

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Biology in Space (7)

Author: Ms. Lisa Anderson-Antle

National Aeronautics and Space Administration (NASA) / University of Wisconsin-Milwaukee, College of
Nursing, United States, andersonantle.l@gmail.com

Dr. Ruth Globus

National Aeronautics and Space Administration (NASA)/Ames Research Center, United States,
Ruth.K.Globus@nasa.govEFFECTS OF PHOTOBIMODULATION IN OSTEOCLAST FORMATION IN VITRO: A PILOT
STUDY**Abstract**

Introduction: Near-Infrared Light Emitting Diode (NIR-LED) photobiomodulation has been found to be effective in improving wound healing, bone regeneration, mitochondrial function, and attenuating cellular oxidative stress. Little is known regarding the use of NIR-LED and formation of osteoclasts, which break down bone. **Purpose:** Determine if the use of NIR-LED 670nm photobiomodulation attenuates or amplifies osteoclast differentiation in the RAW264.7 cell line. **Methods:** RAW264.7 cells were cultured for 24 hours and induced to differentiate into osteoclasts, using the cytokine, RANKL. Cultures were divided into groups according to RANKL dose (0, 2.5, 10, 25, 50 ng/ml), and different energy densities (2.25, 4.5, 45 J/cm²), treated with light either once or on four consecutive days using the WARP™ 75 (Quantum Devices, Barneveld, WI). Osteoclasts were stained for Tartrate-Resistant Acid Phosphatase (TRAP). **Analysis:** Multinucleated, TRAP+ cells were scored as osteoclasts, counted manually by microscopy. Results were expressed as means and standard deviations and groups were compared. **Results:** RANKL-induced osteoclast formation by RAW264.7 cells occurred as expected in all experiments. Light-treatment alone had no observable effect. Single light treatment at a 4.5 J/cm² with RANKL added (10 – 50ng/ml) suggests an amplification of osteoclastogenesis, as multiple light treatments suggests attenuation of osteoclastogenesis. **Conclusion:** The effects of the NIR-LED treatment on osteoclastogenesis are RANKL dose and light intensity-specific. We conclude, as hypothesized, that NIR-LED light-treatment may impair RANKL-induced osteoclastogenesis, particularly when using multiple light treatments.