

THE HAZARDS OF TROPICAL DISEASES AS A RESULT OF WORLD WAR II

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Serious consideration was given throughout the war to risks of introducing exotic diseases and other harmful agents into the United States through the traffic of war and the return of military personnel from abroad. Estimates of hazard varied widely, but the most critical epidemiological analyses anticipated little risk in most instances. This was the viewpoint also of the Interdepartmental Quarantine Commission jointly established by the Secretaries of War and Navy and the Administrator of the Federal Security Agency to study this problem. Precautions recommended by the Commission were established in special quarantine programs of the Armed Forces.

With the end of fighting and return of the bulk of combat forces, it is now possible to review actual results on a preliminary basis. Optimistic conclusions appear warranted though tentative. No acute outbreak or secondary spread of non-indigenous disease has been reported to date in the United States and while more slowly evident infections may yet be identified it must be remembered that traffic and return have now gone on for four years.¹

Malaria has always received priority consideration among risks to the public health of this country as a result of the war. Aiming primarily at maintenance of fighting efficiency, the Army and Navy greatly emphasized prevention and suppression of this disease. Though malaria remained the commonest infectious disease of troops abroad, the 460,000-odd reported hospitalizations of Army

¹Subsequent information requires revision of this statement. One soldier who arrived in San Francisco by air in patient status for neuropsychiatric disease on 28 December, 1945, in the incubationary stage of smallpox is considered the starting point of infection for six subsequent civilian cases. The mode of first secondary infection is uncertain but apparently indirect. Two other military cases arrived at this port in patient status because of smallpox on 29 March and 8 April, 1946; no apparent secondary infections occurred. In Seattle a diagnosed case of smallpox entered in patient status on 5 February, 1946, and was hospitalized immediately. The first secondary case was a patient in that hospital, vaccinated on 6 February with a primary reaction, whose smallpox began on 16 February. Most of the remainder of 40 cases which occurred in Seattle seemed traceable to this second person; routes of infection in the remainder were uncertain. In Los Angeles a diagnosed case of smallpox entered 28 January, in patient status; no secondary infection occurred. A Customs official in San Diego was diagnosed as having smallpox about 5 March, 1946; no definite source was determined and secondary cases did not occur.

personnel from the onset of war through December, 1945, are far below pessimistic anticipation. As this figure includes both initial and recurrent infections, the total of persons involved was appreciably smaller.

Malaria is not susceptible to practicable border quarantine, and prolonged detention of returning personnel in segregation areas to avoid dissemination of the infection among the general populace was deemed unfeasible and unnecessary. Considering that only a portion of persons infected abroad are liable to recurrence after return to the United States (about 60,000 military hospitalizations to 1, July, 1945) and that these will be diluted among the 130-odd millions in the country, often in non-malaria-supporting areas, it is evident little community risk is afforded. Multiples of this risk are offered annually by endemic malaria in the United States, and fears of exceptional virulence and resistance to treatment on the part of foreign strains have not been borne out. What risk does exist has been anticipated by the U. S. Public Health Service in extensive mosquito control projects in communities and about military installations in susceptible areas. Some returned military personnel will, of course, have recurrences of malaria, and local outbreaks may result as following previous wars, but these should remain minor and readily controllable by modern improved measures.

Historical experience indicated the general risk offered even in normal traffic by cholera, smallpox, plague, epidemic typhus, and yellow fever. Their special danger in war is a matter of record. These are the internationally quarantinable diseases, and safeguards established against them by international conventions recognize both their importance and their susceptibility to border quarantine techniques. Immunizations were employed against all of them by the Armed Forces along with water control, environmental sanitation, and disinfection and insect control by newly developed methods. These precautions were exercised even under combat conditions, as parts of preventive medicine toward combat efficiency. Results were evident. Smallpox occurring in the Army overseas was limited to 115 cases along with 64 of typhus and 13 of cholera through December, 1945. There were no cases of yellow fever or of plague.

Elaborate quarantine procedures in traffic to the United States were established by both Services, based on selective accomplishment of the above protective measures before departure from abroad. Only seven cases of smallpox have occurred to date in Army traffic to this country, and most of these arrived in patient status with full attention to contacts. It is possible but not clear that some secondary infection has occurred in Seattle and San Francisco.¹ One mild and atypical infection with typhus was recognized in himself by a medical officer on arrival in the United States after special work with the disease. Eleven typhus infections occurred among prisoners of war brought to the United States. No secondary cases developed, all prisoners having been disinfested before shipment and again inspected on arrival. It is apparent that risk of the quarantinable diseases has been negligible.¹ It may also be pointed out that several hundred cases of endemic smallpox are reported annually in the United States; twelve occurred among military personnel during the war.

Eight lepers were returned from Army personnel abroad in the past four years; all but one had a previous family history of the disease and none are considered contracted abroad, (nine others were detected before shipment overseas). Three Japanese and one Italian prisoner were leprosy and were hospitalized during their entire stay. Had all these been new and unrecognized infections they would not have equalled the acknowledged risk in New York City alone.

Scrub typhus or tsutsugamushi disease has been reported in 6,800 cases. Other than one instance, no active infection has been recognized after return to the United States. This was to be expected from the short incubation period of the disease and the fact it is usually contracted in field exposure. Persons so occupied are not likely to return to this country suddenly. Nor are infected mites likely

to survive transportation in clothing or salvage in view of their fragility. Sandfly fever, of which some 12,000 cases were reported, is subject to similar limitations, and no cases have been recognized after return.

Dengue is sporadic in certain southern states and a handful of cases occurred there each year among troops. No case has been recognized among persons returning from overseas to the continent. Nevertheless, the disease did occur in Hawaii beginning in 1942, probably introduced by returnees from forward areas in the Pacific. Vigorous control was instituted in cooperation with Territorial authorities. The outbreak was well controlled, and no case has now been reported for several months.

Filariasis was much feared in some quarters early in the war, primarily as a hazard to troops themselves. All recognized cases were evacuated from endemic areas at once and slightly over 2,000 diagnoses have been made in the Army. None of these cases showed chronic elephantiasis which would be expected only from prolonged exposure and repeated infections. Microfilariae have been found in the blood with the greatest rarity. Even concentration techniques have routinely failed to show them, and risk to the general populace is obviously negligible.

Leishmaniasis has been diagnosed among hospital admissions 307 times including both cutaneous and visceral forms. No secondary cases have been reported. In view of the vigorous treatment accorded these infections and the necessity for all elements of an intermediate mechanism before transfer can occur, introduction of the disease into this country is most unlikely. The same pertains to relapsing fever, 220 cases of which have been reported almost evenly within and outside the United States. That it was predominately if not entirely tick-borne is suggested by the control of louse-infestation of troops, without which a different problem might have been presented. Self-limitation and fortunate susceptibility of the disease to therapy, and emphasis on control of lice and other insects among troops comprise the protection of our civilian population. Furthermore, relapsing fever, as mite typhus, is a disease of field conditions, and it is again improbable that persons recently exposed will often be returned within the incubation period. Once ill, they can be treated effectively before travel.

Future risk of all disease characteristically contracted under field conditions, will, of course, diminish with cessation of combat and with the advantages of essentially garrison life. This affects favorably the risk of all diseases so far considered, and of numerous others, especially the dysenteries and dermatoses.

Onchocerciasis, trypanosomiasis, Guinea-worm, and yaws have not been experienced in U. S. troops. In the last analysis the common illnesses abroad, including the tropics, are those which are common at home, and with the exception of combat injuries the same pertains to disabilities in war.

Schistosomiasis was contracted by some 1,200 men, mainly on Leyte, and for reasons already indicated additional significant numbers need not be expected hereafter, even among garrisons in infected areas. These cases have generally been mild, and because exposure was of limited duration the late cicatricial changes, which underlie the disability of indigenous cases, will probably rarely occur. For the same reason dissemination of ova should be infrequent, but principal protection of the homeland community will be afforded by its generally excellent sewage disposal. Furthermore, it has not been shown, despite intensive search, that any domestic snail is suitable for the life cycle of the oriental disease in the United States. In any event, risk from service personnel will probably not approach that associated with *Shistosomiasis mansoni* in imported farm labor from Puerto Rico.

Amoebiasis and bacillary dysenteries have occurred, too, but foreign strains have appeared no more virulent than those already widely disseminated in the United States. It has already become evident that chief protection against these diseases, including Ancylostomiasis, lies in well recognized and widely applied principles of waste and water care.

Approximately 20 soldiers have been diagnosed as having Japanese-B encephalitis. Considerable apprehension attached to this disease and the small number of cases to date is highly gratifying. Lack of established epidemiology is most impressive in evaluating risk to this country. Despite demonstration of mosquito vectors, the unknown rather than the known underlies our apprehension. This has been true of many diseases in history. Much comfort is gained from the proved preventive value of distance, small numbers of carriers, dilution, and continuing military alertness and medical care. Should significant outbreaks occur abroad, it is axiomatic that the full military program of preventive medicine will be applied, including probable immunization.

Much attention has been devoted by the Army and Navy to possible introduction into the United States of new species of vector insects. Disinfestation of aircraft was made a responsibility of flight personnel under supervision of the Medical Department and is routine at stations of take-off for this country. To date there is no evidence that any alien form has been implanted. It is possible this might not yet be apparent.

As previously stated, this report must be tentative. Nevertheless, favorable conclusions seem justified. Despite unprecedented breadth of travel and exposure, the military forces of this country in World War II have not subjected the United States to significant risk of disease from abroad. In many respects risk has been less than in normal prewar traffic.

This has not been the result of any single factor, but rather of the entirety of modern preventive medicine applied intensively by both Army and Navy. Exotic disease did occur and breaches of formal quarantine are acknowledged. But extensive investigation of likely hazards and critical application of preventive and corrective measures were effective in reducing risks to small proportions. This was undertaken first to preserve effectiveness of combat forces through protection of personnel in the field. Primary efforts were therefore directed to local risks and to men exposed to them. Measures included immunizations, protective clothing, insect repellents, water purification, waste disposal, mosquito and other insect control and additional environmental sanitation. The development and widespread adoption of suppressive medication and insecticides, and education of men and their officers to risks incurred were parts of this program. Quarantine precautions were established which took maximum advantage of the preventive care of the individual to assure safety to countries of entry. This was a re-orientation of quarantine procedure which is ordinarily directed at momentary observation when international borders are crossed. The military technique is fully applicable only when the responsible agency has control of the traffic throughout, but the principles involved should be of advantage in further development of international health measures.

Further protection has been afforded the United States after entry of military traffic. Thus personnel generally remain under military medical care for the duration of the important incubation periods, hospitalization has been available for the sick, and none have been returned to civilian status until maximum benefit has been offered. This has minimized risk to the patient and to his community.

A final link in protection of this country is the generally high level of sanitation, insect control, and medical care here available. Their continued assurance is a special responsibility of organized medicine. The total effect of the several factors herein discussed is a defense in depth based on broad application of preventive medicine, an essential field of medical science never so fully developed as during the recent war.