



Neuromuscular disorders in pets can be very frightening for owners. Apparently healthy animals may collapse at exercise or become paralysed over a period of a few hours for no apparent reason. An accurate diagnosis is important as, with appropriate early treatment, many conditions can be managed such that the animal makes a full recovery over time.

What is the neuromuscular system?

The nervous system is divided into the central nervous system (brain and spinal cord) and peripheral nervous system (or '*neuromuscular system*' which is composed of nerves and muscles). In the neuromuscular system nerves (the so called peripheral nerves) come from the spinal cord to control the muscles of the limbs. The junction between the peripheral nerve and the muscles is called the neuromuscular junction.

What does the neuromuscular system do?

The neuromuscular system is essential for any activity involving voluntary movement of the body (standing up, walking, running, chewing or swallowing etc). Each muscle in the body is controlled by its own peripheral nerve. In order to move a leg the brain sends a command signal down the spinal cord and activates a peripheral nerve to pass the message on to the appropriate muscles in the leg.

How do nerves transmit messages?

A signal travels along the nerve as an electrical current. This is called an 'electrical impulse'. When the electrical impulse reaches the end of the nerve, the signal must be conveyed to the muscle to make it move. There is a gap between the nerve and the muscle (called the 'neuromuscular junction'). The electrical signal can only bridge this gap by use of messenger. A chemical messenger called acetylcholine bridges this gap. When the messenger is released from the end of the nerve, it flows across the gap and fixes itself to a receptor on the muscle causing the muscle to move. If there is something wrong with the transmission of signals from the nerve to the muscle we call this a 'neuromuscular disorder'. The problem can be caused by a failure of the electrical nerve impulse to be conveyed by the nerve (disease of the nerve or 'neuropathy'), failure of the chemical messenger to bridge the gap between the nerve and the muscle (disease of the neuromuscular junction or 'junctionopathy') or failure of the muscle to contract (disease of the muscle or 'myopathy').

What are the signs of a neuromuscular disorder?

Dogs or cats with neuromuscular disorders present with varying degrees of muscle weakness and loss of muscle mass. If this muscle weakness affects the limbs the animal may be unable to stand or exercise normally. In a mild form, the muscle weakness may only be intermittent and be triggered by exercise. This weakness might affect all four legs or only the back legs. Often when an affected animal starts to exercise they have a short stride and stiff gait with muscle tremors which then progress to weakness or collapse if they continue to exercise. In the most severe forms, neuromuscular disorders may completely paralyse the animal, making it unable to support its own weight, hold its head up and even to have difficulty breathing due to involvement of the muscles of the chest wall and diaphragm.

These disorders can also affect other muscles in the body. The muscles of the throat or the oesophagus (the tube carrying food from the mouth to the stomach) can also be affected in some types of neuromuscular disorder. If these muscles are weak, affected animals may have problems swallowing and often bring back food after eating.

What diseases affect the neuromuscular system?

A large number of diseases can affect the neuromuscular system. They can be divided into diseases that directly affect the various components of the neuromuscular system (peripheral nerves, neuromuscular junction or muscle) and diseases somewhere else in the body that have an indirect effect on the function of the neuromuscular system.

Certain hormonal diseases (including an under-active thyroid gland or diabetes), some cancers, kidney disease, heart disease and lung disease can all cause disorders of the neuromuscular system by an indirect route.

Neuromuscular disorders



Diseases that directly affect the various components of the neuromuscular system include infectious diseases (particularly toxoplasmosis, neosporosis, botulism or tetanus), immune-diseases causing inflammation of the muscle (myositis), inflammation of the nerve or destruction of the muscle receptors (myasthenia gravis), toxic diseases, inherited diseases and degenerative diseases.

How can neuromuscular diseases be investigated?

If your vet suspects that your pet might have a neuromuscular disease they will first want to eliminate diseases elsewhere in the body. This may include doing a complete blood profile, X-rays of the chest and abdomen and abdominal ultrasound.

An electromyogram (EMG) is a specialist test that can be done to confirm that the problem is arising from the neuromuscular junction. An EMG machine delivers a small electrical stimulation to an individual nerve or muscle in an anaesthetised animal. Using an EMG machine a vet can evaluate how well the muscles respond to stimulation from the nerves. If there is a suspicion of disease affecting the junction between nerve and muscle such as myasthenia gravis, a blood test looking for antibodies to the acetylcholine receptor may be considered. Another test to aid the diagnosis of myasthenia gravis is a 'Tensilon test' - in this test a short-acting antidote to myasthenia gravis (Tensilon) is injected into a vein. In affected animals there will be a dramatic increase in muscle strength immediately after injection and collapsed animals may get up and run about (however the effects wear off after a few minutes). A spinal tap may be considered at this stage of the investigation to look for an inflammation of the root of the nerve (polyradiculoneuritis).

If the preliminary tests fail to identify a cause of the problem, it may be necessary to take a biopsy of the nerve and muscle to determine if the problem is caused by an inflammation or a degeneration. This degeneration can be transient and of unknown origin (such as distal denervating disease or chronic relapsing demyelinating neuropathy) while others may be permanent and slowly progressive (inherited neuropathy or myopathy such as muscular dystrophy).

Can neuromuscular disorders be treated?

Treatment and prognosis of neuromuscular disorders directly depend on their primary cause. Some conditions carry a poor prognosis such as neuromuscular disorders caused by cancer, inherited neuropathy or inherited myopathy. Other conditions have a good prognosis with adequate treatment (myositis, myasthenia gravis, distal denervating disease, under-active thyroid gland and most forms of polyradiculoneuritis). It is important to remember that patience is important - a quick fix is unlikely in the treatment of neuromuscular disorders and in some conditions it may be weeks before any improvement is seen (even in animals which go on to recover completely).

If you want any other information on health issues concerning your cat please contact Unicorn Vets on 023 8034 3434 and we will be happy to advise you.