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Short Communication

Low-Level Microcurrent Device System for Recovery Benefits

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Introduction

Microcurrent is an interesting technology purported to provide a variety of consumer benefits. Devices delivering low-level microcurrent have historically been applied for use in skin, bringing about visible improvements in skin condition [1]. Additionally, TENS currents have been used to provide relief to various types of pain, such as muscle ache, arthritis etc. [2]. While historically this has been done during physical therapy type services, at-home versions are now available. Given these diverse applications of microcurrent technology, we wondered if there was application for a hand-held, low level microcurrent to potentially provide overall wellness benefits, particularly the potential of the technology to assist in recovery following exercise as well as with feelings of relaxation. In fact, could there be a multifunctional device that could provide benefits for skin as well as muscle relief?

To test our hypothesis, we conducted a two-week evaluation on the ability of a hand-held microcurrent device system (also developed to provide skin benefits) to impact the feelings of recovery in individuals who are moderately to highly active. This study was commissioned at a contract research organization (Princeton Consumer Research, Chelmsford, Essex, UK). Male and female subjects (n=32) between the ages of 25 and 60 years old who work out or exercise four or more times per week were recruited. They used a microcurrent device system that included a modulated, charge balanced biphasic pulsing microcurrent (up to 640 μA) with a gel topical formulated for recovery benefits four times per week on three different muscle groups. The system was used on each muscle group (whether it be right or left gastrocnemius, quadricep, hamstring, biceps, triceps, deltoids, etc.) for one minute in a light massage motion. Subjects were asked a series of questions after the first use and after two weeks of using the device system that focused on their feelings of recovery. The results (Table 1) are depicted as percent of subjects who agreed, were highly favorable after a single use and after two weeks of system use.

Table 1: Percentage of Positive Responses.

	One use	Week 2
'The product system helps support overall health and well-being.'	91%	100%
'Provides a post-workout massage helping to relax sore (tired) muscles and promote muscle recovery.'	84%	97%
'Helps my body feel recovered and relaxed.'	91%	97%
'Alleviate muscle pain after workout and helps increase mobility.'	88%	100%
'Helps to reduce muscle tension.'	100%	100%

(Table 1) demonstrates that subjects self-perceived the device to provide wellness benefits. Given the positive outcomes of the study, we wanted to elucidate some of the physiological mechanisms which might be contributing to these benefits. Different potential mechanisms could likely be at play, and here we present some preliminary data as they relate to explaining the observed benefits of using a pulsing, biphasic microcurrent application.

Given the potential of microcurrents to utilize a pulsing waveform to distill physical vibration, we investigated the gene expression changes by this application on nitric oxide (NO) pathways. Release of NO can lead to vasodilation [3] which could enhance recovery from work outs. We identified, using human EpiDerm Full Thickness tissues, changes in gene expression associated with the nitric oxide pathway and angiogenesis after application of a biphasic, charge balanced pulsing microcurrent with inert gel over untreated tissue. Genes such as NOS1, NOA1, VEGFA, VEGFC, HYOU1 and HIF3Aall had more than a four-fold change (upregulated) in the transcriptome array. This aligns with the commonly held understanding that vibration, this time via a pulsing microcurrent, can stimulate nitric oxide and/or vasodilation.

In other in vitro work the impact of the low-level biphasic pulsing biphasic microcurrent was applied to adult human fibroblasts cell cultures to explore the impacts of on a subset of genes that included TFB1M. This gene is involved in mitochondrial biogenesis [4]. The current had a 1.74-fold change. This work coincides with research and work [5] put forward pointing out that low-level microcurrent applications can stimulate mitochondrial biogenesis via ATP production and/or resynthesis.

Another pathway could be increased microcirculation. Using polarized hyperspectral imaging via SpectraCam®, changes in skin oxygenation and hemoglobin were evaluated after treatment with the microcurrent device system. Comparing the pre- and post-use of the system (n=29) on the hamstring area there was a decrease in oxygen saturation and hemoglobin concentration and a corresponding increase in deoxygenated hemoglobin. This exchange illustrates a stimulation of microcirculation and nutrient transportation. Similarly in a small pilot study (n=3) using Optical Coherence Tomography (OCT) angiograph imaging again on the hamstring area before and after use illustrated improved vascular flow.

Individuals are continuing to look for simple, non-invasive, yet holistic practices that can fulfill a variety of needs. In this piece, we suggested that a microcurrent device can do more than just provide skin care benefits but can also provide overall wellness benefits such as improved cellular function, muscle recovery, relaxation and overall sense of wellbeing. We also offer up some potential physiological pathways through which this might be happening. The use of microcurrents is an interesting area and could be studied further to elucidate and refine their benefits.

Acknowledgement

None.

Conflict of Interest

No Conflict of Interest.

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