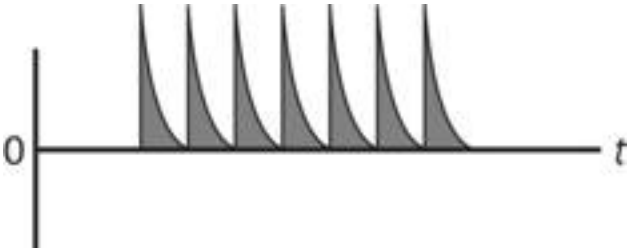
Galvanic Muscle Stimulators

Galvanic stimulators were first developed in the 1940's and became popular in the mid-1970's. Sometimes galvanic stimulators are referred to as direct current or uninterrupted direct current stimulators. The galvanic stimulator was one of the first stimulators used for horses in the early 1960's. Due to this early use, galvanic stimulators have been referred to as "the muscle stimulator" in past equine literature.



Example of Galvanic Stimulation Pattern

The waveform of galvanic devices is monophasic, meaning it has only one peak that is repeated over time. Galvanic stimulation uses direct current to create a unidirectional, continuous current.

Galvanic stimulators are used to produce ionic movement within the tissues toward one of the electrodes. This accumulation of ions to one polarity results in reflux vasodilatation due to the stimulation of the sensory nerve endings. However, the ion accumulation under the electrodes can create an unpleasant stinging sensation.

Damage to tissue, typically skin, can be caused by galvanic stimulators, even when used at low amplitudes because of the electrolytic reactions that occur when the current passes through the skin. The extent of damage is also affected by the length of time of the treatment, and the tissue impedance.

Types of Waveforms

Early models were direct current monophasic. Most current systems sold as "galvanic" devices are actually pulsed monophasic (high-voltage pulsed current stimulators).

- Monophasic
- Continuous

Clinical Considerations

The application of galvanic stimulators should not result in a sensation beneath the electrode. When used in human rehabilitation, if a tingling sensation is felt, the amplitude should be reduced and the electrode contact should be checked to make sure it is uniform. Close inspection of the skin must occur during treatment to avoid any adverse effects.

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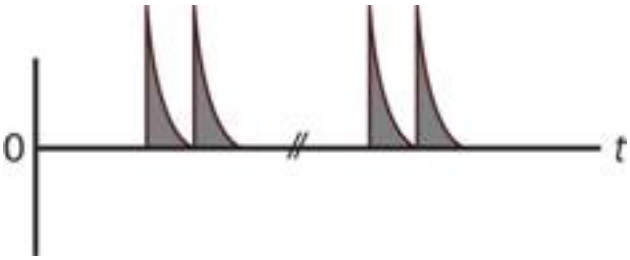
Care must be taken to observe the contact of the electrodes so that there is no irritation to the skin. Switching polarity can improve the comfort and effectiveness of these devices.

Galvanic treatments are typically performed for 15 minutes or less at amplitudes of 5.0 mA. Electrodes must be of the size that current densities do not exceed 0.1 to 0.5 mA per cm squared of electrode surface area.



Example of HVPC Stimulation Pattern

HVPC stimulators typically generate a twin-spike monophasic pulsed waveform. Due to the monophasic waveform, the output polarity does not change during stimulation. Therefore, some forms of pulsed monophasic currents can have similar chemical effects to DC. However, very short duration monophasic pulsed currents do not always produce the negative electrochemical effects on the skin. Timing between the twin spikes can be reduced so that the two waveforms overlap, giving a stronger stimulation sensation. Switches exist on some devices to allow the user to switch the polarity of the electrodes.

Types of Waveforms

- Monophasic (early models)
- Pulsed (most current models)

Amplitudes

- Line current up to 500 V
- Battery operated generally up to 300-400 V

Pulse Duration

- 50-200 microseconds

Pulse Frequency

- Frequency of 1-12 twin-spike pulses per second