Contribution ID: **66** Type: **Oral Presentation**

Photobiomodulation activates the JAK/STAT signaling pathway in diabetic wounded cells in vitro

Thursday, 6 July 2017 10:20 (20 minutes)

The Janus Kinase/Signal Transducer and Activator of Transcription (JAK/STAT) signaling pathway consists of four JAK and seven STAT family members. It is involved in the transmission of external signals via receptors to the nucleus, resulting in transcription and downstream events such as cellular proliferation and migration. Wound healing is coordinated by complex signaling cascades involving different growth factors, cytokines and chemokines. In diabetes, wound healing is delayed due to various mechanisms including decreased cell proliferation and cytokine/growth factor response, with epidermal growth factor (EGF) being one such cytokine. Photobiomodulation (PBM) involves exposing wounds to lasers to induce wound healing, and has been shown to stimulate cellular migration and proliferation. However, the mechanism/s involved in these observations are not well understood. The aim of this investigation was to determine if PBM activates the JAK/STAT signaling pathway leading to cellular migration and proliferation in a diabetic wounded cell model. In this investigation, WS1 human skin fibroblast cells were exposed to a continuous wave diode laser at 660 nm with a fluence of 5 J/cm2. Diabetic cells were continuously grown in media with an additional 17 mM/L glucose. A monolayer of WS1 cells were wounded by performing a central scratch. Diabetic wounded cells cultured in the presence or absence of exogenous human recombinant EGF (rhEGF), an inducer of cell proliferation, were irradiated and incubated for 48 h. AZD1480, a JAK2 inhibitor, was used to inhibit cell proliferation, migration and wound repair. Exogenous rhEGF treated, AZD1480 treated and non-irradiated (0 J/cm2) cells served as controls. Cellular migration was monitored microscopically every 12 h for 48 h by doing time-lapse. Expression of EGF and phosphorylation of its receptor (EGFR), as well as JAK2, STAT1 and 3 was analyzed by the enzyme linked immunosorbent assay (ELISA) and immunofluorescence microscopy. PBM at 660 nm with 5 J/cm2 significantly increased expression of EGF, phosphorylation of EGFR, JAK2, STAT1 and 5, and increased cellular migration. AZD1480 significantly reduced cellular proliferation and migration. PBM of diabetic wounded cells at 660 nm with 5 J/cm2 stimulates migration and proliferation of cells via expression of EGF which binds to and phosphorylates EGFR which in turn leads to the activation of the JAK/STAT pathway.

Summary

PBM of diabetic wounded cells in vitro at 660 nm with 5 J/cm2 stimulates migration and proliferation of cells

Apply to be
 considered for a student
   award (Yes / No)?

YES

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

Main supervisor (name and email)
and his / her institution

Prof Nicolette Houreld
Associate Professor; Laser Research Centre
Faculty of Health Sciences
Room 5306e, John Orr Building, Doornfontein Campus
PO Box 17011, Doornfontein, 2028
Email: nhoureld@uj.ac.za
Tel: +27 11 559 6833
Fax +27 11 559 6884

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

Primary author: Mr JERE, Sandy (Laser Research Center, University of Johannesburg)

Co-author: Prof. HOURELD, Nicolette (Laser Research Center, University of Johannesburg)

Presenter: Mr JERE, Sandy (Laser Research Center, University of Johannesburg)

Session Classification: Photonics

Track Classification: Track C - Photonics