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OASIS MALARIA IN LIBYA

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INTRODUCTION

Desert oases are usually not considered when one thinks of malarious areas. When the malariaologist becomes familiar with desert ecology he will soon realize that oases may offer excellent conditions for the transmission of malaria. In many cases of Libya the essential factors for malaria transmission - men, vectors, and parasites - exist. However the incidence of malaria in these oases is low. This is due to many causes.

The object of this paper is to describe the geographical, climatological, and epidemiological conditions which permit malaria to occur in desert oases; and to outline some of the factors involved in malaria eradication in desert oases as they differ from other localities.

GEOGRAPHICAL, SOCIOLOGICAL AND CLIMATOLOGICAL FEATURES

Oasis malaria in Libya occurs primarily in the Fezzan Province which occupies the southwestern part of the United Kingdom of Libya. The major portion of the province lies between 22 and 28 degrees north latitude, and between 10 and 18 degrees east longitude. This area lies almost entirely within the Sahara Desert. A relatively small part of the Fezzan is sandy desert with the major portion being rocky desert and scrub.

The only permanently inhabited areas in the Fezzan are the oases. These oases consist of isolated areas of vegetation, normally palm trees, generally arranged in long, relatively narrow, broken lines with an eastwest orientation.

They occur where the water table is sufficiently near to the surface to support the growth of date palms, and to permit digging of shallow wells to supply water for consumption by man and his domestic animals. The wells also supply water for irrigation of barley, alfalfa, and a few vegetables.

The climate of the Fezzan is arid with rain falling at rare intervals. The rainy period is from March to May with a variation in rainfall from 0.5 inch to 4.0 inches over a five year period. The relative humidity ranges from ten percent to forty-five percent. The average is probably less than twenty percent. The temperature ranges from -9 degrees Centigrade to 55 degrees Centigrade.

The inhabitants of the Fezzan oases are of several racial stocks composed of Tuaregs, Berbers, Negroes and Arabs. There are several nomadic tribes entering these oases during their migrations. Since World War II there has been a migration of the male population northward, drawn by the opportunities offered by the coastal cities. The people are friendly, courteous, and very hospitable. According to the 1957 report on the Fezzan the population was estimated at 65,000. It is estimated that ninety-nine percent of the population live in town and villages centered around the oases.

The houses of the oases are of two types. In the larger oases they are constructed of adobe brick with a roof of palm branches covered with sand. In the outlying oases they are constructed entirely of palm branches.

The social and economic patterns of the oases are rural. The population can be divided into two classes, farmers and caravaners. The farmers live in the villages and walk daily to their small plots of ground which may be at a considerable distance. The caravaners are the merchants, traders, and craftsmen.

In the past communications have been made by camel caravans and many of these oases were important trade centers. Even with the introduction of motor vehicles the camel still remains the "Ship of the Sahara". Most of the oases can only be reached by four-wheel drive vehicles fitted with special desert equipment. There is a weekly commercial air service from Tripoli to Sebha, the capital and main city of the province. The petroleum companies employ chartered planes to reach their concessions located in various parts of this area.

EPIDEMIOLOGY

Two species of the malaria parasite, Plasmodium vivax and Plasmodium falciparum are found in these oases. P. falciparum is the most prevalent species occurring at the ratio of 3:1. P. malariae and P. ovale have not recently been found in Libya.

In the recent past the incidence of malaria has not been high and epidemics have been rare. Malaria in the oases would probably increase now if some type of control was not in effect. Many of the farmers of this area have abandoned their farms and have migrated to Tripolitania. When farms are abandoned the dug wells and other sources of irrigation water are also abandoned. This results in an increase of suitable breeding sources for anopheline mosquitoes and a probable increase in the transmission of malaria. At the present malaria can be classified on the whole as hypoendemic in the Fezzaneze oases.

The two anopheline mosquito vectors of malaria in the oases are Anopheles multicolor and Anopheles sergenti. A. multicolor has a wide distribution whereas A. sergenti is sporadic. A. multicolor has never been definitely proven to be a vector of malaria, but in the Fezzan oases malaria is found in isolated oases where the only anopheline present is A. multicolor. A very high density is apparently necessary for transmission to occur. This species is anthropophilic and endophilic being readily found resting indoors. The larval stage has a high tolerance for saline water, and has been collected where the total chloride content of the water was 14.4 grams per liter. The larvae are usually found breeding in small holes of saline or stagnant water. The tolerance of this species for saline larval habitat probably accounts for its wide distribution in the oases where the majority of the water suitable for larval development is saline. This species is found in greatest abundance during the dry season as it breeds in small holes of standing water resulting from surface evaporation.

A. sergenti is known to be exophilic in some parts of its range but it has been collected resting indoors during daylight hours in Libya. This species is a fresh water breeder and is usually found where there is aquatic vegetation. A. sergenti is known to be a good vector and in most oases where this species occurs malaria is found. In some oases the inhabitants spend part or all of the night outside of their houses. With residual spraying this phenomenon may create a problem with this species as it is exophilic.

In certain oases of Tripolitania, the western province of Libya, A. hispaniola and A. superpictus are also found, but only in moving water. In the coastal areas A. coustani and A. superpictus are the only vectors of non-oasis malaria in Libya.

There have been no precipitation tests, insecticide resistance studies, or insecticide deposit longevity studies conducted so far in Libya.

CONCEPTS OF MALARIA ERADICATION

The Libyan Malaria Eradication Programme is different in several respects from those of other malarious countries of this region. The programme is under the administrative as well as the technical supervision of a representative of the International Cooperation Administration, and is being conducted under the auspices of the Libyan American Joint Public Health Service (IAJPHS) in cooperation with the Minister of Health of Libya and the Nazirs of Health of the provinces of Libya.

The pre-eradication surveys were conducted by the World Health Organization with the assistance of IAJPHS. The surveys have been completed and the results will soon be made available.

UNICEF has not been involved in this programme which is financed largely by ICA.

A malaria control organization did not exist prior to the eradication programme therefore all personnel involved in the programme had to be recruited and trained.

A malaria control programme was conducted from 1954 through 1957 in certain of the malarious oases of the Fezzan by IAJPHS. No malaria statistics were available prior to this programme, but it is assumed that this spraying reduced the incidence of malaria in these oases.

The spraying operations will be conducted on a seasonal basis employing convoys of desert equipped vehicles operating from headquarters.

The pre-eradication survey indicated that only 30,000 inhabitants live in malarious areas, but the areas cover more than 600,000 square kilometers.

With the incidence of malaria so low, Libya is starting an eradication programme at the stage most malarious countries obtain after three years of residual spraying. The authors believe that the surveillance phase of malaria eradication should be initiated as soon as possible. It is anticipated that this stage will begin in 1960 after sufficient surveillance agents and microscopists have been trained. The surveillance phase will be difficult due to the lack of trained personnel, and to the extreme distances over difficult desert terrain to be covered.

The authors have seriously considered the possibility of attempting vector eradication in order to facilitate the surveillance

procedures. This would require an effective larviciding programme. In certain oases a programme of drainage has already been initiated and artesian wells are being capped to prevent flowing of excess water. In many oases Gambusia fish are present in abundance and do an effective job of controlling mosquito breeding. It is highly possible that a combination of residual spraying, larviciding, drainage, and biological control would eradicate the vector species in these isolated oases.

The possibility of a drug distribution programme in certain oases has been seriously considered.

SUMMARY

A geographical, sociological, and climatological description of the oases found in the Fezzan Province of Libya is given.

A relatively low incidence of malaria caused by P. vivax and P. falciparum is found in isolated desert oases of the Fezzan. Both A. multicolor and A. solliciti are suspected on epidemiological grounds to be the vectors; A. multicolor being the prevalent species. The ecological and epidemiological characteristics of these two vectors are described.

The manner in which the concepts of malaria eradication as pertaining to desert oases differs from those of other malarious countries are discussed. A brief description of the Libyan Malaria Eradication Programme is given indicating some of the difficulties involved.