid) will often result in a cleared background. A 1:1000 or weaker dilution of acetic acid may be used for this purpose also.

Thin films can be stained in the same solution as thick films, but must be fixed with absolute methanol before staining. They are not given the buffer pre-rinse. As with all absolute alcohols in humid climates, the methanol used for fixation must be carefully protected from exposure to the atmosphere. Methanol used for fixation in a Coplin jar should be replaced daily to preclude ruining thin smears with alcohol which has absorbed water from the atmosphere. After staining, thin films are dipped only momentarily in and out of the buffer rinse. Prolonging this rinse will obliterate the Schuffner's dots in cells infected with <u>P. vivax</u>.

Among the slides studied were many thin films in which the red cells were clumped together rather than being spread out individually; such slides required an excessive period of time for examination. Probably the commonest cause of these preparations is the failure to wash all microslides before use for malaria smears. Slides should be carefully washed in detergent, rinsed well, drained briefly, dipped in 95% alcohol and dried with a clean lintless cloth. Clean slides must be protected from dust prior to use. Attempting to make a thin smear using too large a drop of blood, improper thin-film smearing technique and failure to cleanse the skin surface well before making the puncture also produce unsuitable thin films for malaria diagnosis.

Many slides were difficult to examine because of debris deposited on the smears. As mentioned previously, much of this is attributable to the improper use of Wright's stain, but there are other sources as well. Dirty slides or staining glassware and improperly cleaned skin surfaces are examples of these. Another source of confusion was the presence of free-living protozoa in the buffer solution. These often stain so that they resemble malaria parasites and ars a possible source of erroneous diagnoses. Buffer solutions should be prepared fresh each week. Distilled water is ideal if available, if not, filtered chlorinated potable water which has been boiled to remove the chlorine can be used. Rain water or even river or pond water is usable if boiled first to kill protozoa which may be present and then filtered. Examination of a drop of buffer solution with a microscope using reduced illumination often will reveal contamination. Contaminated buffer must be discarded and the container thoroughly cleaned before re-use. Proper staining technique will eliminate most of the artifacts and useless preparations presently being erroneously identified as malaria parasites. The need for care in staining can not be over-emphasized. A somewhat slower staining procedure will provide rich compensation by requiring much less time for examination. Even more important, proper staining will greatly reduce the number of false positives and thereby make a significant contribution to conservation of personnel and medical facilities.

Our observations revealed that 4.6% of infections were incorrectly identified and 4.6% of multiple infections were not detected. The use of thick films in diagnosis will greatly reduce these errors by concentrating the parasites so that small numbers of parasites of species other than the predominating one in that infection are apparent. A frequent error was the failure to recognize P. falciparum infections concurrent with P. vivax. Since gametocytes of P. falciparum are infrequently found, one must learn to detect these infections by the characteristic ring forms. The presence of numerous small ring forms, multiple infections of a number of red cells, double nuclear chromatin ring forms, where both nuclei are round, and the presence of marginal parasites all are indicative of P. falciparum. The presence of three of these four characteristics together in a smear is sufficient to make the diagnosis of P. falciparum. Technicians must continue examination of the slide even after the identification of one species of parasite is made in order to ascertain whether other species are present. The failure to continue searching after identifying P. vivax

in a smear can be disastrous for the patient who has a concurrent infection with P. falciparum. It is good practice to scan thick and thin films with the high-dry objective lens either before, or after, making the examination with the oil-immersion objective. This procedure frequently will reveal P. falciparum gametocytes or P. vivax forms occurring in small numbers in a smear, even though routine search with the oil lens may have failed to disclose these forms. Scanning both margins and the thin end of thin films with the high-dry objective frequently reveals large parasite forms such gametocytes and schizonts, since these forms often appear to be concentrated in these areas.

It is extremely important that the slide used to diagnose a malaria case, and preferably an unstained smear taken at the same time, accompany the patient on transfer to another hospital. If the patient remains for his entire treatment in the hospital making the diagnosis, the slides should be sent for review by another facility such as the 9th Medical Laboratory. Only by means of such a review can errors be detected so that proper measures can be instituted for improvement.

Technicians requiring additional training in identification of malaria parasites can receive this experience by spending one week in the parasitology laboratory of the 9th Medical Laboratory. Arrangements for such training must be made well in advance of the proposed arrival time. In addition, the author, as Parasitology Consultant, is available for short visits to laboratories experiencing difficulties in staining or diagnosis. An SOP on submission of specimens to the 9th Medical Laboratory is available on request.

Summary:

Examination of 300 slides accompanying malaria patients admitted to the 6th Convalescent Center revealed 14% false positives, 4.6% with errors in identification and 4.6% with undetected multiple infections. Plasmodium falciparum was present in 90.3% of the cases. P. vivax and malariae alone, or together, represented 9.7% of the cases.

Sources of artifacts and error were discussed with the following recommendations for better staining and reduction of artifacts:

1. Do not use Wright's stain for malaria diagnosis.

2. Use Giemsa-stained thick films for diagnosis and thin films as a supplement for species identification, as necessary.

3. Protect malaria films from dust and insects during drying to minimize artifacts in smears.

4. Protect thick films from fixation by alcohol or heat so that dehemoglobinization can be accomplished in the buffer rinse.

5. Always use properly cleaned microslides for blood smears.

6. Cleanse the skin carefully and remove all traces of alcohol before making the puncture.

7. Protect alcohol used for fixation of thin smears and stock Giemsa stain to minimize absorption of water from the atmosphere.

8. Prepare Giemsa stain fresh just before use. Follow directions contained in the package with modification as described herein.

9. Prepare buffer fresh weekly. Examine microscopically for free-living protozoa.

10. Do not cease examining a slide before ascertaining whether more than one species of malaria is present.

11. Scan blood smears with the high-dry objective, either before or after, examination with the oil-immersion lens.

12. Do not consider anything a parasite which might be an artifact. Identification should be based on evaluation of the entire smear rather than on one apparent organism.

13. Send slides used to diagnose a malaria case to another facility for review.

References:

1. Wintrobe, M.M. Clinical Hematology. Lea and Febiger, Philadelphia. Fifth ed. 1186 pp.1961.

2. Lillie, R.D. Histopathologic Technic and Practical Histochemistry. The Blakiston Co. N.Y. 501 pp. 1954.

3. Walker, A.J. Manual for the Microcopic Diagnosis of Malaria. Pan American Health Organization Scientific Publ. No. 87. Ed.2. Wash., D.C. 118 pp. 1963.

4. Wilcox, Aimee. Manual for the Microscopical Diagnosis of Malaria in Man. U.S. Dept. of Health, Education and Welfare. Public Health Serv. Publ. No. 796. Wash., D.C. 80 pp. 1960.

LEPTOSPIROSIS IN SOUTH VIETNAM

George L. Allen, LTC, MC and David R. Weber, CPT, MC *

Leptospirosis was encountered by the British (2) in Malaya and the French (3) in Indochina but has not been previously diagnosed in United States troops in Vietnam. In a study of febrile illnesses in the Spring of 1966 done by Deller and Russel (1) at the 93d Evacuation Hospital no cases of leptospirosis were found. However, as a result of continued screening of undiagnoeed fevers at this hospital seven (7) cases of leptospirosis have been found during the past three months.

CASE REPORTS

Case #1. D.W.

19 year old infantryman admitted on 17 Sept 1966 with a two day history of chills, fever, lethargy and headache. He had recently been on jungle operations. Physical examination revealed conjunctival suffusion, scattered cervical nodes and some mild hepatic percussion tenderness. Headache, severe enough to require codeine for control, was a major complaint until the sixth hospital day. Tetracycline for a presumed diagnosis of scrub typhus was instituted on the fourth hospital day. He became afebrile on the fourth hospital day. Laboratory studies are summarized in Table #2.

Case #2. B.M.

22 year old infantryman admitted on 27 Sept 1966 with a three day history of fever, chills and backache and a one day history of severe headache, abdominal cramps, and diarrhea. He had recently been on jungle operations. Physical examination was not unremarkable except for some hepatic percussion tenderness. During hospitalization the patient continued to have nausea, some diarrhea, and a headache severe enough to require codsine for control. He received only supportive care. His fever persisted until the fifth hospital day, but once the fever disappeared he felt well and was discharged to full duty.

Case #3. J.W.

29 year old infantry officer was admitted on 27 Sept 1966 with a three day history of headache, fever, vomiting, abdominal cramps, and generalized muscular aching. He had been in the jungle. Physical examination revealed conjunctival suffusion and moderate abdominal tenderness with definite hepatic percussion tenderness. There was no rash or lymphadenopathy. Severe headache requiring codeine for control remained a complaint during hospitalization. Tetracycline was instituted on the fifth hospital day for the presumed diagnosis of scrub typhus. The patient became afebrile on the seventh hospital day, had an uneventful recovery, and returned to full duty.

*LTC Allen is Chief, Professional Services and Chief, Medical Service, 93rd Evac Hospital. CPT Weber is trained in internal medicine, is on the staff of the medical service, 93rd Evacuation Hospital, APO 96491.

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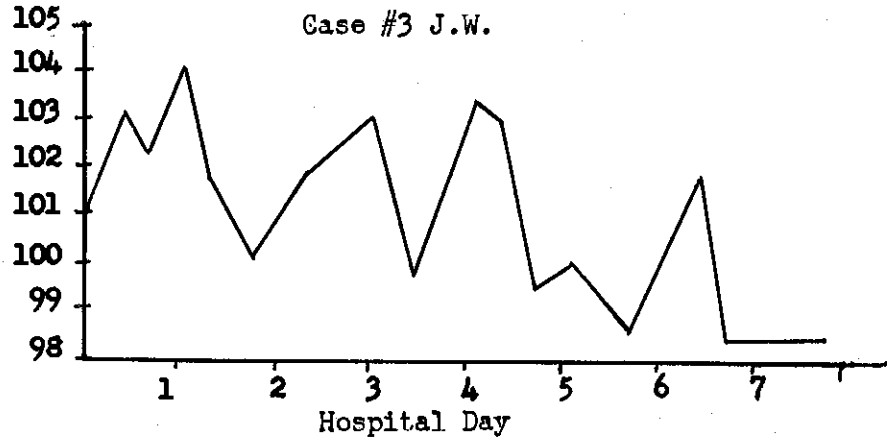

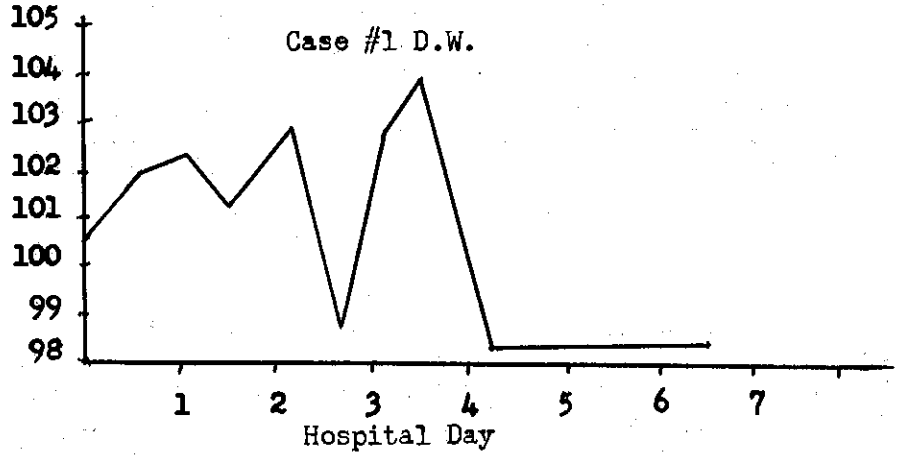

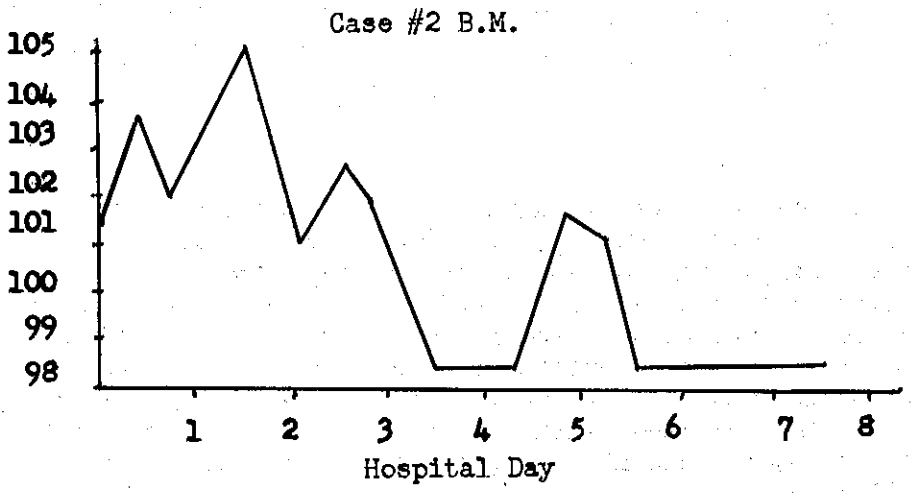

Case #4. D.S.

28 year old infantryman was admitted 9 Nov 1966 with a four day history of headache, fever, nausea, vomiting, non-productive cough, abdominal ache and diarrhea. He had recently returned from a jungle operation. Physical examination revealed conjunctival suffusion and generalized left upper quadrant abdominal tenderness. Severe headache requiring codeine for control was present during hospitalization. The patient was treated symptomatically; he became afebrile on the fourth hospital day and was discharged to full duty.

Case #5. A.C.

21 year old infantry officer was admitted on 18 Nov 1966 with a three day history of malaise, fever to 105 degrees, severe paroxysmal cough and myalgias. Abdominal cramps and nausea had been severe enough to prevent him from eating. Physical examination revealed marked conjunctival suffusion, scattered cervical lymphadenopathy, and generalized abdominal tenderness. Codeine was given throughout hospitalization for control of headache and cough. The initial chest X-ray revealed a questionable left hilar infiltrate but this was absent in a film done two days later. With only symptomatic treatment the patient became afebrile on the third hospital day and returned to full duty.

Case #6. A.R.

21 year old infantry man was admitted on 22 Nov 1966 with a five day history of headache, fever, cough and malaise. He had recently been in the jungle. Physical examination revealed only a few palatal petechae and some cervical and axillary lymphadenopathy. Headache continued to be a major complaint during hospitalization requiring large amounts of darvon for control. Tetracycline was instituted for the presumed diagnosis of scrub typhus. The patient became afebrile on the third hospital day and had an uneventful recovery.

Case #7. R.M.

23 year old infantryman was in the jungles and was admitted on 1 Dec 1966 with a four day history of fever to 104 degrees, backache, calf muscle myalgia and mild headache. Physical examination revealed marked conjunctival suffusion, hepatic percussion tenderness and some costovertebral angle tenderness. The patient had been started on tetracycline before admission and this was continued. He was given additional supportive treatment and became afebrile after admission and remained so. He had an uneventful convalescence.

CASE DISCUSSION

As noted in the above brief clinical descriptions and in Table #1 the patients all had fever, malaise, headache and abdominal distress in common which was usually associated with cramps or vomiting. The headache was frequently severe and one of the predominant symptoms. It was usually of such severity that codeine was required for relief. Diarrhea

was present in two cases and seemed to be part of the clinical picture. The presence of cough as a major symptom in three cases obscured the actual diagnosis and is not considered a common feature of leptospirosis. Generally myalgia is present as a distinctive feature and this was supported in our patients, being present in five cases. However, the myalgia was not of the severity usually reported. The fact that they had all been on recent jungle operations was important.

The physical findings most frequently encountered were conjunctival suffusion and hepatic percussion tenderness (Table #1). Other common findings included diffuse generalized abdominal tenderness and cervical lymphadenopathy. Other features were not frequent enough to be of any value in suggesting the diagnosis. Perhaps the palatal petechae in Case #6 may have represented a mild hemorrhagic manifestation that could be considered a clue to diagnosis. No rashes were seen.

The laboratory studies performed in these cases were not uniform except for a leukocyte count, differential, urinalysis, malaria smears, and serologic tests for leptospirosis (Table #2). The leukocyte count ranged from 4,600 to 14,850 with a mean of 10,300. A leukocytosis is usually present in leptospirosis and may have been present in the early stages of the disease three to four days prior to admission. The percentage of neutrophiles in the differential count ranged from 54% to 85%. It was over 70% in five of the cases. The remainder of the differential was unremarkable. The hematocrit and urinalysis were normal in each case. Despite all the malaria smears done none was positive. In the four cases in which a SGOT was performed only one was elevated to a mild degree (88 Units).

Diagnosis was established in each case by serologic methods. The first six cases proven by at least a four fold increase in the convalescent sera titer as compared with the acute serum titer by the leptospirosis hemolytic test. The seventh case was confirmed only by a serum test utilizing pooled antiserum. Not enough of this material was available for titers to be performed. Attempts at isolation of the organisms from urine or blood and attempts at culturing the organism on Fletcher's media were unsuccessful.

Leptospirosis as seen at the 93d Evacuation Hospital has been a benign, self-limited disease, most frequently confused with scrub typhus or dengue fever on a clinical basis. Malaria was considered a distinct possibility in all cases. The severe manifestations usually associated with leptospirosis by most physicians were not seen. Although fever was generally over 103° F. and frequently over 104° F. no distinctive pattern could be established. In total duration fever lasted six to nine days.

A benign form of leptospirosis is well known (4,5) but needs re-emphasis. This benign form has many names most common of which are Swamp Fever, Swineherd's Disease, Pseudo-dengue, Autumn Fever, Ft. Bragg Fever and Seven-day Fever. It has a favorable out come, a mild course and

a short duration of fever. There are less intense symptoms than the more serious forms and lacks the icteric, renal and hemorrhagic characteristic of Weil's Disease or Leptospiral Jaundice. Menningeal symptoms are found but were not present in our cases. Conjunctival suffusion was common and combined with a severe headache and hepatic percussion tenderness along with muscle myalgia were the most frequent clues to diagnosis. Other features may have been prominent in certain patients but were not constant enough to be reliable findings.

Though the true diagnosis was suspected in several cases during the acute illness no specific therapy was instituted since supportive is all that is required for benign leptospirosis. Although the development of serious complications is possible no real hepatorenal damage was encountered. This was supported by the few blood chemistry studies performed and the clinical course of ths patients.

The British in their Malayan military operations in the 1950's (2) encountered leptospirosis which was generally a self-limited febrile disease, although an occasional death occurred. The general clinical syndrome that was found was exactly as we have described. Hemorrhagic and icteric phenomen were uncommon. They found that some urinary abnormalities manifested by the appearance of proteinuria, cylinduria and an increase in cellular elements were common. Frequently encountered species were L. pyrogenes, L. hebdomodis, L. batavia, L. canicola, L. grippothyphosa, L. autumnalis, and L. celledoni. L. icterohemorrhagicae was present and along with L. australis B accounted for several fatalities.

In Malaya, patients acquired leptospirosis in a variety of environments but contracted it most frequently in the primary forests. The case incidence was proportional to the amount of time spent on jungle operations. Generally any illness characterized by headache, myalgia, conjunctival injection and gastrointestinal symptoms in the presence of urinary abnormalities warranted the diagnosis of leptospirosis until proven otherwise.

In Indochina the French (3) found that leptospirosis was endemic in the delta areas. Military operations in marshy zones and rice paddies had a high incidence of infection. It was also a serious problem in the French prisoners of the Viet-Minh. Many cases were found during the months of March and April at the end of the dry season. This was attributed to the fact that as the waters go down, leaving numerous pools with the warm mud and a shallow covering of water, it provided an environment highly favorable for the spirochetes. Nothing more than contact with the mud was needed for contracting leptospirosis. The French experience was essentially the same as the British concerning the species of leptospira causing disease.

SUMMARY

Seven cases of recently diagnosed leptospirosis at the 93d Evacuation Hospital are reported. These patiente presented with a clinical syndrome characteristic of the benign form of leptospirosis and recovered uneventfully within eight to twelve days. They had all

been on jungle operations and each was confirmed serologically.

The presence of leptospirosis in South Vietnam must be more common than presently reported. Alert physicians who look for the symptom complex of headache, myalgia, conjunctival suffusion and gastrointestinal complaints should be rewarded by making the clinical diagnosis with increasing frequency.

REFERENCES

1. Deller, J.W. and Russel, P.K.: Fevers of unknown origin in American soldiers in Vietnam. To be published.

2. Mc Crumb, F.R. et Al.: Leptospirosis in Malaya. Walter Reed Army Institute of Research, Publication 199-56, Dec. 1956.

3. Excerpts selected and translated from "Le Service De Sante En Indochine 1946-1954".

4. Strong, R. P.: Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases. 7th ed. 1945, Blakiston Co., Philadelphia, pg. 388.

5. Hunter, G.W., Frye, W.W., and Swartzwelder, J.C.: A Manual of Tropical Medicine, 4th ed. 1966, W.B. Saunders Co., Philadelphia, pg. 145.

TABLE I

Clinical Findings in Leptospirosis Patients

Case number	#1 D.W.	#2 B.M.	#3 J.W.	#4 D.S.	#5 A.C.	#6 A.R.	#7 R.M.
Headaches	+++	+++	+++	+++	++	+++	++
Gastroint. complaints	0	+++	++	++	+++	0	0
Diarrhea	0	+	0	+	0	0	0
Fever	104.2	104.8	104	102	105	102.4	104
Myalgia	?	0	++	+	+	+	+++
Backache	0	++	0	0	0	0	++
Cough	0	0	0	++	+++	++	0
Conjunctival suffusion	+++	0	+++	+++	+++	0	+++
Cervical adenopathy	+	0	0	0	+	+	0
Hepatic percussion tenderness	++	++	++	0	?	0	++
Palatal petechae	0	0	0	0	0	++	0

0 - Absent
\+ - Mild
++ - Moderate
+++ - Severe or Marked

TABLE # 2

Laboratory Studies on Leptospirosis Patients

Case number	#1 D.W.	#2 B.M.	#3 J.W.	#4 D.S.	#5 A.C.	#6 A.R.	#7 R.M.
WBC	11,200	10,300	11,300	14,850	9,400	7,900	4,600
Differential							
PMN	85%	81%	84%	71%	74%	63%	54%
L	8%	19	15	28	21	31	30
M	7%	-	-	1	2	3	1
E	-	-	1	-	2	3	13
Hematocrit	45%	44%	42%	44%	42%	47%	46%
Malaria smear	Neg. X 12	Neg. X 14	Neg. X 13	Neg. X 10	Neg. X 7	Neg. X 6	Neg. X 5
SGOT	-	44u	50u	-	-	88u	30u
Alk. Phos	-	-	-	-	-	Nor.	Nor.
BUN	-	-	-	15.5	-	-	-
SERUM TITER							
Acute	40	0	0	40	320	40	Positive (All four pooled sera)
Convalescent	2560	5120	2560	1280	5120	320	

* * *

The human differs from the ape
By murder, suicide, and rape.
A million years of erudition
Account for man's supreme position.

Harry Harlow

CLINICAL EXPERIENCE WITH MELIOIDOSIS

CPT David R. Weber, MC*

A discussion of melioidosis with brief clinical summaries from six patients treated at the 93rd Evacuation Hospital from the 25th Infantry Division appeared in Volume I Number 7 of the USARV Medical Bulletin. (1) Three additional cases of melioidosis, also diagnosed and treated at the 93rd Evacuation Hospital, will be described, and the approach to the therapy of the acute disease which has evolved at this hospital will be discussed. A detailed discussion of the clinical experiences with this disease is being prepared for publication elsewhere.

Cases #1 through #6 were summarized in the Oct-Dec 1966 USARV Medical Bulletin. (1) Case #1 represented the fulminating pneumonic form of the disease with death occurring 30 hours after admission. Therapy had been instituted with tetracycline and streptomycin. Cases #2 and #3 represented fulminating septicemic forms of the disease initially presenting with areas of cellulitis, lymphangitis, and lymphadenitis. Case #4 was confirmed and treated at another hospital. Case #5 presented as a primarily pulmonary disease but evidence of dessemination was present in the form of tonsilar pustules. Case #6 is an example of sub-acute pulmonary disease.

Three additional cases are described:

Case #7. P.L.

A 33 year old white male was admitted to the 93rd Evacuation Hospital, 27 September 1966, with a three-week history of chills, cough, and weight loss. Rales were present in the left upper lung field. X-Ray revealed the presence of a fibronodular infiltrate in the left upper lobe. Bacteriologic studies confirmed the presence of Pseudomonas psuedomallei.

The patient was treated with daily doses of 12 grams of chloramphenicol, and four grams each of kanamycin and novobiocin for 12 days then the kanamycin was discontinued and the dose of chloramphenicol and novobiocin was reduced by half. The patient showed marked improvement at the time of his evacuation from Vietnam.

Case #8. L.S.

A 44 year old Negro male was admitted to the 93rd Evacuation Hospital, 30 September, for the first time complaining of fever, chills, headache, and significant non-productive cough. Physical examination was essentially normal except for a temperature of 101 degrees. Chest X-Ray revealed a fibronodular infiltrate in the right upper lobe. Pseudomonas psuedomallei was cultured from the sputum. Chlaramphenicol, novobiocin, and kanamycin

* CPT Weber is trained in internal medicine, is on the staff of the Medical Service, 93rd Evacuation Hospital, APO 96491.

were instituted in divided daily doses of 8, 4 and 3 grams respectively. The patient experienced a rapid clinical improvement and his chest X-Ray showed definite improvement at the time of his transfer, 10 October 1966.

Case #9. E.R.

A 38 year old white male who entered the 93rd Evacuation Hospital 3 October 1966 describing a two-month history of cough, malaise, and weight loss. Physical examination revealed occasional rales in the right upper lung field. X-Ray revealed a fibronodular infiltrate in the right upper lobe. Pseudomonas pseudomallei was confirmed in the sputum.

Treatment was instituted with chloramphenicol, kanamycin and novobiocin in daily doses of 12, 4 and 4 grams respectively. The patient showed clinical and radiologic improvement at the time of his evacuation 10 October 1966.

In our experience it has been helpful to think of melioidosis as occurring in acute, subacute, and chronic forms. We have had no experience with the chronic form of the disease. The acute form is generally insidious in onset with malaise, moderately high fever, occasionally cellulitis, lymphangitis, arthritis, meningitis and frequently lobar pneumonia. Multiple small vesicular or pustular skin lesions generally appear as the disease progresses. (2) Certainly Cases #2 and #3 fit this classification. Although Case #1 died as a result of overwhelming pneumonia, his course had many of the characteristics of septicemia.

The subacute expression of the disease frequently presents as a febrile illness of pulmonary origin with a mildly productive cough occasionally associated with mild to moderate hemoptysis. The chest X-Ray may reveal a fibronodular infiltrate generally involving an upper lobe, frequently with cavitation. (4) Without treatment this form of the disease may progress or may become relatively asymptomatic after a mild illness then reappear later as chronic disease. (2) Case #6 and the three patients described in this report fit in the subacute category. Case #5 probably best fits in this category also, but he did have definite evidence of desseminated disease and one can only speculate on his clinical course without therapy.

Clinical variations in melioidosis coupled with the relative infrequency of its occurrence make evaluation of therapy difficult. The antibiotics most frequently recommended in the literature are chloramphenicol and tetracycline. In our own experience with the fulminating disease tetracycline even in relatively large doses has been disappointing. (Cases #1, #2, #3. Case #4 was treated with 1.5 to 2 grams daily at this hospital with little change in clinical course. He is reported to have responded well to larger doses.) Chloramphenicol in the generally recommended dose of 3 or 4 grams daily was also relatively ineffective in the acute fulminating infections (Cases #2, #3).

Pseudomonas pseudomallei was identified as the responsible organism in Case #2 shortly before the patients death. At the time the organism

was identified in Case #3 treatment was altered from the initially large doses of tetracycline (given because the patient was suspected of having a secondarily infected scrub typhus eschar) and penicillin to chloramphenicol kanamycin, and sulfadiazine according to sensitivities determined on Case #2 which proved identical to subsequent similar studies done on his own organism.

Early in the course of this treatment tube dilution studies were performed which revealed that 80% of organisms were inhibited by undiluted serum; however, no significant inhibition was present in serum dilutions of 1:2 or greater. For that reason the doses of all antibiotics were doubled, bringing the daily dose of Chloramphenicol to 8 grams, kanamycin to 3 grams, and sulfadiazine to 4 grams (Keflin was also being used because no sensitivity-testing material was then available; subsequently the organisms have been found to be resistant to this antibiotic.) In spite of this increase, the patient's condition continued to deteriorate.

Case #5 entered the hospital complaining of fever, lethargy, and cough. Physical examination revealed tonsilar pustules and left apical rales. A fibronodular infiltrate with cavitation was present in the left upper lobe. Antibiotic sensitivities on this patient's organism proved to be similar to those of the previous cases.

Several factors were considered when therapy for Case #5 was planned. In vitro studies suggested that chloramphenicol continued to be the most effective drug; kanamycin offered the theoretical advantage of a bacteriocidal drug; novobiocin looked quite promising in the laboratory and had not previously been available. Based on the serologic inhibition titers obtained on Case #3 massive antibiotic doses were felt to be indicated. Chloramphenicol was given by the intermittant intravenous method in doses of 3 grams every 6 hours. Novobiocin was given by a similar method in doses of 0.5 gram every 6 hours. One gram of kanamycin was given intramuscularly every 6 hours. On this program the patient quickly lost the clinical manifestations of disease and the X-Ray picture reverted to normal over a period of three weeks. The dangers of high doses of these antibiotics were recognized, but, based on our own previous experiences as well as the reported mortality and morbidity associated with the disease, these dangers were readily accepted. Our experiences with acute melioidosis have been frightening and have influenced an approach where the error, if any, is on the side of overtreatment rather than undertreatment.

Subsequent cases have been treated in a similar manner with excellent response. The dose of novobiocin has been increased in several while the kanamycin has been reduced more quickly, but the basic program is unchanged. Because of the dangers associated with relapses and chronic disease, it has been our recommendation that these patients be treated with oral chloramphenicol and novobiocin for several weeks after apparent clinical cure.

SUMMARY

Three additional cases of melioidosis diagnosed and treated at the 93rd Evacuation Hospital are described.

The program of therapy used in the acute and subacute form of the disease is discussed. Chloramphenicol, novobiocin and kanamycin in large doses have been effective in the patients treated.

ACKNOWLEDGEMENT

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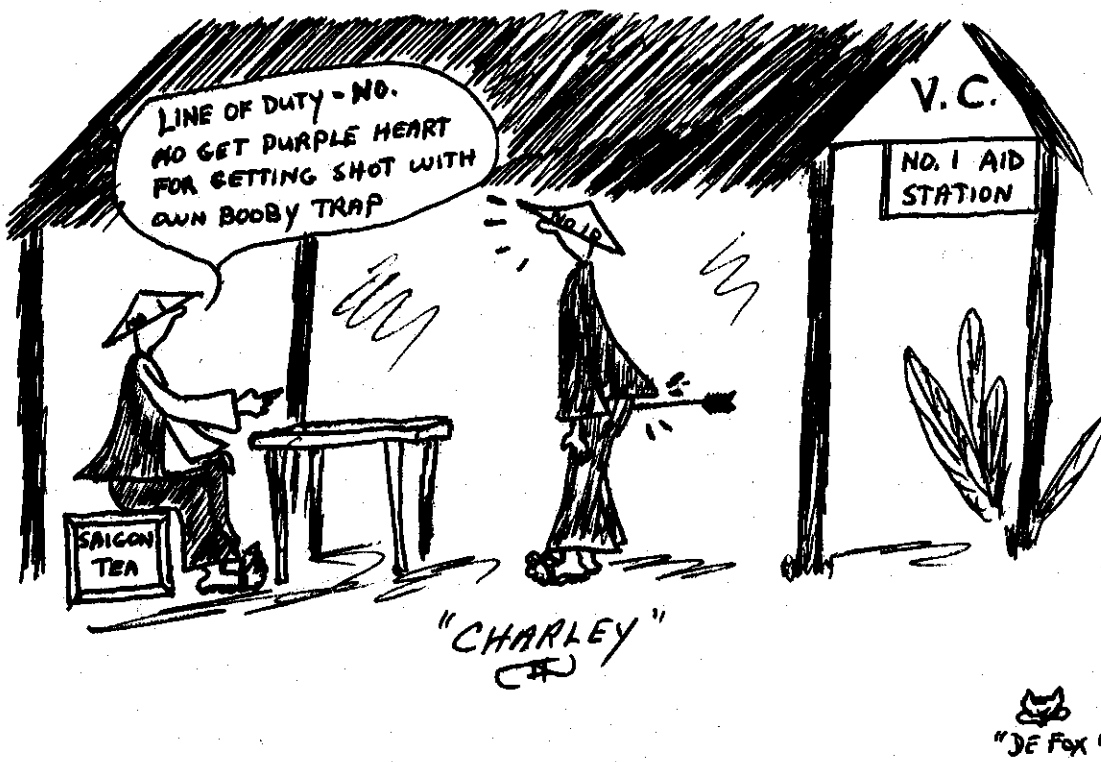
BIBLIOGRAPHY

(1) Chin, W.: Melioidosis. USARV Medical Bulletin, Vol 1, No 7, pp 13-19, Oct-Dec 1966.

(2) Fournier, J.: A Zoonosis Gaining Ground - Melioidosis. MED EGYPTE 9:23-45, Sept 1960.

(3) Prevatt, A.L. and Hunt, J.S.: Chronic Systemic Melioidosis; Review of literature and report of case, with note on visual disturbance due to chloramphenicol. Am J. Med 23:810-823, Nov 1957.

(4) Blohm, R.W.: Melioidosis - USARV Medical Newsletter, Vol 1, No. 6, pp 39-41.



PLAGUE IN VIETNAM*

Col Donald H. Hunter, MSC and LTC Harry G. Dangerfield, MC**

Plague has been recognized in the Republic of Vietnam since 1898. The first case described occurred in the City of Nha Trang. Three years later the disease appeared in Tonkin and finally in Cochinchina in 1906.

The pneumonic form of plague was reported in 1911 when 1018 cases with 886 deaths occurred. In Saigon-Cholon, 233 deaths were reported. A second small but intense outbreak occurred in Vinh Long in 1915. A third outbreak of pneumonic plague was reported in 1925 when a "very severe epidemic with a high mortality rate" occurred in the province of Chau Doc. A single person spread the disease to six families, in one neighborhood, during his two day incubation period and all members of these families died within 48 hours of the onset of symptoms. Plague has occurred sporadically in Vietnam since that time.

The present outbreak of plague appeared to start in Long Khanh Province with 8 cases in 1961. The number of cases and localities from which they have been reported increased gradually until 1965, when 4503 cases from 24 provinces were reported in the Republic of Vietnam.

Plague, primarily a disease of rodents, is spread to man by the bite of infected fleas. A multiplicity of factors are involved in the development of plague in man. Among these are: 1) susceptible versus resistant rodents, 2) species of fleas, 3) numbers of rodents, 4) numbers of fleas and 5) a susceptible human population. These variables are influenced in turn both qualitatively and quantitatively by such factors as 1) geographical and meteorological conditions, and 2) disruption of society by calamities whether occurring as a result of nature or man e.g., a) overcrowding, b) mechanisms for disposal of refuse and sewage, c) movements of refugees and d) collapse of safeguards in transporting material, particularly food.

Transmission of plague from rat to rat and from rat to man occurs almost exclusively by fleas; in Vietnam, xenopsylla cheopis (the rat flea) is the only significant vector recognized in the current outbreak. There is little if any valid evidence that transmission from man to flea to rat occurs. Four animals have been demonstrated to be significant reservoirs for plague in Vietnam - Rattus norvegicus, Rattus exulans, Rattus rattus and the common house shrew Suncus murinus. While sylvatic sources probably also exist, none have been demonstrated to date. The spread of plague throughout Vietnam during the past 5 years can be attributed, most probably, to movement of rodents and/or their fleas from place to place in shipments of supplies and food. The spread of plague from an infected animal depends upon that animal being septicemic. The mechanism by which the infection is transferred is as follows: While taking a blood meal from the infected animal, plague bacilli are ingested by the flea. The bacilli multiply in the proventriculus of the flea and often block it

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**LTC Dangerfield is Chief, United States Army Medical Research Team (WRAIR) Vietnam. Col Hunter is Chief, Plague Laboratory, USAMRT.

completely, thus preventing access of food to the stomach. In this condition the flea becomes and remains hungry. When the original host dies, the infected flea will leave it, and at the first suitable opportunity attach itself to a new host - either rat or man. Further attempts at feeding serve only to distend the esophagus which is either partially or completely obstructed with plague bacilli. On cessation of sucking, some of the plague contaminated blood is regurgitated into the wound, thus infecting the new host.

The length of time that a flea can remain infected depends primarily upon conditions of temperature, and humidity. For instance, survival is favored by temperatures around 10°C and a high humidity, approaching saturation. Adverse conditions are temperatures over 27°C and low humidity. The longest time reported for a flea to harbour P. pestis is 130 days. However, the time that fleas can remain infective for other hosts is much shorter. Most fleas harboring P. pestis die within a day or two but the period of infectivity is approximately 7-14 days.

Naturally acquired human infection with P. pestis occurs as a consequence of either the bite of an infected flea or exposure to another individual with plague pneumonia. The former condition may give rise to either bubonic or septicemic plague. The term bubonic refers to that infection in which the defense mechanisms of the host have been successful in localizing and limiting the disease to regional lymph nodes draining the site of local inoculation. However, in a significant percentage, approximately 50 percent, according to Pollitzer, these local defenses are overwhelmed and septicemia ensues.

The clinical manifestations of this form of the disease are variable. A benign form has been reported in which there is only mild swelling and moderate tenderness of the affected lymph node associated with low grade fever. In these instances the patient remains ambulatory and in all probability will not seek medical attention. In instances of more marked involvement, the primary bubo is enlarged, exquisitely painful and surrounded by a broad zone of edema. As the inflammatory response progresses suppuration and necrosis occurs. In two series comprised of observation of 25,600 cases of bubonic plague the anatomical location of bubos were: 1) Femoral-31%, 2) Inguinal-24%, 3) axillary 22%, 4) cervical 8%, 5) Miscellaneous 2% and 6) Multiple-13%.

In a significant number of cases, 50% according to Pollitzer, the local defenses in bubonic plague are inadequate and invasion of the blood stream, or bacteremia, ensues. When bacteremia progresses relentlessly, septicemic plague occurs. It should be emphasized that plague septicemia may occur in the absence of the bubonic phase of the disease. In this type of infection mortality rates in persons untreated or in whom treatment is delayed have been estimated as high as 90%.

As a consequence of septicemia, secondary foci of infection may develop such as meningitic and pneumonic. When pulmonary infection develops, the stage is set for explosive and devastating consequences. Pneumonic plague is the only instance in which this infection does not

require an intermediate host and is directly transmissible from man to man. Once this condition exists, the infection is highly contagious and mortality rates are virtually 100% in the absence of treatment.

The majority of plague infections have an abrupt onset with sudden appearance of fever, tachycardia, malaise and myalagia. Fever of 103-104F (39.5-40 C) usually occurs within the first several hours of illness and higher temperatures are not uncommon. Of grave import is the paucity of physical findings during the early phases of illness. It is axiomatic that a high index of suspicion must be held by physicians in known plague endemic foci and specific treatment with streptomycin, and either chloramphenicol or tetracycline must be initiated rapidly.

Chemotherapeutic agents which have been used with excellent results in the past for treatment of plague are the sulfonamides, streptomycin, chloramphenicol, Terramycin and Aureomycin. In vitro studies conducted at the Plague Laboratory, Institute Pasteur, Saigon during the past several years indicate that most strains of P. pestis in Vietnam are resistant to sulfonamides and that some (17 examined to date) have been resistant to streptomycin. No strains examined to date have demonstrated any resistance to chloramphenicol, Aureomycin, Terramycin or tetracycline.

PREVENTION

Efficient control measures directed against the flea vector and the rodent host have been shown to have an immediate effect on an outbreak of bubonic and septicemic plague. In contrast to these two types of plague, which are initiated in each case by the bite of an infected flea, pneumonic plague spreads directly from man to man via the respiratory tract, killing almost every person who develops the disease. Each outbreak of pneumonic plague stems from a bubonic or septicemic patient who develops secondary pneumonia during the course of his disease. Control measures effective against the flea and rodent reservoir, therefore, only indirectly influence the occurrence of plague pneumonia and are entirely inadequate to stop an epidemic of pneumonic disease.

Control of plague then evolves around four basic procedures:

(1) Control of the rodent reservoir.

This method if successful could be very effective, however past history would indicate relatively little hope for such a procedure except possibly in relatively restricted areas. Under current conditions existing in Vietnam, eradication of all existing rodent plague foci would be if not impossible, a truly herculean task. One must also keep in mind that death of infected rats forces the fleas to seek other suitable hosts, including man, and a transient rise in the number of plague cases may occur.

(2) Control of vector fleas.

Adequate and systematic application of an effective insecticide has been shown to provide good control of rat plague in endemic areas. There are numerous reports in the literature, since the advent of DDT, that very effective control of the flea vector and of human plague has often

been achieved in endemic areas by use of this agent alone. Reductions of over 95% in the cheopis flea index and complete eradication of rat and human plague have been reported.

Reports of flea resistance to DDT have become more frequent in recent years. Insecticide tests on fleas from Saigon rats have shown them to be resistant to DDT, and a field trial in the Ming Mang district of Saigon in 1965, using 10% DDT dust, failed to demonstrate any control of the Xenopsylla cheopis population infesting Rattus norvegicus.

Xenopsylla cheopis from Saigon and Nha Trang have been shown to be sensitive to Dieldrin, Diazinon, and Benzene Hexachloride (BHC) in laboratory tests. A 4% BHC dust is currently being field tested as part of a rat erradication trial in Saigon and information on its (BHC) efficacy should soon be available.

(3) Immunization

The history of plague vaccine is nearly as old as the science of bacteriology and during this time many kinds of vaccines have been prepared and used in one or another part of the world. It is not the purpose of this discussion to go into all details of these various vaccines or their relative merits but only to describe in general the merits and use of this tool as an adjunct to control of plague.

There can be little doubt that immunity to plague infection is produced primarily in response to injection of the envelope antigen of P. pestis, whether this is done by means of a live, avirulent, replicating vaccine capable of producing considerable quantities of this antigen in vivo or by use of dead plague bacilli containing maximum quantities of the same antigen. The degree of immunity produced in animals and man is related to the quantity and frequency of antigenic stimulation. This fact has been amply demonstrated by K. F. Meyer using killed plague vaccines. He concluded that appreciable resistance to infection can only be achieved after repeated injections have been administered. It can also be shown from the results of vaccine propylaxis in Madagascar in the 1930's where a living attenuated vaccine was used for control of plague. In this later instance, it was not until the vaccine program had been in use for several years, that a precipitous drop in plague cases occurred. A reduction in vaccine usage later resulted in a rise in cases which again declined on resumption of large scale vaccine usage.

There is little or no valid evidence to show that subcutaneous plague vaccination has any direct value in warding off pneumonic plague in man. There is, however, good evidence for its indirect value, in this case, by reducing the frequency and/or severity of bubonic manifestations and thus reducing the number of pneumonic complications which might otherwise occur.

(4) Case finding and Isolation of contacts.

The finding of cases and the isolation of contacts while of minor importance in bubonic plague, is of major significance in outbreaks of

pneumonic plague, in order to limit the respiratory transmission of disease from man to man. The system is simple in principle, however under the conditions of strife currently present in Vietnam may be extremely difficult to effect. In essence, such a program consists of two basic operations. 1) Any person who dies in an endemic plague region must not be buried until a qualified representative of the Health Services has viewed the body, taken samples for examination for Pasteurella pestis, and released the body either after examinations are negative or supervises the burial according to proper sanitary practices. 2) If plague is suspected or proven, all contacts of the patient must be collected and retained in some form of group isolation for a period of 10 days. Temperatures must be taken not less than twice daily and if fever develops, the subject is placed under strict isolation and therapeutic measures instituted immediately without waiting for laboratory confirmation.

Two known outbreaks of pneumonic plague have occurred within the past 14 months in Vietnam. One in Long Khanh province involved 6 family members, 5 of whom died. The other occurred in Binh Dinh province and consisted of 37 cases with 15 deaths. In this second outbreak the six contacts of the initial case all died. In each instance the primary case died after a short illness characterized by a history of cough, fever and bloody sputum. The first contact deaths occurred 3 and 5 days respectively following death of the primary case and demonstrates the necessity for immediate action on the part of medical authorities if control of this disease is to be achieved.

In conclusion, then, one can say that treatment with effective antibiotics and application of potent insecticides makes flea-borne plague a normally curable and controllable disease. When pneumonic plague occurs, the essentials of an adequate control program are (1) case finding and isolation of contacts, (2) immediate treatment with specific antibiotics of contacts who develop signs and symptoms of plague infection, (3) annual immunization of the population at risk, and (4) extensive arthropod control with effective insecticides.

REFERENCES

1. Pollitzer, R.: Plague, pp. 11-619. World Health Organization, Geneva, 1954.

2. Annual Progress Report, USA Medical Research Team (WRAIR) Vietnam and Institute Pasteur of Vietnam, 1 Oct 1964 to 31 Aug 1965, pp 3-37.

3. Annual Progress Report, USA Medical Research Team (WRAIR) Vietnam and Institute Pasteur of Vietnam, 1 Sept 1965 - 31 Aug 1966, pp 29-62.

THE PROVINCIAL HEALTH ASSISTANCE PROGRAM IN THE REPUBLIC OF VIETNAM *

Colonel William H. Moncrief, Jr., Medical Corps, U. S. Army**

INTRODUCTION

The Provincial Health Assistance Program (PHAP) is a multinational assistance effort aimed at two objectives: to give direct medical and health care to Vietnamese civilians and to work with Vietnamese medical and health personnel to augment, develop and expand the Vietnamese capabilities in clinical health care.

Evolving from a program that initially included 24 doctors, nurses and technicians deployed to three sites, the program today has over 700 doctors, nurses, technicians and administrative personnel making up 44 teams in 41 provinces and Saigon, DaNang and Vung Tau autonomous cities. These teams in augmenting the Vietnamese medical capability in the provincial/prefectural health services will help bring medical care to an estimated 2.5 million out-patients and 300,000 in-patients this year. The financial input for support of this program for the U.S. FY67 is US$36,000,000 and the GVN proposed budget for FY67 is VN$1,500,000,000.

BACKGROUND

The basis of medical care for the greater majority of the some 16,500,000 people of the Republic of Vietnam is the Rural Health program made up of the village and hamlet health programs, district health services and the provincial hospital. These echelons of medical care were established by the French and Vietnamese administrations over the years by the grafting onto traditional concepts and ways of western medical practices. Formalized in 1956 by a Government of Vietnam (GVN) decree, the provincial health services came to make up a major program of the GVN Ministry of Health (MOH). The typical provincial health service operates a 250 bed hospital and supervises five district infirmary-maternities and 70 village health stations.

It was early recognized that the Vietnamese government, stressed by internal divisiveness and later external aggressions, would require assistance in developing its programs of nation-building. This assistance was made available by the United States in the United States Agency for International Development Mission to Vietnam (USAID) formerly the United States Operations Mission (USOM). Included in the USAID organization is a counterpart to the GVN Ministry of Health, the USAID Public Health Division. Recognizing the broad requirements for expanding the limited Vietnamese medical capability to cope with the current wide-spread disease conditions and also to develop and enlarge upon the basic health facilities

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**Deputy Assistant Director for Public Health/Operations, Training and Special Projects, United States Agency for International Development, Vietnam.

of Vietnam, USAID/PHD from the beginning emphasized four broad programs: two of these programs were directed at improving the basic education for professional health personnel; the third pointed to the upgrading of existing personnel and the development of an extensive program to serve the rural population; the fourth was a widespread campaign to eradicate malaria.

The educational programs, medical, nursing and mid-wifery, and the malaria eradication, while of great significance and constantly growing will not be commented on at any length in this presentation. It is the upgrading of existing health personnel and the development of a program to serve the rural population that concerns us here.

In the development of the health services USAID/PHD soon came to recognize the requirement for expanded support of the province hospitals, particularly in those provinces where the civilian populace was experiencing casualties from the insurgency. The support for selected province hospitals took the form of a surgical team consisting of a surgeon, an assistant surgeon, an operating room nurse, a surgical ward nurse, a nurse anesthesist and a laboratory/x-ray technician. The first such team was committed to the town of Can Tho in the summer of 1962, and soon after this teams were established in Nha Trang and Da Nang. The fourth team programmed under this concept, to be deployed to Pleiku was used to support the first three teams who experienced high personnel attrition rates due to a variety of factors. Complementing the U.S. effort in support of certain provincial hospitals the first of the Free World Assistance teams was deployed to Qui Nhon in the summer of 1963. This team, from New Zealand, was configured much the same as the U.S. teams already in-country.

With the concept of the surgical teams, there was also conceived a plan for the construction of a standard surgical suite adjacent to the province hospitals to support a program of modern surgical treatment. This surgical suite, of which twenty-six were finally built ending in 1963, consisted of two operating rooms, a central supply and a four-bed recovery ward. This concept of surgical team/surgical suite called for a significant contribution by the Vietnamese medical community in the carrying out of the program. This requirement was particularly demanding in the nursing care areas. The Vietnamese did not, and for the most part could not meet this obligation. Thus, as a consequence of personnel, logistic and coordination deficiencies, the original concept of the provincial surgical teams was reduced in 1965 to two teams, Nha Trang and Da Nang. The team at Can Tho was replaced by an Air Force surgical unit and the Navy deployed a similar unit into Rach Gia. Both of these military surgical capabilities were added to the USAID/PHD effort by the Department of Defense at the request of the State Department.

Continuing to recognize the need for further development and expansion of the medical capability at the provincial level, the United States committed even more military medical resources to the USAID program. In May 1965 the Office of the Secretary of Defense of the U.S. Government directed the military departments to develop a program for increasing the medical posture of the RVN by utilizing U.S. military Medical teams in RVN.

A detailed plan was developed for the purpose of providing expanded health and medical service for the civilian populace, developed jointly by USAID and the Military Assistance Command-Vietnam (MACV), which became known as the Military Provincial Hospital Assistance Program (MILPHAP). Composed of three medical officers, one medical administrative officer and twelve enlisted technicians (one medical records clerk, one laboratory technician and ten medical technicians) the teams are based in provincial hospitals and work for the province medecin chef. The first six MILPHAP teams were deployed to RVN in November 1965 and in early 1966 the decision was made to deploy an additional fifteen teams.

There has been a continuing build-up of the Free World Medical Assistance Teams. Australia followed New Zealand in 1964 and soon after the Republic of the Philippines. Teams continued to be added in 1965 and 1966. A total of eighteen teams from eleven nations make up the Free World medical contribution to the PHAP as of this moment.

CURRENT PROGRAM

Today the personnel strength of the U.S./FWA medical programs totals 703, with 182 doctors. These professional and technical people are working with the Vietnamese and for the province medicin chef. The initial concept of concentrating on the strengthening of the hospital program has been expanded to include the entire spectrum of the provincial health program. This deletion of emphasis on any one area of the provincial health service was brought about by several factors, the first and foremost being that of demand. Not only were the provincial hospitals in need of augmentation but the district health centers, where by far the large number of outpatients are seen, were desperately in need of help. Because of minimum personnel, and even absence of personnel in many instances, in the district facility many Vietnamese were being denied even the most basic of medical care. The lack of transportation, security, and the distances involved isolated most from the provincial Hospital.

Another reason for expanding the utilization of the teams was that in more than one instance the deployment of a sixteen man team to the province hospital completely overshadowed, if not overwhelmed, the small hospital staff present. Because one of the objectives of the program is to augment and strengthen the Vietnamese medical capabilities it is important that the care rendered in the hospital is recognized as a Vietnamese one. This can not be done if the Vietnamese medical personnel are in such a minority that any medical care offered is obviously a U.S. or Free World one. In order to prevent this a section (one medical officer and three or four enlisted men) would be deployed to a district health facility. In other provinces because the province hospital had already been augmented by a small, highly specialized medical/surgical team the MILPHAP team was initially deployed to those districts with larger facilities and more people, thus furnishing a more capable referral program to the province hospital.

It is to be emphasized that the deployment of a MILPHAP to a fixed permanent facility other than a hospital is not MEDCAP. At the district

infirmary-dispensary the medical team augments or substitutes for a definite medical staff, performs consistently over a period of time in one facility, has available a greater capability for treatment and a formal evacuation system recognized by the province medecin chef. In many instances inpatients are cared for if their length of hospitalization is expected to be limited. MEDCAP is a mobile program, strictly oriented to outpatient, and frequently one-time treatment. MEDCAP is basically a psychological warfare program, under the technical supervision of the medical officer and carried primarily by the enlisted technician. MEDCAP and MILPHAP are complimentary, not a substitute for one another.

The PHAP concept has been further strengthened and made more versatile under the current program by the decision to augment the PHAP with USAID General Duty Nurses (GDNs). Predominately assigned to provincial health services where MILPHAP teams are deployed the USAID GDN program calls for nurses to assist the province medecin chef and his chief nurse in improving the standards and quality of nursing by giving direct care to patients, working with and through their Vietnamese counterparts. The USAID GDN program is mainly aimed at the hospital portion of the provincial health service, but in some areas the nurses have established a program of assistance, training and supervision that extends to the district facility. A total of 105 general duty nurses will eventually complete this program; 62 are currently assigned.

But adding personnel to the provincial health program proved to be only part of the answer to the continuing problem of bringing more and better medical service to the Vietnamese civilian population. Another large part of the answer is facilities in which these people could work in order to exploit their talents.

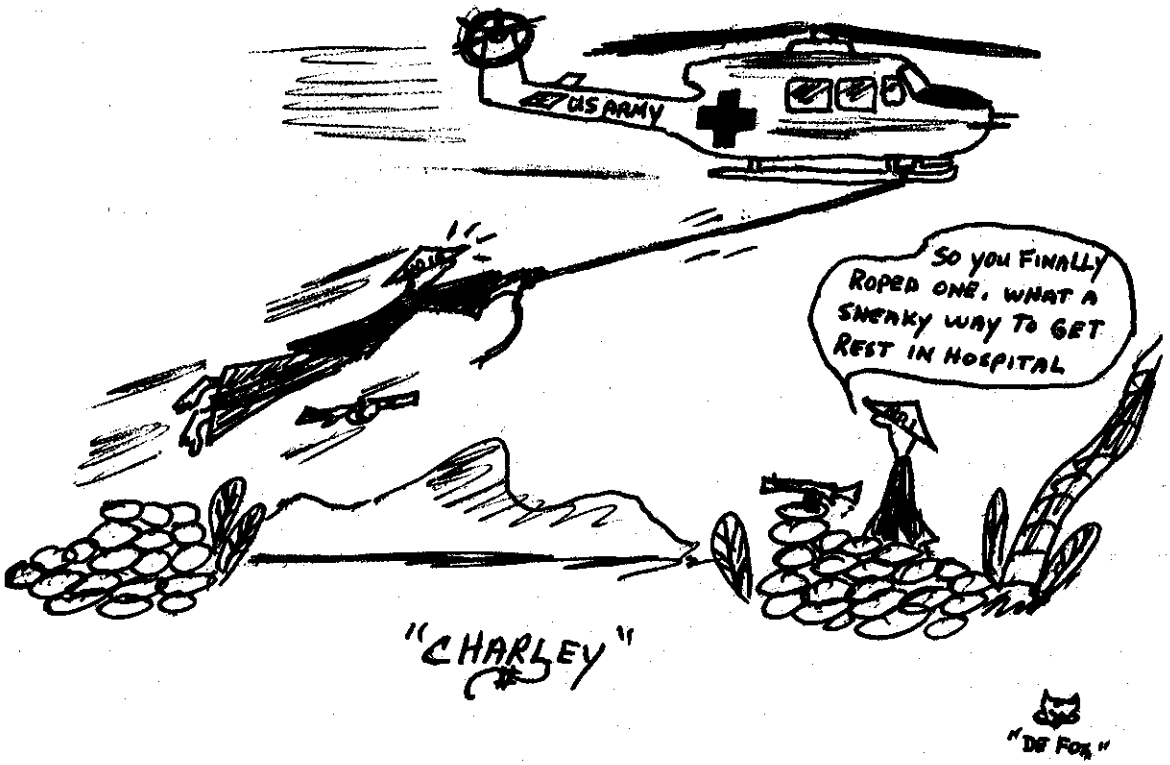
Most of the facilities in the provincial health system when USAID began its program were old and in serious disrepair. This was recognized in the building of the 26 surgical suites mentioned earlier. This updating of facilities continues in three active programs. The oldest one is the major renovation/rehabilitation of selected, larger provincial hospitals. There are a total of eleven hospitals in this program which is now some 85% complete. The last hospital in this program is the Darlac provincial hospital on which work will start soon after the new year.

The second is another hospital program. There is an immediate need for a complete hospital at some nine sites where U.S. and FWA medical teams are located or will be located. Currently working in what were formerly district maternity-infirmary-dispensaries the professional capacity of these teams is not being sufficiently exploited. There is sufficient population in these areas to demand siting a complete Hospital. In coordination with the Ministry of Health some eight complete hospitals will be built, hopefully by the third quarter of 1967, at Bong Son (Binh Dinh), Hau Bon (Phu Bon), Gia Nghia (Quang Duc), Bao Loc (Lam Dong), Ham Tan (Binh Tuy), Song Be (Phuoc Long), Cao Lanh (Kien Phong) and Vi Thanh (Chuong Thien). A 'core' complex of operating rooms, central supply recovery room and laboratory/x-ray will be added to the Chau Phu (Chau Duc) hospital under this program.

The third program of updating the facilities is a locally controlled one. By locally controlled it is meant that the monies to fund such a program have been allocated to each of the four regions, under the control of the USAID Region Chief Health Officer. This fund is used to carry out small modifications and renovations/rehabilitations that are within the capabilities of local contractors to carry out. A project under this program would be re-roofing or rehabilitating plumbing and sewage. Some of these local projects are considerable in extent depending on the contractors capability. The only control the Assistant Director for Public Health exercises over this program is one of guidance and coordination to insure that locally the PHAP team is not attempting a project that is programmed at the national level.

FUTURE PROGRAM

Ideally the objective of the PHAP is to have augmentation of every provincial health program. Realization of this objective is currently being frustrated by lack of facilities in a few provinces and less than ideal political climate in even fewer. Hopefully the PHAP can be extended to every province by 1968. This will require the deployment of possibly as many as six additional U.S./FWA medical teams.



THE JOB OF THE BATTALION SURGEON: HOW HE FUNCTIONS IN VIETNAM

CPT Richard P. Goldstein, MC*

There are times when the Battalion Surgeon in Vietnam must feel that his main duty is to read novels to pass the time. Certainly at times he has a great deal of free time. As I look back on the past eighteen months, however, I realize what protean duties are performed by the Battalion Surgeon. Perhaps my particular situation was unique because I was assigned to an infantry battalion that trained basic trainees, raw recruits, while in the states. The battalion went on to train these men in advanced infantry training, was alerted for overseas duty, and moved as a unit to Vietnam where it was involved in vigorous combat. Hence I was able to see a unit through the entire range of development, and at the same time was called upon to perform many functions in the battalion.

Just what jobs does the Battalion Surgeon perform? He actually wears three hats. He is the medical platoon leader, he is a special staff member who is advisor to the Battalion Commander on matters of health, and he is the physician to all the men of the battalion.

Perhaps the most personally rewarding task is that of the medical platoon leader. Although different units have varying numbers of men and equipment, the infantry battalion medical platoon has over thirty enlisted men as well as a Medical Service Corps lieutenant who is the assistant to the Battalion Surgeon. The enlisted men have a medical background ranging from exposure to the 10 weeks medical training program at Ft. Sam Houston to the E-6 medical specialist with more than a year of hospital training. It falls upon the Battalion Surgeon to keep up a continuous program of instruction for his medics in reviewing first aid, sanitation, malaria prevention and related subjects. Working with these men, understanding their problems and frustrations, and generally living with them from day to day is what sticks with one.

The task of being an advisor to the Battalion Commander is demanding and yet gives one the opportunity to observe the great demands placed on command with its many responsibilities. The responsibility of the Battalion Commander for the lives of nearly 800 men is an awesome burden at times and the Battalion Surgeon can be a tremendous help by offering timely and helpful advice. This entails keeping the commander informed on infectious disease among the men, especially malaria and the preventive measures that can be taken. Combat fatigue, field sanitation, personal hygiene, and foot care are important and must be watched constantly by the Battalion Surgeon and his medics. Keeping a step ahead and keeping the Battalion Commander informed is a prime responsibility. To accomplish this the Surgeon must keep abreast of the mission of the Battalion. This means attending the numerous staff meetings and having an understanding of military terminology as well as the duties and responsibilities of the various staff members and company officers.

*Formerly, Battalion Surgeon, 5th Bn, 7th CAV, 1st CAV Div; now at the 15th Med Bn, 1st CAV Div (AM).

The third function of the Battalion Surgeon, that of physician to the battalion, is perhaps the most important. Daily sick call need not be boring for there is sufficient challenge even if a great deal of the medicine is perhaps psychophysiologic. Malingering, which was an obvious problem in the states, appeared to be reduced in Vietnam. Although one is generally dealing with a healthy population, there is still a suprising amount of interesting pathology. Keeping immunizations current in the battalion is a continuing problem to be watched by the Surgeon. Also time and again one is impressed by the paucity of knowledge about veneral disease among the troops. Periodic lectures to the men stressing basic knowledge of these diseases has been most rewarding in terms of allayed fears and better treatment where needed.

So these briefly are the duties of the Battalion Surgeon. What about the actual living with the Battalion in Vietnam? Being away from home and loved ones for a year is not the most pleasant thing but there is no doubt that much is gained through the comradship of living closely with other men. Seeing a different part of the world, with people having quite different customs and ideas from oneself is certainly broadening, even if it is hard to like or condone much of what is seen.

In this respect, much is learned through medical civic action activities which mainly consists of sick call in Vietnamese and Montagnard Villages. Unfortunately I was not able to participate in this to any great extent due to tactical situations, but this obviously is where the effort to win the hearts of the people should be directed.

Lastly, I would like to comment on the role of the Battalion Surgeon in the combat situation. Obviously the Battalion Surgeon is often by-passed in medical channels with the advent of helicopter medical evacuation; rarely is he in a position that makes it possible for him to render aid to the combat wounded soldier. This is done much better at the medical battalion clearing station. So what is his primary function in combat? It is to be the preventive medicine officer to the battalion, not only with regard to the physical conditions encountered but also with regard to emotional conditions and morale. This is primarily a staff function involving his role as advisor to the battalion commander in all matters of medical liaison and health. Occasionally it will happen that the surgeon will be in just the right place at the right time and be able to perform life saving procedures but this is the exception rather than the rule.

All in all, the Battalion Surgeon is presented with opportunities that are extremely rewarding. It is a job that requires much more than medical knowledge; it requires a real interest in the Army and the men of the battalion.

REFERENCE LIST OF CONSULTANTS TO THE SURGEON, US ARMY, VIETNAM

SPECIALTY	NAME, GRADE, SVCNR	MOS	DEROS	LOCATION	TEL EXCHANGE	TEL NR
ANESTHESIOLOGY	HOLLIS E. BIVENS MAJ, 091162, MC	C3115	SEP 67	45TH MASH HOSP	TAY NINH Landlord	2 Rings
AVIATION	JOHN W. HAMMETT LTC, 073070, MSC	62162	APR 67	44TH MED BDE	LYNX	893
AVIATION MEDICINE	ANTHONY A. BEZREH MAJ, 089724, MC	C3160	JAN 68	1ST AVN BDE	ARMY	518
DERMATOLOGY	LOUIS E. HARMAN LTC, 062916, MC	B3112	FEB 67	93RD EVAC HOSP	LONG BINH	136
DIETETIC	PATRICIA ACCOUNTIUS MAJ, 10158, AMSC	3420	MAY 67	44TH MED BDE	LYNX	893
EAR, NOSE AND THROAT (ENT)	ALBERT C. DONOHOO LTC, 069905, MC	B3126	JUN 67	85TH EVAC HOSP	QUI NHON	667
ENTOMOLOGY	THEODORE E. BLAKESLEE LTC, 056970, MSC	B3315	MAY 67	9TH MED LAB	LYNX ARVN	665 60394
HEMATOLOGY	ALLEN GOODMAN CPT, 05234019, MC	D3325	JUN 67	3RD FLD HOSP	LYNX	700
MEDICINE	RAYMOND W. BLOHM, JR COL, 057559, MC	A3139	JUN 67	HQ, USARV	ARMY	699
NEUROLOGY	ARNOLD W. JOHNSON LTC, 062920, MC	B3129 C3128	AUG 67	HQ, USARV	ARMY	698
NEUROSURGERY	RICHARD D. HAMILTON LTC, 065681, MC	B3131	OCT 67	3RD FLD HOSP	LYNX	709
OBSTETRICS AND GYNECOLOGY(OB-GYN)	ROBERT W. IRWIN, JR LTC, 059555, MC	B3108	MAY 67	61ST MED BN	CAM RANH BAY	363/368

SPECIALTY	NAME, GRADE, SVC NR	MOS	DEROS	LOCATION	TEL EXCHANGE	TEL NR
OPHTHALMOLOGY	STANLEY GALAS MAJ, 088068, MC	B3125	MAR 67	67TH EVAC HOSP	QUI NHON	420
ORTHOPEDICS	ROBERT HALL LTC, 070358, MC	B3153	APR 67	8TH FLD HOSP	NHA TRANG	3211
PATHOLOGY	EDMUND R. KIELMAN COL, 085428, MC	B3225	NOV 67	HQ, USARV	ARMY	698
PARASITOLOGY	DUANE G. ERICKSON MAJ, 075352, MSC	D3310	MAY 67	9TH MED LAB	LYNX	665
PHYSICAL THERAPY	BARBARA D. GRAY MAJ, N 10168, AMSC	3418	MAR 67	17TH FLD HOSP	ARVN EXT	60042
VETERINARY	HERBERT FAUST COL, 052036, VC	3203	APR 67	44TH MED BDE	LYNX	892
PLASTIC SURGERY	JAMES F. PETERSON MAJ, 082874, MC	C3125	JUN 67	3RD FLD HOSP	LYNX	709
PREVENTIVE MEDICINE	RAYMOND W. BLOHM, JR. COL, 057559, MC	A3139	JUN 67	HQ, USARV	ARMY	699
PSYCHIATRY	ARNOLD W. JOHNSON LTC, 062920, MC	B3129	AUG 67	HQ, USARV	ARMY	698
RADIOLOGY	JOHN R. CONNOLLY LTC, 071657, MC	B3306	AUG 67	24TH EVAC HOSP	LONG BINH	312
SANITARY ENGINEERING	DAVID W DUTTWEILER LTC, 065498, MSC	B7960	JAN 68	HQ, USARV	ARMY	698
SOCIAL WORK	RICHARD R. MURRAY LTC, 13 8168	B3606	JUN 67	6TH CONV CTR	CAM RANH BAY	285
SURGERY	ALPHONSE GOMEZ LTC, 069493, MC	B3150 B3151	JUL 67	HQ, USARV	ARMY	698
UROLOGY	IVAN J. WEINER CPT, 05234051, MC	C311	MAR 67	17TH FLD HOSP	ARVN	60042

SHOULDER SLEEVE INSIGNIA
FORTY-FOURTH MEDICAL BRIGADE

NEW HOSPITALS

The 44th Medical Brigade has continued its growth as during the past three months three new hospitals have become operational. The 45th Surgical Hospital arrived from Fort Sam Houston, on 15 September. Equipped with the new MUST Components the 45th Surgical became operational in record time, receiving its first patients on 13 November. The unit, located at Tay Ninh, has been busy since the day it opened, receiving patients and VIPS.

On 19 December the 12th Evacuation Hospital opened its doors at Cu Chi. Having come from Fort Ord in April this unit had the arduous task of constructing their own hospital with Engineer supervision. They are justifiably proud of their accomplishments.

In similar fashion the 24th Evacuation Hospital constructed their facility at Long Binh. After arriving in July from Fort Sam Houston the 24th Evac became operational on 9 January.

Meanwhile the 71st and 91st Evacuation Hospitals arrived on 15 November and 19 December respectively, the former going to Pleiku and the latter to Tuy Hoa. Both of these hospitals are busily engaged in an all-out self help construction effort, anxious to become operational as soon as possible. The 71st came from Fort Campbell and the 91st from Fort Polk.

Welcome to RVN and best wishes to each for the future.

The Seventeenth Field Hospital, Saigon

This hospital was operated by the US Navy from October 1962 until 1 April 1966 when it was placed under operational control of the US Army.

New Arrivals In Country

Name	Grade	Branch	Arrived	Assigned
Jaggers, J. N.	LTC	DC	27 Nov 66	934th Dental Svc
Jameson, Evangeline	LTC	ANC	29 Nov 66	93rd Evac Hosp
Orbin, Mary	LTC	ANC	29 Nov 66	71st Evac Hosp
Coker, Larry W.	Col	MSC	30 Nov 66	HQ USARV
Izer, Leona C.	Maj	ANC	3 Dec 66	93rd Evac Hosp
Fuqua, William	Maj	MC	3 Dec 66	9th Med Lab
Warnes, Allen T.	LTC	MSC	4 Jan 67	51st(3rd) Field Hosp
Gamber, Herbert H.	Maj	MC	4 Jan 67	91st Evac Hosp
Bezreh, Anthony A.	Maj	MC	11 Jan 67	1st Avn Bde
Bravo, Louis	LTC	MC	11 Jan 67	HQ USARV
Siebert, Paul E.	LTC	MC	12 Jan 67	36th Evac Hosp
Duttweiler, David	LTC	MSC	13 Jan 67	HQ USARV

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USARV MEDICAL BULLETIN

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The Surgeon USARV invites all members of the Army Medical Service including the Medical Corps, Dental Corps, Veterinary Corps, Medical Service Corps, Army Nurse Corps, Army Medical Service Corps, and enlisted personnel, as well as other members of the medical professions in Vietnam, to submit articles to be considered for publication in the Bulletin.

Items submitted for publication should be typed single spaced in final corrected form and addressed to the Editor, USARV Medical Bulletin, HQ. USARV, Office of The Surgeon, APO 96307. Accepted manuscripts become the property of the Bulletin. Authors are urged to retain a carbon copy of each manuscript. The editors reserve the privilege of review and editorial modification. Photos submitted to illustrate your article or to depict some aspect of AMEDS in Vietnam should be good quality, good contrast, black and white glossy prints. Photographs of patients should be accompanied by a witnessed signed release.

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2. GENERAL: This headquarters does not necessarily endorse the professional views or opinions that may be expressed in this pamphlet apart from official notices. The contents of this pamphlet are not directive in force.

(AVHSU)

FOR THE COMMANDER:

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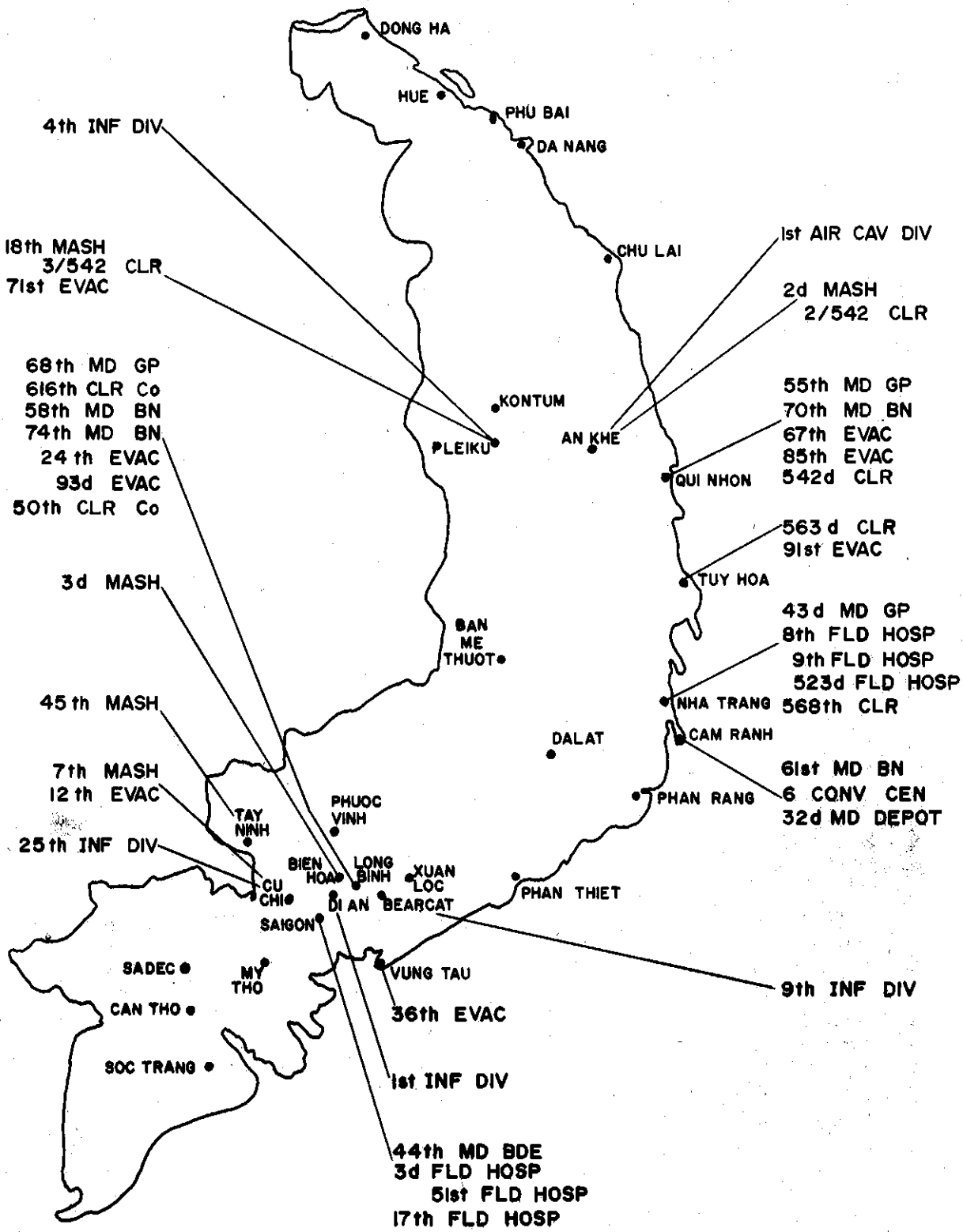
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3d MASH
BAN ME THUOT
43d MD GP
8th FLD HOSP
9th FLD HOSP
523d FLD HOSP
568th CLR
NHA TRANG
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