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THE CLASSIFICATION OF LEPROSY
A PROPOSED SYNTHESIS BASED PRIMARILY ON THE RIO DE JANEIRO-HAVANA SYSTEM

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INTRODUCTION

The picture of leprosy today is very different from what it was when, in 1931, the Leonard Wood Memorial Round Table Conference in Manila formulated for the first time a definitive classification of cases (12). That effort aroused much interest in the matter, and added to the agenda of leprosy conferences a topic which remains the most debated and controversial of all. Since then there have been numerous changes of ideas and terminology, and the present situation is unsatisfactory to practicing leprologists and confusing to others. It is greatly to be hoped that at the coming Madrid congress the different points of view can be reconciled and that a workable and sound scheme of classification will emerge.

THE MANILA-CAIRO CLASSIFICATION

The Manila classification followed the classical line of the Norwegian pioneers in recognizing two types on clinical grounds, and in disavowing the idea of a "mixed" one which Leloir had introduced. The effort was not only a maiden one, the product necessarily subject to modification with experience, but it was made at a time when the prevalence and importance of the tuberculoid form of the disease was not appreciated and when the immunological factor represented by the Mitsuda reaction was practically unknown.[1] This effort at systematic classification focused attention especially upon cases which did not conform to the descriptions set down, and that was one of its most important contributions.

By the time of the Cairo congress, in 1938, real advances had been made on all fronts. At that meeting the Manila classification was modified and expanded, and the resultant—still used in many quarters—is the point of reference for the "old" system (16). It was stated as a basic principle that a system of classification should consider both (*a*) the require-

[1] When the writer drafted the "working document" on classification for the conference he did not include the subject of the tuberculoid lesion, although he was aware that such existed (56). He thought of it at that time as a sort of biological "sport," probably too infrequent and certainly too little known to complicate an already difficult problem, and no one introduced the subject in the sessions. In Japan cases of that kind had long been set apart as a third group, "lepra maculosa," but the Japanese participant said nothing of it. As for the Mitsuda test, it had been largely ignored even in Japan until about the time of the conference, when Fumio Hayashi took it up.

ments of the practical field worker who cannot employ elaborate methods, and (*b*) the refinements which are possible to the specialist. Among other things, the immunological factor was written into the definitions. The tuberculoid form of the disease, divided into "minor" and "major" varieties, was placed in the neural class as a subtype—"for the present," until further study should permit a decision as to whether or not it should be made a separate, third type. The South American members of the committee held that that should be done forthwith.

THE SOUTH AMERICAN CLASSIFICATION

Development.—Immediately following the Cairo congress this matter was taken up actively in São Paulo. Soon afterward there was announced for trial a scheme in which the clinical factor was first given priority (22*a*) but promptly subordinated to the histological one (22*b*), and the matter was dealt with in detail by Aguiar Pupo (1). Outstanding among the numerous subsequent publications was a report by L. de Souza Lima (42) on his experience with the system in which he told frankly of certain difficulties and asked certain questions. The answers by the various groups then appointed were summarized editorially (22*c*). Finally, the system was set forth formally by the Second Pan-American Conference, held in Rio de Janeiro in 1946, in a report (13) of which the only English translation hitherto published is incomplete and otherwise inaccurate (14).

Principal features.—This classification is a three-type one based primarily on the histological characteristics of the lesions, it holding "as the point of departure the different structural types of leprosy, attempting to integrate them, by recognition of the clinical and immunological elements, into a coherent doctrine. . . ." There are recognized two relatively stable polar types, lepromatous and tuberculoid, and a relatively unstable intermediate type. The last, because the lesions show only nonspecific, "uncharacteristic" changes—chronic inflammatory round-cell infiltration—and because of uncertainty of evolution (42), was called *incaracteristico* "for lack of a more precise term" (13). Each of these types was divided into several varieties, or clinical forms, among which in each instance was a macular and a pure neural one. Emphasis being also laid on the immunological criterion (the Mitsuda reaction), the

whole was held to be "biological" and "dynamic," therefore essentially different from the old one.

Difficulties.—From the point of view of others than the proponents of this system, the only difficulty with the lepromatous and tuberculoid types as defined is that both would contain cases with flat, simple macules which could not be so typed on clinico-bacteriological grounds alone. The tuberculoid type would thus comprise many cases which in the older system would be called maculoanesthetic. The controversial form was the *incaracteristico* one, and here there were differences of viewpoints among the originators. Under the rule that the lesions should show only chronic inflammatory histology, many cases with simple flat macules diagnosed clinically as of this form would be shifted to lepromatous or tuberculoid—mostly the latter—after the histological examination (e.g., Rabello (35)). On the other hand, some did not make that shift, holding that class to comprise all simple macular cases regardless of the histopathology (e.g., Souza Lima (43), who still holds that view (personal communication)). But the matter was further confused, in reverse order, by transfer from the polar types to the uncharacteristic one those cases whose lesions had receded clinically to the flat macular stage (42, 43, 46), as well as those in which the original histological pattern had cleared up to leave only residual round-cell infiltration. On that basis some writers even classed as *incaracteristico* (*residuais*) the "secondary neural" cases with deformities (44*a*). Nothing was said of this reverse "mutation" idea by Aguiar Pupo (1), nor does it appear in the text of the Rio de Janeiro report; there one only finds, in a footnote, incidental mention that the reactional tuberculoid condition may, by involution, return to the original uncharacteristic type.

THE HAVANA MODIFICATION

At the Havana congress a relatively solid phalanx of supporters of the South American classification faced an unorganized group from other regions who varied in their attitudes toward that system, but on the whole inclined toward the essentials of the older one. Few of them really understood the new one, and as a group they had no alternative or compromise to offer. However, the committee realized the importance of arriving at a formula which would be acceptable to and could be used by the general run of workers, and mutual concessions were made. It was agreed on the one side that the clinical

factor should have priority, and on the other side that the three South American forms should be retained. The "uncharacteristic" one was reduced in status from "type" to "group," and the name was changed to "indeterminate." [2] These things were in the first part of the committee's report which was accepted by the congress (17).

In the detailed part (18) an attempt was made to do away with the anomaly of having the old-fashioned, stable "maculoanesthetic" form in the supposedly unstable indeterminate group by transferring it to the tuberculoid type, on the ground that histologically low-grade changes of that nature are usually to be found—thus confusing the clinical picture of that type by including lesions without the tuberculoid morphology. The term "polyneuritic" was revived from the Cairo classification, but its meaning was perverted to include cases with *local* anesthesia due to affection of cutaneous nerves as well as those with *regional* disturbances of peripheral trunk origin; and among cases with the latter, no distinction was made between those with and without skin lesions.

On the whole it is probably well that the congress rejected this part of the committee's report, even though the effect was to make unworkable what was accepted (24). To make up the deficiency the Third Pan-American Conference, held in Buenos Aires in 1951 (15), adopted a plan of subgrouping which differs in no essential from the original one.

GENERAL AND ADMINISTRATIVE CLASSIFICATIONS

General classification.—A general division of leprosy cases into two categories is sometimes made before specifying particular types and groups. Some—e.g., Chaussinand (7, 48)—would do this primarily on clinical grounds, applying the terms "malign" and "benign" used by the Cairo congress. Others would make the division as "lepromatous" and "nonlepromatous," more on histological grounds. Rodriguez (38), said that the former "is the only true leprosy," and Lampe (28) suggested making the presence or absence of lepra cells the decisive factor. Dharmendra (personal communication) says that the Indian leprologists would like this division because the

[2] Precisely how this change originated cannot be said. The new term had been used by Chaussinand in 1947 (7). In papers submitted to the congress Basombrio (5) gave it preference, and Latapi (29) used it alternatively.

familiar symbol "N" could be continued, signifying "nonlepromatous" instead of "neural" as heretofore. It would, however, put the borderline group in a somewhat uncomfortable association with other nonlepromatous ones, yet it should not be put together with the lepromatous type. The benign-malign concept, therefore, seems preferable.

Of the three South American forms, the benign class comprises the tuberculoid and indeterminate ones—although in the minds of some there would seem to be doubt about the latter —while the malign class is the lepromatous type. In the grouping here advocated the benign class would comprise the tuberculoid, indeterminate, maculoanesthetic and polyneuritic forms, and the malign class the lepromatous type and the borderline group.

Administrative classification.—As the Manila conference pointed out, from the administrative point of view leprosy cases are divisible according to the degree of liability of their transmitting the infection to others, and may be called "closed" or "open" on the basis of the bacteriological findings by the standard method of examination of the skin and mucous membranes. To a certain extent this division cuts across class lines. While lepromatous and borderline cases will always be "open" until much retrogressed, reactional tuberculoid cases if not also some others will at all times be found bacteriologically positive and hence "open" by definition.

PROPOSED SYNTHESIS OF CLASSIFICATION SYSTEMS

The system here proposed is an attempt to synthesize from the existing systems those things which have been widely found acceptable and to make a coherent and practicable whole. There are four main or first-line classes, the lepromatous and tuberculoid types and the indeterminate and borderline groups, and in addition two subordinate groups, maculoanesthetic and polyneuritic. Whether the names used be histological, or clinical, or anatomical is regarded as wholly unimportant, so long as they are appropriate and understandable.

This six-class system may at first seem unduly complicated, but as will be seen it lessens materially the complications of subgrouping. That more than two or three classes are needed has long been held by Dharmendra (19, 20, 23), and is recognized by Gay and Contreras (27, 48) and Vilanova (48). Even the Third Pan-American Conference (15) contemplated the pos-

sibility of adding a fourth form to the South American trio, as de Souza Lima had suggested several years before (42).

The present form of this article is to a considerable degree due to the cooperation of numerous fellow workers. In a tentative draft form it was sent out as a memorandum for comments to be considered in the final revision and used in a symposium, (48, 25).[3] The criticisms and suggestions which were received have influenced what appears here in many respects. It is desired to thank all contributors for their cooperation.

PRINCIPLES AND PROPOSALS

1. The essential principles and primary groups of the South American classification are retained, with certain modifications. The lepromatous and tuberculoid polar types are therefore recognized, with restrictions, and the indeterminate simple macular group with other differences as well.

This is not to say that the basic criteria are given the original order of priority, or that its three primary forms are regarded as sufficient. It is meant that the matter of classification should be considered from the same general point of view, while giving higher ratings to certain of its subgroups or varieties.

2. The order of priority of the criteria of classification is (1) clinical, (2) bacteriological, (3) immunological, and (4) histopathological, as approved at Havana.

The bacteriological examination is an indispensable part of the clinical one (i.e., the clinico-bacteriological criterion). The immunological criterion is placed before histology because it is a clinical procedure which is readily carried out, but it is decidedly the less instructive.

Other clinical examinations which may often be found useful are the histamin test for the flare reaction of Lewis (39) and the tests designed to demonstrate disturbance of the sweat function, such as that of Wada (49); also the recent nicotine pilomotor test of Arnold (3). (There is an excellent demonstration of the histamin reaction in two colored plates in a treatise by Souza Lima and Souza Campos (44b).)

3. The primary basis of classification must be clinical, with consideration of the morphology of the skin lesions, neurological manifestations, and the bacteriological findings.

This is not to say that all cases of this disease in its manifold aspects can be classified satisfactorily on the clinico-bacteriological criterion alone, and that other examinations should not be applied when necessary and feasible. However, the great majority of cases can be properly classified on this basis. An experienced clinician will have an understanding of the nature of the underlying pathology in most of the lesions classified on clinical grounds.

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[3] The World Health Organization used the memorandum as one of the working documents for the meeting of its Expert Committee held in Rio de Janeiro in November, and the decisions reached there have been taken into account.

4. As a corollary, since the histological criterion does not have priority for primary classification, when that examination is made cases should not be redistributed from their proper clinical classes because of the findings. On the other hand, the histological examination is necessary for determination of some of the subgroups, and it may at times reveal errors in the clinical type diagnosis.

Specifically, cases of the simple macular (indeterminate) group should not be transferred to the polar types because of histological findings. However, correction should be made when it is found that recessive lepromatous, tuberculoid or borderline cases have been classified as indeterminate. Subgrouping of that form if desired, and also of the primary polyneuritic one, will of necessity depend largely on histology. That examination, and the lepromin test, are of course important in the study of problem cases, especially those of the borderline group. (For studies of the histopathology in classification, see de Souza Lima and Alayon [43], Rath de Souza and Alayon [37], Rabello [35], Rath de Souza [36], Portugal [34], and Barba Rubio *et al.* [4, 47].)

5. The classification of cases is based on the findings at the time of examination and is not dependent upon possible future evolution. On the other hand, changes which are known to have occurred in the past, or for which there is sufficient evidence in the history and/or clinical stigmata, must be taken into account.

This is not to say that it may not be necessary at a later date to change the classification of a given case, for leprosy is not static and evolutionary changes are common. On the other hand, account is to be taken of the past condition when, for example, tuberculoid lesions have in subsidence changed morphologically to recessive or residual macules (see next item), or when cases showing only polyneuritic changes are known to have had skin lesions.

The South American workers agreed that "mutation of form, normally observed in almost all cases" [42], should not be taken into account "in the basic criteria of the distinction of fundamental forms" [22c]. The statement that the forms "are distinguished on the basis of objective and evolutive characteristics" [13] is understood to mean only that some forms are more stable than others.

6. Cases with clinically recessive or residual lesions of simple macular morphology, left by subsidence of lepromatous, tuberculoid or borderline ones, are not to be reclassified as indeterminate but put into corresponding subgroups of their proper classes.

Recession does not necessarily signify a change of the essential character of a case, although some cases may later relapse in a different form. The indeterminate group should be a distinctive clinical form, not a common receptacle for both (*a*) cases of unstable nature likely to change to one or the other of the polar types and (*b*) those which have been of those types but are undergoing or have undergone resolution.

7. In addition to the three primary classes of the South American classification, a fourth one of similar rank is recognized for "borderline" (B) cases.

A concensus is developing that these peculiar cases should be accorded separate recognition ([48]). Like those of the indeterminate form, they lack the relative stability of the polar ones, and they should likewise be regarded as constituting a *group* rather than a *type*.

8. On a lower level, as a subordinate class, there is defined a "polyneuritic" (P) group, for cases exhibiting effects of peripheral nerve trunk involvement either (*a*) with no visible evidence or history of having had cutaneous lesions, or (*b*) with residuae of such lesions.

This group, proposed with full appreciation of the various opinions held on the subject ([48]), is primarily a single, composite one instead of two distinct forms, largely because in many instances nothing more can be said with certainty of individual cases when they are encountered. Many cases can, however, be distinguished at once as of the "secondary" (P″) subgroup, and some as of the "primary" (P′) subgroup. Further subdivision into varieties can often be made on the basis of the nature of the actual or previous pathological process.

9. Also as a subordinate form is a "maculoanesthetic" (MA) group, relatively stable and unlikely to change to tuberculoid and much less liable to become lepromatous.

This distinction removes from the indeterminate group a familiar variety of stable kind which it would be anomalous to retain in that essentially unstable class, which is thus cleared mainly for cases which were never satisfactorily placed in the old "neural" type. The old term "maculoanesthetic" is retained, instead of "maculoneuritic" ([15]), because many cases do not have peripheral neuritic manifestations.

10. The tuberculoid type is subdivided into minor and major torpid varieties and a reactional one.

The distinction between minor and major varieties is not based on the reactional state, and it is more than a mere quantitative one. The word "torpid" ([13]) is adopted as preferable to "chronic" or "quiescent." The reactional variety is so much more distinctive and significant than the reactional phases of lepromatous leprosy as to justify recognition as a subtype while the condition exists.

11. Whatever else may be done about subtyping the principal classes, distinction should be made in the lepromatous and tuberculoid types, and also in the subordinate maculoanesthetic group, of those cases in which polyneuritic manifestations have developed, usually as a relatively late, secondary condition. This distinction is made by adding "P" to the class symbol (i.e., "LP," etc.).

12. The principle is followed that descriptions of the va-

rious forms should be more detailed than is usual in reports on classification, to ensure clarity and to aid the nonexpert.

Basic to this whole matter of classification is recognition of the fact that not all leprosy cases fit clearly into the limited number of classes that could be set up in any practicable scheme. Those which are set up constitute, so to speak, nodal points of concentration in a graduated spectrum which contains many kinds and degrees of variant or intermediate cases.[4] Clinical acumen is needed in deciding how to classify such variants.

For example, in 1936 the writer ([51]) mentioned "borderline" lesions between macular leprids and the minor tuberculoid kind, and between the latter and the major one. The Rio de Janeiro conference also said that there are borderline (*fronteiriças*) cases between the uncharacteristic and tuberculoid forms; and Chaussinand ([7]) pointed out that from the clinical point of view there are all degrees of gradations between the flat macules and elevated tuberculoid lesions.

As Gay Prieto said at Havana ([27], [48]), "Nature ignores the rigid molds into which we attempt to fit the observed clinical facts, and consequently there must necessarily exist intermediate forms which constitute the links of an unbroken chain which connects the polar forms." To take care of all variants, Pardo-Castello says ([48]), it would be necessary "to create as many types as there are patients, since each patient reacts to a specific agent in his own peculiar way."

TERMINOLOGY

In this article the terms "class" and "form" are used, interchangeably, in the same general, noncommittal sense as "category." The terms "type" and "group" are used strictly in the sense of the Havana classification, there being two *types*, "polar" and relative stable,[5] and four *groups*, called that chiefly because they are of lesser importance or less stable. The term "variety" is applied to "subtypes" (or "subgroups"), whether they be distinguished on clinical, anatomical or histological grounds.

Following the earlier conferences, "leproma" and "lepromatous" are applied to all of the passive, phagocyte-laden lesions of that type, while "leprid" and "lepridic" signify the more tissue-reactive, paucibacillated skin lesions of the tuberculoid type and the maculoanesthetic form. Neither of these terms seems appropriate for the atypical and varied lesions of the borderline cases.

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[4] This "spectrum" idea is a generalization of a view recently expressed by Rodriguez (personal communication) of the situation between the tuberculoid, borderline and lepromatous forms; also indicated in his 1947 publication ([38]).

[5] The word "stable" implies stability within the class, not as regards progression of the disease or the occurrence of reactional phenomena.

The term "polyneuritic" is used in the sense of the Cairo report, pertaining to peripheral nerve trunks, including those of the face, but not to cutaneous nerve branches on the extremities or body. The Cairo definition is: "This term has been employed to designate involvement of the peripheral nerve trunks which results in sensory changes of the extremities that tend to spread centripetally ('acroteric' anesthesia), and in trophic changes of various kinds, and paralyses and atrophies which may also involve the face. Polyneuritic manifestations do not include the sensory changes in the leprides, or lesions of superficial cutaneous nerves that develop by extension from the leprides." (Alternatively, "peripheroneuritic" might be used, if the fact that there are cases with only one peripheral nerve affected were of sufficient importance.)

The "primary" polyneuritic variety is the "anesthetic (nonmacular, polyneuritic) (Na)" subdivision of the neural type of the Cairo classification. The "secondary" one is a broader application of the idea of the Manila conference when it applied that term to "neural cases that were formerly [lepromatous] but from which the active [lepromatous] lesions have disappeared."

It is submitted that "recessive" should be applied to cases of the lepromatous and tuberculoid types and of the borderline group whose lesions have subsided to the flat macular morphology, but which cannot yet be regarded as "residual," which term would be appropriate when the patients are ready for discharge.

THE LEPROMATOUS TYPE (L)

The lepromatous polar type, a stable, malign form, is characterized by skin lesions which commonly are infiltrated to nodular and strongly positive for bacilli; by practically constant negativity to lepromin; and by a histological picture which is the only one distinctive of leprosy. Administratively, the cases are "open" or "infectious."

This is the old "nodular" form, in which skin lesions develop as a result of massing of lepra cells with minimal tissue reaction. The infection disseminates throughout the body, with notable involvement of the superficial lymph nodes, nasal mucosa, throat, eyes and testes, and to some extent of the spleen and liver. Although there is considerable bacillary invasion of the nerve branches within the skin lesions, there is much less sensory disturbances than in the leprids, because of the passive nature of the condition. The same factor pertains in the peripheral nerve-trunk involvement: although they become manifestly thickened as the disease advances, habitually in symmetrical fashion at the points of flexure, polyneuritic manifestations are usually late and not proportional to the degree of infiltration.

The earliest lepromatous skin lesion is an erythematous macule which is usually distinguishable by indistinct demar-

kation, a tendency to a tawny or bronzy color, no tendency to central resolution, and especially by the presence of bacilli in all parts of the area, often in considerable numbers. With progression the lesions become thickened to form infiltrations, ultimately so marked that crevices occur in the lines of folding; on the face this produces the "leonine countenance." Localized nodules ("tubercles") may develop secondarily in infiltrated areas, or in the subcutis free or attached to the dermis. The presence of polyneuritic manifestations may be noted by the combined symbol LP, but not—in this type—on the basis of mere nerve thickening because that is seen in practically all advanced cases.

Morphological and other modifications occur in the acute reactional conditions peculiar to this type. Varying in kind and degree, they are usually spoken of as "lepra reaction," or as "lepra fever" when there is hyperpyrexia. A special variety is the "erythema nodosum leprosum" or "multiforme" reaction, seen mostly in cases under effective treatment and regarded as of favorable significance.

Histologically, the classical leproma, beyond the stage of the perivascular infiltration of the macules, consists of an accumulation of modified, bacillus-laden macrophages of varied appearance, enmeshed in a reticulum-collagen stroma, the whole adequately vascularized. The lepra cells do not destroy the bacilli, but rather provide them shelter and nourishment; and when they lessen in numbers it is in spite of the passive attitude of the host cells. In some active lepromas the cells are elongate, spindle-shaped ("histioid"), and although the cytoplasm contains many bacilli it appears at most only vaguely vacuolated or reticulate, without typical globus formation. The classical lepra or Virchow cells are more or less conspicuously vacuolated by the development of "globi," i.e., bacillary clumps lying within a more or less lipidic matrix (the *schleim* of Unna). On aging these cells ultimately assume the "foamy" character, with many relatively small vacuoles containing much acid-resistant lipid material and few intact bacilli, the nuclei —often multiple—typically crenated by pressure of the vacuoles.

The characteristic nonreactivity to lepromin is a specific anergy, in keeping with the passive, foreign-body nature of the lesions. Tests with the Stefansky bacillus and other mycobacteria give positive results.

With respect to subgrouping, this type of leprosy does not

have as distinct varieties as the tuberculoid type has. The Cairo classification mentions only a "diffuse" form—also included in the Buenos Aires subgrouping—in which the skin may be extensively but slightly involved, without the formation of discrete macules or infiltrations. There is also a peculiar "Lucio" form, seen almost exclusively in Mexico and Costa Rica, which Latapi (30) calls *lepromatosis pura y primitiva* with a "necrosing vascularitis."

Discussion.—This type as here defined differs from that of the South American classification only in that it lacks the macular cases which cannot be diagnosed as such on clinico-bacteriological grounds. As for the other varieties of that system, those called "nodular" (or "tuberculo-nodular") and "generalized" seem artificial. The pure "neural" or "neuritic" variety—if it exists—belongs to the polyneuritic group.

The most difficulty with this type is the differentiation of borderline cases which are well advanced toward the lepromatous side. Many workers doubtless classify all such cases in which the distinctive features of the tuberculoid type from which they have arisen are obscured.

THE TUBERCULOID TYPE (T)

The tuberculoid polar type as a whole is a relatively stable form of the benign category.[6] The ordinary indolent, "torpid" cases are characterized by skin lesions of distinctive appearance, more or less elevated marginally or more extensively, usually irregular or pebbled of surface and with some erythema, and typically anesthetic to a considerable degree; usually negative for bacilli in smears, hence "closed" or "non-infectious"; normally reactive to lepromin. These cases are divisible into "minor" and "major" varieties (51, 16). There is also a reactional variety (50, 40, 41), often mistaken for lepromatous because of the peculiar appearance of the lesions and their liability to be bacteriologically positive (hence "open"), at least temporarily.

The active, raised outer edge of the individual lesion, whether that be round, ovoid or irregular, is typically clear-cut. The surface irregularity of the elevated portion is a micropapulation due to focalization of the pathology in the upper dermis, the effect varying with the numbers, sizes and concentration or aggregation of those foci; but when the process is located more deeply or is especially massive the surface may be quite smooth. The color variations are not particularly

[6] For a special study of this form of leprosy, see the monograph by de Souza Lima and de Souza Campos (45).

significant, except for the usual erythematous element, dull and dusky or fresher and more reddish.

These lesions, commonly referred to as "macules" but more suitably as "leprids," differ sharply from the lepromas in that the marginal activity leads to slow centrifugal extension, while the process tends gradually to die out toward the center. The resulting marginal zone may be narrow, or broad, or irregular in width. Commonly, especially in the major variety, it tapers off toward the healing center; but, especially in the minor variety, the edges on both sides may be equally abrupt. Activity may cease in one or more parts of the margin itself to leave more or less arciform or interrupted lesion zones. After healing, the normal color and texture may or may not be wholly restored, and there may be some degree of atrophy or fibrous thickening.

Anesthesia is variable in different parts of a lesion. There is usually none in the outer active zone, or there may be hyperesthesia, while in the central area the sensory disturbance tends to vary in degree with the severity of the active process.

The healed areas of these leprids—like many other dermatological lesions—exhibit a local immunity to reinvasion at least by the same process. There is, however, some susceptibility to reactional flare-ups except that the "immune areas" left by torpid major-degree lesions are often exempt in reactions (see later, borderline group). This immunity seems not to develop in areas affected by acute tuberculoid reactional lesions when they subside rapidly, since they are frequently the sites of recurrence.

Nerve involvement in this type is seen more often in cutaneous nerves in relation to the skin lesions than peripheral nerves. When a peripheral trunk is involved it is usually by extension through a cutaneous nerve, which itself may or may not be found grossly thickened along its course; hence the peripheral affection is commonly asymmetrical, unilateral. Occasionally there are encountered pure polyneuritic cases which can be recognized as of tuberculoid nature because of the amount and irregularity of the thickening. The secondary polyneuritic condition is relatively infrequent in this type.

Little can be said about systemic dissemination or generalizaton in tuberculoid leprosy except for the metastatic

nodules seen in many reactional cases, although tuberculoid changes have been found in the liver on biopsy (6, 33).

Histologically, the tuberculoid lesions are characterized by smaller or larger focal collections of epithelioid cells which, unlike the lepra cells of lepromatous leprosy, are actively destructive to the bacilli. These accumulations vary from small groups in the areolar tracts of the skin, primarily associated with blood vessels but also invading the nerve branches, to masses which distort or displace the normal skin structure. The epithelioid foci are normally accompanied by lymphoid cell infiltration. Langhans giant cells occur in variable numbers, seldom numerous and often absent. The foci are sometimes of sarcoid appearance, but usually they are what some writers call "follicular." The only distinctive feature not seen in any other disease is involvement of the nerve branches within the lesion, they containing bacilli when any are demonstrable.

Immunologically, the degree of positivity to lepromin tends to correspond to the degree of the lesions, although not without exceptions. In the reactional state the lepromin reactivity is frequently lessened temporarily, but at times it is increased.

The minor tuberculoid variety (Tm).—The skin lesions of this lesser of the torpid varieties are slightly to moderately elevated, commonly only at the margin or a part of the margin (circinate, interrupted, etc.), the surface usually finely pebbled or "micropapuloid." The condition tends to be relatively superficial in the dermis, and there is less frequent and less marked involvement of the associated cutaneous nerves than in the major variety. Few cases show polyneuritic changes.

The least evident of such cases present only slight marginal elevation and roughening, but definite infiltration on palpation; and here there may be overlapping with indeterminate or maculoanesthetic cases. More typically the marginal zone is definitely raised and studded in whole or in part with isolated or agglomerated micropapulations. In the past, the cases of this kind were probably included in the old maculoanesthetic type (e.g., Plate IV of the English edition of Hansen and Looft).

The major tuberculoid variety (TM).—The skin lesions of this more marked and conspicuous of the torpid varieties are more grossly thickened and elevated than in the minor one, the affected zone usually broader, and typically there is more

deep infiltration. Manifest affection of the associated cutaneous nerves is consequently more frequent and marked.

In many cases the lesions develop gradually, and they are usually annular. Plaque lesions are ordinarily of reactional origin arising from a lesser condition (indeterminate or minor tuberculoid), but they are not classed as of this subgroup until the process has become established in the chronic, torpid state. Ordinarily the cases are self-healing, in time, although the lesions may persist and spread slowly for years and attain considerable size.[7] It seems likely that these cases were usually classed as lepromatous ("nodular") in the old days.

Here are seen the best examples of the contrast between the abrupt outer edge of the active zone and the tapering off toward the center. There is also the best chance of finding, in active cases, a few bacilli in smears from the marginal zone. These cases, as a whole, give the strongest reactions to lepromin, and as said the healed areas exhibit the most marked local tissue immunity. They are also the most likely to show atrophy or fibrous thickening, but not actual scarring unless there has been ulceration.

The thickening of the affected cutaneous nerve branches may be marked, and occasionally it can be traced as far as the related trunk nerves, or such trunks may seem to be involved independently. Caseation necrosis sometimes occurs in this variety, and it may lead to the formation of cold abscesses involving cutaneous, peripheral or great auricular nerves. The occasional case with polyneuritic manifestations may be given the symbol TMP; but that designation should probably also be applied whenever there is definite involvement of a peripheral nerve because—unlike the case in lepromatous leprosy—the condition is unusual and therefore noteworthy.

Histologically, the tuberculoid change is more marked than in the minor variety, with in general more disturbance of the skin architecture. In many instances, however, it would be impossible to say, from the histological picture alone, whether a given specimen was from a lesser major-type lesion or a marked minor-type one—just as there are cases which are difficult to place clinically.

The reactional tuberculoid variety (TR).—Patients with this often spectacular condition present massive, well-outlined, ele-

[7] A rare example is a patient seen in Ceylon, shown in Figs. 1 and 2 of Wade, de Simon and Fernando ([58]).

vated, plaque-like erythematous lesions of active, semi-translucent ("succulent") appearance which develop more or less abruptly from lesions of lesser degree or on sites without previous apparent involvement. They are often bacteriologically positive, the bacilli few or numerous and perhaps even with occasional small globi. Sometimes the lepromin reaction is weakened, sometimes increased, usually strongly positive after subsidence. With repeated reactions such cases may evolve to the borderline form. In the past this condition was diagnosed as lepromatous, and doubtless it often still is.

In many cases there are found, besides the plaques, a few or many small nodules evidently of metastatic nature. Low-grade involvement of the liver has been found, as said. Fever and other general phenomena, however, are lacking except in the most severe reactions. Occasionally in the acute stage bullae may form and ulcerations follow, resulting in the condition to which the term "lazarine leprosy" is usually applied. Such lesions, on healing, will show more or less scarring.

After persisting for weeks or months in a subacute state, with little if any spread, the main lesions may sometimes subside to the torpid state and then progress as of the major variety, rarely the minor one. Frequently, however, they subside *in toto*, sometimes within a few weeks. After subsidence, ordinarily, the affected areas appear as rather ill-defined, erythematous or mottled recessive macules, liable to flare up again in a later reaction.

Histologically the lesions of this variety, while essentially of tuberculoid character, are usually much more massive and much less orderly than any of the torpid lesions. Typically there is more or less edema, often with hydropic vacuolization or reticulation of the epithelioid cells, perhaps a little acute leucocytic infiltration here and there, and occasionally small foci of fibrinoid necrosis. The necrotic nerves are, as said, of caseous nature.

Discussion.—This type as here defined lacks the dermatologically "macular" lesions of the South American classification, not recognizable as tuberculoid by their morphology, with special reference to the maculo-anesthetic kind. The South American "circinate" variety probably covers both the minor and major varieties here described, since there is no other provision for the latter one. The "reactional" variety definitely comprises both the one here described and the borderline form. The "neuritic" one is also composite, a combination of the pure polyneuritic condition and local anesthesia.

Many leprologists who distinguish only the torpid and reactional

states believe that the major form is the reactional one. This misunderstanding may stem from the fact that the original definitions ([51], [16]) *included* the reactional phase in the major variety, but that was not described as consisting *exclusively* of reactional cases, and its application was not so limited.

Some workers see two distinct kinds of reactional conditions. These were described, incidentally in a footnote, in the Rio de Janeiro report as "tuberculoid lepra reaction (Wade)" and "reactional tuberculoid leprosy (Souza Campos)," the former a reactivation of preexistent tuberculoid lesions and the latter developing ordinarily from the indeterminate type. Although the reactional condition may arise in either of those ways, as was shown in the first report of this phenomenon ([50]), the distinction of two kinds does not seem valid; nor was it made by the Buenos Aires conference ([15]).

The question of the supposed "transformation" of tuberculoid cases to the indeterminate kind, previously mentioned, is further discussed in the section on that group.

THE INDETERMINATE GROUP (I)

The indeterminate group as here defined provides for cases with simple macular lesions which cannot on clinico-bacteriological grounds be classified otherwise more satisfactorily. These cases are benign, but on the whole relatively unstable and liable to evolve to lepromatous or tuberculoid; anesthesia in the lesions usual, but seldom marked; almost always bacteriologically negative, therefore "closed"; the reaction to lepromin positive or negative, when positive not strongly so.

This group, "the dynamic element between the two polar types" ([13]), must be defined partly in a negative way. In a clinical classification it cannot be limited, as the Rio de Janeiro and Havana formulas would require, to cases whose lesions show only chronic round-cell infiltration. To justify the concept of instability, it cannot include those cases of long duration and notorious stability known as maculoanesthetic. As a "dynamic" element, it should not have assigned to it cases known to have been previously either tuberculoid or lepromatous whose lesions have receded to the inactive or residual macular stage. This leaves the group essentially for certain macular cases which did not fit properly into the "neural" type (Ns subtype) of the Cairo classification. This condition is not static; like all other skin lesions of leprosy these are subject to progression as such, unless and until the condition is controlled by treatment or the natural process of resistance, or change to a polar type occurs. Since these cases are often

in an early stage of the disease,[8] their frequency depends largely upon the extent of search for early cases, and there may be a regional factor.

The macules are usually small and few, often solitary, but at times numerous and widely dispersed; commonly they are hypochromic, but sometimes slightly erythematous or mixed; the outlines are more likely to be diffuse than distinct. When there are multiple diffuse lesions showing only moderate changes of pigmentation and slight sensory disturbance, the lepromin reaction negative, the danger of undergoing lepromatous transformation is greatest. Polyneuritic changes are not a part of the picture, simple macular cases with that development being eligible for classification as maculoanesthetic.

Histologically the lesions may be "pretuberculoid," or sometimes tuberculoid of slight degree; or "prelepromatous," the predominant cells usually of macrophage or monocyte types not definitely differentiated to Virchow cells but with some bacilli; or they may have only chronic, lymphoid-cell perivascular infiltration—which finding calls for serial sectioning to search for scarce tuberculoid foci, or consideration of the possibility that the condition is merely residual.

Discussion.—Of the South American subgroups of indeterminate, only a part of the "macular" one is retained under this description. The "neuromacular" (or "maculoneuritic") one represents the more advanced maculoanesthetic (MAP) cases. Exactly how a "pure neural" (or "neuritic") variety of indeterminate nature was supposed to be recognized has never been quite clear to the writer.

Certain differences of concept among the proponents of the South American system regarding this group have been discussed (introduction). There has been further confusion of another sort in certain quarters, where the idea got established that "indeterminate" was meant to signify all cases of which the "classification and the probable evolution of the disease is not definite," thus including borderline cases and those here called polyneuritic (Dharmendra (21)); or that it solves all problems of classification by taking care of everything not either lepromatous or tuberculoid (26). (See also the analysis of the recent symposium (25).)

As for the inclusion of cases whose lesions have changed from another class to recessive or residual macules, it is obvious that that cannot always be avoided with cases first seen in that phase, but in experienced hands they should not be many. Biopsy would of course eliminate them if not too completely resolved.

There remains the question of whether such recessive tuberculoid cases should be regarded as "transformed" back to the indeterminate form. Chaussinand (7) has said that this change may occur "rarely," and

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[8] Cochrane (10), after Havana, suggested the name "lepra incipiens" in place of "indeterminate" for this group.

that if the lepromin reaction is negative the cases may later become lepromatous. A São Paulo group ([4], [47]) holds that: "Retrogressive changes in the lepromatous or tuberculoid types in which they lose their typical structures until what remains is simply unspecific infiltration . . . .are evidences of a transformation. . . .to the uncharacteristic type. In this condition, however, there still exists a potentiality towards later new transformations to the polar types. This stage is entirely different from the residual cicatrices of the cured tuberculoid cases," which are merely scars of an extinguished pathological process.

This point of view is at least debatable. It could equally well be said that, so far as histology is concerned, the first condition in the above quotation is merely an incompletely resolved one, the latter purely residual. Granting that a recessive tuberculoid case may reactivate as tuberculoid, or rarely transform to lepromatous on loss of resistance, it is submitted that the recessive stage should not be regarded as a "transformation" to indeterminate unless and until the lesions *become stabilized and progressive as simple macules.* This condition is not demonstrated in any report known to the writer.

THE BORDERLINE GROUP (B)

The borderline group comprises a wide range or "spectrum" of cases presenting features of both the tuberculoid and lepromatous types. As a whole it is decidedly unstable; of the malign category; bacteriologically positive and often strongly and persistently so, hence "open"; typically negative to lepromin. These cases usually arise from the tuberculoid type as result of repeated reactions; also, it is said, sometimes directly from the indeterminate form. The lesions are always multiple and often extensive, and general symptoms are frequently seen in the more active phases. The condition may revert to straight tuberculoid, or persist indefinitely and perhaps ultimately subside without change of character, but occasionally it will evolve to the lepromatous condition. These cases are particularly liable to be classed as of that type, unrecognized for what they actually are.

The variations in this group are so great that a satisfactory brief description cannot be offered; furthermore, they have not yet been sufficiently studied. Some workers would divide the group into two varieties,[9] one toward the tuberculoid end of the scale and the other toward the lepromatous end. There is reason for doing that, with the understanding that there are midzone cases that would be difficult to put into either variety. The distinction is made here as "acute" and "chronic," until more satisfactory terms can be arrived at.

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[9] See the discussion of this section.

In the more "acute"—or, better, less stable—form the reactional lesions, although highly asymmetrical, are more suggestive of lepromatous infiltrations than tuberculoid, partly because they are not sharply outlined but slope off gradually to the normal skin, although typically the surface lacks the glossy smoothness of lepromatous infiltrations. This condition arises in tuberculoid cases which, after a period of recession or apparent clinical cure, have relapsed in this peculiar fashion ("relapsed tuberculoid" (53)). Within the active patches there are often found "immune" areas of healed tuberculoid lesions not affected by the new eruption, which is sharply delimited around them, this being the reverse of the characteristic tuberculoid picture and very different from the lepromatous one. When the previous lesion was extensive, the new one may arise along only a part of its edge, and hence be sharply limited on one side and tapering on the other. This borderline variety often resolves spontaneously, and it responds relatively well to treatment. The more severe acute cases may first develop bullae and ulcerations which leave scars on healing ("lazarine" form).

In the "chronic" form, usually but not necessarily resulting from repeated reactions, the condition is more advanced, stable and persistent, the lesions more bizarre and varied, the whole less easily distinguished from lepromatous. Conspicuous, however, is the asymmetrical distribution of the lesions, in contrast to the symmetry characteristic of typical lepromatous cases of similar advancement.[10] Furthermore, stigmata of the previous tuberculoid phase can often be discovered. In the cases of long duration polyneuritic manifestations may develop.

Despite the serious appearance, the persistent bacteriological positivity, and the nonreactivity to lepromin, the borderline cases as a whole seem to retain in some degree a latent element of resistance, which affects the prognosis. Although some of them gradually evolve to the true lepromatous type, many of them tend to respond relatively well to treatment.

As active resistance is established and the condition improves it may revert to the previous tuberculoid state, or subsidence may occur without that reversion of form. Some ob-

[10] For one example, if one ear should have a conspicuous nodule of apparent lepromatous nature while the other appears normal (e.g., Lowe (31), Fig. 1), or only slightly affected, the borderline condition should be suspected and the case investigated thoroughly, including biopsy.

servers hold that, as a result of sulfone treatment, true lepromatous cases may develop tissue reactivity and follow the reverse course, becoming borderline and possibly going on to tuberculoid; but that has yet to be demonstrated adequately.

The histological picture of borderline lesions is very variable, but again there is insufficient record of clearly differentiated cases. In some of the acute "relapse tuberculoid" kind the predominant feature is massing of elongate, histiocytic cells, not distinctly epithelioid or with the tuberculoid focalization. In the more advanced cases of longer duration there is normally more distinct tuberculoid differentiation, and not infrequently both the tuberculoid and lepromatous structures are found in association. About the permutations of the lepromin reactivity in this form, not much can be said positively. It is possible that cases of supposed lepromatous leprosy which have become reactive after improvement under sulfone treatment may actually have been of the borderline category.

Discussion.—Many names have been applied to this kind of case, formally or otherwise. The writer, especially interested in tuberculoid cases supposedly become lepromatous after studying a few in Africa in 1931 (50), considered separately as "atypical" certain cases seen with Fraser in China in 1934 (54), speaking of one of them as "intermediate, transitional," and of the group as "atypical and borderline." In Calcutta, in 1936, it was learned that Lowe was applying informally the designation "N?C" to reactional tuberculoid cases easily mistaken for lepromatous (52, 55). Afterward, Lowe (31) wrote of an "intermediate type of case" seen in Burma, atypical lepromatous apparently developed from tuberculoid. The first formal application of "borderline" was by Wade and Rodriguez in 1940 (57). Shortly afterward, Cochrane (8) described as "intermediate" a kind of case neither tuberculoid nor lepromatous. Later (9) he favored "transitional"—at a meeting in which Dharmendra (19) used "doubtful" as an alternative—but more recently (10) he has advocated "dimorphous," ascribed to Khanolkar. Rodriguez now prefers that term (48).

In the older literature there is an excellent example of an advanced borderline case, identifiable from pictures, reported in 1893 by Arning and Nonne (2) as one of "tuberomacular" leprosy. Those pictures, being unique, were reproduced in an article on "relapsed tuberculoid and borderline cases" (53).

At the outset of the South American movement, Aguiar Pupo (1) wrote rather vaguely of "combined or transitional" forms, mentioning "intercurrence of tuberculoid lesions within the clinical picture of lepromatosis." In his Tres Corações report de Souza Lima (42) discussed, under "borderline or intermediate lesions and relapsing lesions," cases which transform directly from tuberculoid to lepromatous and therefore "contradict all our doctrines and open a breach in the South American classification." To his question if they should be put into a separate new group, the answers were too divided to permit a conclusion (22c). The Rio

de Janeiro report makes no mention of borderline cases except in an added footnote which says that they should be included in the tuberculoid reactional form. Recently the Brazilian Association of Leprology proposed to the Buenos Aires conference that a "reactional tuberculoid group" should be created because "at least the borderline cases do not correspond to the criteria of the tuberculoid type"; but the conference ([15]), while recognizing a consensus in favor of distinguishing borderline cases, merely suggested that they be studied more thoroughly in order that it might be decided at the Madrid congress whether or not to create a "transitional (T.T.) group." The Brazilian Association, however, still maintains its original position, saying that "'borderline' cases (i.e., Wade type)" and also the "'major tuberculoid' (Souza Campos type)" cases should be put together into an authentic group, not named ([48]).

In the recent symposium the proposal that this group should be given special recognition was agreed to by an overwhelming majority, although two contributors would divide it. One (Cochrane)—who, curiously, lists hypothetical macular and polyneuritic "dimorphous" forms, and apparently a reactional one—has "atypical tuberculoid" and "atypical leproma." The other (Lara), suggested "intermediate ('borderline') lepromatous" and "intermediate ('borderline') tuberculoid.

Some such division would be in line with the writer's original view, in the rather vague distinction between "relapsed tuberculoid" and "borderline" ([53]). The latter term would of course now have to be changed perhaps for one conveying the sense of "sublepromatous," nearer the lepromatous than the tuberculoid type.

THE MACULOANESTHETIC GROUP (MA)

This first of the two subordinate groups here advocated comprises the cases so designated in the older classification, which present anesthetic macular leprids, typically more or less hypochromic and usually fairly well demarked, and often in the later stages with polyneuritic manifestations; practically always bacteriologically negative, or closed; the cases typically reactive to lepromin, although moderately so in most instances; stability marked, the character benign.

These cases present few or many macules, small or large, and they persist indefinitely with progression but without evolutionary changes. There is always positive interference with the flare of the histamin reaction. The polyneuritic manifestations are either bilateral or unilateral, the nerve trunks characteristically much less thickened than in either tuberculoid or lepromatous leprosy. Apart from indicating (as MAP) cases in which this late condition develops, no basis for subdividing this group is seen.

Histologically, the skin lesions, when active, commonly if not regularly show low-grade tuberculoid changes in at least some of the foci of round-cell infiltration, not enough to cause

the elevation of minor tuberculoid leprosy although there may be some palpable thickening and even marginal elevation so slight that it is usually perceptible only with good oblique lighting.

Discussion.—In the South American classification these cases would be in the uncharacteristic class, including a part of the "macular" variety and doubtless all of the "neuromacular" ones—except perhaps such as might be put into the tuberculoid type on the basis of histological findings. But these cases do not conform to the idea of instability or of "dynamic" character. Thus it was that the Havana committee proposed to place them in the tuberculoid type, a none-too-satisfactory proposal which was not accepted by the congress.

It is clearly the consensus that this form should be given individuality ([48]), but usually only as a subgroup. Gay and Contreras, however, would have it as an independent group arising from the indeterminate one, and that view has been adopted here.

THE POLYNEURITIC GROUP (P)

This second of the new subordinate groups is proposed as a composite one for cases which, without skin lesions or with only residuae of them, present manifestations of peripheral nerve trunk involvement defined as "polyneuritic" in the Cairo report, quoted earlier. Those without skin lesions may never have had any, and thus be "primary" (P'), but there is often uncertainty as to whether there may previously have been such lesions which have disappeared without trace. In cases which have been under observation in an earlier stage, or which have residuae of skin lesions, the "secondary" (P") status is obvious. Benign and stable; bacteriologically negative or "closed"; those cases of or arising from the tuberculoid type and maculoanesthetic group reactive to lepromin in varying degrees, those of lepromatous nature typically nonreactive. (No statement can be made about previously borderline cases.) Each of these two varieties can be further divided according to the nature of the pathological process, if and when that can be determined.

Biopsy of the nerve, when that intervention is needed and practicable, should reveal the nature of the pathological process *provided* it is still active. The mere finding of a chronic inflammatory infiltration would not necessarily be significant, for it might only be residual.

Primary polyneuritic (P').—Cases which are accepted, on clinical and historical grounds, as never having had skin lesions. The frequency of such cases is variable, but they are not rare. The disease process may be active, the patients subject to treatment.

Regarding subdivision of this group by the nature of the process, without nerve biopsy, an occasional case can certainly be diagnosed as tuberculoid (P'T) because of marked and irregular thickening or abscess of the nerve and strong lepromin reactivity, also supported by negative findings for bacilli on nerve puncture if that is done. Uniform thickening and a negative lepromin reaction—and positive nerve puncture—are held by some to suffice for diagnosis of the lepromatous type. Certain writers—Cochrane (11) and Schujman (48)—claim to have confirmed that diagnosis by biopsy, but the existence of this condition has not yet been demonstrated by definitive reports of proved cases. How to subgroup those cases whose nerves lack such definitive or suggestive features it would be difficult to say. For one thing, they may be residual. In any case, the unstable "indeterminate" concept would seldom if ever apply, and to call them "maculoanesthetic without macules" would be awkward to say the least, although that would probably represent the actual nature of most of them.

Secondary polyneuritic (P").—Cases which, previously with active skin lesions, have polyneuritic changes remaining as residual sequelae after the disease has died out. These cases, by definition, are "clinically cured" and not subject to treatment except perhaps that which is given routinely to discharged cases as prophylaxis against relapse. The effects of nerve damage may increase in severity after the infection has been overcome, due to slowly progressive fibrosis within the nerves.

On nerve biopsy, cases arising from the lepromatous type would show accumulations of old foamy cells long after the condition has become inactive, they being long persistent. The tuberculoid change would more quickly give way to residual round-cell infiltration and fibrosis. Cases originally tuberculoid or maculoanesthetic should be reactive to lepromin; if this reactivity should develop in previously lepromatous cases, that would be of good prognostic significance.

Discussion.—The primary subgroup comprises the "pure neural" cases which the South American classification distributed among its three types. The group as a whole comprises some cases of the confused polyneuritic subdivisions proposed by the Havana committee, but not those with active skin lesions (LP, etc.), or those with only local anesthetic areas due to cutaneous nerve affection.

As for when a case should be removed from the residual stage of the original type to the secondary polyneuritic class, that would reasonably be when the patient is discharged and removed from the leprosy statistics. Discharged patients without polyneuritic disturbances are of no special

concern except for the possibility of relapse, whereas—as recently pointed out (48)—those with such sequelae continue to be a social problem (Gay and Contreras), or one of rehabilitation (Vilanova), and in any event the original form is of no importance (Tiant).

There are differences of opinion about nerve biopsy (48). Those who insist that primary cases should be assigned as varieties of one or another of the South American classes according to the nature of the process write as if the histological examination were readily and commonly made. On the other hand some regard it as justifiable only in exceptional cases (Basombrio and Fernandez, Schujman), while others say that it should not be practiced at all (Gay and Contreras). The Havana committee wrote, "Histological examination of the nerves is seldom practicable" (18).

LOCALIZED CUTANEOUS ANESTHESIA

Mention should be made of the infrequent cases which present only localized cutaneous anesthesia without macular surface change, due to affection of a cutaneous nerve branch and hence not of the "polyneuritic" category. Patients sometimes tell of such areas as the first noticed manifestation, before the appearance of visible lesions, but that does not affect their actual classification.

Depending on clinical grounds alone, such pure anesthetic cases will usually be put into the indeterminate class (IA) pending further developments. If, however, the related nerve is definitely thickened, the presumptive diagnosis is tuberculoid (TA), especially if the reaction to lepromin is positive. Biopsy of the anesthetic area may or may not show distinctive pathology. These cases are too few to be given much importance in formal classification. In a diagram they might be given small compartments within the frames of the I and T types.

Discussion.—This condition was not taken into account in the Cairo classification, its "anesthetic" class referring only to nerve trunk (polyneuritic) affection. In the Rio de Janeiro report these cases are included in the "pure neural" varieties, along with those of polyneuritic nature, and the Havana committee proposed to perpetuate that arrangement. In a recent note (48) Rodriguez has told of the later developments in five such cases.

SYMBOLIZATION

For the four main classes, besides the familiar symbols "L," "T" and "I," the use of "B" for the borderline group should introduce no difficulty, nor should "P" for the polyneuritic group. For the maculoanesthetic one the two-letter symbol "MA," used by Gay and Contreras (27, 48), seems suitable because the name is a compound one and to avoid possible confusion with "macular."

Cases of the L, T and MA forms in which polyneuritic manifestations have developed would simply be indicated by "LP," "TP" and "MAP," as

"LN" was used in the past. On transferring such a case to the polyneuritic group the original type symbol would be dropped, "P" standing alone (more specifically P″),and when the symbol of the previous class is used for subdivision it would best be a small letter to denote inactivity (e.g., P″t). On the other hand, capitals would probably be best in indicating the subdivisions of the primary polyneuritic subgroup (e.g., P'T).

Other subdivisions of groups—except of course numerical ones by degree of advancement—present some difficulties. To distinguish the minor and major tuberculoid forms, "M" in small and capital letters is used here (i.e., Tm and TM, respectively), at least pending a better suggestion. The capital "R" naturally signifies "reactional."

For distinguishing between "recessive" and "residual," if symbols are to be used, it seems necessary to use three-letter symbols, "rec" for the former and "res" for the latter (small r's).

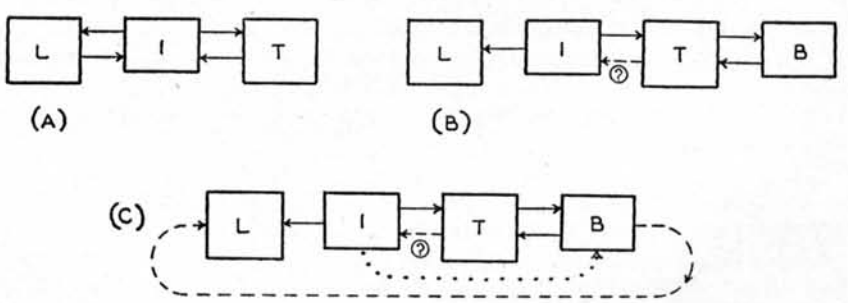
To indicate cases with only nonmacular, anesthetic areas on the skin, local cutaneous and not peripheral, IA and TA are appropriate.

Finally, for complete symbolization of individual cases, one might also add "B+" or "B–" for the bacteriology and "M+" or "M–" for the results of the Mitsuda test. The plus and minus signs would prevent confusion regarding the meanings of these letters so used in, for example, "B,B+M–."

DIAGRAMATIC REPRESENTATION

The South American workers at most used symbol letters connected by leaders (e.g., de Souza Lima ([42])). Muir ([32]) drew a three-compartment figure to show the relationships between the three classes of the South American scheme as he understood it.

The development of the diagram presented here is illustrated as follows: (1) First is a simple linear one representing the South American grouping with leaders going both ways between the intermediate I group

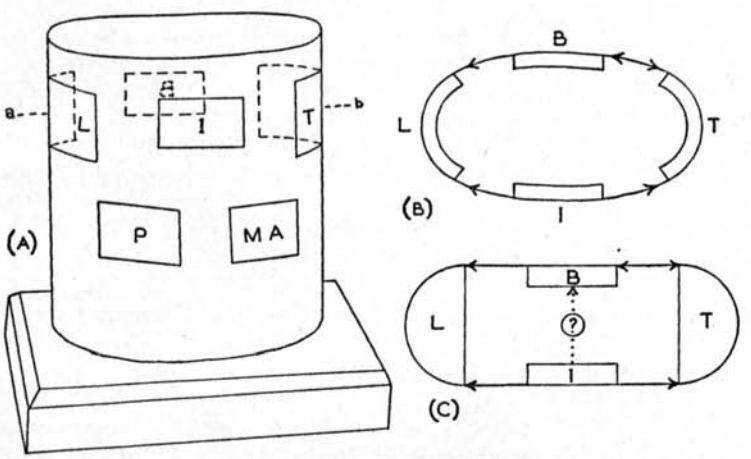


TEXT-FIG. 1.—A. Representing the forms of the South American classification and their supposed relationships. B. Same, with the borderline group added, the connections between the original three forms modified. C. Same as B, with an indicator for the conversion from borderline to lepromatous, and a tentative one for the possible origin of borderline directly from indeterminate.

and each of the polar forms (Text-fig. 1A). (2) Second is the same figure, with a modification of the connectors, plus B group added at the

tuberculoid end (Text-fig. 1B), this being inadequate in the lack of an indication of relationship of the B group with the L type. (3) That relationship can be indicated by a connecting line (Text-fig. 1C). Also included, not too satisfactorily, is an indicator of the supposed possibility that B cases may arise directly from the I form.

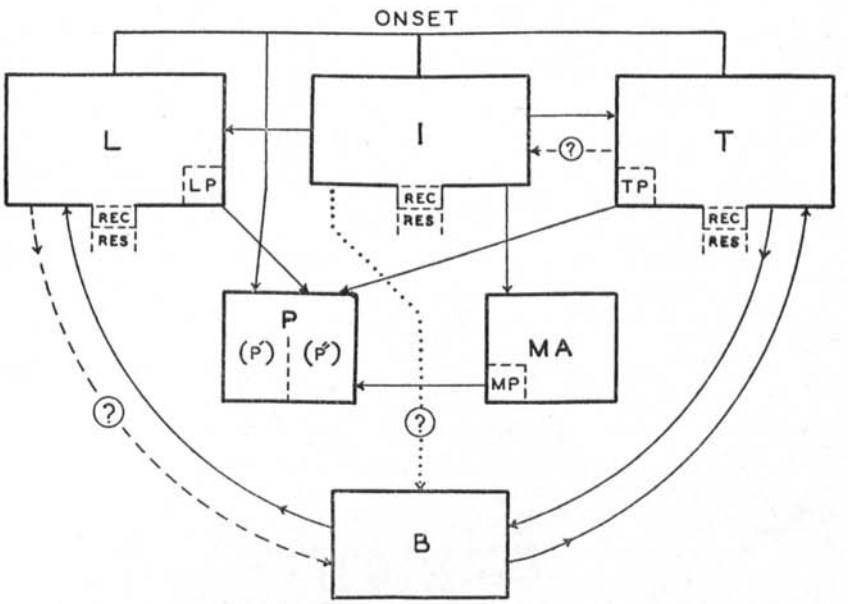
If, instead of laying the four groups out in a straight line, we were to plot them three-dimensionally on a flattened cylinder (Text-fig. 2A), and then make a cross section through that level (*a-b*), we would have a figure like that shown in 2B, modified in 2C. There the I group is intermediate between the polar types on the front surface, and the B group intermediate between them on the back surface and the supposed occasional origin of B directly from I can be indicated directly.



TEXT-FIG. 2.—A. Sketch of a three-dimensional representation on a solid cylinder of the relative positions of the four first-order classes, and of the subordinate maculoanesthetic and polyneuritic groups. B. Representing a cross section of A at the indicated level (a-b). C. Another version of the cross-section plan, with the possible connection between indeterminate and borderline indicated.

For practical purposes, however, it is best to develop the diagram on a two-dimensional basis, as in Text-fig. 3, with the B group so connected with T and L as to correspond with its position on the three-dimensional scheme. This permits the indication of the stage of onset by an upper line, with leaders to the forms in which the disease may first be observed, and also the introduction of the two subordinate forms advocated.

The connector between the "onset" bar and the I group is made heavy to indicate the frequency of the simple macular lesion as the first detectable manifestation. If, as some believe, the first definite sign was a local anesthetic area, before the development of actual lesions, that would have to be considered as within the zone of onset—along with other prodromata if and when they occur. Cases actually seen with only such anesthetic areas could be indicated by small boxes within the I and T frames.



TEXT-FIG. 3.—The two-dimensional representation of the same scheme, showing the various relationships of the classes discussed, including the development of polyneuritic manifestations in the lepromatous, tuberculoid and maculoanesthetic forms. The infrequent pure local anesthetic cases (IA and TA) are not included, to avoid further complication of the diagram.

Evolution from I to T on the one hand and to L on the other hand is indicated definitely. The supposed reverse change, from T to I, is queried; that from L to I is not accepted. Of the connections between B and T on the one hand and between B and L on the other hand, that from L to B is queried. There is a tentative direct connection between I and B.

This disposes of the four main or primary classes as a whole, there being included in their frames indicators for the polyneuritic development and for exit via recessive and residual stages. As for the proposed subordinate groups, the maculoanesthetic (MA) one is shown arising from I and attaining a relatively independent status, and the polyneuritic one is shown primarily as a single entity, with the division into P′ and P′′ subgroups suggested.

Regarding other subtypes, it would be impractical to attempt to indicate, in a single basic diagram, divisions by degree of advancement such as L1, L2, L3, or the minor, major and reactional varieties of the T type.

SUMMARY

On the basis of the principles stated, the following scheme of classifying leprosy cases, based primarily on the fundamentals of the South American system but with place also given to certain features of the Cairo system, is advocated. The sub-

divisions not specifically defined as such are in parentheses. Subdivisions by degree of advancement (e.g., L1, L2 and L3) are not indicated.

1. Lepromatous type (L), (a first-order class)
   (Varieties not distinctive; diffuse and Lucio forms mentioned; LP cases recognized; recessive and residual cases to be distinguished.)
2. Tuberculoid type (T), (a first-order class)
   Minor tuberculoid (Tm) torpid variety
   Major tuberculoid (TM) torpid variety
   Reactional tuberculoid (TR) variety
   (TP cases occur. Ulcerative "lazarine" cases are recognized, an infrequent variety. Recessive and residual cases to be distinguished.)
3. Indeterminate group (I), (a first-order class)
   (Subgrouping possible on histological grounds, but not important; no IP cases.)
4. Borderline group (B), (a first-order class)
   (A variety nearer the tuberculoid)
   (A variety nearer the lepromatous)
   (BP cases recognized; recessive and residual cases to be distinguished.)
5. Maculoanesthetic group (MA), (a subordinate class)
   (No subdivisions; MAP cases recognized.)
6. Polyneuritic group (P), (a subordinate class)
   Primary polyneuritic (P′) subgroup
   (Certain varieties possible.)
   Secondary polyneuritic (P″) subgroup
   (Varieties according to previous form of the disease.)

RESÚMEN

Basándose en ciertos principios planteados en el artículo, se advocą la siguiente clasificación para los casos de lepra, basada principalmente en los fundamentos del sistema Sudamericano, pero usando algunos rasgos del sistema del Cairo. Las subdivisiones no especificadas como tales aparecen en paréntesis. Subdivisiones por cada grado de avance, (e.g., L1, L2, L3, etc.) no están incluídas.

1. Tipo Lepromatoso (L), (clase de primer órden)
   (Variedades no distintivas; formas difusas y formas Lucio mencionadas; casos LP reconocidos; es necesario distinguir casos recesivos y residuales).
2. Tipo Tuberculoide (T), (clase de primer órden)
   Variedad tuberculoide menor (Tm) tórpida
   Variedad tuberculoide mayor (TM) tórpida
   Variedad tuberculoide reaccional (TR)
   (Casos TP ocurren. Casos ulcerativos "Lazarinos" son reconocidos, aunque poco frequentes. Es necesario distinguir casos recesivos y residuales).

3. Grupo Indeterminado (I), (clase de primer órden)
   (Subgrupos posibles a base histológica, pero no son importantes; ningún caso IP)
4. Grupo "Borderline" (contiguo) (B), (clase de primer órden)
   (Variedad cercana a la tuberculoide)
   (Variedad cercana a la lepromatosa)
   (Casos BP reconocidos; es necesario distinguir casos recesivos y residuales)
5. Grupo Maculoanestésico (MA), (clase subordinada)
   (No hay subdivisiones, casos MAP reconocidos)
6. Grupo Polineurítico (P), (clase subordinada)
   Subgrupo polineurítico primario (P′)
   (Algunas variedades posibles)
   Subgrupo polineurítico secundario (P″)
   (Variedades de acuerdo con la forma previa de la enfermedad)

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