A. Ia. Lysenko, Dang Van Ngy: Issledovaniia po epidemiologii malarii v severnom V'etname. Soobshchenie 4: Maliariologicheskoe raionirovanie severnogo V'etnama. Med. Parasit., Moscow, Vol. 34:189-94, 1965.

Translation No. 1210
from RUSSIAN:

EPIDEMIOLOGICAL STUDIES ON MALARIA IN NORTH VIETNAM

Report No.4:

Malariological Division of North Vietnam by Regions

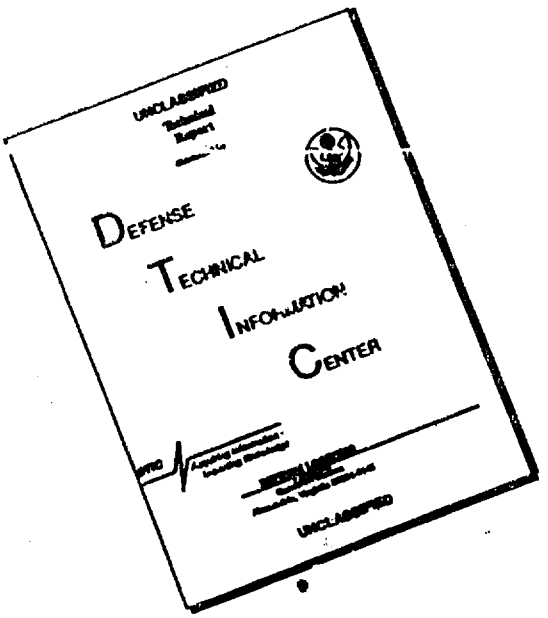
By
A. Ia. Lysenko & Dang Van Ngy

(Received for publication
7-21-64)

First indications as to lack of homogeneity in the Vietnam territory with reference to malaria appeared back at the end of the XIX th century, in the communications from French military surgeons. Even then it was mentioned that the thickly populated delta of the Krasnaia (Red) river is practically free from malaria, whereas the poorly populated mountain areas are extremely dangerous for the non immune continents, because of the high percentage of population affected by malaria.

The causes for selective acclimatization of malaria in the higher altitude portion of the land became clear after Morin in 1930 established that the main carrier of malaria in Vietnam is A. minimus (Morin, 1935), and Toumanoff (1936) in 1931-1933 showed that this species of Anopheles is widely distributed throughout the mountainous localities and is nearly absent in the zone of the delta. To Toumanoff also belongs the first attempt at

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

malariological division of North Vietnam into regions, which he had undertaken based on entomological data. Morin (1935) provided epidemiological characteristics to the malariological landscapes, brought out by Toumanoff, and evaluated them from the standpoint of possibility of Europeans residing in them. During the subsequent years and up to the end of the war of resistance, research studies on the malaria situation in North Vietnam are quite deficient.

A new era (stage) in the studies on malaria in the DRV ("Democratic Republic of Vietnam") began in 1955, when the Vietnam specialists started the studies on malaria situation, assisted by the Soviet malariologists. A striking feature (salient) in the studies of this period is that they are governed by the problems of liquidation (elimination) of malaria in the interests of the entire population of the country. Among the problems of primary importance, arising in 1957-58 during the preparation of the plan for elimination of malaria in DRV, was that of establishing the boundaries of the territory affected with malaria and subsequent division into epidemiologically homogeneous zones.

In our earlier communications (Lysenko et al, 196; Lysenko and Nguian Tien Byu, 1961) we described the method used for dividing into regions and presented characteristics of the main types of zones, marked on the territory of the Tai-Nguen province and the autonomous district Tai-Bak (formerly Tai-Meo). Keeping in mind the practica experience in dividing into regions of these territories and using the material of routed investigation of all

other provinces in the land, we divided into malariological regions the entire territory of the North Vietnam. The present report is devoted to the results of this work.

Boundaries of Territory Endemic for Malaria

In the course of routing investigatepn it was established that practically in all populated points where A. minimus had been discovered, there were local persons sick with malaria. There were registered no endemic foci f malaria putside of the areola of areola this vector either earlier or in the course of our investigation. Therefore, the establishment of the borderlines of malaria territory in the North Vietnam consisted most of all in finding the confines of the A. minimus areola. In regard to the Vietnam plaines, we were guided by the fact that they are, as a rule, free of A. minimus. In case of discovering this vector in isolated populated points, the most common type of water reservoir, where its larvae were found, were cement reservoirs, which the inhabitant use for collecting and storing of rain water. The A. minimus appeared in the delta, as a rile, first of all (the earliest) in the villages, situated by the rivers, where rafts come from hills, thus carrying the larvae of this vector. Based on this, we have classified theentire delta territory and that of the seacoast plains up to the borders of thehills, surrounding them, as the lowland-river zone, practically free from the main of Vietnam vector (and malaria). In regard to the higher altitude border of the areola of A. minimus, it was found to be different in the various parts of the country. In the populated points, situated on the slate-limestone plateau to the west from the Hoang

L'en Shon and Pu Lyong

L'en Shon and Pu Lyong crests (mountain ridges) (within the boundaries of the Tei-Bak district). We found A. minimus up to the altitudes of 1300-1500 m above sea level. In the remaining part of the territory the altitude limit of the areola did not exceed 700-800 m above sea level. In this manner, along with the delta and the seaside plains, the mountain areas s hould also be excluded from the territory which is endemic formalaria. The total area (aggregate) of territories free of A. minimus constitutes 49.1 thousand km^2 (31% of the entire area of North Vietnam), the population living there numbers 10.9 million persons (68% of the entire population). The areola of A. minimus, as well as the borders of the territories endemic to malariad andthose free of it, are all represented in the illustration.

Malariogenic Zones

The general characteristics of the 4 types of malariogenic zone, representing the territory of North Vietnam, endemic for malaria, were already given in Reports 1 and 2 for the sample zones, selected in the Tai-Nguên province and Tei-Bak district. An analysis of the material of investigation in other provinces, as well as review and processing of data of systematic observations in biology of A. minimus (Lysenko, Dang Van Ngy, 1965) permit (us) to draw up comparative characteristics of the zones of the country by the sum total ("complex") of their most prominent signs (see the Table).

The differences between the zones with regards to the level of malarial endemiology are well correlated with extensive and intensive indices of A. minimus distribution. All these indices

are the highest in the hyperendemic middle mountain and river zone, and the lowest in the hypoendemic hilly river zone. Of the 4 zones, at least one, the middle mountain river zone, may be considered as a zone of independent malaria. Here, all settlements of the population are foci of malaria, and they are intensive permanently active foci. From these foci there takes place dissemination of sources of infection to other zones, and sometimes of the vector. In the hypoendemic hilly river zone and flat mountain zones, the foci are formed ont everywhere, they are not permanent, inconstant and are marked by relatively postty indices of infection among the population. There is reason to believe that only a small portion of these could exist over any period of time, in the absence of periodicalentry of the vector and sources of infection from the neighboring middle mountain river zone. From this point of view, both these zones may be considvered as zones of relatively dependent malaria. As for the low mountain river zone, according to all indices, it occupies an intermediate position. As a result of intensive culturing, in this zone, the areas of anophelogenic water basins are gradually decreased and further removed from the populated points. In contrast to the hilly river zone, here there are very few wells and "dugouts", readily populated by A. minimus during the dry season of the year.

Of definite interest is comparison of the boundaries of malariogenic zone with the boundaries of physicogeographical

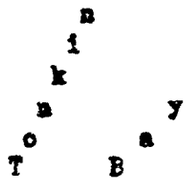
regions, a map of which has been published in 1961 (Friedland, 1961).

Map:

..... border between Bakbo and Chungbo

~~Anopheles minimus~~

middle mountainous river region
low mountainous river
hilly rover
flat mountain
river plain
high mountain



(Bakbo)

Points where Anopheles minimus was found and boundaries of of malarogenic zones in North Vietnam

(underlined, not crossed out)

Of special interest is the comparison of borders of malariogenic zone with, the boundaries of physico-geographical regions, a map of which was published in 1961 (Friedland, 1961);

The lower borderline of the hilly river zone is practially fully coincident with the borders of the delta and the seacoast plains. The altitude limits of this zone in a number of cases coincides with the corresponding borders of the hilly territories, but more frequently it runs below, so that some of the hilly territories, in our division, belong with the low mountain river malariogenic zone. This latter zone extends in a number of places higher than the lower border of the mountain territories. But on the whole, the mountainous territories are occupied by the middle mountainous river malariogenic zone and in the north-west by the flat mountainout zone.

On the whole, the limits of the malariogenic zones in such a mountainous country, as North Vietnam, were found to be very close to the

close to the limits of the largest physico-geographical units - or territories. From the epidemiological point of view, further subdivision of the zones into the taxonomic units, similar to lower physico-geographical units (provinces, districts, subdistricts, regions) was found to be unnecessary.

In conformity with the basic peculiarities of malariogenic zones we have elaborated some differentional groups (sets) of measures for the liquidation (eradication) (elimination) of malaria; their effectiveness was tested out in experimental work, demonstrated in the province of Tai-Nguien (Lysenko, 1960: The use of principles of landscape epidemiology in malaria eradication programs. WHO, Exp. Com. 8. WP/26, 1960).

(Table on following pages)

Conclusions

1. The areola of Anopheles minimus - the principal vector of malaria in North Vietnam - occupies the entire territory of the land, except for the delta and the seacoast plains, and also mountainous localities above 700-800 m in the north and 1300-1500 , in the north east. The boundaries of the territory endemic for malaria, coincide with the limits of the areola of A. minimus.

2. The territory, endemic for malaria, was divided into 4 epidemiologically homogeneous malariogenic zones: the middle mountainous river, the low mountain river, the hilly river, and the flat mountain.

The middle mountain river zone is the main malariogenic

zone in North Vietnam. It may be considered as the zone of independent malaria, in which all human settlements are intensive foci of this disease. Characteristic for this zone are the highest, as compared to other zones, extensive and intensive indices of the distribution of A. minimus.

3. The A. minimus population in various zones differs not alon quantitatively (the specific gravity among other species of Anopheles, abundance at rest stops, duration of the active season); however, in the qualitative respect it differs also according to the age brackets. In the middle mountainous river zone, the epidemiologically dangerous females are being found during 8 months of the year, and their abundance at the rest stops more than 10 times exceeds the number of dangerous females in other zones.

4. The division into malariological landscapes is the best basis of a rational program for the eradication ("liquidation") of malaria in the mountainous land with non homogeneous malaria territory.

Literature is not transcribed.

Table on next pages

10-6-67

For Dr. R.G.Smith Translated by Tatiana Boldyreff

(continued on next pag

Comparative Characteristics of Malariogenic Zones in North Vietnam

Zone	Area, number and density of the population	% of villages with presence[1] of given species	average yearly specific weight (in %) among other species of Anopheles	Anopheles Minimus: Average number in rest stops			Anopheles Minimus: dangerous females (acm
				annual	in spring[3]	in fall[3]	number of months in year, these are present
Midd mountain-ous river	81 thousand-km^2 (51% of terriroty of North Vietnam; 2.1 million inhabitants (13%); 25.7 pers/km^2	80-100	43.7	8.0	10-30	5-10	8
Low Mountain river	12.8 thousand km^2 (8%); 1.4 million inhabitants (9%);180 pers./km^2	60-75	15.8	2.7	3 - 7	1 - 2	7
[illegible]	[illegible] thousand km^2 (1%); [illegible] km^2 1 million inhabitants (9%) 18% pers/km^2	40-50	3.0	1.3	1 - 2	1 - 2	5
[illegible]	[illegible] thousand km^2 160 thousand inhabitants;(1%) 20 persons/km^2	about 30	31.4[2]		1.2		

continued from previous page

average number per rest stop 4	Probable season for transmission of malaria (in months)	Infection in population: Spleen index	Infection in population: Parasitic index
1.4	IV-X, with a peak in May	over 50	over 20
0.04	IV-V and IX-XI	25 - 50	10 - 20
0.12	III-IV and X - XII	10-25	5 - 10
		20 - 30	3 - 5

1 with single examination of about 10% of rest stops per village
2. from data of investigation of Sept.-Oct. only
3. for villages with A.minimus present during the period of observation
4 for the months when epidemiologically described females are present