

## Equine Functional Electrical Stimulation (FES)

An established human therapy helps horses as well

For decades, practitioners have used electrotherapy devices for rehabilitation purposes in human medicine. Now veterinarians are using them with increasing frequency as well. Not to be confused with electroshock therapy, electrotherapy devices are a group of instruments, including functional electrical stimulators, that are used to stimulate sensory nerves and muscles following injury or dysfunction.

### ELECTROTHERAPY DEVICES: AN OVERVIEW

Functional electrical stimulation (FES) is one type of electrotherapy available to equine practitioners for rehabilitation purposes. FES is classified as a neuromuscular electrical stimulator because it stimulates the motor nerves responsible for muscle function, as well as the sensory nerves that are responsible for the senses, such as the sense of pain.<sup>1-3</sup>

The goal is to produce a smooth contraction and relaxation of both superficial and deep muscle groups that mimic a “real” muscle contraction and relaxation cycle (hence producing “functional” movement), which helps damaged sensory nerve and muscle fibers heal, returning the muscle to a healthy state.

Normally, a muscle contraction is produced by an electrical signal generated in the brain. That electrical wave travels down the nerves in the spinal cord to peripheral nerves that run from the spinal cord to a muscle. The electrical current then passes from the motor nerve in the muscle to the muscle fibers, causing the muscle to contract and relax.

#### Fast Fact

*Cardiac pacemakers used in humans to help hearts beat with a normal rate and rhythm are a well-known type of FES.*

Following injury, surgery, or some other type of dysfunction, the electrical pathway can become disrupted, causing abnormal muscle contractions (spasm) and relaxations (atrophy) that can manifest as tight or locked

muscles, pain, muscle wasting, and poor performance.

When used appropriately, FES can cause muscle contractions that result in coordinated limb movements of tendons, ligaments, and even joints.<sup>2</sup>

FES units are small and portable, making treatment in horses relatively easy. The practitioner places surface electrodes on the skin over the area of interest (e.g., the target muscle groups), and the unit delivers the desired intensity for a specified period of time.

Benefits of neuromuscular electrical stimulators such as FES reportedly include the following<sup>1</sup>:

- Pain relief by decreasing muscle spasticity;
- Improved range of motion by decreasing muscle tension;
- Reduced swelling following an injury;
- Reduced scar tissue formation during the healing process;
- “Re-educated” muscles following injury to prevent re-injury;
- Strengthened muscles;
- Reversed muscle wasting; and
- Decreased rehabilitation times after injury or surgery.



Functional electrical stimulation (FES) is one of many types of electrotherapy devices available to equine practitioners for rehabilitation purposes.

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### FES IN HUMAN MEDICINE

In addition to cardiac pacemakers, FES is widely used for stroke patients that have residual paralysis to improve bladder control; in patients following anterior cruciate ligament injuries of the knee and total knee replacements; multiple sclerosis and cerebral palsy sufferers; and spinal cord injury patients, among others. Because physicians and physical therapists have used FES since the early 1970s for a variety of therapy applications, research supporting its use in humans with a variety of ailments is widespread.

### EQUINE FES STUDIES

Researchers have not yet widely studied FES, and evidence supporting FES remains largely subjective and reliant on testimonials. For example, anecdotally veterinarians have used FES in horses with back pain (thoracic, lumbar, sacroiliac, etc.), muscle spasms, osteoarthritis, previous injuries such as shoulder fractures, and to alleviate muscle imbalance, among others, including the catch-all “poor performance.” Presently, FES studies include:

**FES is used in horses with back pain (thoracic, lumbar, sacroiliac, etc.), muscle spasms, osteoarthritis, previous injuries such as shoulder fractures, and to alleviate muscle imbalance, among others, including the catch-all “poor performance.”**

1. **Muscle spasticity.** In one retrospective study, 241 horses diagnosed with dorsal epaxial muscle (the muscles running along the spine) problems received 1,832 FES treatments. All but two of these horses were used for riding—primarily dressage and jumping but also cutting, reining, Western pleasure, and trail riding. The group’s most common diagnosis included lumbar and sacroiliac pain (221 horses), and most horses weren’t specifically lame but had decreased performance. Horses received a minimum of two to four separate FES treatments, and 50% of the horses had more than five FES treatments. In addition, 30% of clients used FES  $\geq 10$  times because “... they determined that the treatments were beneficial to the continued progress and comfort of their horses even after the initial spasm was resolved.” The owners

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also noted that "... the horses felt looser, more willing to move forward, more up in the back, steadier, and smoother with their stride." Only eight owners included in the study saw no changes in their horse after FES, and no client reported that their horse got worse.<sup>2</sup>

2. **Laryngeal paralysis (roaring).** Approximately 8% of horses suffer from "roaring," which is caused by paralysis of the left recurrent laryngeal nerve. In turn, the left arytenoid cartilage, which is part of the larynx, is paralyzed, meaning that it doesn't retract or "abduct" during exercise, preventing enough air from reaching the lungs. With too little air, the horse's muscles can't generate enough energy to contract and function properly, resulting in poor performance. Surgery is one means of treating roaring, but the success rate

**The study authors concluded that stimulation of the posterior cricoarytenoid muscle improved arytenoid abduction in horses even during strenuous exercise.<sup>4,5</sup>**

is only about 50%. To identify a more successful alternative, Jon Cheetham, VetMB, PhD, Dipl. ACVS, and colleagues from Cornell University's College of Veterinary Medicine, used FES in six horses. They used FES to stimulate the horses' left posterior cricoarytenoid muscle, which is usually stimulated by the left recurrent laryngeal nerve to abduct the arytenoid cartilage. They then measured abduction of the arytenoid cartilage during exercise on a high-speed treadmill using a video endoscope. The study authors concluded that FES stimulation of the posterior cricoarytenoid muscle improved arytenoid abduction in horses even during strenuous exercise.<sup>4,5</sup>

## SHOPPING FOR AN FES UNIT

Overall, horses appear to tolerate FES well. Experts in the field encourage owners and veterinarians interested in FES to choose their instrument wisely, because not all units are the same, some are combination units, and not all systems are capable of generating the controlled muscular contraction and relaxation of both deep and superficial muscles that reportedly benefit horses. The "wrong" type of unit might not be tolerated by horses or produce the desired effect, thereby delaying more appropriate treatment.<sup>1</sup>

## CHOOSING AN EQUINE THERAPIST

Only accept treatment for your horse from a qualified individual and only after a veterinarian has examined your horse and made a diagnosis. A number of veterinary medicine colleges have rehabilitation centers/mobile services, and the American Veterinary Medical Association and American College of Veterinary Sports Medicine and Rehabilitation (acvsmr.org) have supported this field since 2010.<sup>6</sup>

### Key References

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**When controlled, symmetrical and precise movement is beneficial for healing, FES is the solution.**

Decades of research has documented the successful use of FES to:

- Strengthen muscle
- Reduce muscle spasms and atrophy
- Improve symmetry
- Stimulate deep muscle tissue
- Comfortable
- Safe
- Compliments other treatment options



*"I am using FES for horses with muscle spasms and atrophy, and have found the technology to be very useful in restoring muscle function. Horses with sore backs and necks, and those with muscle loss due to injury or surgery, are benefiting from the use of FES."*

*Dr. Philippe BENOIT  
French Olympic Team Veterinarian*

# FES

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Electrical Muscle  
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