Electrical muscle stimulation is commonly used to treat athletic injuries. It is administered either by itself or along with pressure, elevation, or heat/cold modalities. Athletic therapists use these methods in various combinations to get athletes back into action as quickly as possible. Unfortunately, this can result in a hit-or-miss approach to the treatment of common musculoskeletal problems. The thought behind these modalities is that they might provide relief; however, often there is no scientific rationale for their use. When several methods are tried, the athlete gets the impression that everything possible is being done to speed up the rehabilitation process. But are we misleading the athlete, and ourselves, as to the efficacy of the treatments?

In their promotional literature and user guides, manufacturers often claim that electrical stimulation can provide everything from pain reduction, to muscle re-education, to edema reduction. When it comes to edema control, however, these claims cannot always be substantiated by the research.

Many athletic therapists learn the basics of electrotherapy during their professional education. However, the practical use of electrical stimulation methods is something they generally learn from the manufacturer or salesperson, not from the research published in refereed journals. Simple acceptance of the manufacturer's claims can lead to the perpetuation of erroneous information and ineffective use of electrical stimulation (Alon, 1989, Advances in Sports Med., vol. 2, pp. 295-323).

Research on edema prevention has used the rat or the frog to quantify the effects of electrical stimulation. Various rates of pulsed high-voltage galvanic stimulation (HVGS), or in one instance pulsed low-voltage stimulation, were applied to contusion or sprain injuries induced to rat or frog legs. In all instances both legs were traumatized but only one leg was treated, thus the animals served as their own controls.

To control for the effects of position during treatment, the animals were anesthetized with the limbs in a dependent position. Changes in limb volume due to edema were measured by volumetric water displacement to a premarked limb level. Both treated and nontreated limbs were recorded. Several studies looked at the effects of one 30-min immediate or delayed treatment and monitored the effects for 24 hrs. Other studies looked at multiple 30-min treatments and monitored the effects for 4 to 24 hrs.

Various pulse rates were used. Immersion application of HVGS was compared with direct application of the electrodes distal to the injury site. A comparison of negative (cathode) pole HVGS treatment to positive (anode) pole HVGS treatment was part of another study (Mendel & Fish, 1993, Athl. Training, vol. 8, pp. 63-94).

The results indicate that, at least in frogs and rats, HVGS current must be applied through the negative pole at a specific pulse rate. Rates other than 120 pulses per sec (pps) had no effect on acute edema formation. It was determined that treatment should begin as soon as possible after injury and continue every 4 hrs as long as edema is forming. Low-voltage current did not appear to reduce acute edema formation, nor did treatment with the HVGS positive pole (Mendel & Fish, 1993).

Another study used surface electrodes distal to the injured area instead of immersion. One 30-min treatment of HVGS at 120 pps followed an induced sprain injury in frog hind legs. Separate electrodes were placed on the plantar surface of the frogs' feet, but current was provided only through one foot, thus the animals served as their own controls. Both extremities were maintained in a dependent position throughout the treatment.

Volumetric measurements for 24 hrs showed that one 30-min treatment of negative pole HVGS via surface electrodes had no effect on acute edema (Mendel & Fish, 1993).

Michlovitz et al. looked at the use of HVGS to reduce acute edema in humans following injury (1988, *J. Orthop. Sports Phys. Ther.*, vol. 9, pp. 301-304). Volleyball players with either 1st- or 2nd-degree ankle sprains were divided into 3 groups. All patients presented to the clinic within 24 hrs of injury. All groups were fitted with a carbon electrode on either side of the injured ankle, had an ice pack wrapped around the ankle with an elastic wrap, were positioned supine with the affected extremity elevated 45°, and were treated for 30 min on 3 consecutive days.

Group 1 did not have the HVGS equipment turned on. Group 2 was treated with negative pole HVGS at 28 pps. Group 3 was treated with negative pole HVGS at 80 pps. Following 3 treatments, there were no statistically significant differences in swelling between the 3 groups.

Apparently no studies have been published on the effects of other popular currents such as interferential, biphasic, Russian, or microcurrent. Since the research on acute edema control using HVGS indicates there are strict protocols for electrode charge, pulse rate, length of treatment, and timing of treatment, other electrical currents may have similar restrictions.

Further research is needed to establish the efficacy of present electrical stimulation treatment protocols routinely used by athletic therapists to treat acute edema following injury. If the athletic therapist decides to use an electrical stimulator in order to reduce swelling from musculoskeletal injury, present research indicates the following is most likely to succeed: (a) negative pole HVGS must be applied through immersion as soon as possible after injury, and (b) treatments should last 30 min and be repeated every 4 hrs until the swelling is gone.

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**Continuing Education Assessment Answer Form**

*(see pp. 28-29)*

Fill in the circle you feel represents the best answer for each question. To receive 0.5 CEUs you must answer 14 questions correctly and mail this form by **March 8, 1996**, to: CEU Assessment Human Kinetics P.O. Box 5076 Champaign, IL 61825-5076

**Contemporary Issues in Head and Neck Injuries**

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