

UNIVERSITI TEKNOLOGI MARA

**STIMULATION OF HAIR GROWTH BY
GLUCOSAMINE SULFATE AND ITS
MOLECULAR MECHANISMS**

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Thesis submitted in fulfilment
of the requirements for the degree of
Master of Science

Faculty of Pharmacy

June 2017

ABSTRACT

Glucosamine sulfate is a naturally occurring amino monosaccharide which stimulates synthesis and inhibits degradation of glycosaminoglycans in synovial fluid and extracellular matrix of connective tissues. The hair papilla is a large structure at the base of a hair follicle, it is mainly made up of connective tissues. Glucosamine sulfate has been reported anecdotally, to stimulate hair growth. This study aimed to determine effects of glucosamine sulfate on human follicle dermal papilla cells (HFDPC) and on hair growth of albino rats. Results showed glucosamine sulfate elicited excellent stimulatory effects on hair follicular growth by proliferating HFDPC at 40 μ M and up regulating mRNA expression of FGF-7, a gene which enhanced epithelial cell proliferation. Glucosamine sulfate also down-regulated mRNA expression of IL-6, FGF-5 and TGF- β 1 genes which antagonized hair follicle growth by inducing catagen transition in the hair cycle. *In vivo* studies showed that 5% glucosamine sulfate significantly increased hair elongation, increased the number of hair follicles and improved skin thickness. It also enhanced vascularisation of blood supply by up-regulation of VEGF during 2nd week of treatment and slowed down apoptosis by down-regulation of Bax, a pro-apoptotic gene. Signalling and transcription factor, sonic hedgehog (Shh) gene was up-regulated during telogen-anagen transition phase. Glucosamine sulfate influenced cellular differentiation and proliferation by regulation of glycosaminoglycan and proteoglycan (syndecan and versican) during hair cycle. These studies provide evidence that glucosamine sulfate has hair growth-promoting potential. This effect may be due to its modulation of syndecan and versican and growth factor gene expression on hair cycle.

Keywords: Glucosamine sulfate, hair cycle, hair follicle growth, human follicle dermal papilla cells, glycosaminoglycan, proteoglycans

ACKNOWLEDGEMENT

الرَّحْمَنِ الرَّحِيمِ اللَّهُ بِسْمِ

“In the name of Allah, Most Gracious, Most Merciful”

Praises to Allah S.W.T because of HIS grace I can complete this thesis. I wish to record high appreciation and sincere thanks to Prof Dr Aishah Adam as the main supervisor. She has guided me from the beginning till the end of the study with dedication and interest. Thank you also to all staffs and colleagues in Pharmacology-Toxicology Research Laboratory, especially Dr Mizaton Hazizul Hassan as co supervisor, Dr Selvarajan Kesavanarayanan for his guidance, Ms Nurul Farhanah Misripin as assistant science officer and all who have given priceless helping hands.

Appreciation and gratitude goes to other departments and laboratories that have helped in successful completion of this study in particular, Laboratory of Animal Facility and Management (LAFAM), BRAIN Research Laboratory and Department of Histology, Faculty of Pharmacy, UiTM Puncak Alam.

Last but not least, a million thanks to my beloved family with special dedication to my parents who have provided me with endless support in terms of financial and moral aid to enable me to complete my study.

May Allah bless all of them and make them beneficiaries of all good deeds. Ameen

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