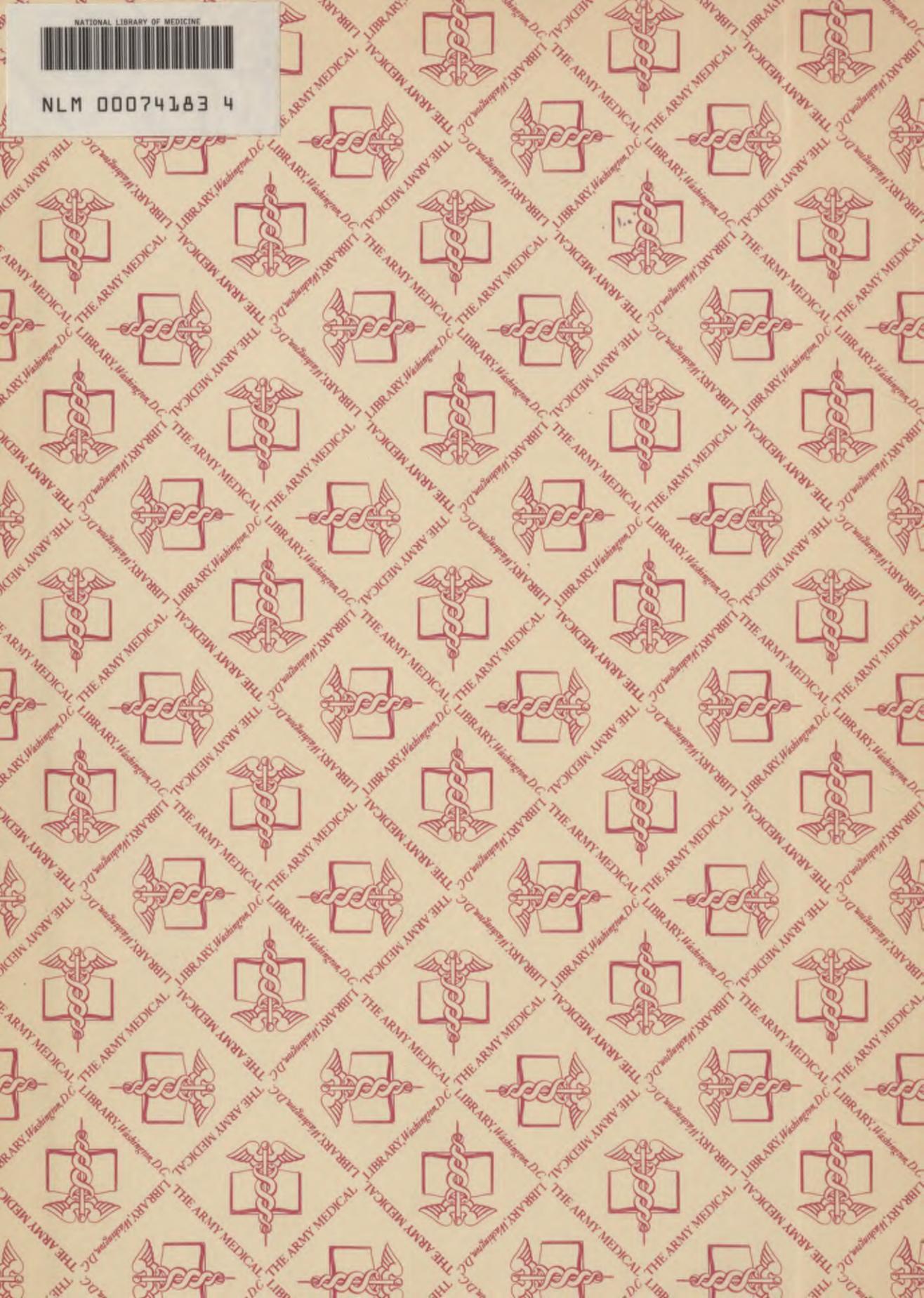


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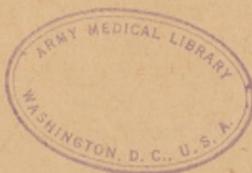
Germany (Territory under Allied Occupation, 1945-
Office of the Naval Advisor

U.S. Zone)

VII - 1 -

Project 3, Folio 3

GEOMEDICAL REVIEW OF THE MEDITERRANEAN COUNTRIES.



Translation prepared by:
U. S. Fleet, U. S. Naval Forces, Germany,
Technical Section (Medical).

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7-15-Sept-23

There is no other sea in the world around which so many and continuous desperate battles have been fought on land, at sea and in the air, between the nations living on its shores. This struggle dates back as far as to the times of Hannibal and Scipio Africanus, the Macedonians, Philip and Alexander, Geiserich and Okba Ben Nafi, to the times of the Knights of Malta and the Doges of Venice, the Hohenstaufen Frederick II., to Bonaparte and Nelson, Lyautey and Kitchener, Franco and Balbo, Rommel and Eisenhower. The decisions and the deeds of each of them put soldiers, ships, and airplanes into action, and they were the cause for many invasions, bridgeheads, naval battles, and expeditions ashore. A common characteristic of all these actions, however, was that the countries on the southern coasts of Europe fought against the countries of North Africa opposite them. Even the planning of war, as well as an economic, scientific, and cultural aggression or agreement is compelled to take into account the life of those two adjacent territories in the broadest sense. On the shores of no other sea do the areas of disease and health of Europe and Africa meet so closely and so powerfully in the positive and in the negative sense as in the Mediterranean. Man, animals and vegetation of the Mediterranean are living in a special climate, the so-called Mediterranean climate, which objectively as well as subjectively is so well defined that it appears as a very peculiarly and clearly distinguished entity when it is compared with the climate of other maritime areas. No other sea links the continents on its shores together so much as does the Mediterranean. During the last two decades of the 20th century the airplane has served to bring the American continent still closer to Africa and Europe and that means to the Mediterranean. Therefore, geomedical "flares" may pass from without and from within through the geopolitical straits, such as the straits of Gibraltar, the Suez Canal, and the Dardanelles, to set fire on potential foci or to make them smoulder and to spread them. A land-locked sea such as the Black Sea may be involved as easily as a free ocean such as the Indian ocean. However, the flare may also go the opposite way. Only during this war have we become fully aware of the Mediterranean being a European sea, although it has been such a sea even from the beginning of historical thinking. The Mediterranean is the sea of the Greeks and Romans, of the latin-byzantine-christian civilization, of fighting Islam, of the safest route to the most valuable part of the British Empire, of the Arabian civilization in Spain and France which linked anew its southern coastline - North Africa- to Europe. Along its shores from Gibraltar to the Bosphorus and back to the Pillars of Hercules the magic carpet is spread from the occidental to the oriental territories which is so colorful and at the same time so entangled through Europe's mistakes and which all of us could enjoy before this war. It was only the campaign in Southeastern Europe

(1941) and the fighting of the German and Italian African Armies which made it obvious that the Mediterranean is the continental entity as conceived by ROSS. This author is anxious to include the coast opposite to Europe, that means North Africa, in the Mediterranean territories and in its way of thinking again, and he believes that this has priority over all other things, and that it would be comparatively easy. Thus, he outlines in the political field an idea of Goethe recommended in his parali-pomena to the "West-östlicher Divan": "He who knows himself and others, knows that the Orient and the Occident are inseparable".

While Colin ROSS directed our attention to the historical, geographical, and intellectual sources for the origin of the "Levant" in the 7th volume of the "Géographie universelle" (Paris 1934) the French geographers Max SORRE and Jules SION, and the Bulgarian geologist Dimitri JARANOFF give new information on the Mediterranean and the Mediterranean countries (1939/40). JARANOFF who very modestly calls his contribution an "essai géographique" was highly regarded by Karl HAUSHOFER. JARANOFF indeed completed a well rounded and reliable work which has to be considered as the basis of any geomedical research concerned with the Mediterranean and its countries, since as yet there is no planned geomedical research in the Mediterranean and its countries, although the tremendous history of this sea, which so often has been the center of far reaching political and historical decisions, invites geomedical researchers for detailed studies. Now, the opportunity is given to make a careful analysis of the geomedical problems of the Mediterranean.

Any consideration of the Mediterranean area, the sea, the coasts, and of the islands, be it concerned with the conditions at the time of Hippocrates or the conditions at the end of the 19th century must principally refer to Gibraltar and Malta which like the Balearic Islands, Sardinia, Corsica, Sicily, Candia, and Cyprus, are situated in the midst of the political and military sphere of influence of the Italian and British Empires. The principal question should be whether they ever were known as areas of disease or, preferably, of health, or whether they were outlined as such by medical investigation. It is worth knowing whether or not the British had followed their line later regarded so strictly during all their campaigns in Africa and Asia undertaking no planned military action before the hygienists and technicians had accomplished their work of sanitation previous to military action in the prospective area of operation. Such preparations usually could have favorable effects only if a thorough work was done. "The doctors' and engineers' war" was the term applied to these absolutely necessary preparations by Lord Derby, before one of Great Britain's Aschanti-campaigns was started. Later on Kitchener had very good experiences with them. During the present war

the British returned to the same methods using and evaluating the medical topographies to become acquainted with the geomedical conditions of the occupied countries or those to be invaded. The basis of all these activities is the tradition left to them by one of their most experienced medical officers, John HENNEN (1779 - 1828), who spent almost his entire service in the Mediterranean. HENNEN himself prepared a medical topography of the Mediterranean. This fundamental work is concerned with the topography of Gibraltar, Malta, and the Ionian Islands Corfu, Kephallenia, Zakynthos, Santa Maura and Ithace. These suggestions and medical and topographical details required for the garrisons are given in minute detail and set in relation to the fighting strength of the troops and the fortress as such. Only in the medical topographies of a small number of single garrisons edited by the Prussian Ministry of War, the former Austrian Ministry of War, and of the Tiflis Military District at the time of the Czars are descriptions of an equivalent and permanent value to be found. Similar medical topographies for the use of the Armed Forces were prepared on the initiative of René DES-GENETTES, Army surgeon of the French Levant Army during the campaign in Egypt and Syria in 1799.

If one compares the descriptions of the epidemic and endemic communicable diseases of the Mediterranean countries with their present incidence, one sees clearly that they are always the same, namely plague, malaria, abdominal typhus, "yellow fever" (infectious hepatitis?), and the "Idiopathic Fever of Malta", sometimes called "Summer Fever". The description of the latter is identical with that of Mediterranean or Malta fever which we call brucellosis of the Mediterranean. The casualties caused by this disease within the Maltese garrison which annually amounted to many thousands since every newcomer seemed to fall sick with them, gave rise to the discovery of the bacterium *Mediterranea* by the British medical officer David BRUCE in the year of 1887. Not until two decades later was definite proof established that the proper source of communication is the milk of the Malta goat. This discovery made it possible to classify for diagnostic purposes the undulant and remittent fevers occurring in the Mediterranean, which were known under various terms. The importance of brucellosis throughout the Mediterranean was recently emphasized by Horst HABS (cf. map VII/1). He stresses the spread of Malta fever to countries north of the Alps and announces the invasion of this disease to heretofore healthy areas which are contaminated by the constant progress of Malta brucellosis and the creation of new areas of disease. This reminds us of the opinion of Charles NICOLLE, who has particular merits as regards the control of Malta fever in French North Africa. He asserts that this disease recently has been progressively distributed throughout the world: "Elle justifie le nom de maladie d'avenir" ("one may correctly call it the disease of the future"), as he stated in 1920. I am not able to decide whether

Malta fever was "born" in the beginning of the 19th century in Malta without ever having been observed there earlier, as NICOLLE stated. NICOLLE calls Malta fever the best example of an infectious disease coming into existence before our eyes which previously was entirely unknown. He compares it with epidemic meningitis as a probable example, since this disease suddenly appeared at about the same time - the year 1805 is assumed for Europe. Its North American origin is not proven but there is no doubt about its peculiar migration throughout the world since 1805 which made it a typical soldiers' disease. The first attempts of epidemic meningitis to gain a foothold in Africa were successful after several intervals. It now is firmly established in North Africa, principally in the Sudan, the great recruiting area for the Anglo-Egyptian army of Egypt. The outbreak of epidemic meningitis among Sudanese elite regiments and simultaneously among the indigenous population revealed an African focus which certainly has become endemic and which doubtlessly feeds the foci of the North African coast. There is no acute danger of epidemic meningitis decisively influencing military operations since there is no connection between this disease and particular living conditions (epidemic equation = "Seuchenformel").

The efforts of the British Naval surgeons to classify the different febrile diseases demonstrate the difficulty and uncertainty of diagnosis due to the large number of febrile diseases common in the Mediterranean. In these efforts "Mediterranean fever" with and without jaundice plays a leading part. There is no possibility of ascertaining whether Malta fever, as we call it now, at that time was accompanied by jaundice having a different appearance than nowadays, since no bacteriological and serological methods were known in those early times. However, there is no doubt that an epidemic jaundice occurred to such an extent among the British Naval Forces and its insular garrisons for many decades - one is tempted to think of the epidemic hepatitis of present times - that another expert on the Mediterranean diseases, the British Naval Surgeon William BURNETT (1779 - 1861) introduced it as "commonly called the bilious remittent". To what an extent the syndrome of jaundice struck each physician, is revealed by numerous medical histories and epidemiological reports. Therefore, BURNETT agreed to introduce the more adequate term "Mediterranean fever" instead of the term "bilious remittent". On this basis the epidemic jaundice of the Mediterranean, considered identical with American yellow fever, was taken to be the same as Mediterranean or Malta fever.

In this connection it is particularly instructive to know that

Gibraltar was the principal focus of jaundice called Bulam¹⁾ fever, bilious remittent equal to the yellow fever of the West Indies.

The British physicians remarked that the years 1799, 1800, 1803, 1804, 1810, 1813, and 1828 were years of particularly severe Malta fever²⁾. These outbreaks also included Cartagena, Cádiz, Malaga and Algeciras to a greater or lesser extent, while other towns in the neighborhood were entirely spared or suffered only very little. Thus, for instance, the Spanish troops stationed at a distance of about 2 kilometers in the glaxis of the Rock of Gibraltar were entirely free of Gibraltar fever. It is, therefore, clear that the opinion and the suggestions of the various observers - contagionists or anti-contagionists (physicians believing in contact infection or not believing in it) - differed considerably. The former asserted that this disease is "sui generis" unusually infectious leaving an immunity throughout life. In addition they assert that it is of foreign origin and, a fact particularly important for us, that it is always liable to be imported into countries "enjoying a certain degree of heat". Contrary to them the anti-contagionists dismissed their opponents with contrary statements and directed the attention to the observation that this febrile disease had been inherent along the Spanish coast for a longer or shorter period of time and that the outbreaks were only caused by local and atmospheric disturbances.

Both views are supported to a certain degree by our present theory of infection. Its distribution depending on a certain temperature suggests the communicative activity of some insect such as some mosquito while the imperceptible occurrence among the population of the Spanish Mediterranean coasts permits us to assume a virus reservoir. Furthermore we must add the fact that the vector of genuine yellow fever, the *Aedes aegypti*, simultaneously communicates dengue fever. Therefore, the geomedicine of the Mediterranean countries will be completed by accurate maps of the distribution of the vectors as well as of the endemic or of the epidemic virus reservoirs. Some of the medical histories of the British reports suggest that pappataci fever at that time was among the Mediterranean fevers. This makes these maps, which show the distribution of the mosquitoes all the more valuable. (cf. map I/8 and I/3). One should, therefore, pay particular attention to the

1) Bulam is a settlement on the Lesser Antilles on which the yellow fever occurred.

2) HENNEN died during the outbreak of the year 1828 of the same disease in Gibraltar.

recent experience of the British (1941) with yellow fever in the Nuba Mountains of the Anglo-Egyptian Sudan (1940) which R. KIRK called "a most important outbreak of yellow fever in the Nuba Mountains, the most striking rural epidemic of the disease ever recorded from Africa" (cf. map VIII/1-3). Simultaneously G. FINDLAY published important observations and therefore the records on this threatening epidemic must be examined by experiments and from the geomedical point of view in all details. "Although there is no definite account of an epidemic of yellow fever in the Anglo-Egyptian Sudan in historic times, natives of Kordofan were immune to yellow fever when taken to Mexico in 1803. There is also evidence that they were far more resistant than Egyptians to fevers present in the Upper Nile Province of the Anglo-Egyptian Sudan. - There is no evidence to suggest that yellow fever has been recently introduced into the Sudan".

Comparing the symptoms of all the infectious diseases occurring there with each other one is struck as by an "optical signal" (to use the words of Gottfried HOLLER) if jaundice is mentioned which is described as an ever recurrent motive as well as an incidental one. As a chief symptom it is predominant with yellow fever which is so clearly described with all its symptoms that there is no doubt whatever as to its African or American Origin. Simultaneously the bilious character of other infectious diseases within the same disease area is mentioned. There is no other large territory in the world excluding these parts of America and Africa where yellow fever is common, in which such an ever recurring symptom is found. One is subject to such an impression as is particularly considered by HOLLER in his recently published critical and comprehensive study "The epidemic diseases accompanied by jaundice" (Vienna 1943). For this author, however, the jaundice is only one symptom which is "explained by the coincidence and the effect of several, probably many (sometimes not demonstrable) factors". Applying the theory of HOLLER to the Mediterranean complex one will discover that the infectious diseases not related to genuine yellow fever or to spirochetosis ictero-hemorrhagica such as hepatitis epidemica, paratyphus B, malaria and recurrent fever, bilious remittent fever and Malta fever belong to the above mentioned group of symptoms. Therefore, the clinical and micro-biological differential diagnosis must be made very carefully if it is desired to use it for geomedical prognosis; as the geomedical distribution of the infectious diseases with some visible chief symptom or incidental symptom is almost exclusively restricted to the typical Mediterranean climate. According to my personal experience in Asia Minor and Syria (1916 - 1918) and in Greece (1941) this observation is probably correct and agrees with the statements of HOLLER who assumed that within this climatic area of the Mediterranean particularly the liver in its principal function, which is the preparation and the di-

gestion of the food and the defense against numerous infections, is exposed to noxious agents in the altered metabolism. It is the task of geomedical research to investigate these problems by means of JARANOFF's and our own maps.

While for recently arriving troops the Mediterranean and its territories is a change from a seemingly safe and healthy area to an area of disease, it is a healthy region for the indigenous population and those Europeans living in it for a long period. For everybody who is transferred to this region the local influences upon the macro-organism are and remain relative and subjective. Together with a changed disposition of the macro-organism the prognosis is also altered. This relation clarifies the geomedical distribution of the bilious remittent fever which was given a classical description by the German physician Wilhelm GRIESSINGER during his activities in Egypt (1850 - 1852). This report led to the consideration of paratyphoid fever C, which was continuously investigated before World War I and during the present war has revealed most interesting areas of disease in some Mediterranean countries (cf. map I/7). For military geopolitics and geomedicine yellow fever, when considered together with the forms of jaundice occurring in the Mediterranean basin at earlier times, at the present or in the future, gains acute importance. This is summed up by GRIESSINGER in the following statement: "In Europe and among us there are numerous diseases which cannot be distinguished with certainty from yellow fever". A map of the occurrence of yellow fever in southwest and southeast Spain also showing the test method, in view of the dynamics of each infectious disease revived by war or migration might perhaps reveal a survival of yellow fever in the garrison towns described by HENNEN as foci of this disease. If the testing experiments of Arnold DCHMEN (discussed before the Berlin Medical Association on 19 May 1943) with a virus found by him associated with hepatitis epidemica brings about similar successful results as did the serum tests for yellow fever, GRIESSINGER's postulate formulated a century ago demanding an etiological determination will be linked to our present micro-biological research 3). The distribution of hepatitis throughout Europe will soon be delimited in this case.

3) "It is evident that a precise delimitation of the above mentioned diseases from yellow fever as it is revealed by its symptoms, is not advisable and that the diagnosis which in some cases is liable to cause confusion is based on the etiology for the most part."

MRUGOWSKY gave his personal ideas on the etiology of yellow fever which are still discussed and have not been thoroughly investigated as yet, and he gave some evidence for them by means of the following map. He relies upon the theory of Alfred WEGENER concerned with the "Origin of Continents and Oceans" and asserts that the yellow fever area was divided by the detachment of the African Continent from the American Continent into an African and an American part. "In these areas, now separated from each other, the yellow fever virus developed two serologically different varieties. Geological and palaeo-climatic reasons are not opposed to this opinion. - In South America the virus, therefore, has always been inherent and was not imported from Africa at a later date. - The virus grew in the original area even before the cretaceous period".

The Illustration shows South America and Africa during the lower tertiary (Lutetian period.) South America is detached from Africa and rotates westward. South America and the Antarctic as well as Africa and Madagascar are still coherent. The South Pole is situated south of the Cape Colony; the equator passes through present day Central America and the Mediterranean countries. The shallow seas north of South America and Africa are indicated by a dotted area. One recognizes that in North or South America and in the region of Sierra Leone extensive stretches of land are waiting which during the lower tertiary period begin to detach themselves from each other. (According to KOEPPEN, W., and WEGENER, A.; the climate of the geological primeval age, Berlin, 1924). - From MRUGOWSKY, J.: Essay of the ontogenesis of yellow fever. Arch.Hyg. Vol. 111, p. 104-112 (1933).



Plague and tularemia must be considered from another point of view. Since ancient times the Mediterranean and its coasts were regarded as the principal area of "Levantine Plague". The mysterious countries and nations of the Levant, so to speak, were the source of this scourge of humanity, which was well known in its symptoms, in the form of bubonic and pneumonic plague, as the black death, just as was small-pox. It is unknown whether plague was dreaded as a war disease on the Venetian battle ships, among the Carthaginian and the Roman legions, or among Okba's cavalry armies, or whether it did not occur at all at that time. It is certain that it broke out during the historical controversies

between Great Britain and France, soon after Bonaparte's invasion in Egypt. Here too, the same thing happened as in the winter camps of the Prussian Army during the Seven Years' War, where the term "plague" that means the actual diagnosis, was not to be mentioned in public to avoid a panic. Such concealing tactics are not desirable nowadays to insure an effective control since only an extensive knowledge of the epidemics and their details provide the hygienist with effective means to extinguish them. A clear diagnosis is required all the more, as it frequently happens that within the area of plague tularemia also occurs which, similar to plague, strikes man as well as animal. The geo-medical virus reservoir of both the diseases is identical with the only difference that no tularemia foci of the 2nd and 3rd order and ports with tularemia incidents are known so far, as is the case with plague in the Mediterranean and its coasts. The experience of HENNEN and DESCENETTES, however, shows that a certain type of plague occurred among soldiers and civilians which apparently was not true plague although bubos were found. Though DESCENETTES received reports of his Army Surgeons from Egypt and Syria on a varying course of the bubonic plague, which within a certain time either took a very mild or a very severe course, he was correct to maintain his diagnosis since he had no other knowledge and since tularemia was not yet known at that time. In our time we have available a large number of hygienic and bacteriological methods of differential diagnosis, if such variations in the course of a disease occur.

This increases the value of Bonaparte's intrepid self-experiment made in the presence of his Army Surgeon in the plague hospital of Yaffa (1799). This is recorded in the reports of DESCENETTES and the French General Staff on the Levant campaign.

Bonaparte stayed for more than $1\frac{1}{2}$ hours in both hospitals without considering any special precautions when contacting his soldiers sick with plague. During his attempt to prove that plague is not communicable the general went so far as to assist in raising the "horrible" body of a soldier who had died from plague and whose tattered uniform was soaked with the pus of a draining bubo. There is a very famous picture by Grosz showing this visit.

The distribution of exanthematic typhus shows particular features. The entire Mediterranean basin is encircled by foci of exanthematic typhus. Not only does the classical form of the disease occur, but also several of its varieties. The progress of the dynamics of exanthematic typhus since World War I may be recognized from the following facts: No earlier than in 1915/16 exanthematic typhus spread as a solid focus from its endemic foci in the Caucasus westwards over the Anatolic highlands to the lifted Aegean coast, where it was firmly

established. From Anatolia it was carried to Syria and the entire Near East by the operations of the German and Turkish Forces. The surrender of the British fortress of Kut-el-amara, according to British sources, was due to exanthematic typhus within the boundaries of this town. At any rate the besieging army also had to bear the same burden of exanthematic typhus, which caused the death of the Commanding General, Field Marshal von der GOLTZ. This advance in a westward direction was followed by a second one during the civil war in Spain (1936-1939). Now and then isolated cases of typhus had occurred in southwest and eastern Spain, imported from the African coast. The supplies brought in by the Communist forces from their base in Odessa imported new infections to Iberia which since then have been deeply rooted there. (cf. map VII/10a). It will be a huge task for the whole of Europe to make the Mediterranean free from exanthematic typhus after the war. Here one will have to rely upon the investigations and the research work of the outstanding French scientists BURNET, NICOLLE, and the two SERGENT's in Algiers and Tunisia, of the Spaniard PRIMITIVO DE LA QUINTANA which are of equal importance for the etiological and the geomedical aspects of this disease. This concept found its realization when immediately after the occupation of Abyssinia the Italians established an excellent typhus institute in Addis Abbeba. For the investigation of murine exanthematic typhus the German hygienist Emil REITHMANN recently published a fundamental monograph based upon his considerable personal experience in Greece (Endemic Typhus throughout the Mediterranean, Leipzig, 1943).

From its outset in India cholera has frequently used the isthmus between Asia and Africa as a springboard to Europe and to the North African coast. It certainly left endemic residual foci in the Nile delta from which the disease was spread whenever intrinsic or extrinsic conditions were given. - Mention must however be made that an outbreak of cholera in Egypt does not mean the same in the adjacent territories or on the Mediterranean islands. The comparison of the unpublished maps of Walter HEINE for cholera in Africa in the period from 1775 to 1940 according to the data of Georg STICKER and Henry-Clermond LOMBARD, substantiates the statement of LOMBARD. HEINE sums up that "heretofore large territories remained safe even during the most violent epidemics. This applies to the east coast south of the Delagoa Bay, the Cape Colony, and to the western coast as far as the Rio Grande, and to the interior of the continent".

The close investigation of the almost innumerable small and large colonial campaigns of the big European powers in Africa during the

nineteenth and twentieth century reveals that no mention was made of the cholera although all conditions for its outbreak were present. This applies to the two largest campaigns of the past half century, the Herero campaign in southwest Africa (1904 - 1906) and the Boer War of Great Britain (1899 - 1902). Contrary to that cholera had a considerable influence upon the operations during the Krym War (1854 - 1856) and the Second Balkan War (1912 - 1913) in south-eastern Europe. During the Krym War many thousands of British, French, Turkish, and Russian soldiers lost their lives through cholera. It occurred not only in the trenches and within the fortress of Sevastopol and throughout the Krym, but also in the embarkation ports of the British and French fleets in the Piraeus. The epidemics were restricted to this port, the region about Athens, the islands of Paros and Aegine without invading the other parts of Greece. During the two Balkan Wars (1912 and 1913) the peculiar "immunity" of Greece was also evident. Although the Bulgarian and the Greek army on the Kresna Pass suffered heavy losses from cholera no case occurred in Greece itself. The Bulgarian army suffered all the more, on the Tchotaldja front as much as its enemy, the Turkish Army. Cholera, however, decided against the Bulgarians, since they lost the struggle when a particularly severe cholera seized their brave army encircled by its too mighty enemies. It was really cholera which forced Bulgaria back from one of the best parts of the country and from the Mediterranean for decades by the Peace Treaty of Bucharest (1913).

World War I offered no opportunity for this epidemic to take a decisive effect in the Mediterranean. Neither in Callipoli, nor in Asia Minor, Syria, or Palestine did it appear to a noteworthy extent. The outbreaks occurring in the western parts of Asia Minor (1916) and in the Near East (1917/18) were easily and rapidly localized and extinguished by general sanitary measures and, most of all and in the safest way, by the very reliable cholera vaccination. The same applied to the parts of the Serbian army assembled in Corfu (1916) whose entirely exhausted troops suffered heavy losses through cholera and exanthematic typhus.

As an introduction to this study I mentioned great princes, military leaders, and naval heroes who in their time had altered the shape of the world, that means the Mediterranean and its countries, and had changed its political boundaries for many centuries. All these struggles centered around the civilization of the Occident and "its" Levant. In the wake of the political and the simultaneous

intellectual and religious controversies, medical science followed as an auxiliary and also as the valuable substance of philosophical and religious ideologies. Medical scientists with a particular interest in geography and history, therefore, are not surprised to find the studies of Hippocrates born on the Aegean island of Keos containing considered and sharply outlined observations of most varied diseases, the nature and symptoms of which suggest an accurate geometrical knowledge of the islands of the Mediterranean known at that time. Hippocrates therefore may be called with due restrictions the first classical geometrical scientist within the limits of his time whose works are revived to a new dynamic interpretation and evaluation when considered as a whole and in relation to modern ideas. Only the centuries of medicine and natural science, such as the 19th and the 20th century, with their spiritual and material association with technics, which is one of the most decisive powers in the struggle of man with his own kind, carries the medicine of such a time away with the exigencies of utility and imperceptibly makes it an active fighting force and not only an exclusively charitable and succoring component. Geomedicine as a part of war medicine becomes a weapon without knowing it, the handling and use of which may be decisive for the outcome in a certain sense, but in any case is of importance for war. The above mentioned examples speak for themselves.

There is no doubt whatsoever as to how much the territorial expansion of a nation promotes its scientific progress. The outstanding research work of Spain, France, Italy and Greece during the military or cultural conquest of their African counter-coasts is revealed by the example of France for Morocco, Algiers, Tunisia, and Egypt, of Italy for Tripolitania, of Greece for Egypt and the Eastern Mediterranean, and of Spain for its part of Morocco. In contrast to that the North American University in Beyrouth and all the other North American and British colleges and schools create the most disharmonious impression. They are not "appropriate" for the Mediterranean, as their spiritual foundations are contradictory to those reigning throughout this area. They disturb the bio-geographical harmony of the psychology of the Mediterranean nations which prefer to entrust themselves to the mentality of the Germans, the Italians, and the French, the Anglo-American point of view being strange to their thinking.

This statement concerning geopsychology as defined by HELLPACH describes "geo-urgia" as a science concerned with the "formation of the earth on which we live in order to harmonize better with it, to make it our servant, or to adapt ourselves to it", and the attempt to achieve this end leads us directly to the geometrical discoveries

in the Mediterranean and its coasts. If we examine a selection of them in regard to their value, that means as to their consistency for present and future times, a short and precise survey is sufficient to find out that every military, political or scientific enterprise has and will become possible only by the discoveries and the research work of hygienists. Thus, a large number of fundamental discoveries has been made throughout the Mediterranean which made possible the surrender of the earth to man. In the following a detailed survey of these studies is given:

ITALY:

- Hieronymus FRACASTORO: Differential diagnosis of the various types of typhoid fever. Exanthematic typhus classified as a genuine disease (Verona 1546).
- Bernadino RAMAZZINI: Author of the first scientific publication concerned with the professional diseases of man ("De morbis artificum diatriba") (Modena 1700).
- Angelo DUBINI: Discovery of hook-worm (Milano 1838).
- Angelo CELLI and Ettore MARCHIAFAVA: Discovery of causative organism for Malaria tropica (Rome 1889).
- Giuseppe GUARNIERI: discovered Guarnieri's bodies as a diagnostic characteristic of small-pox (Pisa 1892).
- Angelo CELLI: Experimental communication of malaria through mosquitoes (Rome 1898).
- Battista GRASSI: Discovery of the Anopheles as the exclusive vector of malaria (Rome 1898).
- Amico BIGNAMI, BASTIANELLI and Battista GRASSI: Ontogenesis of plasmodia malariae within the anopheles (Rome 1898).
- Adelchi NEGRI: Discovery of Negri's bodies with rabies (Pavia 1903).
- Cililio RAFFAELE: Discovery of extra-erythrocytic non-pigmented forms of parasites (EE-forms) in the malaria of birds (Rome 1936).

Alberto MISSIROLI: Sanitary measures in Sardinia and first use of modern chemotherapeutics. Ontogenesis of the sporozoites in the malaria of birds. Extracellular division of sporozoites within the lymph spaces. After that the sporozoites migrate into the endothelial cells (Rome and Sardinia 1938 - 1942).

This is only a small selection of the important Italian investigations but the reference to the great medical tradition of the classical medical faculties indicates the practical importance of the above mentioned discoveries. The work of RAMAZZINI is mentioned although at first sight it seems inappropriate to refer to it. Its consequences however, demonstrated in other countries, particularly in Germany, that the classification of the tropical diseases in general and of exanthematic typhus and scurvy in particular as occupational diseases liable for indemnity, should be considered as equal to service disability in the military sense. During the 19th and the 20th century the direct succession is continued from Camillo GOLGI, Bartolomeo GOSIO to Aldo CASTELLANI, the successful Chief Surgeon of the Italian Army during the Abyssinian campaign of 1935 to 1936. The prophylaxis and treatment of exanthematic typhus in Italian East Africa was conducted in an outstanding manner by Giacomo MARIANI, Italo ARCHESI and Brenno BABUDIERI.

Without the classical studies of malaria by Italian scientists the development of international malaria research and the rehabilitation of the marshes of the Campagna would not have been possible. Contrary to that the extermination campaign against ankylostomiasis is an example of how a scientific discovery to a certain degree becomes an almost invisible political tie and the pioneer of imperialistic expansion. The distribution of hookworm throughout the world and the exemplary extermination campaign conducted by the Rockefeller Foundation opened the way for the dollar-imperialism concealed behind charitable tendencies as was revealed in some places of the earth after the entry of the United States into the war.

And now let us turn to the African coast opposite France.

The French Expeditionary Force debarking on 14 June 1830 not far from Algiers found a fever scourged country which above all suffered from its "climate" ("dans un climat ou l'élément fébrile est essentiellement dominant"). (In a climate where febrile diseases are common).

These febrile diseases, among which those accompanied by jaundice prevailed reminding one of the yellow fever of the West Indies, struck the French medical officers as much as they did the British 30 years ago. By the febrile diseases occurring there the freshly conquered country suffered considerable economic and military losses which were described by the French medical officer Adolphe ARMAND 24 years after the occupation in the extensive work of medical topography "L'Algérie médicale" (Paris 1854). Similar to the work of Franz PRUNER on the diseases of the Orient, principally of Egypt, this French publication was a heretofore uncommon form of medical topography. ARMAND gives his geographical and climatological study under the heading of topography with the motto: "La topographie est à la médecine ce que la géographie est à l'histoire". (Topography means the same to medicine as geography to history). Geomedicine truly cannot be described more briefly, ARMAND recorded the experiences of a whole decade. Turning from that first quarter of the century of French colonization in the Mediterranean to the fundamental discovery of the French medical officer Alphonse LAVERAN in Constantine (1880) that malaria organisms are living parasites belonging to the protozoa, we remember ARMAND's question in the introduction to his work: "Quelle est la cause des fièvres d'accès? Réside-t-elle dans une viciation de l'air, dans un poison subtil appelé miasme? Non, assurément, l'air de l'Algérie n'est pas infecté, et la cause de la fièvre, là comme ailleurs, cessera d'être hypothétiquement placée dans une prétendue intoxication miasmatique, quand on appréciera mieux le mode d'action des influences climatériques dont une bonne hygiène peut efficacement garantir. Cette question préalable, pour la résoudre en y rattachant ce qu'un climat presque semblable nous avait fourni de faits à l'appui, dut faire le sujet d'un traité spécial sous le titre de: *Études étiologiques des fièvres en Algérie et dans d'Italie centrale, avec cette épigraphe en indiquant le but: "Le miasme paludéen est l'X, l'inconnue à éliminer du problème étiologique des fièvres."* ("What is the cause of the remittent fevers? Is it contained in a viciation of the air, in a subtle poison called miasma? Certainly not, since the air of Algiers is not contaminated and here, as elsewhere, the cause of the fever will not be attributed hypothetically to a pretended miasmatic intoxication as soon as one knows better the mode of the effect of the climatic influences which can be appropriately modified by effective sanitary measures. The solution of this important question by the means available to us, in an almost similar climate was the topic of a special study which appeared under the title: "Etiological studies of febrile diseases in Algiers and Central Italy" culminated in the following conclusion: "The paludinal miasma is the X, the unknown figure which must be eliminated from the etiological problems of the febrile diseases").

This remark of ARMAND was preceded by a similar statement of another French medical officer, Auguste HASPEL, urging consideration of all factors as a whole in his work on the "Maladies de l'Algérie" (Paris 1850 - 1852) published two years before and highly appreciated by GRIESSINGER. From CELSUS' words "differunt pro natura locorum genera medicinae" HASPEL concludes somewhere in his introduction: "Que de choses en effet, à trouver, à expliquer? D'ailleurs la plupart des observateurs n'ont tenu compte qu'accidentellement de l'influence des saisons sur les modifications morbides et presque tous, pour ainsi dire, se sont absorbés dans l'étude exclusive des fièvres intermittentes. Nous eussions désiré aussi que ces habiles médecins eussent franchi la Méditerranée avec un esprit plus libre, plus dégagé des idées systématiques qui règnent en médecine. Cette terre africaine désolée par tant de maladies veut être vue avec la plus complète indépendance d'imagination et de jugement. Les maladies de ce pays avaient en outre besoin, comme je de le disais dans la Gazette médicale, d'être étudiées dans leur marche, dans leur ensemble, d'un point de vue élevé, dans un certain ordre qui en fasse sentir l'importance de la liaison." ("What matters can be found, what can explain this? Elsewhere the majority of the observers took incidental notice of the influence of the seasons upon the modifications of disease and almost all of them were, so to speak, absorbed by exclusive studies of the intermittent fevers. We should have liked that these able physicians had crossed the Mediterranean with a more liberal spirit and had been more detached from the systematic ideas prevailing in medicine. This African territory, desolated by so many maladies, should be seen with the greatest independence of imagination and judgement. The maladies of this country furthermore must be studied during their progress, as I explained in the Gazette Médicale, as an entity, from a detached point of view and in a certain order which makes us feel the importance of their relations".

The searching of ARMAND and HASPEL for the etiology of the Algerian fevers was concluded by LAVERAN's discovery.

In the following a short survey is given of the big problems discussed and studied in the Pasteur Institutes of Algiers, Tunisia, and Tanger after LAVERAN.

Alphonse LAVERAN; Discovery of a protozoon causative for malaria (Constantine 1880).

Edmond and

Etienne SERGENT:

Fundamental investigations of the typhus organism and its experimental communication to man. Numerous investigations of almost all infectious diseases occurring throughout the Mediterranean basin (Algiers since 1900).

Charles NICOLLE:

successfully injected blood contaminated with typhus to monkeys and guinea pigs (Tunisia 1909 and 1911). He further succeeded in communicating exanthematic typhus through the body louse from one monkey to another (Tunisia 1909).

Etienne BURNET:

particularly studied the course of the brucellosis throughout the Mediterranean (Tunisia since 1922).

Here too, we see the assault on exanthematic typhus foci throughout the Mediterranean basin. I do not exaggerate in saying that typhus was the incentive for NICOLLE's eminent study "Naissance, Vie et Mort des Maladies infectieuses" (Paris 1930), which is derived from history as a spatial and temporal basis for all diseases in the same way as we have established it for the epidemiological maps (Seuchenatlas). "L'existence historique de la maladie est sa vie à travers les âges. On est en droit de lui supposer, comme à tout ce qui vit, une origine (naissance) et une fin (mort). C'est cette existence historique qui fait exactement l'objet du présent livre. Pour l'imaginer, l'expliquer il nous sera utile de traiter tout d'abord des existences individuelle et collective des maladies, de la façon dont elles s'exercent de leur début et de leur fin." ("The historical existence of disease is its life throughout the ages. One is correct to assume for it as for every living matter, an origin (birth) and an end (death). It is this historical existence which is the topic of this book. To imagine it and to explain it, it will be useful to treat first of all the individual and collective properties of the disease in such a way as they appear from their origin to their end". These are the words of NICOLLE.

Our reply is that geomedicine is the science to trace these problems and to clarify them by its method of medical cartography. Geomeditine will achieve this work all the easier as various countries issued useful and practicable laws for the control of the malaria, such

as Italy, Greece, Roumania, and Bulgaria. The great clinician Wassil MOLLOV and the hygienist Toshko PETROFF of the University of Sofia are worthy of the particular gratitude of their country for their prudence and their tenacity when the anti-malaria law was prepared the favorable effect of which became evident immediately after the restitution of Macedonia (1941). Here, again, the consideration of all factors as a whole is particularly obvious which for every physician in the Mediterranean countries is so to speak obligatory namely the accurate knowledge of the tropical diseases and of general hygiene. MOLLOV for instance simultaneously was the Bulgarian specialist for tropical hygiene and he was not an "also-tropical hygienist". The Professor for physiology in Sofia, Dimitri ORACHOYATZ, is a hygienist of high qualities as regards the effect of his medical, scientific and organizing virtues. There is no other word of PETLENKOPFER's on the purpose and the peculiarity of hygiene which is more appropriate than when he calls it the physiology of environment. The leadership of the Bulgarian hygienists which is well established even though the number of its representatives is small, is proved by the names of Stephan KONSULOFF, Peter KOSHCHAROFF, Georgi SHAROFF, Mirtcho SLIVENSKY, and Lubimir ZVETKOV. These authors dispose of a most valuable knowledge of the territorial diseases as it is required for the geopolitical situation of Bulgaria which has become an amphibious country since July 1941.

Greece, which for many centuries was a part of the Osman Empire and successfully fought for its liberty only at the onset of the 19th century, had to rebuild its national organization from within in the decades to follow and it had to preserve it by new struggles. A basis of Greek science had to be formed first. It is true that the Greek physicians whose practice was preserved by Greek hospitals in almost all large towns or settlements of a Greek colony and religious community were much sought for in the Levant. Many Western Europeans who through their profession, their research work, or their love for traveling came to the Levant, owe their salvation from typhoid fever, exanthematic typhus, or malaria to the nursing in a Greek hospital. The formation of Greater Greece after the second Balkan War and after World War I promoted the notable development of the national Greek science and above all of Greek medicine and natural science. There has been a close connection with German medicine since the arrival of the first King of Greece, Otto from Bavaria, in Nauplia (1833). After the Treaty of Versailles French more than British influences became effective in addition, as the foundation and the first management of the Hellenic Pasteur Institute in Athens (1920) was entrusted to the very experienced tropical hygienist Albert CALMETTE, originating from the Medical Corps of the French Navy. His co-worker was a disciple of BLANCHARD

and NICOLLE, the actual director of the Pasteur Institute in Casablanca, George BLANC, who is one of the most successful research workers on exanthematic typhus throughout the Mediterranean.

Hellenic medicine always preserved and followed the tradition of the great Hippocrates from Keos. During the greatest trial of the nation, when the Greeks were expelled from Asia Minor to their country of origin (1922), it showed a great sacrificing spirit. Greek science showed its best which it had learned from such hygienists as Jean CARDAMITIS, Constantin SAVAS, the Consulting Hygienist of the Greek Forces (1941) Constantin MOUTOUSSIS, and the pharmacologist George JOACHIMOGLU. Malaria, black water fever, dengue and pappataci fever, Kala-Azar, exanthematic typhus and dysentery of any etiology and epidemic meningitis are the fields studied by these men. Among these scientists we must also mention the emigrated Greek Stephan KARTULIS whose research work on entameba histolytica in Alexandria (1885 - 1913) provided valuable information on which a part of our present knowledge of amebic dysentery is based. Even though the history of the discovery of entameba histolytica is so complicated that even scientific heroes such as CELLI and GRASSI, KOCH and SCHAUDIN, MARCHOUX, COUNCILMAN and LAFLEUR, MUSGRAVE and CLEGG could not find their bearings, as Clifford DOBPELL proved, KARTULIS paved the way after KOCH had shown him the post-mortem evidence of destruction caused by the amebic dysentery. On this basis KARTULIS continued his research work. Later on KOCH together with George GAFFKY in his report on the Cholera Expedition stated that the intestinal amebae curing amebic dysentery were identical with those occurring in a tropical liver abscess (1887). DOBBELL (1919), however, asserted that this was well known to the British tropical physicians and he wrote: "that 'tropical' hepatic abscess is definitely associated with 'tropical' dysentery which had, however, been recognized long before by the Anglo-Indian clinicians, whose observations thus found their true explanation." It hardly requires mention that also the Rockefeller Foundation undertook to control malaria which in Greece is usually rather severe. Gregory LIVADAS and John SPHANGOS made efforts to continue this work in cooperation with Germany. The foundation of the German-Greek Institute for Biology of the Kaiser-Wilhelm-Society in Athens (1943) demonstrates how much both the German and the Greek science are interested in the problems of biological research.

British medicine has a peculiar position throughout the Mediterranean basin. One would expect that British tropical hygiene, on

the basis of the strong political position of Great Britain, would have conquered and organized a field of research which from military reasons alone takes a secure position. This is not the case. The discovery of the bacterium *melitense* as the organism causing Malta fever (1887) by David BRUCE, and the cultivation of this germ, which was accomplished only two decades later, from the milk of the Malta goat by the "Mediterranean Fever Commission" (1904 - 1906) are the principal British discoveries. To name just a few of the members of this commission working under BRUCE, such as P. BASSET-SMITH, F. CLAYTON, T. McCULLOCH, J. EYRE, J. KENNEDY, P. HORROCKS, T. ZAMMIT, we will find among them the most famous names from British bacteriology and tropical hygiene. Otherwise there were just the medical records from the British garrisons, ports, and naval units. One particular link in the malaria research shall be mentioned here. That is the suggestions provided by the discovery of Ronald ROSS for the work of the French and Italian scientists for the elucidation of the etiology of the malaria. These suggestions have their source in the synthetic reviews of Patrick MANSON. Details of that matter can be found in Fritz ECKSTEIN's historical study on GRASSI and ROSS and in the classical article of ROSS himself. By the way, his last scientific expedition was devoted to malaria throughout the Mediterranean and particularly in Spain, Cyprus, Egypt, and Greece.

While the countries of the scientists whose discoveries were described here were countries bordering on the Mediterranean, that means that they always were "at home", and while they studied the diseases occurring there in order to be helpful to their own nations, there was no such reason for the German scientists. Germany did not touch the Mediterranean even with a small piece of land, nor did it have a mandate or a colony on the North African coast. There is only some tradition originating from the age of the Crusades and the Order of the Knights of Malta, and from an engagement of Prussian sailors on the coast of "Rif pirates" (1856) and in addition from numerous German soldiers who had fought in foreign services as individuals or in whole units and thus lost their lives in many cases. Mention is made only occasionally of German physicians as medical officers of German regiments. Not until the campaign of Bonaparte in Egypt was the eastern Mediterranean opened to the influence of European medicine which then became rather considerable. Since that time it preserved its influence throughout the whole Near East and was widely distributed. A remarkable feature of this development is the fact that particularly in Egypt German physicians made fundamental studies the significance of which correctly recognized at that time and which in the course of many decades retained their importance as decisive and even nowadays are valid facts, and on which other important discoveries

were to be based.

- Franz PRUNER: author of the first scientific monograph on tropical hygiene and medicine in the German as well as in the international literature concerned with tropical diseases: "The Disease of the Orient as seen from the point of view of comparable Nosology" (Erlangen 1857).
- Theodor BILHARZ: Discovery of the Bilharzia Worm (Cairo 1851).
- Wilhelm GRIESSINGER: Description of Bilious Remittent Fever in Egypt (Cairo 1852).
- Robert KOCH: Discovered the Cholera organism (Alexandria 1883).
- Artur LOOS: Discovery and experimental investigations of the invasion of the ankylostoma larvae into the human skin (Cairo 1897).
- Felix GOTSCHLICH: Discovery of the El-Tor Cholera vibrio (El-Tor 1905).
- Robert DOERR: communicates the Pappataci Fever through the blood and phlebotoma mosquitoes (Hercegovina 1908).

In the following we shall give a review of the German research work done in the Mediterranean.

A solid basis was given by PRUNER's work which in its disposition and views on the disease of man, animals, and plants constitutes a genuine geomedicine of the Orient. The etiology of the syndromes given by PRUNER was demonstrated by outstanding and very accurate investigations of GRIESSINGER and his assistant BILHARZ soon afterwards. In spite of their general significance for the parasitic diseases of man, the observations of the two scientists at that time had no other effect than to cause curiosity because the German scientists showed little interest in diseases not occurring within the boundaries of their country. At the utmost such diseases were imported by Germans returning to

their country and usually were not diagnosed as of an infectious nature. Suddenly the situation was completely changed, as German trade extended beyond the boundaries of the Levant and took its place in the extra-European territories and increased in importance twelve years after the constitution of the new German Empire and one year before the acquisition of its own colonies in Africa. The tropical diseases were carried closer to the Occident. Bacteriology, the classical representatives of which were PASTEUR and KOCH, gradually attracted more attention, since instinctively one became aware of its significance for diagnosis and recognition of the great plagues of the world. Therefore the discovery of the cholera organism was to cause a tremendous sensation. Hygiene revealed a rapidly migrating Asiatic epidemic, which heretofore had been considered as dreadful, before it was able to invade the Mediterranean and it is likely that it prevented this plague from advancing further towards the Occident.

In former times the discovery of organisms causing diseases was published first in the secluded scientific archives and periodicals, gradually spreading from there into the more or less interested public, while nowadays wire and radio broadcast the outbreak of every epidemic from the most remote parts of the world. But it was cholera which very soon presented a great number of unexpected problems to the hygienists, when PETTENKOFER established his principal theses on cholera, the unknown problems of which have become a particular field of concern for geomedicine. The present-day generation of hygienists is hopeful regarding the solution of these unsettled questions by geomedical methods. An encouraging preliminary work has already been done.

After the discovery of the El-Tor-vibrios by GOTSCHLICH, not to speak of many other types occurring in Soviet Russia and East Asia it became obvious how little had been done hitherto in systematically classifying the genuine cholera organisms and other organisms similar to cholera and related to them.

An important intermediate research work in the field of parasitology concerned with the worms contaminating man was done with the classical studies of BILHARZ and LOOS in the period from 1851 to 1897. They completed the studies taken up by DUBINI and finished by BILHARZ, GRIESINGER, and PRUNER.

In addition mention must be made of Pappataci fever occurring with man in the Mediterranean basin which in its etiology and spreading was recognized first by German scientists. The preliminary work of Alois PICK in Hercegovina (1886) concerned with the differential diagnosis of

the various transitory fevers gave a solid basis on which Robert DOERR continued his decisive final experiments with blood containing viruses withdrawn from man and injected to man and with a mosquito which communicated the disease from patients to healthy persons. In this way GRAHAM had demonstrated the virus causing dengue five years earlier in Syria by passing blood through mosquitoes (1903). This disease is the same acute affection of the knee joint or the "acute rheumatism" which was correctly outlined by PRUNER in his accurate clinical study contained in his above mentioned work. It is all the more worthy of attention, as its vector *Aedes aegypti* simultaneously is the vector of genuine yellow fever. One of the greatest and most violent outbreaks of dengue in Greece and particularly in Athens was reported by MOU-TOUSSIS (1928). All experiments concerned with the communication of febrile diseases are based upon the classical experiments with malaria as a model disease.

There is a large number of fundamental discoveries which were accomplished by German scientists in a remote part of the Eastern Mediterranean basin and the effects of which reach into the present day. Egypt itself lies before us as a geopolitical and simultaneously geo-medical bridge linking Asia and Africa on which many lives are lost, if the warnings and suggestions of the hygienists are not sufficiently considered. Because the enormous Nile River reigns over the country no general and no hygienist will be successful against it unless they make it their ally by accurate observations and definitions of its environmental conditions by means of geomedical maps. The French influence upon Egyptian medical science in spite of the short stay of the French Expeditionary Force in Egypt remained important enough to provide a dominating influence on the training of the Egyptian medical officers and civilian physicians (1823 - 1848) for a man like Antoine CLOT-Bey, who was much discussed and opposed because of his views on plague. In this sphere of influence and in the decline of the institutions brought up to a high standard by CLOT but declining after his return to France, GRIESSINGER and BILHARZ were involved. The personal and material difficulties in the educational activities of both scientists must be traced back to this fact which would have been rendered ineffective by a man like PRUNER, who, however, at the time of GRIESSINGER was living in Germany to reconstitute his health. After his return in the latter part of March 1852 he seems to have been in contact with GRIESSINGER only very superficially as the time of the arrival of this scientist was in August 1850. The literature states about GRIESSINGER: "without being able to contact PRUNER". The suggestions for GRIESSINGER, however, were unusually numerous and valuable. Ten years later he compiled the famous volume on the

infectious diseases in the "Manual of Specific Pathology and Therapy" (Handbuch der speziellen Pathologie und Therapie) edited by Rudolf VIRCHOW (Urlangen 1857). As a preliminary publication he had prepared "Clinical and Anatomical Observations of the Diseases in Egypt" in three volumes of the "Archive for Physiological Medicine (Archiv fuer physiologische Heilkunde)" (1853-1855).

CLOT returned to the Nile valley in 1856 and he succeeded once more in developing his foundations to a high standard but he was not able to remain there because of sickness, and he finally returned to his country in 1858. PRUNER, under the supervision of CLOT, was in charge of military and civilian hospitals for several years. Together with CLOT he acted with the same authority and importance and in spite of his German education he was considerably influenced by the French. This is revealed by his work on the "Topographie médicale du Caire avec de plan de la ville et ses environs" ("Medical topography of Cairo with a plan of the city and its environments") edited by him in Munich in French "at his own expense", (1847) the total of which has to be considered as a model of any such scientific enterprise. He explains the reason for this study and here too, he puts yellow fever and racial pathology to the fore: "Les maladies de toutes les parties du globe, sans même en excepter la fièvre jaune, s'offrent l'une après l'autre à l'œil scrutateur; et l'idée que la boîte de Pandore s'est vidée dans cet ancien Emporium des richesses n'est ni neuve ni exagérée. - Le but exclusif de ce petit travail est de présenter à nos confrères l'aperçu des maladies qui règnent comme permanentes ou passagères dans la capitale de l'Egypte, en ayant égard à l'étiologie et aux modifications que les maladies offrent dans les différentes races. . . ." ("The diseases of all parts of the earth including yellow fever are shown to us one after the other; and the idea that Pandora's box was opened in this old emporium of riches is neither new nor exaggerated. The exclusive desire of this little work is to present to our colleagues the description of the maladies occurring permanently or transitorily in the Egyptian capital with regard to their etiology and to the modifications shown by them among different races.") With this topography PRUNER had completed a small but noteworthy early study of his compatriot and friend Jacob Ritter von ROESER, personal physician of some minor German prince. The title of that study was "Some Diseases of the Orient, Observations Gathered during a Journey to Greece, Turkey, Egypt, and Syria". (Augsburg 1837). Here ROESER, like PRUNER 15 years later, was most impressed by the significance of the Mediterranean basin for the discovery and the history of diseases, principally of the infectious diseases and he (ROESER) writes in his introduction: "I want to direct attention to the fact that these are the diseases of those coun-

tries in which physical sufferance was perceived first, considered and subjected for the weal of humanity to scientific research and that the old heroes of medical science described them and that similar to the human races living in this area they certainly still possess many of their former peculiarities so that the works of the ancients cannot be fully understood and evaluated without their being studied."

Both POESER and FRUNER have antecedents who wrote critical summaries on medical geography and topography and in most cases stood isolated. One of these, Moritz HASPER, Professor of the University of Leipzig, was correct in criticising the great ignorance of the etiology and the epidemiology of diseases, particularly of the infectious diseases, among German physicians. His work: "Nature and Treatment of the Tropical Diseases elucidated by Medical Topography of the Tropical Countries and Completed by the Special Diet to be Considered in the Tropical Countries for their Prevention" (2 vol., Leipzig 1838), certainly is the first German manual of tropical diseases which, however, is not based on personal experience but on the knowledge of the literature which is very critically evaluated. Topography is a solid basis for this author and he writes: "The earlier medical topography of those countries is a necessity not satisfied yet and known to every physician who has studied this topic with some thoroughness since FINKE's medical geography is so full of errors that it is of no use for the practice of medicine, as one easily discovers when glancing through it". The incentive for his studies was the occurrence of yellow fever in Barcelona (1821) and he extended his studies to East India and particularly to Egypt. It almost happened that we, his descendants, inherited a map "for the explanation of diseases" but "to avoid an increase in price" he had "for the present omitted it upon advice of the publisher".

The geomedicine of the Mediterranean basin would not be complete without considering the highlands north and south of it. Such highlands according to HAUSHOFER's opinion have their proper geopolitical dynamics. The same applies to their geomical situation. This requires, however, special studies which would have to elaborate on the "boundaries of their geographic and political significance" according to HAUSHOFER with a view to areas of disease and health. The heretofore commenced and available investigations of the geomedicine of cholera in Switzerland (Ilse TEUBER) and in the Eastern Alps of the former Austro-Hungarian monarchy (Gertraud KREBS) are the first attempts in this direction. "The Alpine Pass-Countries" according to

Albrecht HAUSHOFER (1928), as a model test, may be of great value for the geomedicine of the highlands. When considering Germany as the former battle-field of the Occident, that is of the world, the military politics, as conceived and outlined by Oscar von NIEDER-MAYER (1939 and 1943) will have to be taken into account. And finally a worldwide study of geomedicine, not written and investigated as yet as a complex, will have to be available one day, particularly of the North American tropical sea with the Gulf of Mexico and the Caribbean, the sea between Australia and Asia, and the Japanese sea, the geopolitical power fields of which were discussed by Hermann LAUTENSACH 15 years ago (1928). In addition the Mediterranean of the North, the Baltic must be mentioned, the geomedicine of which has been increased for the past 30 years in its importance for the military power of the Germanic nations living around it as it is the area where poliomyelitis occurs.

One more word on the visible shrinking of the continents through the airplane. The problem is whether or not its technical dynamics produces a dynamics of the epidemics. The big powers are well aware of this danger which they dreaded when they signed the "International Medical Agreement on Aviation" in 1933; it was joined by Germany in 1935. It is directed principally against the great world epidemics, namely plague, cholera, yellow fever, exanthematic typhus, and small-pox.

In this agreement the airways are checked with particular care, and one must bear in mind that its demands and observations are copied from those of naval traffic and were changed accordingly. But how little did one think of the land routes. Thus relatively little attention was paid to the first crossing of the Sahara desert in motorcars by the French from Tuggurt to Timbuctoo (17 December 1922 to 7 January 1923). At any rate this crossing was equivalent to a flight over the same distance. Politically as well as medically access was gained to a new area, or better still, two parts of Africa were linked together over a desert.

Finally I should like to outline that our adversaries always made successful attempts to acquire colonies through their physicians. Our own colonial history, too, is relatively rich in important physicians acting as political colonial pioneers. It was the unrelenting conqueror of French Morocco, Field Marshal LYAUTEY, who confessed that the hygienists and hospital units commissioned by him frequently advanced into unoccupied and empty territories and "were more attractive than rifle-balls" ("jouaient un rôle d'attraction

autrement efficace que le coup de fusil".

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MEDITERRANEAN FEVER
(MELITENSIS-BRUCellosIS)
IN THE MEDITERRANEAN REGION.

Translation prepared by:
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The Mediterranean fever (Malta fever), caused by bacterium *milutense* (*brucella melitensis*), is primarily an epidemic of animals, particularly goats and sheep. Together with the infectious abortions of cattle, caused by *br. abortus* Bang; and the infectious epidemic of pigs, caused by *br. suis*, it forms the circle of brucellosis. The agents are closely related to each other; they cannot always be definitely separated from each other in laboratories, particularly since there are intermediate forms and secondary types with a certain geographical distribution. Brucellae may infect the various domestic animals (such as horses, dogs, cats, chicken), wild animals and laboratory animals; epidemic distribution, however, is limited to the infection, principally of the named animals. According to the respective predominant breeds of animals, the epidemics distribution - area of *abortus* brucellosis is spread over north and central Europe, that of *melitensis*-brucellosis over the Mediterranean basin. *Suis* brucellosis has occurred only in a few small groups in Europe so far, without having any constant foci.

All three brucellae may pass over to man and produce in him the clinical picture known as "undulant fever". But a separate representation of *melitensis*-brucellosis is justified, since *br. melitensis* has a considerably greater pathogenicity to man than *br. abortus* and the European *br. suis*, so that it causes not only individual cases, but may also cause epidemic-like numbers of cases.

On Malta, the clinical picture was determined first. In 1887, the agent was found there by BRUCE; in 1904/05, the way of transfer was explained. Without offering remarkable symptoms itself, the hornless Maltese goat formed the source of infection for man. With the Maltese goat, which is a favorite breeding-animal and consequently often exported, *melitensis* brucellosis has been widely spread. It can be assumed for certain, however, that the indigenous goat-races of other countries were primarily infected as well.

As an epidemic of the goat, *melitensis* infection produces relatively slight symptoms of disease though it may lead to abortions and loss of lambs, particularly on its first introduction into a stock. Owing to the insignificant economic damage, no careful examinations as regards the distribution of this epidemic of animals are available. - Also the data on the *melitensis* cases of man are not exact in most countries as regards the absolute figures, since, above all, classes of the population are infected with whom a positive medical diagnosis is not always made. The data are sufficient, however, to fix the limits of the epidemic area of *melitensis*-brucellosis in the Mediterranean region and to draw

up a medico-geographical map, even if the representation of intensity in the various districts must be based on estimates to a large degree.

If the cartographical representation is to be enlarged to a geomedical one, we may start from the following reflection:

Potential distribution area of Mediterranean fever is primarily the total region where goat-breeding is predominant. This region coincides to a large degree with that zone of the Mediterranean climate, which is arid in summer. Only a flora whose proper vegetation period falls in late winter but which is capable of persisting through the whole year, may grow during the hot, arid summers on the one hand, in the moist but mild winters on the other hand. In the agricultural landscape, we find no dense groves of olive-trees or evergreen oaks, and the moisture in the soil does not allow the cultivation of cereals and tropical fruit. In wide tracts, however, we only find the macchie, that community of plants consisting of evergreen shrubbery with small hard leaves, and hard-leave-pasture composed of single trees and a ground flora of shrubs and vegetation, which explains the predominance of the goat as milk supplying domestic animal. The keeping of goats makes the growth of a compact higher vegetation impossible by their constant grazing and maintains and fosters the formation of chalk, which excludes the breeding of cattle, in its turn.

The mentioned region is characterized as the vegetative area of the hard leaf plants. It approximately coincides with that zone which has been climatologically named the zone of etesian winds by HETTNER. It forms the zone of transition between the tropical and non-tropical climates. In summer, it is under the influence of tropical air-currents, there are trade-like winds ("etesians") which carry hot and dry air. In winter, the region is included in non-tropical air movements, which involves predominant west-winds, associated with frequent atmospheric disturbances. The gradations which consist from lower to higher latitudes, in the fact that in the former the rainfall is limited to a still shorter period than in the latter, which are also recognizable from the sea-coast toward the interior in a decrease of the total rainfall, and which finally exist in different altitudes, can be neglected for the present purpose. For this reason, the etesian-zone has been entered in the map as a regional unity.

The representation shows that the etesian-zone and the principal distribution area of melitensis infection largely coincide.

The endemic area of the epidemic is better marked by this climatic zone than by the 55° F (= 12,8°C) isotherm as its northern boundary, which was indicated by HUGHES in 1899 but is often mentioned even today, with addition of the endemic foci up to the 68°F (= 20°C) isotherm approximately, which runs along the North African coast.

Even if the epidemic area in the Mediterranean basin is naturally limited by the etesian zone; the following must be considered: goat-breeding in Europe plays a part also outside this area. If melitensis infection is not endemic there after all, this can be explained by the fact that the way of breeding the goat - i.e. the factors starting from the fact that the goat is no longer the exclusively or predominantly milk-supplying domestic animal - has become decisive for the limits of the epidemic. It cannot be refused from the first, however, that still other geometrical laws inherent to the epidemic itself cause its limits within a certain region. Since the map shows, in addition, that there are centers of activity at the northern edge of the epidemic area, it is necessary to enter into a further analysis of the dynamics of Mediterranean fever.

Now as ever, the center of the epidemic is Malta (12-17 % of the goats infected, sick rate around 7,5 permille of the population annually). In the endemic area of the adjoining coasts and islands, the epidemic is in a certain condition of equilibrium, characterized by the fact that 5 - 15 % of the goats on an average are infected. The human sick rate, with constant infection of the goats, depends on the possibilities of infection. It is, for instance, much lower in the eastern Mediterranean basin, where milk is partaken of chiefly in a boiled state (or as yoghurt), than in the western part.

If the epidemic center were in a condition of complete stability, it could be implied that there was a maximum of infection in the center of the area, which constantly decreases in intensity towards the periphery. This conception corresponds to former representations of Malta fever and probably to the geometrical conditions of former decades as well. Today, such a decrease still exists towards the south and the east of the epidemic area.

In Africa, the etesian zone is joined towards the south by the circle of arid steppes and deserts, which, with its scanty population and accordingly smaller number of domestic animals, causes a decrease of intensity of the epidemic, even if the goat is the most important domestic animal. In the east, Cyprus, Palestine, Syria, were formerly regarded as infected, while during partly careful recent examinations, only individual infections were detected. The same seems to be true

for all Asia Minor as well. It is possible, that this zone is an area of retreat of brucellosis. In southeast Europe, only Greece is infected, apart from the Adriatic coast. Even if the data there are scarce, it may be said that the epidemic is slowing down even in Macedonia. Towards the north, a zone free from brucellosis follows, since in the other Balkan countries even the abortus infection of cattle is insignificant. No activity of melitensis brucellosis can be recognized in this region.

If the situation on the northwestern edge of the Mediterranean epidemic area is different, this is caused by the fact that the epidemic has found a new form there by the transition to the sheep. Even in the center of the endemic area, the sheep is infected in addition to the goat. In the northern border-districts with predominant sheep-breeding, the sheep has not only become an independent carrier of the epidemic, but its melitensis brucellosis, which, by the way, is characterized clinically by the frequent occurrence of abortions, is recently no longer limited to the epidemic area of melitensis brucellosis of the goat.

The conditions in southern France have been carefully examined. While, in 1900, only two departments had been infected, the figure rose to 17 in 1929, to 57 departments in 1935 (Taylor, Lisbonne and Vidal). The main focus remained at the Rhone delta (the departments Bouche du Rhone, Gard and Herault); the whole Provence and Languedoc had to be regarded as infected. Furthermore, in 1929, the department Meurthe et Moselle, in 1932, even Meuse had been reached through migrating flocks of sheep. With the advance up to beyond Verdun, even the 49th degree of latitude has been passed, at the same time, the epidemic has turned eastward and arrived at the upper Rhine Lowland Plain.

A similar development appears to have been started in northern Italy. The seriously infected southern Italy (animal chiefly infected: goat), is followed by a less infected zone (Latium, Abruzzi, Marche, Umbria). In Tuscany, the intensity of the epidemic increases once more: now the sheep is the chiefly infected animal. With migrating flocks of sheep, melitensis brucellosis is taken over the Apennine into the Po-plain. Since this focus of activity simultaneously forms a zone, where abortus-brucellosis is frequent not only in cattle but seems to have a remarkable tendency to pass over to man, a secondary epidemic center forms there, whose dynamics cannot yet be forecast. On the Iberian peninsula, too, a condensed focus of sheep-brucellosis seems to form at the northern boundary of the etesian zone.

If thus brucellosis could get a new impetus by its transfer to the sheep, this means that it has separated from its old geomedical laws and that a certain prognosis can no longer be established for the zone of European continental climate which adjoins the etesian zone in the north. One more possibility of development of melitensis brucellosis renders any prognosis for any length of time vague: In the experiment, br. melitensis is pathogenic also for cattle, causes abortions in them and is secreted with the milk, thus shows the same behavior as br. abortus Bang. Under natural conditions, too, it has been repeatedly proven that in mixed stocks, into which goat- or sheep brucellosis is penetrated, cattle have been infected and that this infection was transferred to man. Such occurrences have remained isolated in the Mediterranean area of the epidemic so far; the infection of cattle occurred only as a consequence of sheep brucellosis. But whenever melitensis infection with its greater pathogenicity to man would replace abortus infection in cattle, we should have to face an absolutely new, serious brucellosis situation in Central Europe.

The brucellosis area in the Crimea and on the northeast coast of the Black Sea holds a special position. A few human cases have been reported even in former decades, and since the etesian zone extends to this region it might be regarded as an extension of the Mediterranean epidemic area. According to Soviet Russian examinations, however, it must be assumed that a melitensis brucellosis of the sheep is concerned, which has advanced from the interior of the country. Thus, a large independent epidemic zone extends from the south Ural through the Kirghiz steppes, the Caucasus, Georgia, Azerbeidshan to the Iranian Highlands, and the occurrence at the Black sea may be regarded as its western border zone. The epidemic formula of this region, in which melitensis infection of cattle seems to be of importance as well, cannot yet be evaluated.

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MALARIA IN SPAIN AND PORTUGAL.

(with 2 illustrations).

Translation prepared by:
U. S. Fleet, U. S. Naval Forces, Germany,
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I. Malaria in Spain.

Malaria occurs in all of Spain, though the cases in high altitudes in the mountains are probably imported. The province of Caceres stands out considerably as being particularly infected (see table 1). The provinces Badajoz, Cadiz, Murcia, Alicante, Jaen and Huelva follow; then, at a large distance, Sevilla, Ciudad Real, Cordoba, Salamanca, and Avila.

Thus, the serious malaria areas of Spain largely form a continuation of the portuguese malaria area into the upper courses of the large rivers flowing into the Atlantic, which decreases to the same degree as the region is more remote from the coast and more elevated.

On the eastern side of the peninsula, Murcia and Alicante are rather marked malaria districts. The whole mountainous north of Spain is not greatly infected with malaria, the same is true for the center of the country. (e.g. Cuenca). In the province of Madrid and even more, of course, in Madrid City, malaria has only slight importance. The pronounced difference in altitude probably accounts for the fact that the province of Granada stands apart as one of the healthiest areas of the Mediterranean coast. It is a remarkable fact that both the Ebro-delta and the Llobregat-delta are only occasionally more intensely infected with malaria.

The rule that areas less infected with malaria have predominantly non-malignant tertiana, is true for Spain as well; in addition, that spring malaria until the middle of June causes almost always only a slight second-day fever. Only then do the serious (tropica) cases begin and are temporarily predominant at some places in mid-summer and early fall. Considering the whole year, however, tropica infection attains only 20 - 25 % of the malaria cases, even in the most seriously infected districts. The broad valleys and the level regions with their more dense rural population are the foci of serious malaria, as contrasted to the higher altitudes.

The plain between Sierra de Credos and Sierra de Guadalupe (see map) is the largest malaria district. There, the anopheles find extensive possibilities of development through the numerous artificial water-reservoirs for the irrigation-system (alberca), particularly in the valley of La Vera (Tietar). In addition, the water-places, which are left behind by the banks of the rivers drying up in summer (remanso) and ditches with stagnant water (quebrada) form favorable

breeding-places for the anopheles. In the south of the Sierra de Guadalupe, the very slowly flowing Guadiana-river traverses the province Badajoz for a distance of almost 300 kms. After intense rains, it may flood an area of 400 km² and thus leave behind innumerable pools in the dry season.

As in northern Italy, malaria in Spain on the whole seems to have a retrograde tendency (see tables 2 and 3), and thus, tropica seems to decrease in its proportion to tertiana.

In the province Valencia, the cultivation of rice did not cause any serious outbreak of malaria, on the other hand, there exists much malaria in the Ebro-delta near Tortosa in the rice-fields. Though the provinces Barcelona, Gerona, Lerida, and Tarragona were, on the whole, but slightly infected with malaria in 1915, there were infected districts, in which in one case, for instance, 46 % among a total of 26,000 inhabitants had been infected with malaria, though it was tertiana in most cases. Even afterwards, the malaria index has remained rather high there. These malaria foci limited to small areas allow favorable total averages for the provinces despite their rice-field malaria. Since there are no exact data in the official statistics of 1934, these districts have been indicated in the map as "endangered by malaria". The focus in the province Tarragona (Ebro-delta) shows, as a peculiarity, a high percentage of quartana forms (30 % of all cases).

In the Llobregat-delta, too, the attempts at rice-cultivation have led to the outbreak of a circumscribed malaria in an otherwise healthy region.

The variety of the regional picture renders difficult a cartographical representation of the distribution of malaria in Spain. Since a moderately exact statistic of the endemic cases is available only for those provinces which have joined the Malaria Control Service, at present, only an attempt can be made to represent on the map the varied malaria infection of the population in 16 provinces for one year of report (1933) by various marking of those districts in which advisory places (dispensories) of the Malaria Control Service have been established.

Table 1.

Malaria Control Service in Spain 1).(Comision Central Antipaludica).Results of the year 1933.

Province	Centers of treatment	Number of positive cases observed	Number of positive cases in the province	Calculated per 1000 inhabitants		
1. Alicante	San Fulgenico	2271	} 3435	6,16		
	Orihuea	1164				
2. Avila	Total:	1294		5,75		
3. Badajoz	Total:	12367		17,20		
	City Control Service	10249	}			
	La Bazagona	654				
	Jarandilla	392				
	Jaraiz	1163				
	Majadas	276				
4. Caceres	Mirabel	951			} 18232	39,57
	Navalmoral	1961				
	Peraleda	246				
	Plasencia	784				
	El Robledo	508				
	Trujillo	738				
	Valle del Jerte	310				
	Arcos de la Frontera	2691				
5. Cadiz	Jerez	1372	} 5275	10,63		
	Villamartin	1212				
	Daimiel	2)	} appr. 750	appr. 1,50		
6. Ciudad Real	Gualdalmes	2)				
	Puertollano	366				
7. Cordoba	Fuenteovejuna	397	} 615	0,90		
	La Carlota	218				
	Calanas	984	} 2793	7,70		
8. Huelva	Gibraleon	1074				
	El Repilado	735				
	Campo Redondo	2561	} 3418	5,00		
9. Jaen	Guarroman	470				
	Linares	387				
	Mircia y Huerta	3468	} 5436	8,40		
10. Murcia	S. Pedro d. Pinatar	785				
	San Javier	1183				
11. Orense	Castrelo de Mino	*)		*)		
	Lebrija	1027	} 1827	2,18		
12. Sevilla	Lora del Rio	800				
13. Valladolid	Total:	*)		*)		
14. Zamora	Total:	*)		*)		
15. Salamanca	Matilla de los Canos	194		0,56		
16. Toledo	Talavera de la Reina	494		0,98		
Total number of positive cases observed in 16 provinces in 1933:			55746	7,35		

1) Data taken from: Anuario Estadistico de Espana ano XIX - 1934, Madrid 1935, page 814.

2) For both places, only data on the total number of the persons examined have been submitted (498 and 633, respectively).

*) = no data available.

Table 2.Mortality of Malaria in Spain.

Year	Total	Per 100,000 inhabitants	
1910	4707		according to
1922	1527	7.1	data of the
1923	1291	5.9	Hygiene Section
1924	1195	5.5	of the League of
			Nations.
1931	364	1.54	According to
1932	308	1.30	data of the
1933	289	1.27	official sta-
			tistical annual
			registers.

Note: Comision central antipaludica since 1920.
 Prof. G. PITTALUGA estimated the number
 of malaria-cases in Spain in the early
 twenties to be 300,000 cases annually.

Table 3.Mortality of Malaria 1931 - 1938.

	in Italy:	in Spain:	in Portugal:
1931		364	149
1932	3171	308	137
1933	1956	289	148
1934	2238	286	196
1935	1693	220	214
1936	1291	168	236
1937	1032	217	280
1938	738	289	217

The absolute figures of positive malaria findings observed in these districts, which are listed in table 1, have been added up for the whole respective province and then reduced to 1000 inhabitants of the respective province, even if the control area does not extend

to the whole province. But since the rate of the reported endemic malaria cases in the provinces outside the control districts is probably not considerable, the figures observed are sufficient for a scale of comparison of the provinces and for a basis for the drawing up of a synoptical map. The various hatchings on the map thus indicate only approximately the actual conditions in the respective infected districts. To increase the clearness of the single malaria areas, the respective mountainous regions have been excepted from the more marked hatching because of the slighter density of population and of anopheles which is to be expected there. In contrast to Portugal, no values of the spleen index and the parasite index could be given for Spain.

II. Malaria in Portugal.

In the Portuguese section, as on the whole Iberian peninsula, the varieties of *A. maculipennis* (1) are the principal vectors of malaria. *A. bifurcatus* (3) is distributed over the whole country, though usually rare and widely spread. In addition, no other species of anopheles have been mentioned previously, though *A. algeriensis* (7) and *A. plumbeus* (4) should be expected as well.

With *A. maculipennis*, only the variety *atroparvus* is mentioned in addition to the typical form. The pictures of the eggs of the latter are not quite convincing. *A. maculipennis atroparvus* lives in the proper malaria areas. Where the variety *typicus* is more frequent, malaria occurs more rarely. But even in the distribution area of *atroparvus*, malaria is serious only where the gnat occurs in great multitudes. This is the case particularly in the rice-districts.

In 1935, around 50,000 acres had been cultivated with rice. This form of cultivation, however, extended further. Outside the rice cultivation area, there is a considerable malaria zone on the river Douro and its affluents. There, the majority of the rivers dry up in summer and dissolve in large water-pools, which produce masses of *A. mac. atroparvus*. The Guadiana river, too, almost completely ceases to flow in summer and is accompanied by malaria areas at some places. In addition, there is a moderate amount of malaria in the south and east, where lazy watercourses produce plenty of *atroparvus*.

Thus, the highest sick-rates of malaria occur in the rice-districts on the Sado (district Setubal, parts of Beja and Evora) on the Tejo (dis-



Explanation of Signs:
 national boundary
 bound. of the hist.
 regions in Spain
 and Portugal
 bound. o. t. prov. i. Sp.
 " o. t. distr. i. Port.

Illustration 1.

Mortality of Malaria in 1924 per 100,000 inhabitants.
 (According to data of the Hygiene Section of the League
 of Nations)

more than 40 more than 20 more than 10 more than 5

more than 2,5

trict Santarem), on the Guadiana (district Evora), on the Mondego (district Coimbra) and on the Douro (district Braganca) (see table 4 and 5).

Table 4.

Malaria in Portugal.

Province	Number of new cases of malaria in civ. and mil.hosp. in 1934 1)	calculated per 1000 inhabitants	spleen index 1933 2)	parasite-index 1933 2)
Aveiro	10	.	13.0	0,67
Beja	287	1.20	35.7	14.3
Braga	5	.	0	0
Braganca	25	0.10	30.0	15.0
Castelo Branco	77	0,20	10.1	2.9
Coimbra	456	1.10	54.5	8.3
Evora	130	0.70	65.2	5.2
Faro	39	0.10	39.1	1.8
Guarda.	14	.	23.5	5.9
Leiria	32	0.10	0	0
Lisboa	306	0.33	18.1	6.0
Portalegre	170	1.06	55.0	15.0
Porto	15	.	0	0
Santarem	292	0.80	41.6	20.8
Setubal	654	2.80	95.4	34.0
Viana do Castelo	4	.	1.2	1.2
Villa Real	17	.	10.8	4.0
Viseu	15	.	2,0	0
Portugal total:	2548	0.40		

Notes: 1) From: Anuario Estatístico de Portugal. Ano de 1934, Lissabon 1935, page 87.

2) From: F. Landeiro and F. Cambournac: O Sezonismo em Portugal. Lissabon (Table VII).

. = no data available

Table 5.

Malaria Control in Portugal.¹⁾

Control centers	Province	number of consultations in 1934	number of positive findings in 1940
Aguas de Moura (Palmela)	Setubal	.	512
Idanha a Nova	Castelo Branco	.	1491
Montemor o Velho	Coimbra	.	11190
Soure	Coimbra	7891	8972
Azambuja	Lissabon	.	2302
Ponto de Sor	Portalegre	.	1907
Benavente	Santarem	4877	13056
Alcacer do Sal	Setubal	10443	8541
Pocinho (Tras os Montes)	Braganca	374	1771
	Total:	23585	36090

Notes: ¹⁾ From: Anuario Estatistico de Portugal. Ano de 1934. Lissabon 1935. Page 89. Monthly Synopsis of Consultations in 1934.
 . = no data available.

In Portugal, there are all forms of malaria, even tropica (often in the majority, which suggests a hyperendemic situation for tertiana (see table 6)). The seasonal distribution is the usual one (see Ill. 2), with spring-tertiana and tropica occurring first in June, later predominant. In the most serious malaria area on the Sado, spleen indices up to 95 % have been observed, (Alcacer do Sal) but at other places, too, spleen indices of 34 % and parasite indices of 42 % have been found. In Agnas de Monra (Pamela), the children not yet one year old were infected without exception in 1936 up to the end of September, viz. almost nobody there escaped malaria infection in that year. Malaria infection up to around 80 % of the population has been observed for instance in Landeira.

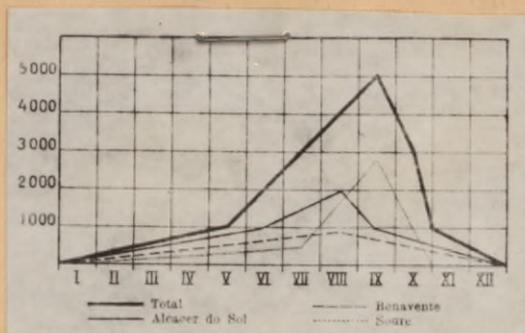


Illustration 2. Monthly total of new cases of treatment in Portugal in 1934.
From: Anuario Estatistico de Portugal 1934 (Lissabon 1935) page 89.

Table 6.

Proportion of the various Malaria-forms in Portugal in 1934.

Number of patients in 1934	Total:	7966	
thereof:	tertiana:	3885	= 48,1 %
	tropica:	2559	= 32,1 %
	quartana:	541	= 6,8 %
	mixed forms:	359	= 4,5 %
	indefinite:	672	= 8,5 %

Through the wandering toward the interior of the agricultural seasonal workers (ranchos), malaria is continuously distributed in the country despite all control measures. In 1940, the various stations of the Control Service (see map) registered more than 36,000 new cases and issued around 80 kg quinine preparations. The most important means of control against malaria is an adaptation of rice-cultivation: no sowing but planting and to let the field dry about 5 days after every 10 days of irrigation. This will not decrease the crop. It is better to increase the crop by more careful cultivation than by further extension of the rice-fields. If necessary, the cultivation of rice must be terminated completely in the direct neighborhood of important places. To control the anopheles, the usual methods should be used, though petroleum and Schweinfurt green should not be used in rice-fields.

The cartographic representation of malaria occurrence in Portugal is first intended to indicate the districts with intense infection, furthermore, in adaptation to the representation of the malaria conditions in Spain, to afford a synopsis of the varied hazards in the single districts of the country in the same year (1933). The basis of this chart has been the registrations of the General Directory for Public Health and of the Rockefeller Foundation (R. HILL, F. LANDEIRO., F. CAMBOURNAC) for the year 1933 on the distribution of spleen index and parasite index in Portugal. In addition to that, the data of the figures of patients treated at the dispensaries in 1934 and 1940 according to the statistical annual registers have been consulted and evaluated by calculating them for the number of inhabitants of the respective district in the same way as the Spanish data. Thus, the degree of the probable malaria hazard of single regions can be easily determined on the map. A more exact representation must be reserved for a future work on the basis of larger material of examination.

III. Distribution of Anopheles on the Iberian Peninsula.

On the Iberian peninsula, there are, apart from very high altitudes, practically no districts without any anopheles.

A. maculipennis(1): The sign for the everywhere present *A. maculipennis* on the map is not limited to certain places but is entered for whole regions, though it would have been more correct to indicate those places at which it is not found. This must be reserved for a future, more detailed work. On the other hand, the signs for the four "strains" of *A. mac.* refer to certain places, for which the differential diagnosis of the strains of *A. mac.* has been made on the eggs.

On the Iberian peninsula, *A. mac.* is the principal vector of malaria. As a gnat of the warm sunny waters, which exist above all in the valleys and lowlands with agriculture, and as the chief vector of malaria, *A. maculipennis* is observed without fail within the areas of the malaria control stations. As it is particularly closely associated with man and animals, it is easily observed everywhere and thus has been reported from almost all regions and thoroughly examined. On the other hand, much too little attention has been paid previously to the other species of anopheles.

A. bifurcatus (3), for instance, has been mentioned from quite different parts of the peninsula with quite different climates; in Spain, chiefly at places of which particularly exact examinations of the occurrence of anopheles are available (e.g. Naval Moral, province Granada). The conclusion is justified that *A. bifurcatus* is absent in hardly any province.

The accidental findings of *A. plumbeus* (4) and *A. algeriensis* (7) permit no conclusion as regards the actual distribution of these species on the peninsula, though they probably are of no practical importance anywhere.

A. hyrcanus (12) has been observed only in the east of the peninsula, chiefly in the rice-districts, though it is probably more widely spread than the previous locations indicate.

A. hispaniola (9) and *A. superpictus* (2) are limited to the southern section of the peninsula. They chiefly occur at the foot of the mountains and in the mountains. Only in the neighborhood of Naval Moral, where particularly industrious examinations have been made, *A. hispaniola* has been found even in the center of the country. The boundaries of both species are probably more northward than the previous data indicate, though it is not certain whether they are of considerable importance for the distribution of malaria in Spain.

Of the "strains" of *A. maculipennis* (1), *atroparvus* is most widely spread and is predominant in Portugal almost exclusively. There, only the nominate form *A. ma. maculipennis* occurs in addition to *atroparvus*. The few places where it has been observed suggest that it is still widely distributed in the highlands and mountains of the north and in the west of the peninsula.

On the other hand, *A. mac. melanoon* and *A. mac. labranchiae* are limited to the east and represent the predominant forms there.

In the rice-districts of Portugal, *A. mac. atroparvus* occurs, sometimes in great multitudes. On the Mediterranean coast, it inhabits the new rice - areas in the north, in the deltas of the Ebro and of the Llobregat, while it is replaced by *A. mac. melanoon* in the old rice areas. In the southern adjoining area, *A. mac. labranchiae* inhabits the richly irrigated gardens, particularly of Murcia.

Of the strains of *A. mac.*, chiefly the two forms of the *labranchiae*-group, *labranchiae* and *atroparvus*, are associated with

serious malaria. It cannot yet be determined today, whether this is accidental or whether their way of living makes them more dangerous vectors than *A. mac. typicus* or *melanoon*. GIL COLLADO points out that in the province of Caceres the numbers of *atroparvus* are by no means particularly large and the breeding-places by no means extensive. It is possible that the previous history of the gnats plays some role, perhaps even more the conditions of temperature.

Thus, the anopheles fauna of the west of the country approaches that of western France and Germany, the fauna of the east that of Italy.

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OCCURRENCE OF MALARIA AND DISTRIBUTION OF ANOPHELES IN ITALY.

(with 1 text-map).

Translation prepared by:
U. S. Fleet, U. S. Naval Forces, Germany,
Technical Section (Medical).

I. Occurrence of Malaria in Italy.

Map VII/3 indicates on a large scale the extent and situation of malaria foci with regard to the intensity of malaria occurrence in 1940. The altitudes, particularly the Apennine, with their scarcity of malaria form an effective contrast to these foci. Particularly in the north the altitudes are practically free from malaria. On the Italian continent and on Sicily, one assumes the vertical boundary of malaria to be at around 400 m. On Sardinia, some altitudes higher than 800 m. are still considerably infected with malaria. Since the majority of the population who are malaria-free is crowded in the cities, malaria in the lowland infects a much greater proportion of the country than of the people.

The intensity and danger of malaria varies a great deal in the single foci. Due to the wanderings of the population, no district is absolutely free from malaria, though the hazard of infection is slight in the district declared not infected with malaria. In some sections still marked as endangered with malaria, on the map - particularly Lombardy - the hazard of malaria has practically disappeared recently. For outward reasons, however, these districts have not yet been separated from the malaria areas. There malaria may recover much of its former importance, if the present situation is basically altered by serious changes of the composition of the population, such as wars of occupation by foreign troops.

The average malaria morbidity of the districts per 10,000 inhabitants appears relatively low not only by the mixture of proportions quite differently infected with malaria, but also by the fact that in a country used to its fevers, there are many cases self-treated and thus not known to the surgeon nor statistically registered, particularly the cases of slight tertiana and the recurrences of tropica. In addition, in the districts seriously infected with malaria, there is such a quantity of acquired immunity among the adult population that numerous persons no longer fall ill by the infection but are, at the most, carriers of parasites and thus dangerous to their environments. They are not even known to the surgeon as infected. In central and southern Italy, the relatively moderate morbidity rates thus by no means adequately indicate the degree of hazard to non-immune strangers. Nor has malaria, i.e. the danger of infection decreased so much in the course of this century as the decrease of malaria morbidity seems to show.

Lethality (=: number of cases with fatal termination per 100 malaria cases) has rather decreased to a fifth of that of the be-

Table 1.Reports of Malaria.

Year	cases	fatal cases	lethality in %
1902	177945	9908	5,6
1906	230798	4871	2.1
1910	201247	3621	1.8
1914	129428	2045	1.6
1922	234656	4085	1.7
1926	220602	2583	1.2
1930	203590	2781	1.4
1934	222171	2238	1.0
1938	74276	738	1.0

ginning of the century due to improved medical work and increased administering of quinine.

The figure of malaria cases per 10 000 of the population for 1940 and for the 94 districts of Italy is indicated on the text-map (see Ill. 1).

The figures show the average morbidity as a medium value of in part quite different malaria conditions of the single sections of the whole district, which may contain communities free from malaria as well as those infected. In table 2, the figure of the communities declared as infected with malaria is indicated for every district. Of course, the malaria rates of the communities would show a considerably more exact picture of the distribution of malaria in the country and bridge over, at the same time, the abrupt contrasts at some district boundaries. But even within one community, part may be hardly, the other seriously infected with malaria. This applies, above all, to the extensive precincts of the cities, in the interior of which, malaria, as rural epidemic, can rarely settle, while the outskirts may show various conditions and contain several malaria foci beside each other. Around 37 % of the inhabitants of Italy live in towns with more than 20 000 inhabitants. Above all, Rome itself is absolutely free from the danger of infection in the interior. Thus, more than 1 million men enjoy this protected situation. Thus, the average infection within the district of Rome is kept far below the statistical extent which would correspond to the rural proportion of the outskirts and their surroundings. These would hardly show the contrast to the

northern and southern adjoining districts as indicated on the map.

The fact that the malaria foci, i. e. the places of endemic malaria, occupy only part of some communities endangered by malaria explains that in such communities, there lived, in the twenties, around 41 % of the inhabitants of Italy, in the malaria foci themselves, however, only 12 % of the inhabitants. It is true, however, that imported malaria may occur everywhere in Italy, particularly at the hospitals of the large cities.

All these figures, however, show only a very conservative picture of the extent of the actual infection. A satisfactory result could be obtained only on the basis of systematic observation of spleen- and parasite index of the children. Such examinations, however, have been previously made in Italy only to such a slight extent that their cartographic representation is not yet possible.

Table 2.

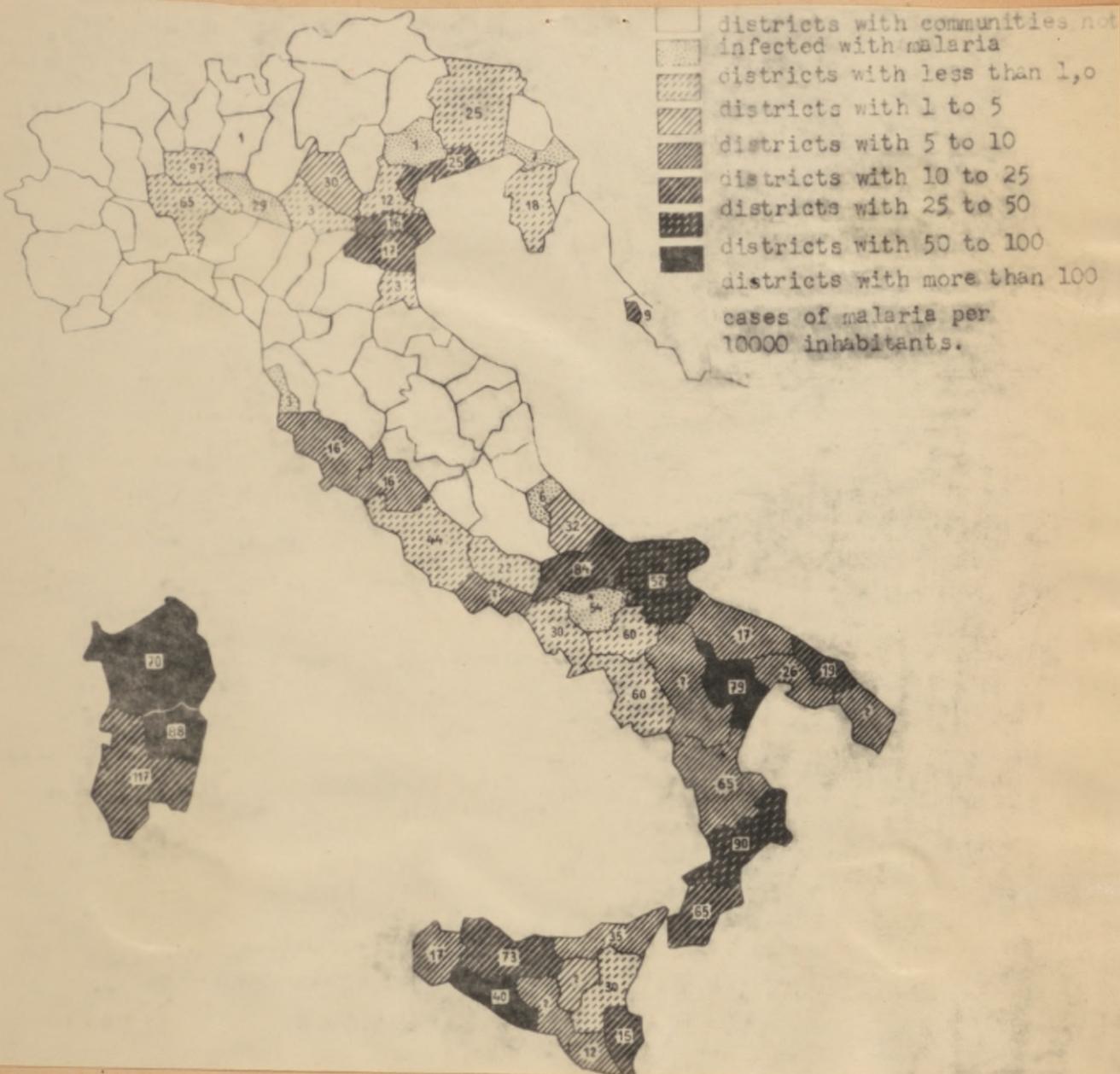
Numbers of communities declared infected with malaria in the single districts. Condition in the fall of 1943.

<u>Piemonte:</u>			
Aosta	0	<u>Venezia:</u>	
Novara	0	Venezia	25
Vercelli	0	Belluno	0
Alessandria	0	Verona	30
Torino	0	Vicenza	0
Asti	0	Udine	25
Suneo	0	Padova	12
<u>Lombardia:</u>		Rovigo	16
Milano	97	Mantova	3
Pavia	65	Treviso	1
Como	0	<u>Venezia Giulia:</u>	
Varese	0	Trieste	7
Cremona	29	Gorizia	0
Brescia	0	Fola	18
Sondrio	0	Fiume	0
Bergamo	1	<u>Emilia:</u>	
<u>Venezia Tridentina:</u>		Piacenza	0
Trento	0	Parma	0
Bolzano	0	Regio Emilia	0

Table 2 (contd.)

<u>Emilia:</u>		<u>Campania:</u>	
Modena	0	Campobasso	84
Forli	0	Napoli	30
Ferrara	17	Avellino	60
Ravenna	3	Benevento	54
Bologna	0	Salerno	60
<u>Liguria:</u>		<u>Puglie:</u>	
Genova	0	Foggia	52
Imperia	0	Bari	17
Savona	0	Brindisi	19
Spezia	0	Taranto	26
<u>Apuania:</u>		Lecce	79
Massa Carrara	0	Matera	30
<u>Toscana:</u>		<u>Lucania:</u>	
Firenze	0	Potenza	69
Lucca	0	Cosenza	65
Pistoia	0	<u>Calabria:</u>	
Arezzo	0	Catanzaro	90
Siena	0	Reggio Calabria	65
Livorno	3	<u>Sicilia:</u>	
Grosseto	16	Palermo	73
<u>Marche:</u>		Messina	35
Pesaro	0	Enna	*)
Ancona	0	Catania	30
Macerata	0	Agrigento	40
Ascoli Piceno	0	Trapani	17
<u>Umbria:</u>		Siracusa	15
Perugia	0	Ragusa	12
Terni	0	Caltanissetta	*)
Rieti	0	<u>Sardinia:</u>	
<u>Abruzzi:</u>		Sassari	70
Aquila	0	Nuoro	88
Chieti	32	Cagliari	117
Pescara	6	<u>Zara:</u>	
Teramo	0	Zara	9
<u>Lazio:</u>			
Viterbo	16		
Roma	44		
Frosinone	22		
Littoria	19		

*) no data available.



Illustr. 1. The districts of Italy declared infected with malaria in 1940. (With indication of the number of communities declared infected with malaria within a district infected with malaria).

Unfortunately, there are no differential reports of the kinds of malaria for large synopsis of Italy available so far. *Plasmodium ovale* has not been found in Italy. *Plasmodium malariae* is nowhere found frequently in Italy. It is completely absent in the sections of northern Italy with only slight fever and near Maccarese (district Rome). As regards tropica, the rule is true also for Italy that the proportion of tropica increases with the intensity of malaria infection. Thus, Piedmont, Liguria, Friaul, Lombardy, and Emilia are practically free from tropica and show the spring peak or the double peak of the epidemic curve due to tertiana. With the decrease of malaria on the whole also tropica, has almost completely disappeared from Maccarese.

Also in Italy, the period of malaria infection lies in summer in the north, it begins somewhat later than in the south and is shorter, particularly with tropica. Generally, malaria in Italy culminated in August and September, especially in the south. Even there, the maximal proportion of tertiana occurs in May and June, since the spring-fevers are tertiana almost exclusively. The summer peak is the peak of relative frequency of tropica as well. As of July, tropica rapidly increases in southern Italy, while it occurs epidemically in northern Italy only in August and September.

A certain decrease of malaria morbidity is due not only to improved medical activity and better supply of remedies to the population, but probably also must be regarded as a partial phenomenon of the great decrease of malaria in Central Europe since the middle of the past century. In the coastal plains, the decrease of morbidity is chiefly caused by the systematic sanitation of the soil within the plan of agricultural ameliorations (e.g. Maremma of Tuscany, Maccarese and Tiber-delta, Pontinian Swamps, Venetian Coast and Po-delta). Not only the creation of draining-systems were important, but also the freshening of the soil and waters by skilful irrigation replaced the dangerous salt-liking anopheles by less dangerous freshwater species.

Distribution of Anopheles in Italy.

The following species of anopheles have been observed in Italy:

1. *A. maculipennis* in the varieties:

- A - *A. mac. maculipennis* (typicus)
- B - *A. mac. atroparvus*
- C - *A. mac. melanoon*
- D - *A. mac. labbranchiae*
- E - *A. mac. messeae*

- 2. *A. superpictus*
- 3. *A. bifurcatus*
- 4. *A. nigripes* (plumbeus)
- 5. *A. hyrcanus* var. *pseudopictus*
- 6. *A. elutus*
- 7. *A. algeriensis*
- 8. *A. italicus*
- 17. *A. marteri*

The signs for the various species of anopheles (figures) and for the *maculipennis* "strains" (capital letters) have been entered on the map according to the places where they have been found. The represented locations have been selected in a way that the respective places are characteristic for a whole region and the respective names could be accordingly entered on the respective region. Marks without simultaneous entry of a location refer to larger geographical areas in which no characteristic locality could be determined.

Of these, *A. maculipennis* (1) and *A. bifurcatus* (3) are certainly distributed at appropriate places all over Italy, the islands included. Of course, some high altitudes are free from them. If *A. bifurcatus* (3) is not so frequently observed, though reported at widely separated places this is caused by the fact that it is not so conspicuous to the observation of the malariologist, for it avoids the houses and is seldom observed in stables. The larvae are found in particular, cool waters.

A. pseudopictus (5) lives under similar conditions. In Sicily and Sardinia, it has not yet been observed, in southern Italy, only at one place. It is marked as frequent only in the province of Bologna. *A. algeriensis* (7), too, has been found almost everywhere in Italy, even if only dispersed and isolated.

The principal distribution of *A. superpictus* (2) is the southern part of the Apennine peninsula and begins only about 60 kms. south of Rome. It has not been observed on Sardinia and Corsica, but has been occasionally found in the northern provinces. It formed 4 % of the anopheles of Novarra (FRONGIA 1931).

A. nigripes (4) has been previously observed at some places in Central Italy and on Corsica. It is probably widely distributed in Italy as well, for it occurs even in more northern latitudes, e. g. on the Baltic Sea, but it occurs in Italy, as everywhere else, only in small numbers and then limited to forests, old parks, etc.

A. elutus (6) is a species fond of salt and probably occurs everywhere in the coastal lowlands, particularly on the northern Adriatic coast. It is frequent on Corsica, for Sardinia it was reported only once (HACKETT 1924) and has not yet been found on Sicily. It is rare in the provinces of the Continent.

A. italicus (8) has been certainly found only once in Calabria.

A. marteri (17) has been recently observed on Sicily, formerly, a larva had been found once on Corsica (1925).

Of the five varieties of *A. maculipennis* (1), *A. mac.labbranchiae* (D) has been found in Upper Italy and Emilia, only in limited numbers. It is rather a western form (is absent on the Balkan peninsula) and is predominant on Sicily and Sardinia.

The other four varieties occur now and then in all Italy, particularly the typical form, but their frequency is varied. The Orti di Schito near Naples and the ground of the former Lago Funcino in the Abruzzi have turned out to be the areas with the purest occurrence of *A. mac. maculipenni* (A). *A. mac. atroparvus* (B) is the predominant anopheles in some districts of Lombardy and many places of Emilia, particularly in the Po-delta. *A. mac. melanoon* (C) occurs especially in Central Italy, *A. mac. messeae* (E) in upper Italy.

Serious malaria in Italy is associated with the three southern forms of anopheles; with *A. elutus* (6), *A. mac. labbranchiae* (D) and *A. superpictus* (2).

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OCCURRENCE OF MALARIA AND DISTRIBUTION OF ANOPHELES IN
SOUTH EAST EUROPE

(With 4 maps.)

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I. General Climatic Data.

The area of the map comprises the whole South East European peninsula, if one takes - as usual - the Sava-Danube line as its northern boundary. Geomorphologically and climatically, it is divided into two large areas: the continental northern area and the peninsular Mediterranean southern area. On the map, the geomorphological boundary described by O. MAULL has been entered. The climatic and vegetation-boundary, which can be marked by the olive-tree boundary, lies somewhat more toward the sea than the geomorphological one, but runs parallel on the whole (see also the region of the etesian-climate on map VII/1).

On the map, the climatic difference between the two large areas has been indicated by entering the 22°-July and the 0°-January isotherms. In the Mediterranean South East Europe, both run parallel, so a mild winter corresponds to a hot summer. On the other hand, in the continental Southeast Europe, only the 22°-July isotherm turns far toward the interior of the country from the Danube delta, while the 0°-January isotherm runs along the coast; thus summer has high temperatures also in this area, and on the other hand winter frost.

Not only the continental but also the Mediterranean climate of Southeast Europe has a marked seasonal rhythm. With the former, this rhythm is characterized above all by the contrast of temperature with the latter, by the distribution of rainfall (see the climograms for Agram and Bucharest on the one hand, for Scutari, Athens and Istanbul on the other on map VII/14).

II. General Data about the Distribution of Malaria.

In the whole region, summer-temperatures are high enough for a sufficiently long time so that not only an increase of anopheles to great density but also the development of the tertiana-plasmodia in the anopheles is guaranteed. In the northwestern area, malaria tropica occurs only to a slight degree. Malaria quartana occurs in the whole region (except the Sava-Danube district), but is statistically so insignificant that it may be neglected in the representation.

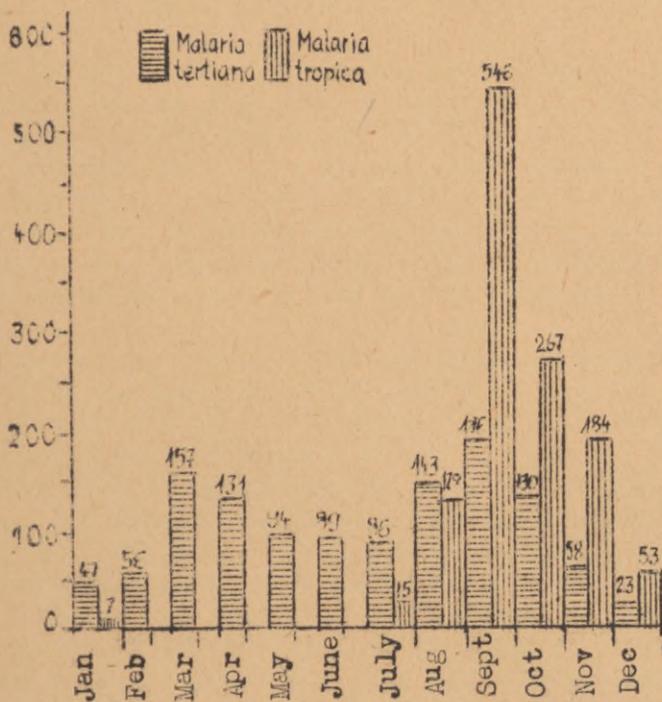
Dynamically regarded, the region of the map evidently lies within the area of the great change which becomes manifest in all Europe by a retreat of malaria toward the south. Particularly malaria tropica has lost much ground in the northern section of the region of the map. Wars and times of distress, however, again and again increase the infection and cause a new settling of malaria tropica in the terri-

teries of retreat. The entries on the map correspond to the behavior of malaria between the two World Wars.

Malaria morbidity may undergo considerable fluctuation from one year to the next, on the one hand in dependence on the factors influencing the development of anopheles (chiefly the quantity of rainfall), on the other hand in consequence of events effecting the social structure and the general health conditions of the population.

Table 1.

Of every 1200 cases, the share of the single months is:



Seasonal distribution of malaria cases in South Macedonia (German troops 1942).

The seasonal rhythm causes an interruption of the infections which sets in approximately in November. Malaria accordingly obtains a distinct seasonal character. It begins with spring-tertiana (composed of recurrences and late cases) with its peak in March-April. Since

the termination of June, the first new tertiana-infections appear, which are soon followed by the first tropica cases in the tropica areas. The tertiana peak usually occurs in August - September, the tropica-peak in September - October (see table 1.).

A synoptical representation of malaria in Southeastern Europe must desist from the plan of giving uniform figures of the degree of infection. In the politically split area, the data are absolutely of different value; they have been obtained at various times, by various methods (e.g. spleen index, frequency of disease, mortality) and with very different exactitude; for many regions, there are no useful values whatsoever.

Thus, it was only possible to try to start from one's own experience and to unite the data of literature and statistics to a temporary whole.

Data about spleen index figures for Greece are indicated on map VII/4a, for Albania on map VII/4b. The most important places in Bulgaria infected with malaria are shown on Illustration 1 (according to DRENSKY 1940). Malaria morbidity in the single administrative districts is represented for Serbia on Illustration 2 (according to data of the Chief Medical Officer), for Croatia on Illustration 3 (according to a map of the Central Hygienic Institute in Agram), for Roumania on Illustration 4 (according to ZOTTA 1938).

The representation of the principal map is based on the following principle: The endangering of two areas by malaria may be different quantitatively and qualitatively. A quantitative difference consists in the frequency of malaria cases in general, a qualitative difference in the proportion of malaria tropica in total malaria. Both differences are usually so closely correlated that in the less infected districts, the relative figure of tropica cases decreases as well. This correlation is present above all, if the differences are caused by the climate. On the other hand, there may be geomorphological differences within climatically uniform regions, which cause different densities of anopheles and a thus different danger of infection, so that both in a pure tertiana area and in a mixed area, there are distinct zones of serious and less serious intensity.



Illustration 1. Map of the most important Malaria districts of Bulgaria.

- places infected with malaria
- anti-malaria controlled areas
- ⊙ examination-stations.

Accordingly, three principal marks have been chosen which are intended to indicate the proportion of malaria tropica in total malaria; then these have been divided into 2 degrees of intensity. But since the principal marks indicate quantitative differences as well,

overlappings are inevitable. Thus, it is possible that in one zone the mark 1 b had to be chosen for places with approximately the same danger of malaria as those which are indicated by the mark 3 a in another section of the map.

III. Distribution of Anopheles.

The following species of anopheles have been observed on the southeast European peninsula:

A. algeriensis	A. maculipennis
bifurcatus	marteri
elutus (sacharovi)	plumbeus
hyrcanus	superpictus
italicus	

Of these species the following can be eliminated at once as vectors: A. italicus which is reported only in uncertain individual findings, the tree cavity breeder A. plumbeus, which is distributed almost all over the region but never occurs in a great density, and A. marteri, which has been found only in limited districts of the southern section of the map and breeds in cool, shadowy mountain-brooks. Also the other free land gnats are insignificant: A. algeriensis and A. hyrcanus (pseudopictus), though the latter occurs in considerable density in rice-districts and in the Danube delta and has been occasionally suspected to be a vector. The localities where these species have been found are not entered on the map.

A. bifurcatus occurs in the whole area, apparently with increasing density toward the south. It may be regarded as chiefly a free land gnat, though it occasionally finds its preferred shadowy cool breeding-places among human settlements as well (in wells and cisterns). On the continent, it is improbable that A. bifurcatus is a vector. On Crete, it is regarded as a vector, though its importance is certainly less than that of the other species. On the map, it accordingly has not been entered on the continent and is inserted in brackets on Crete. Thus, there remain, as principal vectors, A. elutus, A. superpictus and A. maculipennis.

A. elutus is known as a brackish-water-breeder but is found in fresh water with little shadow near the coast as well. In the interior of the country, it is practically completely absent, and also in salt-districts. A. elutus practically dominates the malaria

situation of the lagoon - and delta - districts, of the whole southern coastal zone generally. It occurs in great density on the Adriatic coast up to Montenegro, furthermore at the mouth of the Narenta (Neretva), further northward, it probably occurs in a few places. Its distribution area there adjoins that of *A. maculipennis labbranchiae*. On the Blacksea coast, *A. elutus* extends northward to Burgas, not so dense to the north of Constanza, where it is replaced by *A. maculipennis atroparvus*.

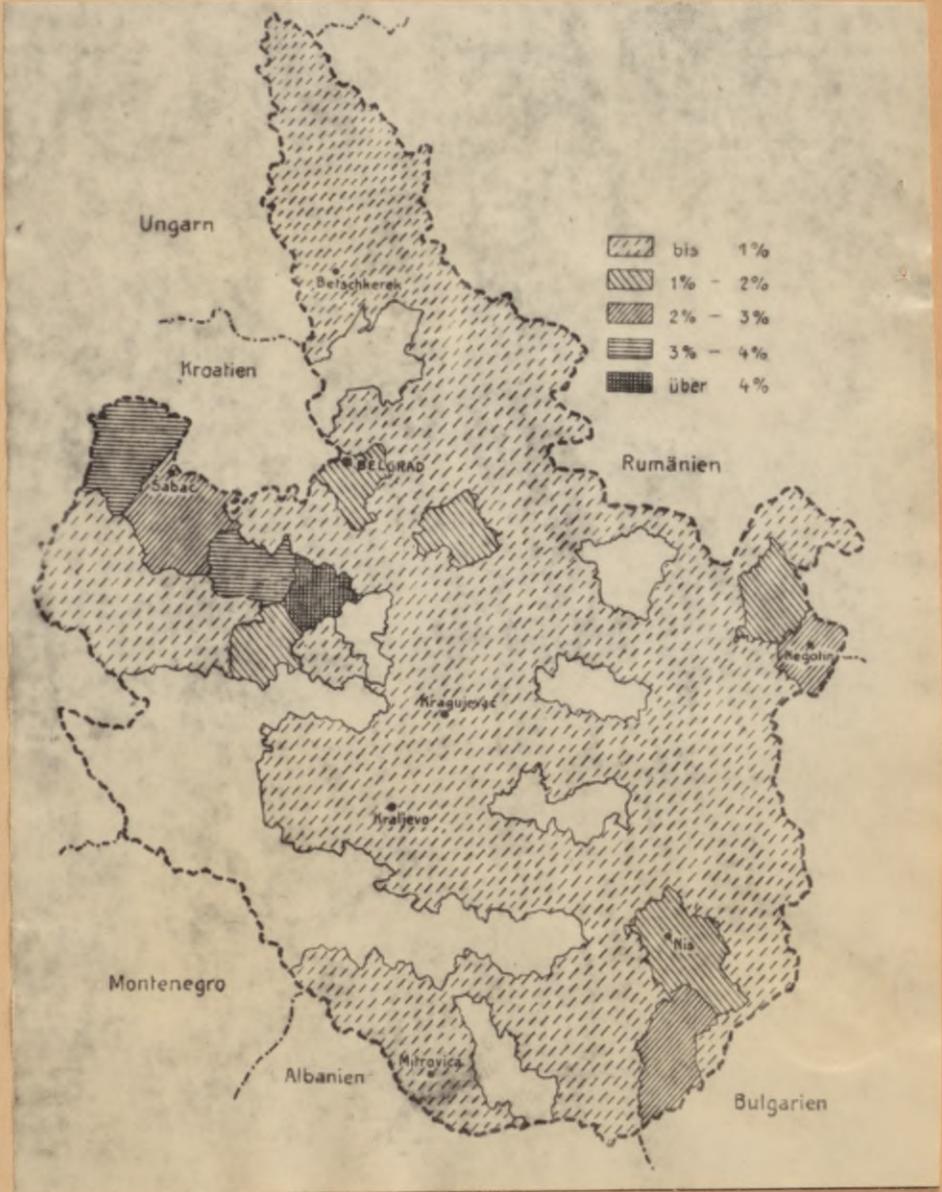


Illustration 2. Annual malaria cases in Serbia in % of the population 1942/43.

Thus, the northern boundary of its chief distribution lies near 42° (see secondary map 1) that of its distribution on the whole near 44° northern latitude.

A. superpictus prefers, as breeding places, stony, sunny brookbeds with a moderate stream. It occurs up to altitudes of 800 m. in the mountain valleys and within its distribution area, participates in deciding the malaria situation in the mountain-valleys and in the hills, but it occurs in the middle and lower courses of the rivers as well. Its compact distribution area from the south on the Adriatic to the bay of Cattaro, in the interior to the north of Kumanovo. It has been found even near Mostar, in the interior up to Vranja. In the eastern section, it is the principal vector as far as the Rhodope-massive; though it has been found even on the northern slopes of the Balkan mountains, it apparently is of no considerable importance for the malaria situation (see secondary map 1.)

A. maculipennis is distributed over the whole region. The following strains have been observed (see secondary map 2):

A. maculipennis maculipennis (typicus) on the whole peninsula, chiefly in the hills of the interior, even in altitudes of more than 1200 m. in the river valleys often near the forests, usually mixed with other strains.

A. maculipennis labbranchiae as brackish-water breeder in the area of the Adriatic coast up to the level of Sebenico toward the south, about 80 kms. toward the interior.

A. maculipennis atroparvus, a brackish water breeder too, on the Black Sea coast north of the Balkan mountains, it occurs to a limited degree also in the interior of continental South Eastern Europe, particularly on salty soil. Most western locality is near Ossijek in Croatia, most southern near Skolpje.

A. maculipennis messeae as principal form in the valleys of the large rivers in the north, mixed with typicus in the whole interior up to Upper Macedonia (more frequent in the Macedonian lake-districts).

A. maculipennis subalpinus in the southern section of the peninsula under similar ecological conditions as *A. mac. messeae*. Since it had not been differentiated from the latter formerly, its boundary of distribution toward the north is not certain.

Regarded over large areas, *elutus*, *labbranchiae* and *atroparvus* on the one hand, *messeae* and *subalpinus* on the other may be considered



Illustration 3. Frequency of Malaria in Croatia.

up to 10 % }
more than 10% } of the population infected

geographically vicarious forms with sufficient approximation, while *typicus* is distributed over the whole region. Secondary map 2 is based on this concept. Single localities have not been marked on the principal map since it cannot do justice to the actual conditions of occurrence, and since the findings recorded in the literature are still too inadequate and regionally too different. It is not yet certain how great the importance of the single strains as vectors is, it may also vary for every geomorphologic situation. Only large-scale serial examinations of the sporozoite-index, which are not yet available, can be decisive.

IV. The malariological Structure of the Region.

The geomorphologic-climatic division of southeastern Europe into a continental and a peninsular section is also expressed by the malaria situation, as shown by the principal map. In the latter section, the 22°-July isotherm is as it were the guiding line of malaria which passes right through the most seriously infected areas (see e.g. Southern Macedonia). In the former section, however, the isotherm is approximately the boundary - line of malaria distribution, the infected regions lie on the warmer side of the line.

On the whole, continental southeastern Europe is characterized by the fact that on the one hand, only the *maculipennis* strains act as vectors and that, on the other hand, the hazard of tropical infection is less than in the peninsular section.

The malariological boundary does not quite coincide with the geomorphological one on the Black Sea since a coastal region extends there to about the level of Constanza, which must be accounted epidemiologically to the peninsular section. This is easily explained by the fact that the West Pontine Climatic Zone with Mediterranean character extends northward over the spurs of the Balkan mountains as well.

On the Adriatic coast, the northern zone of the peninsular section is in a special position. According to the entries on the map, the malaria situation is similar to that of the continental section (exclusive occurrence of *A. maculipennis*, predominance of malaria *tertiana*). It must be considered, however, that malaria *tropica* has there decreased in frequency only recently and that, in contrast to the continental section, *A. mac. labbranchiae* occurs as a vector. If the geomorphological boundary is thus simultaneously a primary malariologic boundary, a secondary malariologic boundary can be drawn on the Adriatic coast approximately at



Illustration 4. Frequency of Malaria in Roumania.
(Average of the years 1925-36)
according to ZOTTA 1938.

the level of the Bay of Cattaro. In the following further subdivision into single malariologic zones, it must be considered that only the most important points could be schematically emphasized. The figures of malaria intensity must be regarded as roughly approximated values. Effects of sanitation could not be considered. The especial position of the towns must be pointed out, whose centers are usually free from malaria.

A. Continental Section of South Eastern Europe.1. The Croatian-Serbian Sava-Danube Area.
(Country between the rivers).

The malaria situation is chiefly determined by the spring inundations in the Danube and Sava lowlands, particularly within the mouths of their affluents. The most important anopheles is *A. mac. messeae*, usually mixed with *A. mac. typicus*; the latter is predominant in the hills. Occasional occurrence of *A. mac. atroparvus* on salty soil must be reckoned with. Within the mark 3 a, the rate of the reported cases lies between 2 and 5 % of the population annually. In the endemic area, however, almost all children are infected. *Mal. tropica* is far less frequent than *mal. tertiana*.

2. The Serbian-Bosnian Mountainous Country.

The entomologic situation in the river-valleys and basins is similar to that of zone A 1, but *A. mac. typicus* is more important as a vector of malaria in the hills. In general, the morbidity is less than in zone A 1. - *Mal. tropica* is rare.

3. The Lower Danube-Basin (Moesian Basin)

a) Wallachia:

The Danube, which is accompanied by a broad area of marshes and inundations, and the deeply incised lower courses of the northern affluents cause extensive breeding-places for *A. mac. messeae*. The plains between the water-courses, particularly the Baragan-steppe, have frequently salty soils and accordingly predominance of *A. mac. atroparvus*, while *A. mac. typicus* is usually less frequent. The rate of the reported malaria cases within the mark 2a amounts to 5 % of the population on an average. The spleen index usually amounts to 25 %, at some places up to 70 %. *Mal. tropica* accounts for about a fourth of the cases.

b) Danube-delta:

Despite heavy distribution of anopheles (chiefly *A. pseudopictus*, then *A. mac. messeae*, and rarely *atroparvus*), slight frequency of malaria. Spleen-index around 5 %. Proportion of *tropica* around a third of the cases.

c) North Bulgarian Plateau:

Due to the steep Danube banks and the better drainage conditions of the affluents, there are fewer possibilities of breeding-places than north of the Danube. Chiefly *A. mac. messeae* and *typicus* are found. Spleen-index within the mark 3 a usually 5 - 10 %. Proportion of *mal. tropica* less than 10 % of total cases.

d) Dobruzha:

On the side toward the Danube, chiefly *messeae*, in the center, according to the salty ground, chiefly *A. mac. atroparvus*, on the coast, *a. elutus* as well. Malaria-cases occur in the whole zone, particularly on the coast where there is a transition to the situation on zone B 5.

B. Peninsular-Mediterranean Section of South Eastern Europe.

1. The Dinarian Coastal Streak.

In the Karst zones of Dalmatia, breeding places of anopheles are found chiefly in the poljes (tub-valleys) with irregulated drainage and at the small water-places (Lokvas). Principal vectors: *A. mac. typicus* and *messeae*, in northern Dalmatia, chiefly *A. mac. labranchiae* as well. Since the turn of the century, there has been a considerable decrease of malaria, particularly of the once frequent *mal. tropica*. Spleen index within mark 3 a is still around 50 %.

In the Hercegovina and in western Montenegro, the situation is similar. The principal vector is *A. mac. messeae*. Spleen index, 10 - 20 %. The *tropica* proportion has fallen below 10 %.

On the mouth of the Narenta (Neretva), the malaria situation is similar to that of the coastal districts of zone B 4.

2. High and Central Macedonia, Rhodope-region.

Mountains and river-valleys abound with extensive breeding possibilities for *A. maculipennis* (chiefly *typicus*, in addition to *messeae* and *subalpinus*) and for *A. superpictus*. Valleys and mountains up to

1200 m. are seriously infected. Spleen index in most settlements within mark 1 a is between 50 and 100 %, within mark 1 b, 15 - 30 %. There is a high proportion of tropica.

3. Central Bulgaria (Eastern Roumelia)

On the upper course of the Marica and on the Tundza, extensive occurrence of *A. maculipennis*, besides *A. superpictus* (?). Within mark 1 a, the spleen index is higher than 30 % as far as no measures of sanitation were carried out. There is a great proportion of tropica.

4. Albania, Greece, Thracia.

Very serious coastal malaria is found in the lagoon- and delta districts. *A. elutus* predominates. *A. maculipennis* is found (chiefly typicus, in addition to subalpinus). In the interior of the country, particularly in valleys and basin-plains, there are numerous breeding places of *superpictus* and *maculipennis*. Within mark 1 a, the spleen index usually is between 30 and 100 %. There is a very great proportion of malaria tropica (details see map VII/4a and VII/4b).

On Crete and the Aegean islands there is much the same situation, though usually more circumscribed occurrence. On Crete, perhaps also *A. bifurcatus* is important as a vector.

5. Western Pontine Coastal Region.

On the whole, the same entomologic conditions as on the Mediterranean coast with predominant importance of *A. elutus*. In the district Burgas-Aitos, the spleen index is 25 - 50 %. There is a very great proportion of malaria tropica.

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OCCURRENCE OF MALARIA AND DISTRIBUTION OF ANOPHELES IN GREECE.

(With 2 text-maps).

Translation prepared by:
U. S. Fleet, U. S. Naval Forces, Germany,
Technical Section (Medical).

Except for the high mountains, the whole of Greece is more or less intensely infected with malaria. The map shows those districts in which malaria must be considered a frequent national disease and in which there is consequently an increased hazard of infection. The map of the region which has been examined by German experts, is based on around 25 000 spleen palpations and as many blood examinations of school-children at 350 places. The data for Peloponnesus and Epirus have been taken from LIVADAS and SPHANGOS, Malaria in Greece, Athens 1942. In addition, for the rest of the region, some Greek examination-results, partly from the same source, partly according to local health authorities, have been used as well, for the adjoining Albanian and Macedonian territories, the examination- results of the mission of the "Istituto di Malariologia E. MARCHIAFAVA" from June 1939 to November 1940 have been consulted (Rivista di Malariologia XX (1941), Section I, Nr. 2/3, page 69 - 228).

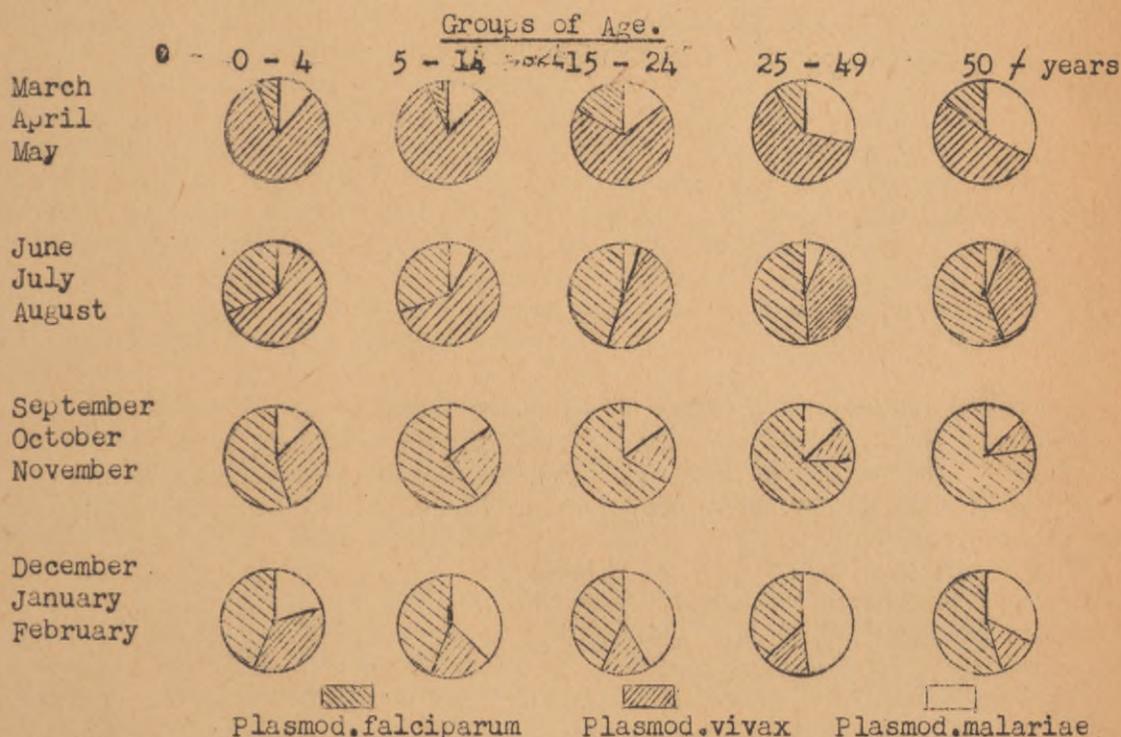


Illustration 1. Seasonal Distribution of the kinds of plasmodia to the groups of age.

According to the Italian examinations of the years 1939 - 1941 (G. LEGA), malaria is very intensely distributed in Albania, particularly along the coast and along the rivers and mountain-brooks, at some places even up to altitudes of 1000 - 1200 m. All three kinds of parasites occur, chiefly *pl. vivax* and *pl. falciparum*. The principal period of malaria in Albania lasts from June to October. As most important vectors, *A. elutus* (6) is predominant along the coast and *A. superpictus* (2) in the river valleys in the interior of the country, *A. maculipennis*, *typicus* holds the second place.

The spleen and parasite -indices refer to school-children and are higher than those of the rest of the population, as experience has shown. By the way, these figures are subject to considerable fluctuations, their constancy may be expected neither in different years nor in different seasons. They can only indicate the extent of malaria infection, not its absolute height at any time you choose and it may occur that very seriously infected places are quite close to places which are remarkably slightly infected. Only particularly characteristic indices have been indicated. Spleen-and parasite index do not always run parallel. The spleen index is usually higher than the parasite index, particularly if there is no recent epidemic in addition to the endemic. If there has been such a recent epidemic, the parasite-index will sometimes rise higher than the splenic-index. A high parasite index, associated with a marked density of anopheles, always involves an increased hazard of malaria infection for foreigners.

All three kinds of plasmodium occur throughout Greece. Their distribution is apparently not very closely dependent on the regions, but chiefly a function of the group of age and of the season. This is demonstrated by Illustration 1, which is based on 15 767 Greek examinations from 1931 to 1939.

Good work has been done on the malaria-entomology for Greece. In addition to the detailed data of HADJINICOLAU in LIVADAS and SPHANGOS, a series of American works (BARBER, RICE and others) deal with it. As regards the geographical distribution of the species of anopheles to the single regions, the published knowledge is scarce, however, the gaps concern chiefly the species rare in Greece and not pathogenic: *A. algeriensis* (7), *A. hyrcanus* (12), *A. plumbeus* (*nigripes*) (4), and *A. marteri* (17). The most important vectors *A. maculipennis* (1), *A. elutus* (6) and *A. superpictus* (2) occur almost everywhere, and *A. superpictus* may settle also in typical breeding places of *maculipennis*, particularly in the late summer. *A. bi-*

furcatus (3) seems to be a vector of malaria only in Crete. Since *A. elutus* (6) has a high natural infection index (N.I) and, in addition to that, is more likely to bite man, the question of its distribution is of practical importance.

The most important breeding-places of anopheles are small and large marshes, brackish-water swamps in the coastal districts, banks of slowly flowing rivers with a rich vegetation, sunny mountain-brooks and rivers with gravelly beds, irrigation- and drainage systems in bad state of repair, loam-pits, and badly set Artesian wells. The banks of sunny mountain-brooks with poor vegetation are typical breeding-places for *A. superpictus* (2), which may often be associated with *A. maculipennis* (1) and *A. elutus* (6), in the late summer and fall. *A. elutus* (6) requires sunny breeding places, with some horizontal vegetation. It prefers brackish water, but is also found in fresh water far from the coast. *A. maculipennis* (1) is the typical marsh-breeder in fresh water.

Species	N. I. (Salivary-glands)	Precipitine test with anopheles caught in			
		homes		stables	
		positive for human blood	positive for animal blood	positive for human blood	positive for animal blood
<i>A. elutus</i>	2,37	61,3	38,7	7,5	92,5
<i>A. maculipennis</i>	0,27	21,2	78,8	0,5	99,5
<i>A. superpictus</i>	1,87	29,7	70,3	1,6	98,4

Geologically seen, Greece is the result of various foldings with elevations and depressions. The manifold formation of mountains in partially opposite direction was extremely favorable to the formation of basin-regions and deeply cut-in river-valleys. The disintegration is fostered by the violent force of the sun on the deforested mountains. The decomposition of the stones which often contain a great percentage of felspar provides the rivers - particularly in Macedonia - with a considerable content of colloid clay. In its turn, this leads

to the formation of typically elevated river-beds with spring inundations and to the gathering of periodically flooded, impermeable alluvial land, marshes, and river-deltas. Thus, the marsh-breeders *A. maculipennis* (1) and *A. elutus* (6), find extensive breeding-places. In the mountain-brooks, *A. superpictus* settles, which likes the sun and breeds somewhat later in the year. Thus, the mountains and hills are by no means free from malaria, only from 1000 m altitude on can the absence of endemic malaria be expected. In addition to swamp malaria and mountain malaria, malaria by man's hand plays an important role in Greece. The earth for railroad dams and protective dams against water has often been removed without respect for the new formation of breeding places of anopheles. Particularly in Macedonia, the often unclosed Artesian wells cause the same damage.

LIVADAS estimates the total number of the annual malaria cases in Greece (old boundaries) to be around 1 000 000. Malaria morbidity in the Army and Police, per 1000 men, amounted to:

Year	Army	Police	Year	Army	Police
1930	125	77	1934	91	51
1931	121	120	1935	117	73
1932	145	21	1936	142	72
1933	128	83	1937	119	61

The monthly distribution in percent, calculated from 7476 cases of various malaria stations, is shown by Illustration 2.

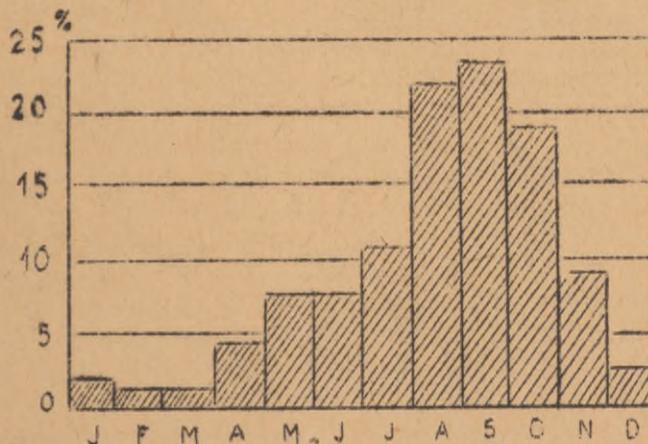


Illustration 2. Annual course of malaria.

The Greek organization for malaria control is well equipped in personnel. Even after the outbreak of the war, their area of work has been continuously extended.

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VII/4b

OCCURRENCE OF MALARIA IN ALBANIA.

Translation prepared by:
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OCCURRENCE OF MALARIA IN ALBANIA.

The malaria situation of Albania corresponds to the geomorphologic and climatic conditions which have been described for the peninsular-Mediterranean section of southeastern European peninsula (see text to map VII/4). On the lower courses of the rivers and in the whole coastal region, the southern section excepted, there are in the regions of inundation, marshes and lagoon-zones extensive breeding possibilities for *A. elutus*, which is mixed with *A. maculipennis typicus*. In the region of the middle and upper courses of the rivers and in the mountain-valleys, *A. superpictus* is the predominant vector, in addition to which *A. maculipennis typicus* occurs as well. The latter is of great importance in the area of the Scutari-lake. - The other anopheles observed in Albania (*A. pseudopictus*, *bifurcatus*, *algeriensis*, *marteri*, *plumbeus*) are epidemiologically insignificant.

The first adult flies of *elutus* appear at the end of May; the principal flying time lies in June and July. *A. maculipennis* behaves in a similar way. In the respective zones, the first cases occur in the second half of June and persist till the end of October. The flying time of *A. superpictus* begins in the middle of July, malaria in the interior zone of the country accordingly sets in in the first half of August and persists until November.

The proportion of tropica cases is very great (more than half of the total cases). With children, quartana infections are frequent. During the determination of the parasite index in children at the places entered on the map, the following distribution was found in 1939: 28 % tertiana, 56 % tropica, 16 % quartana.

The zones of various degrees of hazard by malaria have been represented according to a still unpublished map of A. COLUZZI. This representation shows, on the whole, the shape of the surface of the country. All lowlands have been indicated as seriously infected, furthermore, part of the elevated valleys, finally the basin-plain of Korca. There is probably no considerable difference of the hazard from malaria between the plain and the "Zone of medium malaria-endemic".

The data of the spleen index show that there are, in part, considerable differences of malaria intensity (examinations in 1939 and 1940 according to G. CASINI).

Since 1929, measures of sanitation have been carried out by the Albanian Government with the help of the Rockefeller-foundation only in the towns, and these have been continued from 1939 to 1942, by the Italian Instituto di Malariologia "E. MARCHIAFAVA".

In the course of these measures, the spleen index decreased

in Tirana	from 42 % (1929)	to 11 % (1938)
in Durazzo	from 45 % (1929)	to 18 % (1938)
in Scutari	from 49 % (1939)	to 18 % (1938)
in Berat	from 70 % (1933)	to 31 % (1938)
in Valona	from 85 % (1931)	to 48 % (1938).

In Elbasan, no important results have been obtained (spleen index around 50 %).

There are malaria stations in Tirana, Valona, and Durazzo.

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LEISHMANIASIS
IN THE MEDITERRANEAN BASIN.

(With 8 Drafts attached to the text.)

Translation prepared by:
U. S. Fleet, U. S. Naval Forces, Germany,
Technical Section (Medical).

Visceral Leishmaniasis (Kala-Azar, *L. donovani*) and dermal Leishmaniasis (Oriental Sore, *L. tropica*) are characteristic diseases of the Mediterranean basin. Almost throughout the entire Mediterranean littoral and the islands one must expect both these diseases. As a rule they occur only as sporadic cases. Even though they are observed at all times and in all places they do not assume the form of epidemics. The most suitable term to be applied to them would be "endemo-sporadic diseases".

In this connection I want to stress that the marks in the principal maps and in the drafts indicating the incidence of Leishmaniasis refer to all places in which autochthonic cases of Leishmaniasis ever have been recorded and that no special consideration was given to the actual number of cases in these places. Such a procedure is justified by the fact that the places in which Kala-Azar or Oriental Sore have occurred once, are regularly affected again by such diseases although there may be no such cases for several years. The hiding place of the organism during the interval is so far an unsolved problem of the epidemiology of Leishmaniasis. The phlebotomi (see HENNIG, map I/8) as the probable vectors are a reservoir of the agent only under certain conditions. The question of to what extent higher animals particularly the mammals, harbor the parasites and thus may become the source of a new infection for man is still more important. For Kala-Azar of the Mediterranean it seems to be established that the dog should be considered as a possible source of infection. For this reason areas with an occurrence of canine Leishmaniasis which are worthy of mention, have been given consideration on the maps. In all cases in which no special note was made the observations made throughout the entire Mediterranean basin are valid, that Leishmaniasis of dogs occurs in addition to the intestinal Leishmaniasis of man. This fact does not apply to the Indian Kala-Azar. It frequently happens that dogs suffer from a general Leishmaniasis without showing any symptoms. In their skin, however, Leishmaniae may be found. Dermal lesions which may have the appearance of the Oriental Sore of man according to CAMINOPETROS are only secondary manifestations of a visceral canine Leishmaniasis.

It may be true that while studying the epidemiology of Leishmaniasis previously insufficient consideration has been given to the fact that the Leishmaniasis do not occur in the form of epidemics, but in general are found as isolated cases. This suggests that the Leishmaniae are not primary parasites of man. During the recent years

a few data for such an assumption were established by some Russian scientists. They found that in the sand desert the wild rodents may be the carriers of the *Leishmania tropica*. In the Murgab valley in Turkmenistan the phlebotomi of the sand desert deliver their eggs in the burrows of the wild rodents (gerbils, ground squirrels). The detailed investigation of the various rodents revealed the most remarkable fact that on the average 30 % of 1087 rodents examined were contaminated with *Leishmaniae* (LATYSHEW and KRONKOVA 1941). In the course of that year the number of infected animals was increased from 2.3 % in the month of May to 56.3 % in the months of November and December. Through experiments proof was established that the organism of Oriental Sore is identical with the *Leishmaniae* found with the rodents. Similar findings were made with two other representants of the family of the rodents, namely the *Meriones erythrourus* and *Spermophilopsis leptodactylus* which are the typical representatives of the sand desert fauna. Hence it results that originally the dermal *Leishmania* apparently was a disease of animals and that the rodents have to be considered as the carriers of the agent and the source of the infection. This, for its part, would result in entirely new viewpoints for the fight against that disease. As the same relations are assumed for the *Leishmaniasis* in Tunisia, this observation is of some importance.

The frequency of *Leishmaniasis* differs widely in the various countries of the Mediterranean basin. In this connection I want to make reference to the fact that one does not always know with certainty whether or not all cases of Kala-Azar and Oriental Sore have been recognized as such. The increase of the morbidity rate therefore does not always mean that the frequency of the *Leishmaniae* has increased. In the malaria areas for instance cases of an enlarged spleen in which no malaria plasmodiae were found very often were diagnosed as a chronic malaria without parasites. If once the erroneous diagnosis had been recognized, frequently even foci of visceral *Leishmaniasis* were revealed. Relevant references can be found in a large number of studies on the occurrence of *Leishmaniasis*. In many cases this may be the reason for the widespread opinion that in the Mediterranean basin adults do not fall sick with visceral *Leishmaniasis*. It is established with certainty that the visceral *Leishmaniasis* of the Mediterranean basin is chiefly a disease of the children (usually between the first and the third year of age). However, even adults are not protected against the infection.

The majority of the cases occurs in the months of March to June. There are local variations which will be discussed below.

Even though these figures do not represent all the cases of visceral Leishmaniasis which to our knowledge have been under treatment up to the present date, they indicate clearly the relatively high frequency of that disease in the various provinces of Spain.

Before 1925 the total amount of Kala-Azar in Spain was 343. During the following years it was raised to 892 cases. As a rule it affects children in the age between 1 and 4 years (6 months up to 10 years). However, adults are also afflicted with visceral Leishmaniasis in an ever increasing number. This was recently revealed during the civil war in Spain, when 5 members of the "Legion Condor" (German troops in Spain) fell sick with Kala-Azar.

The infection usually occurred during the late summer or in the fall. During the winter the first symptoms will appear. The canine Leishmaniasis apparently is of special importance. It is found with certainty in the big cities and it seems to be distributed to a greater or lesser degree throughout all the provinces of Spain. In this connection the reference of KOWALZIG is worthy of note, that the troops of the "Legion Condor" amongst which 5 cases of Kala-Azar had occurred liked to play with stray dogs. An extensive examination of the dogs in Madrid made in 1935 revealed that 178 out of 2,000 dogs examined were infected with Leishmaniae, and in Sevilla in 1933, 5 out of 76. Cats may also be carriers of Leishmaniasis, although the likelihood is very small. Only 1 cat out of 495 cats examined in Sevilla was contaminated with Leishmania.

In Spain the phlebotomi are considered as the principal vectors of visceral Leishmaniasis; in many cases ticks are also regarded as transmitters between the dogs and man.

Oriental Sore is not very frequent in Spain. It occurs under the term Llunari and it is more frequently found among children. During the period from 1913 to 1934 27 cases were recorded. However, as with visceral Leishmaniasis one must take into account that more cases are revealed, if a thorough search for them is made.

The east coast of the province of Tarragona (Arboli, Alforja), and Valencia should be regarded as endemic areas of Oriental Sore. Isolated cases were recorded in Abaran (Province of Murcia, 1935) Perello (Province of Tortosa), Castellar de Santesteban (Province of Jaen) and on the coast of Granada.

Portugal geographically does not belong directly to the Mediterranean basin. However, it can be regarded as "the continuation of the Mediterranean coast to the Atlantic", as the Mediterranean diseases are spread as far as its territory. In 1910 visceral Leishmaniasis was observed in Portugal for the first time and here too it occurs predominantly as a disease of infants. About 86 % of the children sick with Leishmaniasis were 2 - 5 years old. The greatest hazard occurs at the age of 2 years.

The geographic distribution of Kala-Azar in children is very irregular. Centers of endemics are Lisbon and the northern territory around Porto, and the valley of the Douro (Illustration 1). The coast areas are above all involved, but isolated cases occur in the area between Lisbon and the Douro in the north, and the coast of the province of Algarve in the south. In the northern area of endemics, where the first case was observed in 1927, 16 cases were recorded before 1934. All of them were children under 4 years of age. Recently the first case of an adult contaminated with Leishmania was observed in the valley of the Douro river. Within 5 months 11 cases of Leishmaniasis were found among children of the age from 7 months to 8 years in Alcazar do Sal. As a rule, Leishmaniasis is not frequent. However, it has been repeatedly stressed by the scientists that it is very likely that a more widespread distribution of this disease will be revealed with the increase of its knowledge. Nevertheless an epidemic occurrence of Leishmaniasis need never be taken into account.

Dermal Leishmaniasis as an autochthonic disease does not seem to have occurred in Portugal as yet.

It is certain that canine Leishmaniasis occurs in the big towns. In Lisbon 2 % of all dogs were found to be contaminated in 1938. It is not clear whether the dogs must be considered as a source of infection or not, but it is regarded as probable by reason of general observations and experiences in the Mediterranean area. Extensive systematic investigations of Spain and Portugal are not available.

In France the most extensive focus of Kala-Azar extends directly along the Mediterranean coast from the Franco-Italian frontier to Marseille, and it is continued deep into the country for 100 kms.

The first case of infantile Kala-Azar in France was found in 1918 in Nice. Since then a relatively large number of cases have occurred in the French Mediterranean coastal area between Menton and

and Marseille. The two principal foci are Nice and Marseilles. During the period before November 1934 about 150 autochthonous cases of infantile Kala-Azar were observed; CASTILLON (1937), however, holds that it is very likely that the real number of the recognized cases is three times as high. GIROD (1936) reports 146 cases for the region of Marseille since 1922; it is certain that 135 cases of these were truly endemic. In addition to 137 children, 5 adults and 4 youths were contaminated. As is shown by the figures Kala-Azar here too is principally an infants disease. During the recent years, however, several cases have occurred in adults. The first autochthonous case in an adult was observed in 1923. It was a 32 year old woman keeping 3 dogs, one of which suffered from visceral Leishmaniasis. Since then numerous cases of Kala-Azar in adults have been recorded. Before 1938 4 more cases of adults sick with Kala-Azar were reported from Marseille and Arles. It is very likely that the dogs must be considered as carriers and it appears that the organisms are communicated to man through an intermediate carrier. The definite proof of these connections is not established so far. It is certain that just in the area of the southern French Mediterranean coast, in which human Leishmaniasis is to be found, many infected dogs occur and that the dogs apparently play an important role in spreading the disease. During the last years several cases of Kala-Azar were observed in the interior of France which, as far as it could be established, could be traced back to dogs who had been living on the Mediterranean coast. PEHU and BERTOYE (1937) observed 3 cases of an autochthonic infantile Kala-Azar: one of them was found in Remiremont in the Vosges mountains where it was established for certain that a five year old child had played very frequently with a dog which came from Italy. The second case occurred in the vicinity of Aubenas and the third in Aubenas itself (Province of Ardeche). Contaminated dogs were also found in Toulouse, Biarritz, and Bordeaux. In consequence of this observation CASTILLON believes that for the future in France Kala-Azar may occur more frequently. In all coastal towns of southern France there are many contaminated dogs. An investigation of the dogs in Nice during the year 1932 revealed that 19.6% of the dogs were carriers of *Leishmaniae*. A certain number of these dogs showed no symptoms of disease. This high percentage is not found in all towns; however, it ranges between 2 and 10 %.

An autochthonous Oriental Sore has not been observed in France so far.

No reports are available on the occurrence of Leishmaniasis between Marseille and the Spanish frontier. However, there are considerable doubts as to whether this part of the Mediterranean coast is really free from Leishmaniasis, since the adjacent Spanish littoral shows a considerable incidence of Kala-Azar.

In Corsica visceral Leishmaniasis was observed in the north, in Bastia and Calvi and in Ghisonaccia (central part of the eastern coast). Among the cases observed in these places was a 23 year old patient who beyond all doubt had acquired the infection in Corsica. - One out of 16 dogs which were examined in Bastia and its environments was infected with Leishmaniae. PIERI and LENA (1933) assume that in this case too, the dogs have to be considered as the carriers of the agent. - There has been no Oriental Sore so far.

In Italy the frequency of Leishmaniasis is greatest in the south of the country. The highest number of infections was found in Calabria and on the island of Sicily. Since 1925 Leishmaniasis has been a notifiable disease in Italy. The annual number of Kala-Azar cases varies from 200 to 300. The geographical distribution of the 202 cases reported in 1932 was as follows: Liguria 8, Emilia 2, Toscana 1, Latium 1, Campagna 10, Apulia 5, Calabria 5, Sicily 166, Sardinia 4. Most of the cases occurred during the month of March, but Leishmaniasis was also found during the period between April and August.

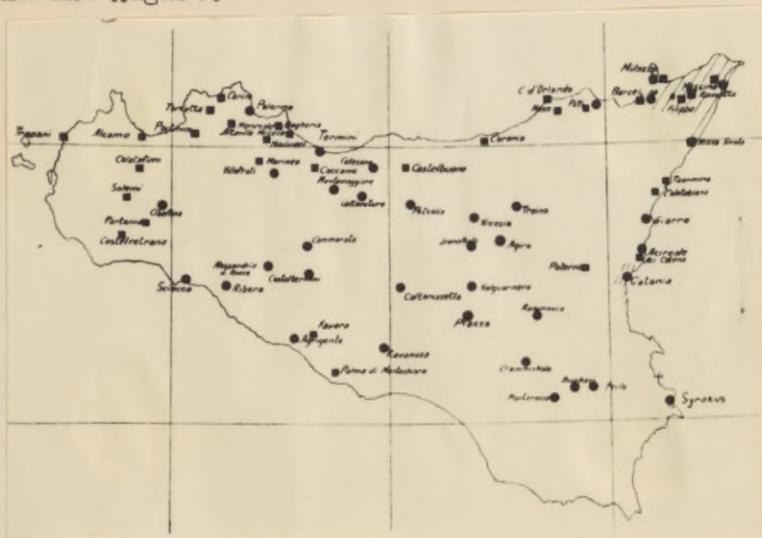


Illustration 2.
Leishmaniasis in Sicily.

In Sicily more than 80 % of all cases occurring in Italian territory are to be found. The principal endemic areas are located in the provinces of Catania, Palermo, and Messina (Ill.2). Kala-Azar is prevailingly distributed along the coast while in the interior only a small number of isolated cases can be observed. The occurrence of visceral Leishmaniasis apparently depends on a certain altitude. None of the 1424 cases found during the years 1916 to 1926 was found at an altitude higher than 733 M. Usually visceral Leishmaniasis occurs at an altitude between sea-level and 214 M. In Catania alone the annual number of infections frequently amounts to 150 to 200.

Kala Azar is principally found with children. In Sicily 60 % of all cases are children under 2 years of age. However, recently several cases of visceral Leishmaniasis of adults were observed. In Catania 3 to 6 adult cases used to occur every year. According to IZAR the actual number of adults sick with visceral Leishmaniasis is always larger than that of the statistics, as the symptoms of the disease are different with adults and with infants, and as only the symptoms of the latter are remembered when the diagnosis is established. Most of the cases are found during the months of March and April. In Palermo, the number of cases is particularly high during winter and in spring. The incidence is highest with the poor population of the suburbs.

The incubation period is reported to be 6 months and less.

In the territories with visceral Leishmaniasis a considerable infection of the dogs with *Leishmaniae* is regularly found. In 1912 1.09 % of the dogs in Catania, according to another author 2.42 % (of 165 dogs) were infected. An examination of the dogs in 1933 revealed that 6 % of the dogs examined were contaminated. This fact is of an epidemiological interest as under certain circumstances the dogs are of some importance as a source of infection of man.

The disease is transmitted above all by phlebotomi, possibly by *Ph. perniciosus* and *Ph. major*.

During recent years Oriental Sore has become familiar to an increased degree. It was observed for the first time in 1910, prevailing in Calabria, Reggio, and in the vicinity of Messina (Bordonaro). According to recent investigations made by MONACELLI (1934) the casual occurrence of Oriental Sore must be taken into account for all Sicily and the southern parts of the Italian peninsula, while in central Italy,

namely in the province of Teramo (Ill.3). There is an endemic focus with numerous cases (VANNI 1938). During the months of May to July 1938 about 300 cases were observed. The highest number of cases occurred among the rural population, particularly among children of the age group between 7 and 13 years NUTRARIO (1934) assumed that there is an endemic zone along the Adriatic coast between the Romagna and Apulia.

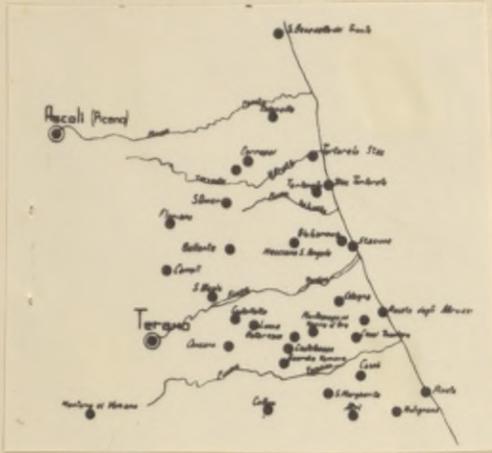


Illustration 3.
Dermal Leishmaniasis (Oriental Sore) in the province of Teramo (Acc. to VANNI 1938).

In Sardinia the number of cases of Leishmaniasis was relatively small. According to FRANCO 31 cases were observed before 1931, which were recognized as Leishmaniasis by microscopic examination. 24 of them were visceral, 6 of them dermal Leishmaniasis. One case was considered as a mucosal Leishmaniasis. Pronounced foci of Leishmaniasis do not exist in Sardinia. The places of occurrence are distributed throughout the entire island (Ill.4).

The highest number of cases of Oriental Sore is found during the months of February to April. The phlebotomi (*Ph. papatasi* and *sergenti*), which are considered as the vectors of dermal Leishmaniasis swarm until October. Hence it results that the average incubation period is six months. However, this can be considerably longer.

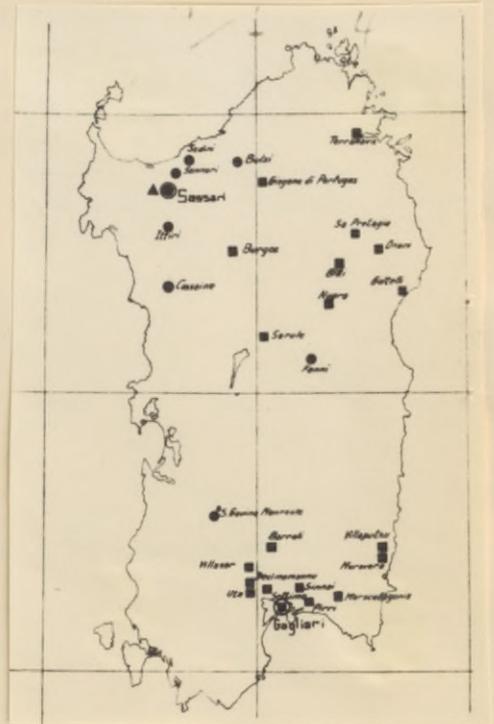


Illustration 4.
Leishmaniasis in Sardinia.

Some of them are located in the mountains where they are found at an altitude of even 1,000 M. (Fonni).

The 24 cases of visceral Leishmaniasis were found within a period of 11 years, during which only one case per year occurred on the average. In 5 single years no case occurred, while 13 cases were observed in the course of the year 1930. I want to mention as a peculiar fact that 20 of the patients belonged to the male sex, while only 4 females were affected. The age of the patients varied between 8 months and 33 years. Even though a large number of these patients - as in most cases of the Mediterranean Kala-Azar are infants and children in the age group between 8 months and 10 years, a relatively high number of patients in the second decade of life was found in Sardinia. One case was that of a 33 year old adult. Both FRANCO and IZAR assumed that the small number of visceral Leishmaniasis of youth and adults is to be traced back to the fact that the possibility of Kala-Azar is not always taken into account when the diagnosis is considered. - 22 of the 24 cases have to be considered as autochthonous. Between 1931 and 1938 only 3 or 4 cases of Kala-Azar were found.

Before 1931 only 6 cases of Oriental Sore were found, one of them in 1910, one in 1920, and 1924, and 3 cases in 1931. All patients were males in the age group up to 24 years. One of them was living in a mountain village at an altitude of 1,000 M. Before 1938, 3 more cases of Oriental Sore were observed (Sedini, Cossione, Ittiri).

Canine Leishmaniasis has been known since 1917, but it was found in only a very few places. In Sassari 12 cases of canine Leishmaniasis were examined. They could be proved as Leishmaniasis by the demonstration of the organism.

On the island of Malta many cases of Kala-Azar occur annually. According to a report given in 1934, 121 cases were notified in 1933. This figure allegedly represents the annual average. According to another author the number of infections is considerably smaller. ZAHRA (1931) reported the number of cases treated from March 1923 to May 1932 as 315. Kala-Azar occurred chiefly in the rural districts. The number of cases found in adults was small. Some autochthonous cases occurred among the troops.

In Malta dermal Leishmaniasis was recognized only once in 1934. For this case the source of infection was not known and it is questionable whether this single case should be considered as endemic.

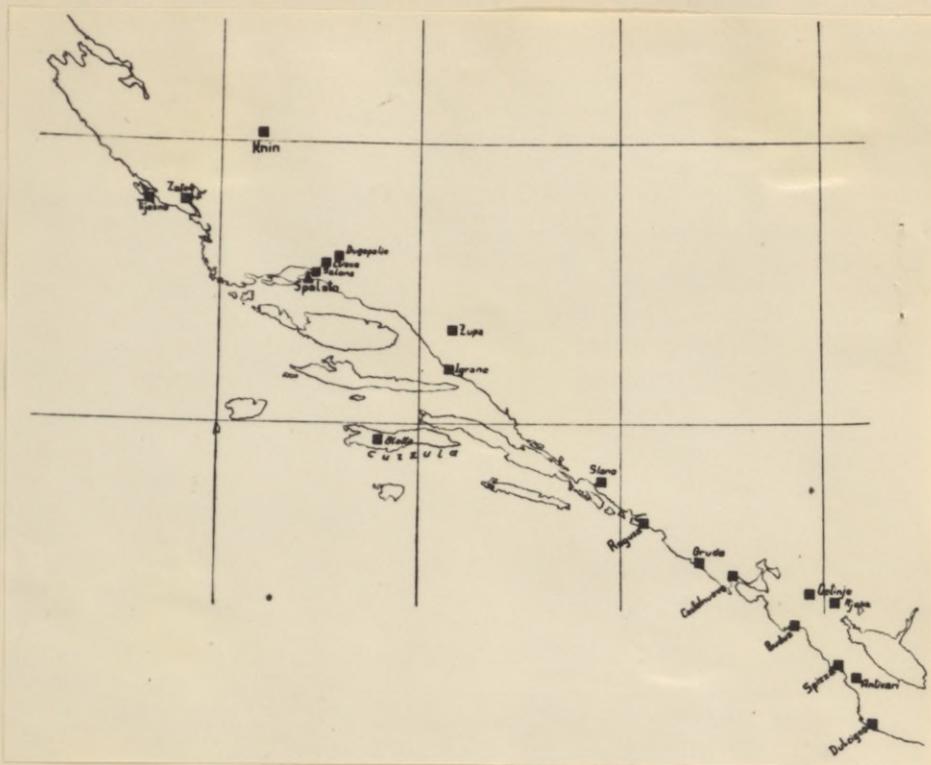


Illustration 5.
Leishmaniasis on the Adriatic coast.
(According to TARTAGLIA 1938)

Of the northern part of the Balkan peninsula the eastern Adriatic coast shows a high incidence of Kala-Azar. In the coastal towns and villages of this area inserted in the chart altogether 89 cases occurred during the period from 1931 to 1934. 59 of them were observed in the province of Ceta, and 30 in the littoral of the Herzegovina. The number of cases in each village varied considerably. In the vicinity of Spalato 13 cases occurred, 8 of which were found in Klis, 3 in Zrnovica, 1 in Cuccine, and 1 in Yesenica. In the mountains the disease is observed at altitudes of up to 300 to 400 M. 82 of the 89 cases found before 1934 were observed with children in the age group of 1 to 12 years, usually with those of 2 to 4 years of age. There were only 7 cases of adults between 20 and 47 years suffering from Kala-Azar, 6 of them females, 1 of them a male. TARTAGLIA (1934) however, assumed that the number of adult

cases of Leishmaniasis is considerably higher, as most likely the disease is not recognized in all cases and very often is considered as a chronic malaria without findings of parasites. This assumption was confirmed by a report of SIMITCH (after ABRAMOV) in 1938. During the years of 1933 to 1936 this author examined 42 Kala-Azar patients among which there were 25 adults. In 1937, 25 out of 50 patients were adults suffering from Kala-Azar which at first was not recognized, but was considered as malaria. Kala-Azar is more frequent in the villages than in the towns. The affected persons, particularly the children as a rule are poor and belong to the rural population.

Canine Leishmaniasis occurs in addition to human Leishmaniasis, although the two are not always concurrent. An examination of dogs in Split revealed that in 1935, 4 out of 50 and in 1936 2 out of 28 dogs were contaminated with Leishmania. In these cases too, the dogs are considered as the source of the infection and for the prevention of the disease the extermination of the dogs was recommended.

Oriental sore has not been found in this area so far.

Roumania also is not free from Leishmaniasis. Even as early as in 1912 infantile Kala-Azar was observed in Bucharest and 1934 MIHAILESCU and NIKOLOFF had found 2 cases of canine Kala-Azar in Bucharest. A frequent occurrence of this disease, however, seems not to be observed. There are no recent cases, so that the suspicion is aroused that the earlier cases were imported.

In Hungary the first autochthonous case of Kala-Azar was found a short while ago (GELDRICH 1941). The infection apparently had occurred in Szeged.

The presence of phlebotom in this country, particularly of Ph. macedonicus which allegedly transmits Kala-Azar in Greece, has been known for a long time.

In Bulgaria at first only isolated cases had occurred. An autochthonous case of Kala-Azar in a 26 year old soldier was reported in 1938. It appears that this soldier had acquired the infection in the vicinity of the Greek frontier. MOLLOV, however, who made reference to it assumed that more cases occur along the coast of the Black Sea. SLIVENSKI (Sofia) had the same opinion when there was a discussion of Kala-Azar in 1940. He holds that a large number of cases would be found if a thorough search for visceral Leishmaniasis would be made in the

villages of Thrace and Macedonia. Even without a special search in the villages single cases were found as in the village of Petrovo-Sveti-Wratch.

Oriental Sore was observed once in Aitos.

There are large areas with Kala-Azar in Greece. Even more than 100 years ago this disease was known in that country as a clinical syndrome (Hydra, Spezia). In our days visceral Leishmaniasis is endemic in the provinces of Messenia and Argolis, on the Peloponnesus, in the town of Patras, in Thessaly, and on the islands of Poros, Spezia, Hydra, Crete, Kephalaria, Kerkyra, and in the vicinity of Athens. In the eastern part of the Peloponnesus, in Argolis, 200 cases of infantile Kala-Azar were found within 3 years (KIRIMILIDES 1938). While in the villages of the plain of Argolis Kala-Azar occurs sporadically only, one may even speak of an epidemic incidence of the disease in the area northwest of the town of Athos. Here too,

the disease principally affects children of 2 to 3 years. The province of Messenia was investigated with regard to Kala-Azar by PAPANTONAKIS (1936). Most of the villages located at an altitude of 100 to 500 M. on the hills and mountains were involved, while the plains apparently were free from Kala-Azar. Accordingly many cases occur in the northeast of the province, while the number of Kala-Azar cases is small in the southwest. In 20 smaller villages about 135 Kala-Azar patients could be found, most of them children of 2 to 3 years. The principal focus of Kala-Azar in the Mediterranean has been considered to be the island of Hydra. A publication in the year 1911 made reference to the fact that 39 % of the deaths of children below 6 years of age had to be attributed to Kala-Azar on this island. In Athens 46 cases of human Leishmaniasis came under medical treatment in the periods between 1933 and April 1934. 18 of the patients originated from Athens, 14 of them from the island of Poros, the rest from the remaining parts of Greece.

It was frequently remarked that the patients had kept dogs in their houses many of which were infected with Leishmaniae. During the same period between 1933 and April 1934 in Athens and in the villages of Attica 31 sick dogs were observed. Similar cases occurred in the Peloponnesus. CAMINOPETROS found that canine Leishmaniasis always precedes the human Leishmaniasis. In 1936, 498 stray dogs were examined 55 of which were infected.

Most of the cases appear during spring and during the first months of summer while the occurrence of Kala-Azar is rare in autumn and winter.

There is a huge number of cases of Oriental Sore in Kanea. They are chiefly found in the old Turkish part of the city. All age groups are liable to infection. From 1932 to 1934 614 cases were observed. This number, however, represents only a small fraction of the real number of infections. A certain seasonal increase of frequency could not be remarked.

Phlebotomus major and *Phlebotomus perniciosus* were considered as the vectors of Kala-Azar. (MUELHENS 1943).

On the island of Cyprus only isolated cases of visceral Leishmaniasis were observed (in Nicosia); likewise dermal Leishmaniasis was rare. In 1934, 2 cases of dermal Leishmaniasis were treated in the hospital of Nicosia. Canine Leishmaniasis did not occur on Cyprus.

From Turkey reports are available (MARCHIONINI 1940) which indicate that there were numerous cases of Oriental Sore in central and eastern Anatolia. Preferential areas are those with a dry continental climate (a long hot summer, a short cold winter). In Ankara about 200 cases of Oriental Sore were treated in the period between March 1938 and June 1939. No accurate data on the places where it occurs are given in the literature.

The adjacent countries of the Near East, Syria, Palestine, and Egypt, have been discussed in connection with map II/5: Leishmaniasis in the Near East. For Egypt the occurrence of Oriental Sore in the vicinity of Rosette in the Nile delta and of Assyut in the Nile valley must be mentioned in addition.

The frequency of Leishmaniasis in the countries of the North African littoral varies considerably.

In Tripolitania Leishmaniasis was found in Tripoli and Homs only. The total number of the Kala-Azar cases is about 16, that of Oriental Sore about 4 to 5. Canine Leishmaniasis was also found in these places and according to one of the authors allegedly had affected 13 % of the dogs examined.

In the Cirenaica single cases of Kala-Azar were observed in Benghazi, Tolmetta, and Derna. - Canine Leishmaniasis was found in Benghazi, but apparently it was not frequent in this area.

In Tunisia accurate observations of the development of Leishmaniasis were made for many years. At intervals of 4 years accurate

reports (NICOLLE, ANDERSON) were published during recent years. These reports show that in the places given in Illustration 7 the morbidity with visceral Leishmaniasis has increased slowly but continuously.

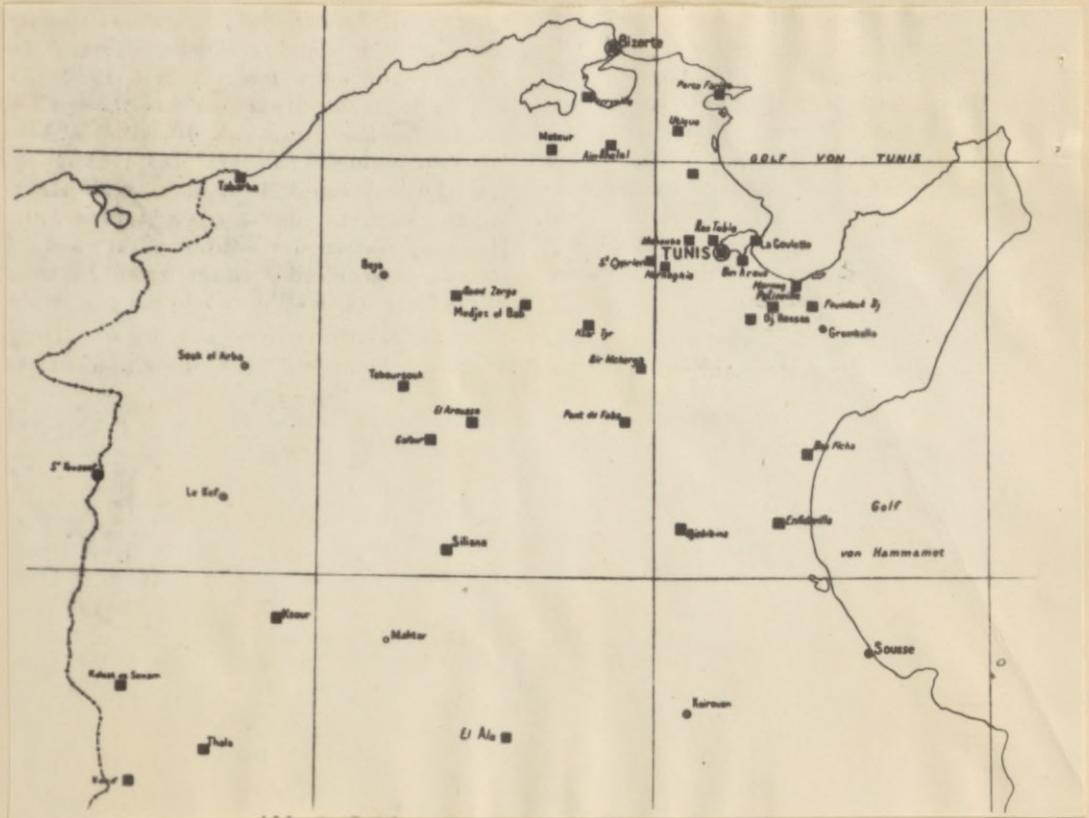


Illustration 7.
Leishmaniasis in northern Tunisia (before 1938).

The new cases usually are always found in the same villages. The total of 131 cases observed in the period from 1906 to 1937 reveals that the hazard of the infection is very small. Since the report of the year 1934, 8 more cases occurred before 1937. Until 1925 visceral Leishmaniasis was found exclusively among children. During the following period ending in 1938 it was also observed with

6 adults. The fact that adults also can fall sick with visceral Leishmaniasis was of some importance because one had assumed that the organism of infantile Leishmaniasis is a special type of organism which is not pathogenic for adults. The major part of the infantile patients (87) was of Italian origin, the remainder came from Italian-French (5), French-Maltese, and indigenous parents.

Except for 1 case in Tozeur in the south, Kala-Azar exclusively occurs in the northern part of Tunisia.

In the south the Oriental Sore is widespread. The cases of dermal Leishmaniasis are particularly concentrated in the mountainous oases, chiefly in Medlaoui and Gafsa. The entire region north of the Chott-el-Djerid is an endemic center for Oriental Sore. In the north only Sidi Yussef on the frontier between Algeria and Tunisia is known as a place where Oriental Sore occurs. Yussef on the one and Tozeur on the other hand give proof that one cannot speak of the two types of Leishmaniasis being vicarious for each other. Both of them are liable to occur simultaneously in the same region. Oriental Sore seems to be tied to mountainous, rocky areas. It apparently depends on an intermediate carrier which has to be considered as the reservoir of the agent. One suspects that this intermediate carrier is a certain class of rodents in Tunisia, the *Ctenodactylus Gondi* (see the general remarks in the introduction).

Canine Leishmaniasis also was repeatedly found in Tunisia. Its frequency in the towns is given as 1 to 2%. - Accurate investigations on the relations between human and canine Leishmaniasis had been made but they supplied no definite information.

In Algeria the area of Oriental Sore extends deep into the area of the sand deserts of the Sahara as far as the general borderline located at 30° latitude. The southernmost place of occurrence is Igli on the Wadi Gir. In the vicinity of Colomb-Bechar and in the oasis of Figuig numerous cases of Oriental Sore were observed. This borderline area between Algeria and Morocco has to be considered as an area of endemics. The remaining south Algerian territory south of the Great Atlas mountains shows only isolated cases, which, however, are found in almost all oases of this area (Laghouat, Ghardaja, Vargla). An endemic area which has been well known for a long time is situated in the Oasis of Biskra and south of it in the vicinity of Touggourt and in the Oasis of Souf. A second zone with Oriental Sore is located in the foothills of the Little Atlas Mountain. Oriental Sore was found in many places in the oases and the valleys of these mountains. In the region of Algiers, and Constan-

tine the number of places where Oriental Sore occurs, is particularly frequent. The number of single observations, however, is very small, and it does not exceed 1 to 5 cases.

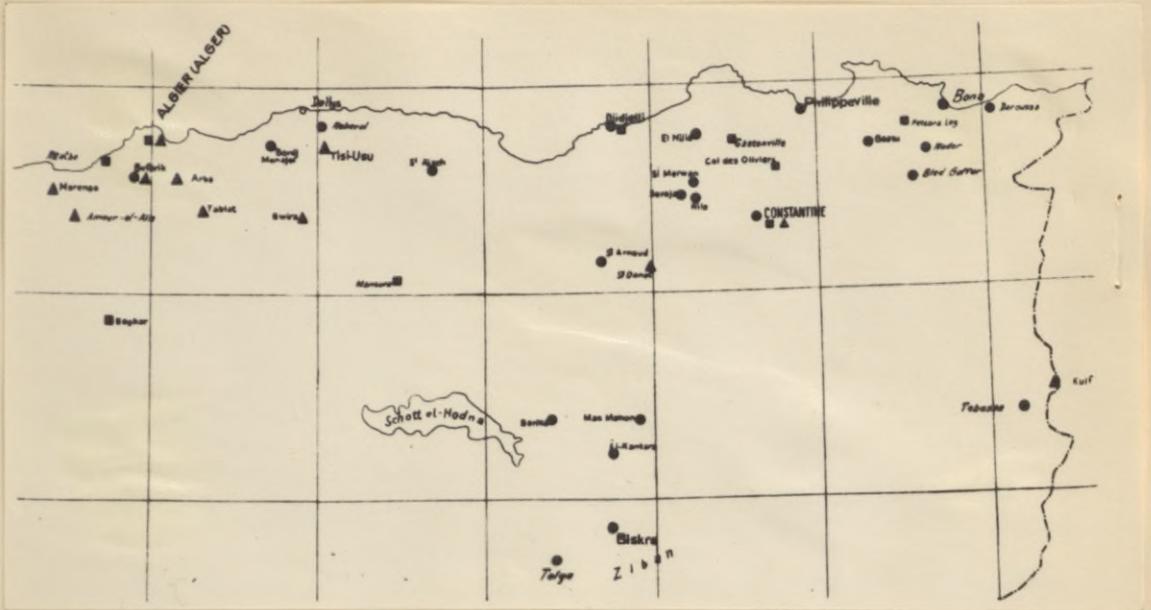


Illustration 8.
Leishmaniasis in northeastern Algeria.

Visceral Leishmaniasis is not very frequent in Algeria. It is exclusively found in the Algerian littoral. Since 1911 when Kala-Azar was observed for the first time in Algeria, until 1931 only 21 cases were diagnosed, 4 of them in adults. 8 of these cases were observed in the province of Constantine, while 1 case was found in Mostaganem. The geographical origin of 3 more cases is uncertain. From the Sahara cases of visceral Leishmaniasis of man have not been reported.

Canine Leishmaniasis was repeatedly found in Algeria and it was sometimes observed in various other places of the littoral, above all in the province of Algiers. The cases of the Sahara seem to be free from canine Leishmaniasis.

In Morocco Kala-Azar was found for the first time in Meknes in 1921. Since then a few cases have been observed in the vicinity of Tetuan, in Fez, and around Marrakech and not far from Ighan in the southwestern part of the Atlas Mountain. Three out of the total

of 6 certain cases occurred in adults, 3 in children. Even though an accurate search certainly will reveal more infections of man, there are no large areas of endemics in Morocco. The same applies to canine leishmaniasis. In Casablanca, Tangier, and Fez some dogs contaminated with Leishmaniae were caught, but there is no widespread distribution of canine leishmaniasis.

In southern Morocco a large endemic area of Oriental Sore takes its origin. From the southern Moroccan territory of the oases of Buanane, Boudenib along the northern border of the Sahara it extends through southern Algeria to southern Tunisia. In southern Morocco itself dermal leishmaniasis occurs in Fez and east of this town. The oases located in the south along the foothills of the Atlas mountains together with the south Algerian oases Figuig, Colomb-Bechar, and Beni Ounif form an endemic focus within which numerous cases were observed.

The comparison of the areas of distribution of visceral and dermal leishmaniasis reveals that Mediterranean Kala-Azar is spread farther to the north than Oriental Sore. This fact is of some interest because of the fact that the phlebotomi which principally occur in the northern parts of the Mediterranean basin (*Ph. chinensis*, *pernicius*, and the species of the "major"-group) are the species which are considered as the probable transmitters of visceral leishmaniasis. On the other hand *Phlebotomus papatasi* is predominantly found throughout the area of Oriental Sore (cf. HENNIG, map I/8).

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VII/6 - 1 -

LEPROSY

IN THE MEDITERRANEAN BASIN

(with 4 Charts)

Translation prepared by:
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One of the strangest epidemiological phenomena is the relatively rapid disappearance of leprosy in the course of the 16th century in spite of its widespread and general occurrence in Europe and in the Mediterranean countries during the medieval ages. The reason for this rapid extinction of leprosy is completely in the dark. On the other hand, however, the reasons which were responsible for the continuation of leprosy for many centuries up to the present day in single confined areas of the most varied European and Mediterranean countries are not clear either. In the countries of the European continent small endemic foci of leprosy exist which at first seem to be distributed rather arbitrarily and the comparable investigation of which, according to systematical viewpoints, is an urgent task for European scientific cooperation in the future, after the attention of the leprosy research recently was directed by the thesis of OBERDOERFFER to the importance of the alimentary factors, namely to the foodstuffs containing sapotoxin, and to the corn-campion as an admixture to the grain. A substantial preliminary work, however, would be the cartographical registration of all places where leprosy occurs. The map given below is intended to be a contribution to this task which, after the end of the war, needs to be completed by inquiries made in the countries themselves, as was initiated by Emmo and Elisabeth GEHR.

For the countries of the Iberian peninsula Emmo and Elisabeth GEHR carried through a new cartographic investigation shortly before the beginning of the war which supplied accurate information on the present distribution of leprosy throughout Spain and Portugal by means of two cartographic designs (see Illustration 1 and 2). The predisposing factor, which with regard to leprosy seems to be confined to certain areas of the earth and which is changed only over very large time intervals, seems to implicate a certain diet on the basis of obsolete agricultural methods and economical conditions in these areas as well. This causes such a high admixture of corn-campion seed to the grain that as a result of the high consumption of grain, particularly by the poor among the rural population, a considerable amount of sapotoxin may be taken in which, according to OBERDOERFFER's hypothesis, creates a disposition for leprosy.



Illustration 1. Distribution of leprosy in Spain
(after MONTANES and ARMAS)

In Spain leprosy cases seem to increase rather than to decrease in number. While in 1851 HIRSCH gave the official number of lepers as 284 patients, E. and E. GEHR quote the official figure according to GIMENO (1928) as 732, and according to MONTANES (1934) as 928 cases. The principal foci are situated in southern Spain, on the Mediterranean coast, and in the extreme northwest. Some of them are connected with the Portuguese foci.

In Portugal conditions are very similar. The number of 800 lepers given by HIRSCH for 1821 did not decrease in the course of the last century as in other European countries, and it rather was increased. According to the statistics for 1938, it amounts to 1124 cases. The total number of the lepers in Portugal itself is estimated at 3-4,000 throughout the Portuguese mainland.

According to the Portuguese data Portugal, not considering Russia, where the number of leprosy patients is not known, has the highest number of lepers of all European countries in proportion to its population.

In the two countries of the Iberian peninsula the immigration and the remigration of leprosy nationals from overseas is considered as an important factor for the increase of leprosy. This problem also exists in France and Italy.

Contrary to Spain and Portugal, almost no autochthonic leprosy occurs in France. The last cases of a definitely inherent leprosy in France were observed in some valleys of the Maritime Alps (Paillon valley: Contes, La Trinite, Paillon; in Eze, Castagniers, St. Maurice (1929)). The number of such cases is continuously decreasing. After 1860 about 100 lepers were found in the rural district of Nice, which had been reduced to 40 in 1914, and to 15 in 1929. Some of the old foci are said to have completely died out, such as the foci in the Var valley and in the Rhone delta. There, the last case was found in La Crau in 1925. In addition to the above mentioned cases in the area of the Maritime Alps, 3 more autochthonic cases were observed in the vicinity of Tulle. Several cases were spread to the province of Cantal (District of Mauriac). It is likely that here too, there was an old leprosy

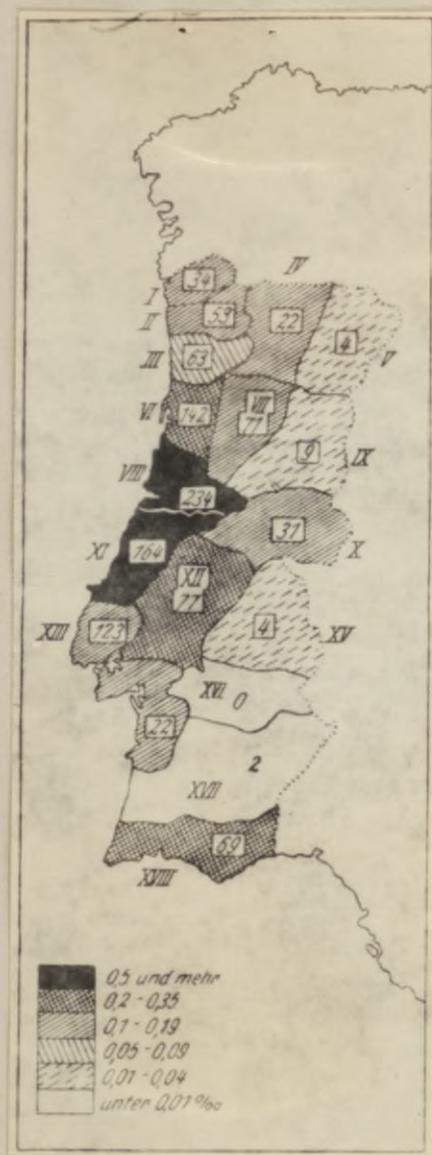


Illustration 2.
Distribution of leprosy
in Portugal
(after SILVA CORREIA)

area in which similar to Brittany and the Provence, leprosy was observed rather frequently before the end of the 18th century. They were, however, restricted to single villages and to certain families (in the Provence: Martigues, Biotrolles, the vicinity of Marseille, and Toulon).

In these areas a very small number of lepers is found in some remote villages where it affected only the members of a few of the indigenous families.

Contrary to this autochthonic form of leprosy, the other form of leprosy increases in importance. This is the continuously increasing number of leprosy cases imported from the French colonies and from other overseas countries by the returning emigrants (tradesmen, missionaries, soldiers etc.). Their number was continuously increased before the outbreak of the war. Even though no accurate figures are available the leprosy cases treated in the clinic or in the policlinic of St. Louis Hospital in Paris clearly show the increase of the number of such cases:

1887 to 1895:	80 cases,
1910 to 1925:	104 cases (Report of the French Academy).

During the period after World War I about 160 to 200 lepers lived in Paris, who had been infected with leprosy in the overseas countries. To these one must add the 30 cases observed in Bordeaux during the last 20 years before the last war, and further 39 cases in the hospitals of Marseille.

In the fall of 1929 a leprosy sanatorium was established in France with the aid of an American society, the Society for the Victims of Tropical Diseases. According to the report of December 1936, 59 lepers were admitted to this sanatorium during the first 7 years of its existence. It is called the Sanatorium of Valbonne and it is situated at a distance of 10 km. from the Pont St. Esprit in the province of Gard.

There is a retreat area of leprosy in the Canton of Wallis in Switzerland. Here, a 20 year old girl suffering from nodular leprosy (POMETTA 1906) was discovered during the construction of the Simplon tunnel. Two lepers out

of the 5 cases discovered in 1907 were living in Guttal in 1921, and 1 in Getwing, while 2 of them had succumbed.

In Italy leprosy has recently played a more important part than in the adjacent central European countries. Two problems particularly were subject to discussion in a broader public during the last years:

1. The significance of the leprous remigrants from overseas, particularly from Brazil, for the increased number of leprosy cases in Italy, and
2. The registration and the isolation of the really autochthonic leprosy.

The epidemiological explanation of the autochthonic leprosy would be a very important basis for the solution of the problems of leprosy of our days. So far no one has been successful in finding an adequate explanation for the obstinacy with which leprosy persists in certain areas even though it appears there only with very few isolated cases throughout the lifetime of several generations. In its present appearance leprosy seems to be the most inactive of all epidemics, but also the most resistant and it even may be impossible to extinguish it.

During the leprosy conference in Berlin in 1904 MANTEGAZZA gave a report on 246 cases in Italy. The official estimation revealed 212 cases in 1913 and 196 cases in 1923. Even in 1926 274 cases were observed, which means that the number was not as reduced compared to 1904. Even though the figures for the various areas varied considerably in the statistics of the various years, the total result reveals no substantial decrease of leprosy in Italy.

From time to time lepers are detected who never had left their villages and who had never been in contact with leprous persons and who had lived with their families for many years without being detected. During the period from 1925 to 1937 as many as 66 such autochthonic cases were discovered in Italy. These freshly discovered leprosy cases frequently directed the attention to those leprosy foci which were well known during the past century and which in our time were considered extinct. Such cases were reported from Liguria, Ferrara (Comacchio), Piedmont

(Vercelli, Monferrato), Parma, Romagna, Lombardia and Campania, and they represent a great problem for leprosy research. To make close investigations of these retreat areas of leprosy in Europe accurate geometrical records are required of all the areas which during the past century were considered as contaminated with leprosy. This also applies to the Riviera valleys, namely the Val di Var, Val di Nervia, Val d'Oneglia, which towards the end of the past century were the last remnants of an originally large area extending from Chiavari (Riviera di Levante) along the Italian and French Riviera as far as to the mouth of the Rhone river. In 1843 about 100 lepers lived in this area, 40 of whom were admitted to the leprosy asylum in San Remo which was established in 1858. West of this area the French leprosy territory of the Provence was situated (see above).

Further impressive examples for the course of leprosy in recent times are the old leprous areas of Italy, namely Sardinia, Sicily, Calabria, and Apulia.

The leprosy incidence in Sardinia is the greatest of all the Italian provinces and it was very thoroughly investigated. The autochthonic cases of leprosy in Sardinia were closely watched for many decades by SERRA. Their geographical distribution reveals several larger leprous foci which can be traced back for a very long period of time. Since the end of the past century the number of the autochthonic cases in Sardinia has neither increased nor diminished to a marked degree. In 1902 MANTEGAZZA recorded more than 43 lepers, in 1912 more than 47 were observed by SERRA, and in 1918 RADAELI found 67 cases in Sardinia. The villages where leprosy occurred were situated to the west of the central parts of that island around Oristano and along the road to Cagliari (see map VII/6a). In all, 131 cases of leprosy were recorded during the period from 1891 to 1932 which were distributed throughout 32 villages. In 1932, 29 lepers were found in 11 different places (see Table I). There is a distinct focus in the district of Oristano in the village of Terralba which is inhabited by 4,000 persons and in which 17 lepers were found in 1918.

Table I

Leprosy in Sardinia 1932

(According to P. PINETTI)

Place	Number of cases	Place	Number of cases
Cabras	3	Oristano	4
Cagliari	1	Santa Giusta	1
Leprosorium Cagliari	1	Seneghe	2
Carloforte	1	Siamaggiore	1
Nurachi	3	Solanas	2
Ollasta Simaxis	3	Terralba	7

In the second place in the official statistics of the Italian provinces in 1926 one finds Sicily with 36 cases of leprosy, which are spread throughout the entire island although they are particularly frequent in the provinces of Messina, Catania, and Syracuse. The route of the leprosy infection from the middle of the past century on can be traced accurately. From 1867 to 1911 the various scientists found 315 cases altogether which were distributed throughout the villages recorded in Table II. According to TRUFFI the geographical distribution reveals several real endemic foci: Lipari, M. S. Giuliano, Trapani, Florida, Pachino, and particularly Avola, which were mentioned by HIRSCH in 1881. The villages with lepers found by TRUFFI's inquiries in 1924 are given in the map VII/6b.

On the continent the southernmost provinces of Apulia and Calabria for the time being are the largest Italian areas of endemic leprosy. In the old focus in the province of Bari, which in the official statistics of 1926 takes the third place with 29 leprous persons, 127 autochthonous leprosy cases were observed during the period from 1886 to 1930. One of the most important foci is situated in Cariati (4,000 inhabitants) where about 20 cases occurred between 1890 and 1923. In addition a small endemic focus exists in the province of Reggio di Calabria not far from Gerace Marina where 27 cases occurred, 20 of which were still alive in 1933. The village of Portigliola (2,500 inhabitants) had 1 case of leprosy 70 years ago, while

Table II

Leprosy in Sicily 1875 to 1911.

(According to LA MENSA)

Province of Syracuse	Province of Messina	Province of Palermo	Province of Trapani
Buccheri	Messina	Palermo	Trapani
Avola	Mirto	Carini	M.S. Giuliano
Floridaia	Lipari	Petralia	Favignana
Solarino	Portorici	Polizzi	Castellamare
Chiaromonte	Montagna Reale	Cefalu	Partanna
Spaccaforno	Mondanici	Montelepre	Salaparuta
Modica	S. Stefano	Ustica	Marsala
Tachino	Comastra	Permini	Pantellaria
Noto	Graniti	Valledolmo	
Augusta	Nizza Sicula	Chiusa	
Iozallo	Falcone	Sciasani	
Monte Rosso	Castel-Umberto		
total 12	11	10	8 communities

Province of Catania	Province of Girgenti	Province of Caltanissetta
Catania	Girgenti	Vallelunga
Motta S. Anastasia	Sciacca	
Randazzo	Naro	
Calatabiano	Sambucabut	
Vizzini		
Acireale		
Catena Nova		
total 7	4	1 communities

Table III

Data on the Distribution of Leprosy
throughout the Mediterranean Countries

Country	New cases reported (R.E. League of Nations)				Total number of lepers	Estimated number of lepers	Year	Data according to
	1935	1936	1937	1938				
Spain	88	.	.	.	928	2,500 - 3,000	1934	Montanes (quoted after Gehr)
Portugal	.	.	.	.	1124	3,000 - 4,000	1938	Silva Correia (qu. after Gehr)
France	.	.	.	.	40	200	1925	Academy report
Italy	54	54	21	.	274		1926	Official statistics
Malta	2	14	6	9	63		1924	Cochrane
Roumania	10	9	10	13	140	500 - 600	1939	Angheliescu (quoted after Gehr)
Yugoslavia	2	8	5	9	42		1926	Gehr
Montenegro	.	.	.	.	100		1904	Gehr
Bulgaria	0	0	1	0	7		1930-40	Gehr
Greece	21	41	31	23	758	1,000 - 3,000	1939	Gehr
Turkey	43	62	57	57	593	2,000 - 3,000	1927-40	Gehr
Cyprus	12	7	15	12	74		1928	Salzberger
Syria	8	15	12	21	unknown			
Palestine	6	7	10	7	120-150		1937	Canaan
Iraq	164	121	208	105	500		1928	Cochrane
Egypt	139	156	312	533	6,513	18,000	1929	Dalgamouni
Tripolitania	.	.	.	.	unknown			
Tunisia	2	5	3	4	unknown			
Algeria	1	2	2	5	150		1885-1923	Montpellier
Morocco (French)	429	544	481	458	1,330		1921-32	Flyc St. Marie

nine lepers were living there in 1931. While by the official estimation of 1912 only one case was recorded in the three southern provinces and while only 6 cases were revealed by the inquiries of 1929, in recent times Apulia and Calabria stand in the third place after Sardinia and Sicily as far as the absolute number of lepers is concerned.

In Malta obligatory measures against leprosy were ordered in 1919 and a leprosy asylum with 150 beds was attached to the charity hospital in the vicinity of Valetta. From 1900 to 1926, 255 lepers died in Malta, while 43 were discharged as cured and 63 retained in the asylum.

For the Balkan countries E. GEHR published his accurate investigations of the distribution of leprosy in our time (1939) in 1941 and evaluated his results as a support for OBERDOERFFER's hypothesis. These investigations again show the almost complete absence of leprosy in the modern agricultural countries, such as Bulgaria, and the greatest incidence throughout the poor and outmoded agricultural territories of the Balkan. The greatest number of lepers was observed in Greece with 758 patients, and here it is particularly Crete where more than one third of all the Greek lepers live. The total is estimated at 1,000 to 3,000 cases. According to GEHR, here too, the areas with advanced agricultural methods, such as the large lowlands where the grain is cultivated, and the tobacco areas of Agrinion, Boeotia, the Drama basin, Thessaly, Thrace, and Macedonia, are free from leprosy. Although one third of the Greek people live in the big cities, leprosy is a disease of the open country "which is rather unusual behavior for an infectious disease and which always attracts the attention in all countries where leprosy occurred." (GEHR). Approximately five sevenths of the Greek lepers originated from the islands, particularly from Thasos and Aegina, Samos and Zante, Chios, Leukas, Corfu, and Euboea (see Ill. 3). On the mainland the number of leprosy cases is continuously diminishing, since the registration of leprosy as well as the isolation of the patients and the medical examination of the members of the families was enforced by the law of 24 July 1920.

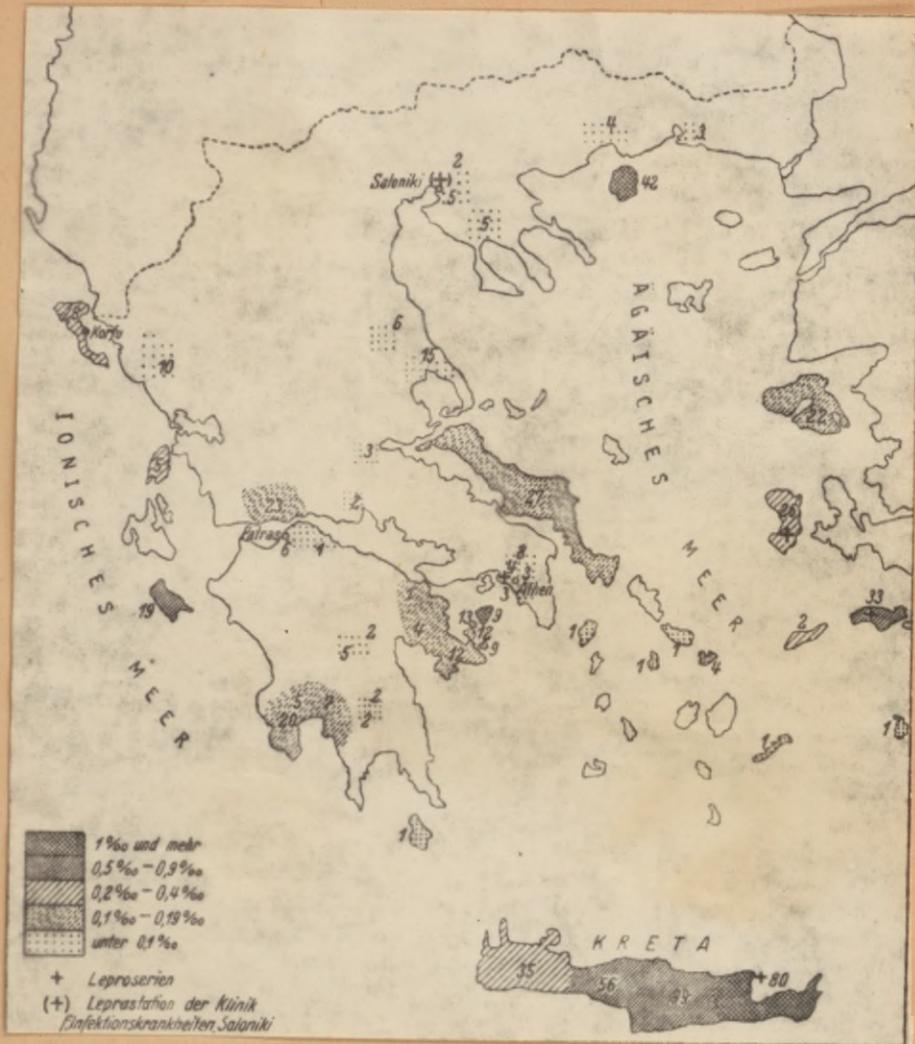


Illustration 3. Distribution of leprosy in Greece
(after Ermo GEHR)

In Greece the lepers are admitted to two big leprosy asylums, namely in the leprosy asylum which was set up in 1904 on the island of Spinalonga eastward of Crete with 390 patients, and in the Nosokomion Limodhon Noson in the

vicinity of Athens on the road to Daphni, with 230 patients. In addition 60 patients were confined in Samos, 20 in Chios, and 10 in Thessalonika.

In Roumania leprosy is much more infrequent than in Greece. According to GEHR 140 lepers are living in Roumania most of which are detained in the only Roumanian leprosy asylum in Tichilesti which is situated in the northern part of the Dobrogea (District of Tulcea). About 10 fresh cases are recorded every year. The majority of the cases are found in the districts of Tulcea, in the Danube delta, and in Ramnicul-Valcea and the adjacent districts.

The incidence of leprosy is still more inconsiderable in the former Yugoslav territory. GEHR mentions only the figure of 42 cases which was published first in 1926. These patients originate from the mountainous countries of Bosnia and Herzegovina. No recent data are available on Albania and Montenegro.

Bulgaria is almost free from leprosy. Only 7 cases were observed during the period from 1930 to 1940 some of which were attributable to a family epidemic.

The distribution of leprosy throughout Turkey needs detailed inquiries before definite data can be given. For the recent period the only material available, records of the Turkish Ministry of Health, gives the number of registered leprosy cases between 1927 and the end of August 1940 as 593 cases. The total, however, is estimated at 2,000 to 3,000 lepers. According to various reports an increased frequency of leprosy must be assumed for the eastern and southeastern provinces, and for the coast of the Black Sea. Here, special mention is made of the mountainous and coastal areas of Kastamou (with Devrekani), Sinop, and Samsun.

For Cyprus only the data of 1928 are available according to which 74 lepers were living in Nicosia. In 1867 the leprosy asylum of this town harbored 35 patients. HIRSCH made reference to the fact that in Cyprus leprosy is principally found in the districts of Morfu, Lapethus, and Kythraea, which are situated in the wet climate of the lowlands.

In Syria leprosy occurs particularly south of Beyrouth and along the Palestine frontier, and according to older observations also in the valleys of the Lebanon and the Antilebanon. Almost every town has its leprosy houses, but no exact data are given in the literature.

In Iraq the number of lepers is estimated at 500 patients (COCHRANE 1928), one half of whom are Persians. In general leprosy seems to be rare throughout the entire Arabian territory, as due to the religious ideas and rules the lepers are banished and secluded from the others. A frequent incidence of leprosy was observed throughout the coast territory of the Persian Gulf, such as f.i. in Oman and along the coast from Kuwait to Ras el Rheina. For the lepers of the Pirates coast an isolation station was established in the vicinity of Dubai.

A report on leprosy occurring in Palestine was given by T. CANAAN as late as in 1937. The total number of leprosy persons amounted to 120 to 150 cases. According to this author the older and higher figures are definitely wrong. The geographical distribution of the cases was given by CANAAN who prepared a roll indicating the origin of the lepers on the basis of the data contained in the records of the leprosy asylum in Jerusalem. These records reveal that leprosy occurred in the course of this century in 142 different villages which were situated particularly in the vicinity of Jerusalem, while the coast was relatively free from this disease. The same investigations also showed that leprosy is observed with Jewish nationals as well as with the Bedouins, both of which, however, fell sick with leprosy much less frequently than the inhabitants of the towns and the Fellahs (see map VII/6c).

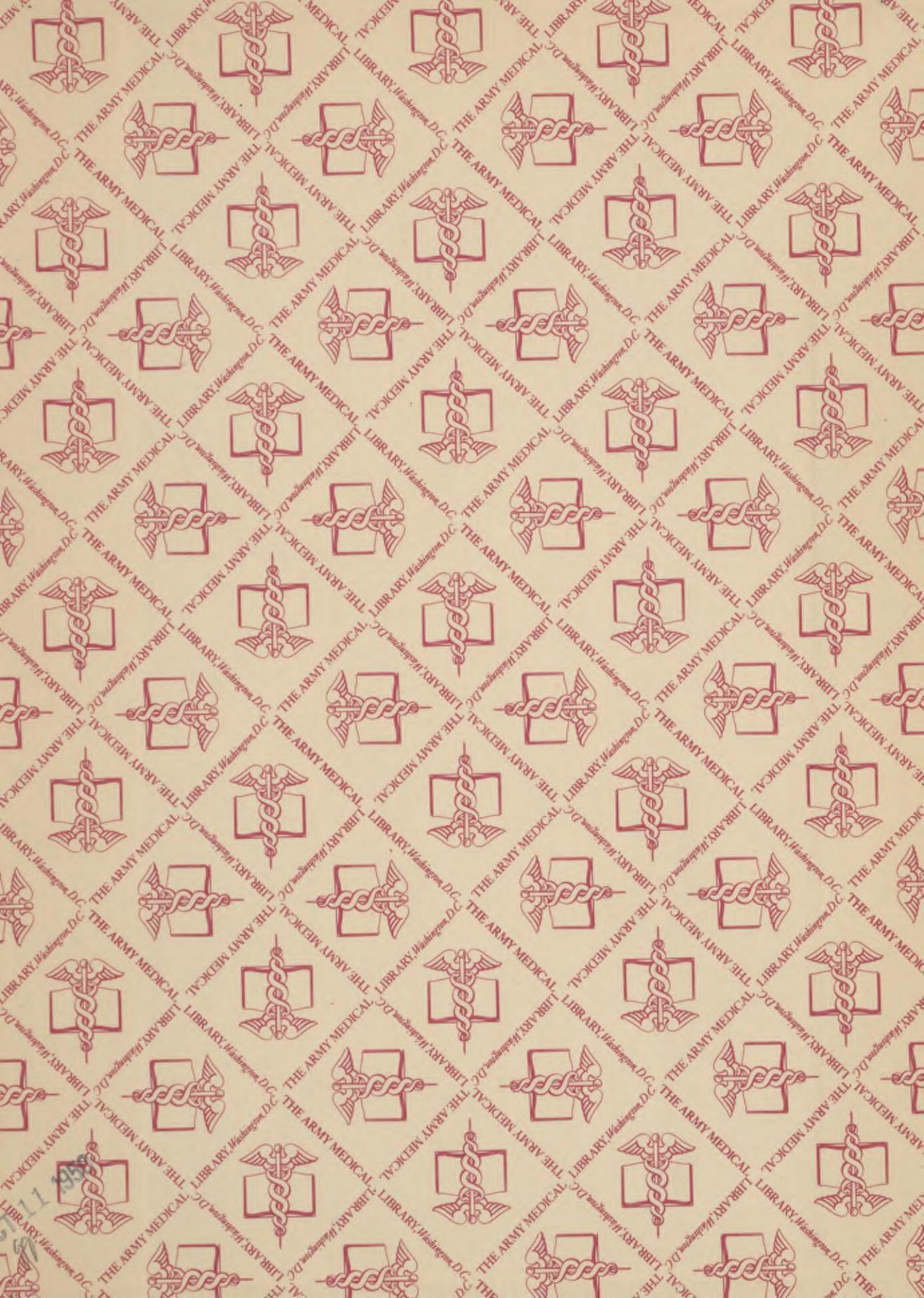
Egypt which, according to the conformable opinion of all medical historians, must be considered as the principal old focus or even as the home country of leprosy in the medieval ages, in our days should also be regarded as that Mediterranean country in which for the time being the disease has the highest rate of incidence. The German medical scientist Dr. Franz ENGEL-Bey who for 30 years before World War I was the director of the statistical department of the Office for Public Health estimated the number of lepers in Egypt at 4,000. The real number, however, was said to be 18,000. At the International Congress for Tropical Medicine in Cairo in 1929 DALGAMOURI gave the actual number of lepers

in Egypt as 6,513. Before the end of 1937, 5,000 lepers were detected and subjected to treatment as a result of the campaign against leprosy which was intensified from 1929 on. No material on the geographical distribution throughout the country is available. However, one must assume that about one half of the populated territory should be considered as contaminated with leprosy. In the month of February 1929, in addition to the lepra hospital of Cairo (150 patients in 1936), policlinics for lepers were organized in Cairo, Zaqaq, and Suhag, 1931 in Tanta and Minia, and 1938 in Alexandria and in two other places. A leper colony for 250 male lepers was established in Abou Zaabal north of Cairo.

A conspicuously small number of reports on leprosy is available in Tripolitania and in Tunisia so that HIRSCH's cautious statement could not be checked. He asserted that Tripolitania and Tunisia "are exempt from leprosy". In the Cyrenaica only a very few cases of a genuine autochthonic leprosy were observed among the indigenous population. While there are no data in the literature on leprosy in Tunisia, reliable records on leprosy are given in Algeria and Morocco.

In Algeria 150 cases were observed within the 40 years from 1885 to 1923. This figure, of course, only displays an approximate estimate of the real conditions. MONTPELLIER stated that in Algeria the leprosy focus did not enlarge, but was not extinct either. Particularly the Kabyles are the victims of the disease, among them a certain tribe with an old racial disposition and very primitive habits of life. Of the European immigrants the Spaniards provided the major part of the European lepers in Algeria, in addition to the Maltese and the Italians. Some of the Spaniards imported the infection from their home country. The smallest number of lepers occurred among the French, and only 4 definite cases of infection were published heretofore in Algeria.

Even towards the end of the past century there was a large leper colony with 200 patients in Morocco in the vicinity of the town of Morocco. The lepers always used to be accommodated there in special settlements ("Harat" and "Zariba"). Two leprous foci are distinguishable in the French protectorate of Morocco, a large focus in the



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