



## Functional Electrical Stimulation Gets Muscles Moving

*This therapy targets everything from performance enhancement to pain management in the equine athlete.*

BY LINDSAY BERRETH

**E**venter Lynn Symansky had always struggled to keep a topline on her four-star horse Donner, despite proper flatwork, nutrition, and therapies like laser treatment and acupuncture. When she returned home to Middleburg, Va., from the Pau CCI\*\*\*\* (France) in 2013 after a top-15 finish, she attended a seminar at Virginia Equine Imaging and learned about a new therapy: functional electrical stimulation.

A year later, it's safe to say Symansky is a believer. Donner has developed the topline Symansky always dreamed of, and he's stronger and healthier.

"I knew not a lot of people had done it before, and I wanted to make sure it was in his best interest," she said. "There was no guarantee it was going to work or not, but I was intrigued. It made a huge difference on him."

FES is one of many electrotherapies, including transcutaneous electrical nerve stimulation (TENS), electroacupuncture and microcurrent, used on horses for rehabilitation and perfor-

**Functional electrical stimulation has become a popular way to treat both performance horses and those rehabbing from injuries.** DUSTY PERIN PHOTO

mance enhancement.

Electrotherapies have been used in humans since the 1960s to manage pain, improve range of motion, and reverse muscle wasting, but various studies have come up with different answers as to whether their use has a tangible benefit to patients.

The same can be said about use in horses, but nevertheless, electrostimulation therapies, most recently FES, have become increasingly popular in the recovery and maintenance of top equine athletes.

### What Is FES?

Electrical stimulation is thought to encourage muscles to contract and relax, increase blood flow, and stimulate nerves to decrease pain.

A popular unit for use in horses and humans is a TENS machine, which can assist with pain relief. The unit produces

an analgesic affect when applied, but typically the sensation is short lived.

TENS machines were developed for humans based on the gate-control theory of pain developed by Ronald Melzack and Patrick D. Wall in 1965, which states that pain transmission can be stopped when the “gate” is closed. A TENS machine sends an electrical impulse to confuse the pathway of the pain sensation by “gating” it, but more recent research shows that the body deals with pain in many ways.

TENS can remove pain temporarily by affecting the sensory nerves, but it doesn't help with the cause of the pain.

In contrast, FES accesses both sensory and motor nerves, which control muscles, by using electrical waves to stimulate them and create a motor neuron response.

“Electrotherapy was more of a shock—an electrical signal that caused a tremor or twitch, like today's non-FES systems,” explained Sheila Schils, Ph.D., of EquiNew LLC and one of the pioneers of FES technology in horses. “You get a vibration of the muscle, sort of like when your eye involuntarily starts to twitch. Shake a muscle, and you might be able to tremor or twitch it out of spasm, especially if it's a small muscle. Thick, heavy muscle or chronic issues need a mimic of the brain signal to cause it to contract or relax. That's a motor neuron response.”

Schils, whose education includes a Ph.D. in biomechanics and kinesiology and a master's degree in animal science, has worked extensively in the equine rehabilitation field and has been working with FES in horses since 1994. She estimates she's performed more than 4,000 treatments and helped train many equine practices on how to administer the therapy.

She believes that FES helps bring the body back to the biomechanically correct way of moving by encouraging correct contraction and relaxation of muscle movement.

“If you have a repetitive incorrect movement, that's where the majority of injuries occur,” she said. “Rarely is it one bad step. Eventually the body just can't handle it anymore, and it breaks.”

She said using FES as a performance enhancement in conjunction with proper training can help everything from gait

abnormalities to muscle tone.

“When you have an injury, or even for performance enhancement, you're going to have muscles that are overused and muscles that are underused,” Schils said. “What we try to do with our riding exercise is to try to bring a horse into symmetry the best we can. If you look down to the bottom line of riding, if a horse is symmetrical and can do flying lead changes, do canter pirouettes, or approach a jump and land on the right or left lead, those are athletes that have a greater chance of not only success, but longevity. When you start looking at how to return the horses to symmetry through your riding, if you've got a core muscle spasm the muscles can be very protected by the body, and trying to access that is very difficult.”

FES can reach deeper into large muscle groups than other electrotherapies because of the computer-generated signal it uses. Horses tend to tolerate it better because the voltage is low—about 10 volts—compared to up to 120 that a TENS machine can create.

To use an FES machine, a veterinarian will place a pad, usually with six electrodes, over targeted muscle groups. He can simulate correct muscle contraction and relaxation using the computer-generated signals that connect to the pad via wires. The signal reaches six to eight inches below the surface.

Most horses relax once they realize the muscle movement that the machine creates feels natural, and many fall asleep since it feels like a deep tissue massage.

Treatment lasts about 35 minutes, and Schils usually recommends two treatments 12 to 48 hours apart, followed up by another treatment in two to four weeks, then as needed.

She always consults with a treating veterinarian before beginning FES.

“It's not unlike taking riding lessons.

When you're trying to learn something, it's better to take a couple of lessons right close, back to back, instead of a lesson in January and a lesson in May,” she explained. “It's better to take a lesson on a Monday and a lesson on a Wednesday. Then work on your own a little bit and ideally come back to take another lesson. Keep expanding the time out, and that's very similar to the gold standard of FES treatment.”

Schils typically sees improvement in the horse's movement and muscle mass after the first month.

“The rider is such an important part of this work,” she said. “Any performance enhancing work sets the stage for the rider to do their job better. It doesn't fix the horse—the rider and the work performance does. I get them symmetrical and moving again in areas that were locked, then the rider comes in and puts that muscle memory on that they need to do their job. The relief that these horses feel when that spasm [for instance] goes away is not unlike when you have a knot in your neck, and you work it out. You feel happier, you can do your job better, and it reciprocates into everything.”

Because the application of FES in horses is relatively new, Schils says there aren't many studies to show how effective it is, but she's leading the charge.

She's written numerous papers, including one with Dr. Tracy Turner of Anoka Equine Clinic in Elk River, Minn., that studied 241 clinical cases and utilized more than 1,800 FES treatments to alleviate muscle



**An FES machine delivers computer-generated signals that mimic the body's natural muscle contraction and relaxation.**  
PHOTO COURTESY OF SHEILA SCHILS

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### ▶ Other Common Electrotherapies For Horses

- **Transcutaneous Electrical Nerve Stimulators (TENS)** – These small handheld units are used to decrease pain by sending electrical signals to confuse pain pathways and block the sensation of pain. They stimulate only sensory nerves and must be used with caution so as not to surprise a sensitive horse or one not used to the treatment. They are often used for electroacupuncture and for post-surgical pain.
- **Microcurrent Electrical Stimulators** – These units emit low-amplitude currents to simulate the weak electrical currents produced by tissue healing. They do not activate nerve or muscle tissue because of the low amplitude, so the horse doesn't feel a tingling sensation. They're used to help reduce recovery time using a soothing treatment.
- **Inferential Electrotherapy** – This is an alternative to TENS for suppressing pain by stimulating nerves. It combines two higher frequency waveforms to create an interference pattern for sensory stimulation. It can reach deeper into the skin than TENS units.
- **Galvanic Muscle Stimulators** – These are often used to transmit medications through the skin by iontophoresis. They generate a low-voltage electrical signal transmitted in one direction. They can cause tissue trauma if used excessively. These units were one of the first stimulators used for horses in the 1960s and reached their peak popularity in the 1970s.



Sheila Schils is a pioneer of FES technology in horses and has conducted numerous studies showing its benefit for everything from building muscle to managing pain.  
PHELPS MEDIA GROUP PHOTO

spasms. Almost 80 percent of the horses showed a Grade 1 out of 4 improvement in muscle spasms after two FES treatments, based on the Modified Ashworth Scale, a scale used in humans to determine the initial level of muscle spasm and to grade changes after the treatment. Sixty percent of horses showed sustained improvement for a minimum of two months.

Schils recently sent muscle biopsy samples from before and after eight weeks of FES treatment on a group of six horses to an independent lab of scientists at the University of Padova in Italy who were familiar with the use of FES in human patients. They found that FES was a safe and effective treatment for horses with epaxial muscle spasms and that several of the horses showed an improvement in spasms.

### Overcoming Injury And Muscle Weakness

"It's a hard thing to study," said Tim Ober DVM, who's utilized FES therapy for his clients for about three years. "There are papers out there in human literature for sure, but I would say it's a matter of clinical impression that's convinced me. I was satisfied with the safety question with the human information available and from seeing it work. The only tool to convince myself was seeing how individual horses responded. We use it as an adjunct therapy for most circumstances. I think of the FES as a therapy tool that follows our treatment

to help get the most from the treatment."

Ober, who's also the U.S. show jumping team veterinarian, had experience with electroacupuncture, but he's found that FES is useful after administering a therapy to areas like the back, neck and sacroiliac region.

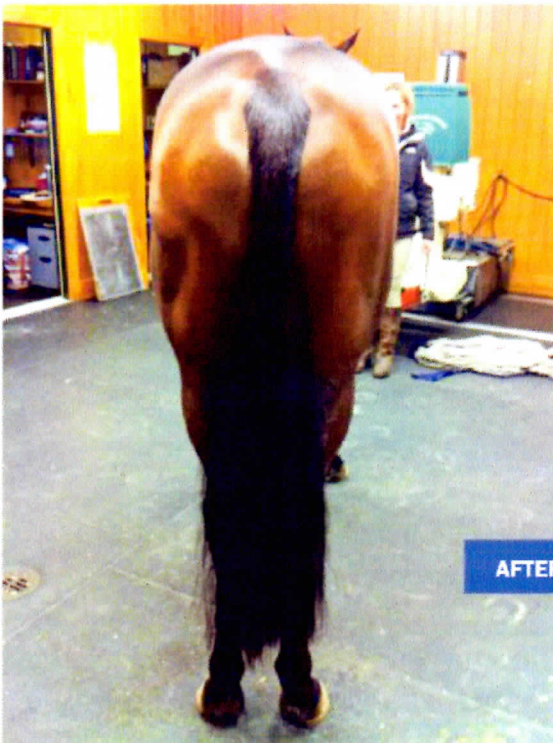
"I knew that we could do better with some horses than we were doing with conventional treatment," he said. "We were missing that way to impact the muscle directly. Two of the more common uses are for neck and back problems, specifically a horse that's got long term immobility in their sacroiliac joint—they don't recruit the muscles surrounding their pelvis normally. They either have a lack of engagement of a muscle group or a spasm of a muscle group, particularly lower lumbar muscles will often be in spasm as a result of a horse trying to hold themselves around sacroiliac pain. When we treat the sacroiliac problem, we'll often follow with FES therapy with the goal of helping get the lumbar muscle out of spasm more quickly as we treat the sacroiliac joint and get the horse more normalized."

Dr. Mark Revenaugh, DVM, of Northwest Equine Performance in Mulino, Ore., isn't currently using FES, but he was familiar with Symansky and Donner's case when he was head of the Land Rover U.S. Eventing Team's veterinary panel last year.

He sees promise in the use of FES to treat horses that need to develop muscle,



After completing two four-stars in 2013, Lynn Symansky's Donner had lost some weight and muscling, and Symansky had struggled with his topline muscling throughout the year. PHOTOS COURTESY OF LYNN SYMANSKY



Six weeks later, after several FES treatments and diligent flat work, Donner's hindquarters and topline developed muscling that surprised Symansky and her veterinarian, Dr. Susan Johns. PHOTOS COURTESY OF LYNN SYMANSKY

but for the moment he's content using therapies such as electroacupuncture and other noninvasive therapies with which he's more familiar.

"It's difficult because there are so many options," he said. "When a horse is under our care, we have a certain group of therapies we like to try first that we're pretty comfortable with. If I had an FES, I would probably use it, honestly.

"[FES] certainly seems to help horses that are struggling to get a topline get it," he continued. "These are horses that we've tried the other things in our toolbox and not really gotten that far. I think it's a real viable tool, and I love the idea of developing the strength of a horse without asking a lot of the horse to get stronger. Sometimes in the process of doing that, you break down other struc-

tures, or you injure the back. This is a way of developing the topline without putting a lot of wear and tear on the horse."

He noted that his practice is in contact with human therapists on a regular basis and has been trying to integrate their mindset into how to get a horse's back strong and supple. He's also intrigued about using therapies like

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**FES treatment is more relaxing to horses than traditional electrostimulation therapies like TENS or electroacupuncture.**

DUSTY PERIN PHOTO

the sensation of FES,” said Johns. “It basically mimics the body’s natural motor neuron response, so it feels like voluntary

FES to treat around a joint.

“It’s a big area in human sports medicine,” he said. “We focus on, ‘Well, that joint is sore, so what do you do?’ Well, you treat the joint. That’s usually successful, but if you go backwards a couple of steps, at least in people, a lot of times the joint is sore because the structures around it are not as symmetrical as they should be—as in musculature. The joint’s not being used properly, and it’s not as stable as it should be, so the joint gets sore as a result.”

### Donner’s Case

Donner is a sensitive Thoroughbred, and Symansky and her veterinarian, Susan Johns, DVM, CVA of Virginia Equine Imaging, have to be careful when administering alternative therapies.

“He has a bit of a quirky personality and can be a bit of a challenge to work on from a veterinary standpoint,” said Johns. “His neck and back have always been a concern to us because he had signs of muscle atrophy along his topline. Although he can do his job really well, we always felt like there was potential to make him better, specifically topline muscular development. Things like acupuncture and more invasive technologies can be done a couple of times a year, but we wanted something to do on a more regular basis.”

Johns and her colleagues at VEI started using FES treatment after Schils gave a seminar and spent two days at the clinic doing detailed training.

Donner was evaluated during the seminar, and with six months of downtime ahead of him after completing Pau, Johns and Symansky decided they’d give FES a try. Symansky also tried the treatment on a lower-level horse.

“The horses are really willing to accept

muscle contractions to the horse. He seems to really enjoy it. It just gives us another tool in the toolbox for horses to develop topline musculature and improve their performance.”

Donner received two treatments over his sacroiliac region and back within 24 hours, and Symansky was instructed to work him lightly on the flat after that. He then received a treatment about once every two weeks for most of 2014.

“In the beginning, I noticed he would get a little bit stiff and tighter,” said Symansky. “The biggest thing I noticed was in his hind end. He would get very up and down in his canter, which isn’t necessarily a good thing, but for him, in the end, it was a great thing because it taught him how to sit more.

“He actually felt worse before he felt better,” she continued. “Not that he was in pain, but I think they’re trying to get used to their new body. He felt stuck in his neck and tight behind, and I’d been told that would maybe happen. You just keep them moving until they figure it out. After the first few sessions, he started feeling better right off the bat. Now, I wouldn’t notice if he’d had it the day before.”

Since Donner was the first high performance horse on whom Johns had tried FES, she wasn’t sure what to expect, but she and Symansky saw improvement in the gelding’s muscle tone and topline strength within the first month.

“I was not expecting to see it so quickly, and I really had to go back and look at the pictures on our phone that we had taken of him prior to the start of therapy,” said Johns. “I was surprised how well he tolerated it from the get-go. You actually see the results fairly rapidly. A lot of the time when we do more inva-

sive techniques like ultrasound-guided SI or back injections, I tell the client they may not see improvement in the horse’s muscling for 60-90 days or so. In general, we see muscle development a lot quicker with FES.”

Donner went on to compete at the 2014 Alltech FEI World Equestrian Games in France and completed the Rolex Kentucky CCI<sup>\*\*\*\*</sup> for the second time this season.

The science behind FES in horses is still new, and with the cost of each treatment ranging from \$100 to \$150, the treatment may not be for the average horse owner or skeptic of alternative therapy. But Revenaugh sees a place for the therapy in veterinary medicine.

“In our industry, it’s kind of young to say how that’s all going to play out or not,” he said. “Hard evidence is hard to get on something like this. The application of the FES in horses is primarily on axial skeleton stuff—neck and back and pelvis. That’s where the real big muscle groups are. But even that, I think there’s certainly a growing awareness that neck and back problems are affecting a horse’s performance but are not necessarily causing lameness. This is hopefully another effective tool in our toolbox.”

Symansky believes FES has helped her long-time partner feel his best and will continue to use it as she prepares for her next three-day this fall. “I don’t know if it works for every horse, but I will swear by the effect it has on him,” she said. 🍎

### ▶ Benefits Of FES

- Improves range of motion/joint mobility
- Decreases swelling
- Improves motor control and strength
- Reverses muscle wasting/atrophy
- Increases blood flow
- Decreases pain
- Reduces muscle spasms
- Gentler than other electrotherapies, but more effective on deep muscle groups