



## Clinical References

### Professional Device Applications - Advantages of Integrating Tennant Biomodulator® therapy into Pain Management

- <sup>1</sup> Fisbain D, Chabal C, Abbott A, et al.. Transcutaneous electrical nerve stimulation (TENS) treatment outcome in long-term users. *Clinical Journal of Pain*. 1996;12;201-214.
- <sup>2</sup> Chabal C, Fishbain D, Weaver M, Heine L. Long-term transcutaneous electrical nerve stimulation (TENS) use: Impact on medical utilization and physical therapy costs. *Clinical Journal of Pain*. 1998;14;66-73.
- <sup>3</sup> Erd M, Erdogan A, Erbil N, et al.. Prospective, randomized, placebo-controlled study of the effect of TENS on post-thoracotomy pain and pulmonary function. *World J Surg*. 2005;29;1563-1570.
- <sup>4</sup> Bjordal J, Johnson M, Ljunggreen A.. Transcutaneous electrical nerve stimulation (TENS) can reduce postoperative analgesic consumption. A meta-analysis with assessment of optimal treatment parameters for postoperative pain. *Eur J Pain*. 2003;7;181-188.

### Home Use

- <sup>1</sup> WebMD “The Rising Incidence of Chronic Pain: Chronic pain comes at a cost – from lost wages to social stigma. You don’t have to pay the price.” R. Morgan Griffin, Reviewed by Ephraim K. Brenman DO August 15, 2007 (Article link: <http://www.webmd.com/pain-management/chronic-back-pain/cost-ofpain? page=3>)
- <sup>2</sup> Cheng, Ngok MD. “The Effect of Electric Currents on ATP Generation, Protein Synthesis and Membrane Transport in Rat Skin” in *Clinical Orthopedics* volume 171: pages 264-272. (1982) Direct electric currents ranging from 10 microA to 1000 microA increase ATP concentrations in the tissue and stimulate amino acid incorporation into living proteins of skin. The amino acid transport through the cell membrane, followed by the alpha-aminoisobutyric acid uptake, is stimulated between 100 microA and 750 microA. The stimulatory effects on ATP production and on amino acid transport, apparently mediated by different mechanisms, contribute to the final increased protein synthesizing activity. DNA metabolism followed by thymidine incorporation remains unaffected during the course of current application. The effects on ATP production can be explained by proton movements on the basis of the chemiosmotic theory of Mitchell, while the transport functions are controlled by modification in the electrical gradients across the membranes.