This chapter is divided into two sections that discuss the pathology of illnesses that affect skeletal muscle and those that involve peripheral nerve. Within each section, there is a brief introduction to the general reactions to injury as seen with the electron microscope, followed by an account of important diseases which affect each tissue. The discussion of the most each disease, or category of disease, is divided under three headings: clinical manifestations, diagnostic criteria, and etiology. General reference texts and reviews are cited in the introductory comments within each section; in addition, selected recent publications and noteworthy articles dealing with specific aspects of a particular disease entity are referenced in the text.

Skeletal Muscle

(Figure 13.1.)

The normal light microscopic and electron microscopic structure of skeletal muscle is discussed in standard textbooks (Sternberg 1992; Engel and Franzini-Armstrong 1994); several illustrations are given here as a starting point to orient the reader (Figure 13.1). The basic responses of skeletal muscle to injury visible with the electron microscope can be subdivided into the following categories: (1) alterations in sarcolemma (e.g., discontinuities of plasma or basement membrane); (2) alterations in myofilaments (e.g., degeneration and loss of myofilaments, central cores and target formation, ring fibers, sarcoplasmic masses, and contraction bands); (3) Z-band alterations (e.g., streaming and nemaline bodies); (4) nuclear changes (e.g., abnormal location of the nucleus within the muscle fiber and inclusions); (5) mitochondrial changes (e.g., abnormalities in number, size, and structure; intramitochondrial inclusions); (6) abnormalities of sarcoplasmic reticulum and T-system (e.g., tubular aggregates); (7) abnormal accumulations of metabolites (e.g., glycogen and lipid); (8) abnormal cytoplasmic structures (e.g., vacuoles, cytoplasmic bodies, tubular and filamentous inclusions, zebra bodies, concentric laminated bodies, fingerprint bodies, curvilinear bodies).

In general, many of these ultrastructural abnormalities are not specific for a single disease. Electron microscopy can be a valuable adjunct to help the pathologist arrive at a proper interpretation of a muscle biopsy when taken together with all other available clinical, electrophysiologic, and histopathological data. In addition to the pathologic changes that might involve the muscle fibers themselves, many diseases of muscle also simultaneously affect adjoining connective tissue components, blood vessels, and intramuscular nerves. It is, therefore, important to pay particular attention to these
structures when examining muscle with the light and electron microscope. For general reference citations that include discussions of the ultrastructural pathology of skeletal muscle, the reader is referred to the references listed at the end of this chapter. These include chapters in textbooks and comprehensive treatises dealing specifically with the pathology of diseases of skeletal muscle (Engel and Franzini-Armstrong, 1994; Carpenter and Karpati 1978; Neville 1979; Dubowitz 1995; De Girolami and Beggs 1997).

A simple classification of diseases of skeletal muscle recognizes two major groups: disorders in which the muscle fiber itself is the primary site of injury—myopathies—and diseases in which dysfunction of the muscle cell is secondary to an abnormality of its innervation—neurogenic atrophy. The myopathies can be subclassified as follows: (1) hereditary disorders with known or suspected genetic abnormalities, including the muscular dystrophies and the congenital myopathies; (2) hereditary or acquired metabolic and toxic myopathies; and (3) infectious and noninfectious inflammatory myopathies. In the text that follows, the principal light and ultrastructural alterations seen in selected diseases are discussed.

(Text continues on page 920)