Evaluation of cytotoxic and inflammatory properties of clove oil microemulsion in mice

Raktham Mektrirat *, Kantaporn Janngeon b, Surachai Pikulkaew c, Siriporn Okonogi b,d

a Department of Veterinary Bioscience and Veterinary Public Health, Faculty of Veterinary Medicine, Chiang Mai University, Chiang Mai 50100, Thailand
b Nanoscience and Nanotechnology Program, The Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand
c Department of Food Animal Clinic, Faculty of Veterinary Medicine, Chiang Mai University, Chiang Mai 50100, Thailand
d Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

ARTICLE INFO

Article history:
Available online 25 November 2015

Keywords:
Clove
Essential oil
Microemulsion
Cytotoxicity
Inflammation

Clove oil is the essential oil of Syzygium aromaticum Merr. and L.M. It is widely used in pharmaceutical applications because of its biological potential including anesthetic, analgesic, anti-inflammatory, antibacterial and antioxidant properties [1]. The pharmacological efficacy is hindered by the high hydrophobicity of the essential oil; therefore, a thermodynamically stable microemulsion is an alternative attractive preparation for overcoming this problem [2]. However, high surfactant concentration used in microemulsion may cause toxicity and other disadvantage to the formulation. This study aimed to investigate the immunotoxic effects of clove oil microemulsion in mice.

The essential oil was isolated from clove bud using simultaneous steam-distillation. Chemical characterization was analyzed using gas chromatograph coupled to a mass spectrometer (GC–MS). The result showed that oil was composed of eugenol (96.11%), caryophyllene (1.34%) and naphthalene (0.63%). The amount of eugenol is related to that previously reported [3]. Clove oil microemulsion was formulated from the ternary phase diagram, constructed by using clove oil 10% w/w, Tween20 and distilled water (Fig. 1). Cytotoxic effect of the microemulsion was tested on murine peritoneal macrophages by XTT reduction assay. Inflammatory effect was evaluated by intraperitoneal injection in laboratory mice. The result demonstrated mild cytotoxic effect of clove oil microemulsion on peritoneal macrophages (21.71 ± 4.03%). It was found that the cytotoxicity was affected by vehicle substance where clove oil

* E-mail address: raktham.m@cmu.ac.th.

Peer review under responsibility of Shenyang Pharmaceutical University.

http://dx.doi.org/10.1016/j.ajps.2015.11.020

1818-0876/© 2016 Production and hosting by Elsevier B.V. on behalf of Shenyang Pharmaceutical University. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
showed no cytotoxic effect (p > 0.05). The current study shows that high surfactant concentration causes in vitro cytotoxicity [4]. However, it does not play a role in the inflammatory response in mice. Our results contribute to understanding the cytotoxicity and inflammatory ability of clove oil microemulsion which has a predictive value with regard to its safety. However, proper composition in pharmaceutical preparation and the pharmacological application needs to be further investigated.

Acknowledgements

This work was supported by research budget of the National Research Council of Thailand (R000012795) and the Royal Golden Jubilee granted by Thailand Research Fund (5.NS.CM/56/A.1). We also thank Faculty of Veterinary Medicine and Faculty of Pharmacy, Chiang Mai University for providing laboratory facilities.

REFERENCES