Leprosy
Leprosy
Leprosy is caused by *M. leprae* and predominantly affects the skin and peripheral nerves.
Immunopathologic Spectrum Leprosy
The sequence of disease pathogenesis is complex, very chronic, and depends on host-parasite immunologic responses. The spectrum of leprosy is a continuum, and ranges from lepromatous leprosy at one pole to tuberculoid leprosy at the other. The terms BT (borderline tuberculoid), BB (midborderline), BL (borderline lepromatous), and LL (lepromatous) are used to denote patterns that share some features of both tuberculoid and lepromatous leprosy.
TT and LL patients are stable, the former often self-healing and the latter remaining heavily infected unless treated.
Leprosy = الجلام
Leprosy = laa'dama

absence of treatment. The central point of the spectrum (BB) is the patient's place, with widespread de
tropone, a high proportion of people are infected by M. leprae, and some may develop no disease or have de
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Staining of Mycobacterium leprae Bacilli
The classical method for demonstrating leprosy bacilli in lesions is a modified Ziehl-Neelsen stain, where the degree of bacterial index (BI) follows Ridley's logarithmic scale (which applies to both skin biopsies and slit skin smears).

\[ \text{BI} = 0: \text{no bacilli observed} \]
<table>
<thead>
<tr>
<th>BI</th>
<th>Description</th>
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<tbody>
<tr>
<td>1:</td>
<td>1 to 10 bacilli in 10 to 100 hpf (oil immersion)</td>
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<tr>
<td>2:</td>
<td>1 to 10 bacilli in 1 to 10 hpf</td>
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<tr>
<td>3:</td>
<td>1 to 10 bacilli per hpf</td>
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<tr>
<td>4:</td>
<td>10 to 100 bacilli per hpf</td>
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<tr>
<td>5:</td>
<td>100 to 1,000 bacilli per hpf</td>
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<tr>
<td>6:</td>
<td>&gt;1,000 bacilli per hpf</td>
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Solid-staining bacilli indicate that the organisms are capable of multiplication. Fragmented (beaded) and granular acid-fast bacilli indicate that they are dead. Patients with no bacilli detectable in lesions are termed paucibacillary; those with some or many bacilli are multibacillary (this distinction is important in determining the duration of chemotherapy).

Immunocytochemical methods for demonstrating mycobacterial antigens have a limited role. The most frequently used is a...
For general discussions of clinical leprosy and leprosy pathology, the reader is referred to Job (147) and...
Early, Indeterminate Leprosy

Many patients present with obvious or advanced skin and peripheral nerve lesions (the latter are primarily nerve loss). Any part of the body may be affected.
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Histopathology.

There is mild lymphocytic and macrophage accumulation around neurovascular bundles, the superficial and deep dermal vessels, sweat glands, and erector pili muscle; focal lymphocytic invasion in
A distinctive variant of lepromatous leprosy, the histoid type, first described in 1963. Rarely, lepromatous leprosy can present as a single lesion rather than as multiple lesions (150).
Leprosy = اﻠﺠذاﻢ

*Histopathology.*

Lepromatous leprosy, in the usual macular or infiltrative nodules (Figs. 21-33), exhibits an extensive cellular infiltrate that includes epithelioid cells, Langhans' giant cells, and lymphocytes. The macrophages have abundant eosinophilic cytoplasm and contain a mixed population of solid and fragmented bacilli (Fig. 24 or 5). The bacilli are seen on Wade-Fite staining to measure about 5.0 by 0.5 μm and may form epithelioid cell granulomas. Lymphocyte infiltration is not prominent, but there may be many plasma cells.
In time, and with antimycobacterial chemotherapy, degenerate bacilli accumulate in the macrophages—the so-called lepra...bacilli are fragmented or granular and, especially in very chronic lesions, disposed in large basophilic clumps called globi.

In lepromatous leprosy, in contrast to tuberculoid leprosy, the nerves in the skin may contain considerable numbers of leprosy bacilli but remain well preserved for a long time and slowly become fibrotic.
Leprosy = اﻠﺠذاﻢ
Histoid Leprosy

Histoid leprosy shows the highest loads of bacilli (frequently, the BI is 6), and the majority are solid staining, often associated with a lobular or patchy dermal infiltrate. The epidermis may be stretched over such dermal expansile nodules.
Histopathology

The important difference between LL and BL leprosy histology is that in BL, the lymphocytes are more prominent and there are foamy cells.
In midborderline (BB) leprosy, the skin lesions are irregularly dispersed and shaped erythematous plaques.
Histopathology. In BB leprosy, the macro phages are uniformly activated to epithelioid cells but are not focalized into distinct granulomas. There are no Langhans giant cells. The Bl ranges from 3 to 4. Dermal edema is prominent between the inflammatory cells.

Borderline Tuberculoid Leprosy
In borderline tuberculoid (BT) leprosy, the lesions are asymmetrical and may be scanty. They are dry, hairless plaques with central hypopigmentation. Nerve enlargement is usually found, and the lesions are usually anesthetic.

**Histopathology**

Granulomas with peripheral lymphocytes follow the neurovascular bundles and infiltrate sweat glands and erector pili muscles. Langhans giant cells are variable in number.
and are not large in size. Granulomas along the superficial vascular plexus are frequent, but they do not

*Tuberculoid Leprosy*
The skin lesions of tuberculoid (TT) leprosy are scanty, dry, erythematous, hypopigmented papules or plaques with sharply demarcated margins. The lesions heal rapidly on chemotherapy.

Histopathology
Primary TT leprosy has large epithelioid cells arranged in compact granulomas and...
Peripheral Nerves

In all of these patterns of leprosy, the major peripheral nerves are often undergoing parallel pathologies.
Leprosy Reactions

Leprosy reactions are classified into two main types (1 and 2). A third reaction is specific to Lucio multibacillary leprosy.
Type 1 Reactions
Because the immunopathologic spectrum of leprosy is a continuum, patients may move along it in both directions. Shifts toward the tuberculoid pole are called upgrading or reversal reactions; shifts toward the lepromatous pole are termed downgrading reactions. Both are aspects of delayed hypersensitivity, or type 1, leprosy reactions. TT patients are stable. BT patients may suffer edema that results in enlargement of lesions with more erythema. At worst, there is caseous necrosis of large peripheral nerves resulting from upgrading reactions.
Histopathology. The histopathology of type 1 reactions has still not been well evaluated. The distinction between upgrading and downgrading reactions is difficult to make and may require serial examinations.
there is edema within and about the granulomas and proliferation of fibrocytes in the dermis. In upgrading
type 2 Reaction: Erythema Nodosum Leprosum

Erythema nodosum leprosum (ENL) occurs most commonly in LL leprosy and less frequently in BL leprosy.
On the skin, tender, red plaques and nodules together with areas of erythema, and occasionally also purpura, are seen in some patients. This is the only type of reactional leprosy that responds to treatment with thalidomide.

**Histopathology.** In ENL, the lesions are foci of acute inflammation superimposed on chronic multibacillary leprosy.
anti mycobacterial immunocytochemical stain (e.g., anti-BCG) will indicate abundant antigen. A necrotizing vasculitis affecting arterioles, venules, and capillaries occurs in some cases of ENL; these patients may have superficial ulceration.

**Lucio Reaction**
The Lucio reaction occurs exclusively in diffuse lepromatous leprosy, in which it is a fairly common complication. It usually occurs in patients who have received either no treatment or inadequate treatment. In contrast to ENL, fever, itching, and swelling of the affected skin, particularly on the legs, into ulcers. There may be repeated attacks or continuous appearance of new lesions for years.

**Histopathology.** In the Lucio reaction, vascular changes are critical. Endothelial proliferation leads to luminal obliteration, leading to hemorrhagic infarcts and results in crusted erosions or frank ulcers.
Electron Microscopy of Leprosy
Under electron microscopy, M. leprae can be seen to consist of an electron-dense cytoplasm line

Pathogenesis of Leprosy
With respect to immunologic reactivity, patients with leprosy have a defect in cell-mediated immune responses, which are crucial for the body to destroy phagocytosed bacilli. This defect is specific for \textit{M. leprae}, as patients with leprosy show normal immunologic responses to antigens other than lepromin in both \textit{in vivo} and \textit{in vitro} testing.
The specific inability of T lymphocytes obtained from patients with lepromatous leprosy to react against lepromin is an increase in the lymphocyte response to lepromin during the reaction and a decrease during the postreaction phase.
Analysis of T-cell subsets in lesions has shown that in tuberculoid leprosy, with its high degree of resistance...
In patients with either ENL or the Lucio reaction, deposits of IgG and the third component of complement...
The lepromin skin test, or Mitsuda test, consists of the intradermal injection of a preparation of M. leprae derived from autoclaved infected human tissue. A positive reaction consists of the formation of a nodule measuring...