

UNIVERSITI TEKNOLOGI MARA

**CHEMICAL ELEMENTS USED AS
COLOUR ADDITIVES IN COSMETIC
COLOUR CONTACT LENSES AND
THEIR EFFECTS ON NORMAL
HUMAN CORNEAL EPITHELIAL
CELLS VIABILITY *IN VITRO***

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MSc

July 2021

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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Thesis Title : Chemical Elements Used as Colour Additives in
Cosmetic Colour Contact Lenses and Their Effects on
Normal Human Corneal Epithelial Cells Viability in
vitro

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ABSTRACT

Purpose: The protective corneal epithelial layer can be easily compromised with unsupervised contact lens wear. The emerging popularity of cosmetic colour contact lens (Cos-CCL) wear has raised another concern about the hidden threat of colour additives used in Cos-CCL. The information on the chemical elements used as colour additives in the Cos-CCL products is scarce. Our research aimed to identify the chemical elements used as colour additives in Cos-CCLs and to investigate the effects on the human corneal epithelial cells viability. **Methods:** Two clusters of contact lens were studied in the controlled laboratory setting: the high water content (HWC) and the low water content (LWC). Four contact lenses (one clear contact lens and another three Cos-CCLs of different colours) were used within each cluster. Contact lens parameters such as body matrix material, water content, base curve, diameter and refractive power were standardized within each cluster comparison. Each surface orientation (front and back) of these contact lens samples were analysed using the field emission scanning electron microscope equipped with energy X-ray dispersive spectroscopy (FESEM-EDX) to identify the chemical elements on the contact lens samples. The same specification of contact lens samples was treated on the human corneal epithelial cells (HCEC) in an 8-hour time frame. The HCEC viability was assessed by MTT-assay at the end of the treatment period to acquire the effects of the contact lens samples on them. **Results:** FESEM-EDX examination identified five metal elements (iron, chromium, titanium, magnesium and aluminium) used in the colour additives of the Cos-CCLs, that were not found in clear contact lenses. The compositions and locations of the colour additives varied between Cos-CCLs. The HCEC viability was significantly reduced in the Cos-CCLs ($p < 0.05$). Clear contact lenses from both clusters showed no effect on the HCEC viability at $p = 0.70$ and $p = 0.85$ for HWC and LWC clusters, respectively. **Conclusion:** Cos-CCLs contained metal elements to achieve the different coloured effects in a range of coloured contact lenses. Lenses with those identified metal elements posted detrimental effect on HCEC viability *in vitro*. Further research is required to study the contribution of those metal elements in cosmetic colour contact lens related ocular complication under real clinical scenario.

ACKNOWLEDGEMENT

First of all, I would like to thank my main supervisor, Professor Dr. Chen Ai Hong for giving me the opportunity to embark on my master's degree and for successfully guiding me through this long and challenging journey. As my supervisor, she did her very best in all possible ways to ensure that this research reaches its goal so it may contribute to the body of knowledge.

A special appreciation also goes to my co-supervisor, Mrs. Wan Elhami Wan Omar who always believed in my capability to complete this degree and for helping me out whenever possible throughout my study years.

My research would not have completed without the financial support by Research Acculturation Grant Scheme (RAGS) / Project Code: 600-RMI/RAGS 5/3 (71/2014), Geran Inisiatif Penyelidikan (GIP) and LESTARI / Project Code: 600- IRMI/MYRA 5/3/LESTARI (003/2018). My deepest appreciation to everyone involved.

Thank you Dr. Zolkapli Eshak and his science officers for granting me the access to use the facilities in the Imaging Center, Faculty of Pharmacy. I would also like to thank the Institute for Medical Molecular Biotechnology (IMMB), under Assoc. Prof. Dr. Siti Hamimah Sheikh Abdul Kadir and the supervision of Mrs. Norita Salim as the science officer, for welcoming me to conduct my research there.

Not to forgot to all my postgraduate friends whom I refer to as my comrade, thank you for showing great support and always cheering me up whenever I was out of motivation. Finally, this thesis is specially dedicated to my beloved father and mother, Mr. Mohd Abdullah and Mrs. Wan Nooriah Wan Sulaiman for the vision and determination to educate me. This piece of victory is dedicated to both of you. Alhamdulillah and thank you everyone.

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