UNIVERSITI TEKNOLOGI MARA

TISSUE MORPHOLOGY STUDY: VAN GIESON STAINING IN HEALING PROCESS OF FULL THICKNESS WOUND ANIMAL MODEL

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Dissertation submitted in partial fulfilment of the requirements for the Bachelor of Pharmacy (Hons)

2014

ACKNOWLEDGEMENTS

All praise and glory to Almighty Allah who gave me spirit and patience to complete out this work. Peace and blessing of Allah SWT be upon last Prophet Muhammad.

I would like to express my appreciation to my supervisor Mdm Nor Amlizan binti Ramli for her excellent guidance, caring, patience and providing me a laboratory with an excellent atmosphere for doing this Final Year Project.

My appreciation also goes to my co-supervisor Dr Normala for her unreserved support and assistance which had enabled me to write my dissertation.

Special thanks to Veterinary Officer, Dr. Mohd Hafidz Mohd Izhar and Science Officer, Puan Huzaima as well as all staffs of Laboratory Animal Facility and Management (LAFAM) for their knowledge-sharing and assistance that enabled me to complete my laboratory works.

I also acknowledge my colleague, Caroline Esther Paul and friends with whom I had a pleasant, enjoyable and fruitful research.

Finally, I extend my acknowledgement and heartfelt love to my parents, brother and sisters, who have been with me all the time to spur my spirit. Alhamdulillah. Thank you.

TABLE OF CONTENTS

ABSTRACT

This study was done to investigate the histology property of the wounded skin during the process of initially wounding until day 28 and to study the extent of reepithelialization of wounds which is important because it is a process that create a barrier between the inner organs and the surrounding environment. Full thickness burn wound was produced at the dorsal part of Sprague Dawley rats. The macroscopic image of tissue morphology was captured and the skin samples were harvested on 0, 2, 7, 14, 21 and 28 days post injury. Subsequently, the samples were fixed in 10% buffered formalin solution prior to staining with Van Gieson solution. The histology study was done to bring out the different structures of the tissue, especially collagen and elastin fibers, by staining the cells in contrasting colours. Van Gieson solution stained collagen fibers in red and elastic fibers in black. For the first two days, it was observed that the histologic findings showed a complete destruction of both of dermis and epidermis. By day 7, the inflammation phase was almost absent as proliferation phase occurred where the injured tissue was covered by thick scab. At day 14, injured tissue undergo rapid reepithelialization process. The presence of homogenous, closely packed and interwoven bundles of red-stained collagen fibers and black-stained elastic fibers in the wounded area of the rat were observed at day 21. By day 28, the wound histology showed an incomplete tissue re-epithelialization with the presence of modeled dense collagen mesh and a moderate fibroblastic proliferation. The time required for complete reepithelialization of the injured tissue of full thickness wound without applying a specific therapeutic agents, may take 3 to 6 weeks or even more and might leave a scar tissue due to the excess collagen fibers formation.

CHAPTER 1

1.0 INTRODUCTION

1.1 Background of study

The skin is the largest organ outlining the human body. Anatomically, it is composed of two main layers; the outermost region, the epidermis, and the underlying region, the dermis. The hypodermis underlie beneath the dermis. As the largest organ, one of its main functions is to serve as protective barrier, guarding the internal organs from physical trauma, harmful microorganism and pathogen entrance, thermal and chemical influences (Groeber, Holeiter, Hampel, Hinderer, & Schenke-Layland, 2011; Timmons, 2006). However, as it is directly exposed to the surrounding environment, cutaneous injuries may occur such as burns and physical wounds; the acute wounds and the chronic wound (Lei, You & Andreadis, 2013).

Wound healing is a normal biological process in human body, which involves four highly integrated and overlapping phases namely, haemostasis, inflammation, proliferation and tissue remodelling. Based on the information obtained from laboratory investigations and clinical studies, an optimal wound healing in adult humans involves: (1) rapid haemostasis; (2) proper inflammation; (3) differentiation, proliferation and migration of the mesenchymal cell to the wound site; (4) appropriate angiogenesis; (5) quick re-epithelialization (re-growth of epithelial tissue over the wound surface) and (6) proper synthesis, cross-linking, and arrangement of collagen to provide strength to the healing tissue. These processes are very complex and the biological mechanisms underlying them are still poorly understood. With this