



Premiera Hotel Kuala Lumpur, MALAYSIA

A PRELIMINARY STUDY ON THE EFFECTS OF RADIATION EXPOSURE ON CHONDROCYTES: Sulphated Glycosaminoglycan (sGAG) Content Using Cellular Model

Nur Farhana Mat Nawi¹, Zainul Ibrahim Zainuddin², Munirah Sha'ban^{1*}

¹Department of Biomedical Science and ²Department of Diagnostic Imaging and Radiotherapy, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, 25200 Kuantan, Pahang Darul Makmur, Malaysia

Introduction: Radiation is known to be harmful to human health. Effects of radiation on tissues and organs are well documented. However recently, radiation was used as an evaluation tool to assess newly formed engineered tissue reconstruction and regeneration. This raises questions on the positive application of radiation, amidst the usual discussions pertaining to the risks of radiation. Up to now, there is little to suggest of scientific evidence to relate the effect of radiation on the cell cultures.

Objective: To evaluate the possible effects of radiation on monolayer cultured chondrocytes.

Result and Discussions: The results or morphological observation are shown in Figure 2 below.



Methodology: The study has been approved by the Institutional Animal Care and Use Committee (IIUM/IACUCApproval/2015/[5][24]), International Islamic University Malaysia (IIUM). The experimental set up is shown in the Figure 1 below.

Rabbit articular cartilage tissue sample were obtained from commercially available source Enzymatic digestion method was used to isolate "chondrocytes" from the cartilage tissue

The isolated chondrocytes were counted and prepared for expansion in monolayer culture. It were divided into into two groups; (1) irradiated and (2) non-irradiated groups. Culture wells were filled up with growth media and maintained in a CO2 incubator.



Fig. 2. Cellular morphology, 100x (a) irradiated groups (b) non-irradiated groups. All cell groups experienced gradual changes from chondrocytic to fibroblastic morphology.

In terms of cellular morphology, all cultured chondrocytes showed a spherical, chondrocytic morphology at P0. Regardless of treatment, the cells gradually changed to become more fibroblastic in shape, characterized by the presence of spindle and dendritic-like cells at later passages. There are no differences between all groups throughout passages. The results for sGAG concentration is given Figure 3 below.





Cells in both groups were cultured and expanded in a serial passages from $p0 \rightarrow p3$

> Both cell groups were transported back into incubator





Both groups were transported to X-ray

room examination in a thermal container

THERMAL CONTAINER



Fig.3. sGAG concentration on different groups of cells at each passages. The irradiated group showed an increasing trend in relative sGAG concentration while, the non-irradiated group showed a decreasing trend of sGAG concentration after each successive passage. This study suggested that the introduction of radiation could have certain effects on the cartilaginous exposure extracellular matrix (ECM) production. This particular phenomenon is unexpected in view of the known harmful nature associated with radiation. It is postulated that the induced radiation created a yet to be explained situation, where the cells tend to recover, regenerate and secrete extracellular matrix. In addition, it is indicative that when the optimum proliferating conditions of these cells were manipulated, stress was induced in the cells. In this case, the stress that resulted from the exposure to radiation showed a positive effect on the cells. However, this finding warrants further evaluation where gene expression and histological analysis will be conducted. The limitation of study includes the number of samples used (n=2). Future work involving more samples and subjecting the cells to irradiation following subsequent passages after passage 3 will be conducted.



The group 2 cells at different passages were exposed to radiation

Fig.1. Schematic diagram of the experimental set up.

All groups were evaluated using morphological evaluation and sulphated glycosaminoglycan (sGAG) production at passages 0, 1, 2, and 3.

Acknowledgment: The authors thank Kulliyyah of Allied Health Sciences (KAHS), IIUM Kuantan Campus and eScience Fund SF14-012-0062 from MOSTI.

Conclusion: Despite the harmful effect of radiation, this initial study suggested the probable application of radiation towards the growth of cells. **Correspondence*: Munirah Sha'ban | munirahshaban@iium.edu.my

3RD PAN-ASIAN BIOMEDICAL SCIENCE CONFERENCE | 7 – 8 DECEMBER 2016 | PREMIERA HOTEL KUALA LUMPUR, MALAYSIA