UNIVERSITI TEKNOLOGI MARA

FORMULATION, CHARACTERIZATION AND *IN VIVO* EVALUATION OF NANOEMULSION FOR ENHANCING ORAL BIOAVAILABILITY OF IBUPROFEN

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

Faculty of Pharmacy

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 6th January 2015 to conduct the final examination of Nurfazreen Binti Anuar on her Master of Science thesis entitled "Formulation, Characterization and *In Vivo* Evaluation of Nanoemulsion for Enhancing Oral Bioavailability of Ibuprofen" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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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 topic has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledged 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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ABSTRACT

Ibuprofen, a phenyl propionic acid derivative, plays a significant role in the treatment of rheumatoid arthritis, osteoarthritis and related conditions. However, ibuprofen is practically insoluble in water and would not completely absorb in the gastrointestinal tract. Nanoemulsion carrier system was formulated in this study to improve oral absorption of ibuprofen. A ternary phase diagram was constructed to identify the optimal concentrations of oil, surfactant and co-surfactant. It was found that formulation containing 3% ibuprofen, 57% olive oil, 15% SE L-1695 and 25% glycerol showed the best nanoemulsion property with droplet size of 232.1 nm, polydispersity index of 0.047 and zeta potential of -31.7 mV. A reversed-phase high performance liquid chromatographic (RP-HPLC) method has been developed for the quantification of ibuprofen in rat plasma. The proposed method was validated based on linearity, accuracy and precision. The percentage mean recovery was found to be 99.16%, while the percentage of relative standard deviation of within-day and between-day measurements were all less than 5%. Subsequently, *in vivo* oral absorption study was conducted to determine the oral bioavailability of ibuprofen in rat plasma after administration. Ibuprofen nanoemulsion and oil solution in rat plasma showed AUC values of 6670.10 ± 283.83 μg/ml·h and 3060.32 ± 169.93 μg/ml·h respectively. The absorption of ibuprofen nanoemulsion showed an increased by 2-folds in contrast to the absorption value of the oil formulation. Meanwhile, both ibuprofen macroemulsion A and macroemulsion B showed an increase of AUC values by almost 1.5-fold as compared to the oil formulation. Therefore, it is proved that nanoemulsion formulation achieves higher rate of ibuprofen absorption as compared to macroemulsions and oil formulations.

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