Basic knowledge of normal and abnormal muscle physiology is essential to an understanding of muscle disorders and to the interpretation of many specific tests. This article presents an overview of basic muscle metabolism, differential diagnoses that should be considered when presented with a weak or collapsing patient, and the rationale and interpretation of the frequently necessary testing procedures with specific reference to metabolic muscle diseases.

Feline Neuromuscular Disorders

A veterinarian encountering a cat with suspected neuromuscular dysfunction is faced with three basic challenges: (1) to determine whether the cat’s presenting complaint and physical findings are the result of a neuromuscular disorder, because similar clinical signs may result from disorders of the brain, spinal cord, ventral horn cells, peripheral nerves, neuromuscular junctions, or muscle; (2) to formulate a complete list of differential diagnoses that lead to proper identification of the type and cause of the neuromuscular disorder; and (3) to institute the appropriate therapy (pharmacologic if available and supportive care) to modify the basic disease process and improve the cat’s quality of life. The management of a cat suspected to have a neuromuscular disease may be extremely frustrating, because there is a narrow range of presenting clinical signs for the numerous disorders affecting the feline neuromuscular system. These clinical signs are frequently common to many different disorders, regardless of the cause.
Inherited Peripheral Neuropathies in Dogs and Cats
Joan R. Coates and Dennis P. O’Brien

Inherited peripheral neuropathies have rarely been reported in veterinary medicine. A classification scheme for inherited peripheral neuropathies encompasses motor and sensory (mixed) neuropathies, primary sensory neuropathies, and neuropathies related to inborn errors of metabolism, including storage disorders. This review summarizes the clinical, electrophysiologic, pathologic, and genetic aspects of various inherited neuropathies in dogs and cats.

Motor Neuron Disease: Inherited and Acquired
Natasha Olby

Motor neuron diseases are rare and frequently fatal disorders of the motor neurons of the spinal cord and brain stem that may be acquired or inherited.

Malignant Hyperthermia: A Syndrome not a Disease
David B. Brunson and Kirk J. Hogan

Malignant hyperthermia (MH) is not a single disease but a clinical syndrome characterized by progressive increases in PaCO₂, elevated body temperature, cardiac arrhythmias, hyperkalemia, and muscle necrosis. The recent discovery of a mutation in dogs illuminates the complexity of this disorder in veterinary medicine. Veterinarians need to increase the vigilance and level of monitoring of anesthetized animals so as to diagnose these disorders. The use of end-tidal carbon dioxide and core body temperature monitoring enables diagnosis and treatment. Elevations in carbon dioxide and body temperature need not be excessive to indicate an MH syndrome reaction. Cases in which carbon dioxide is persistently elevated despite aggressive ventilatory support and core body temperature elevates during general anesthesia should be viewed as positive MH cases until proven to the contrary. With appropriate treatment, complete recovery is expected. After an MH event, the animal should be able to return to normal activities and live a normal quality of life.

Tremor, Fasciculations, and Movement Disorders
Michael Podell

Abnormal involuntary movement (AIM) disorders are common neurologic problems in small animals. Most animals exhibit hyperkinetic uncontrolled movements that are the result of underlying cerebellar or neuromuscular diseases. Using precise historical and examination information, a well-planned diagnostic approach can be formulated. Most important for the clinician is the ability to discern if a primary brain or neuromuscular disease is present. The use of a guiding algorithm has been presented to aid in this
decision-making process. Advanced diagnostic testing with electrodiagnostic testing or biopsy of the peripheral nervous system or imaging or cerebrospinal fluid analysis of the central nervous system is critical in the definitive diagnosis of many of the diseases associated with AIMs in small animals. Fortunately, with proper diagnostic testing that leads to appropriate treatment strategies, many animals suffering from these often unusual problems can go on to lead quality lives.

Paraneoplastic Neuromuscular Disorders 1453
Karen Dyer Inzana

Paraneoplastic neurologic diseases are rare. Therefore, it is often difficult to establish a true causal relation between the neoplasia and the neurologic clinical signs. Almost every neurologic syndrome has been attributed to a paraneoplastic effect. When the incidence of disease is much greater in patients without cancer than in those with cancer, it becomes almost impossible to determine if the disease is ever truly a paraneoplastic phenomenon. Nevertheless, the possibility of underlying cancer should be considered in patients presented for neuromuscular disorders, especially those in which another etiology cannot be found.

Rhabdomyolysis, Myoglobinuria, and Necrotizing Myopathies 1469
G. Diane Shelton

The clinical syndrome of rhabdomyolysis is composed of acute muscle necrosis with swollen painful muscles (myalgia), limb weakness or collapse, markedly elevated creatine kinase concentration, and dark “coca-cola”–colored urine (myoglobinuria). Rhabdomyolysis literally means “disintegration or dissolution of skeletal muscle, associated with excretion of myoglobin in the urine.” Early recognition of this syndrome is critical, because myoglobinuria may result in acute renal failure with potentially life-threatening metabolic derangements.

Muscle Pain, Cramps, and Hypertonicity 1483
G. Diane Shelton

New clinical syndromes involving presumed muscle pain (myalgia), cramps, and hypertonicity are being recognized in veterinary medicine, but there are few published reports. In general, these have been breed specific and still poorly described. The aim of this article is to give a brief introduction to the concepts of myalgia, cramps, and hypertonicity and to present new clinical syndromes with specific breed predilections. It is the hope of this author that this introduction will alert clinicians to these interesting syndromes and stimulate interest for further exploration.
Newly Identified Neuromuscular Disorders
Scott J. Schatzberg and G. Diane Shelton

Since the publication of the first issue in this series on neuromuscular diseases, several new disorders have been identified and important information has been learned on previously described disorders. With the advent of newer diagnostic techniques and increased recognition of the neuromuscular phenotype by veterinarians, the list continues to grow. This article focuses on the continually expanding spectrum of muscular dystrophies, recently identified nondystrophic myopathies with cytoarchitectural abnormalities, new peripheral neuropathies, and important new information on canine inflammatory myopathies.

Therapeutic Options for Neuromuscular Diseases
Marc Kent

The most important aspect of optimizing therapy for neuromuscular disease is establishing a definitive diagnosis. The first step in this process is to make a correct neuroanatomic diagnosis. After this, histopathologic assessment of muscle and nerve specimens can provide a definitive etiology. Even when an etiology is not identified, muscle and nerve biopsy samples can help to define therapy. A thorough knowledge of the mechanism of action and side effects of various therapeutics is essential in outlining a course of therapy. In the future, clinical investigation may help to define more rational approaches to therapy for neuromuscular disease.

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