Mutagenicity evaluation of *Anastatica hierochuntica* L. aqueous extract *in vitro* and *in vivo*

Siti Rosmani Md Zin¹, Zahurin Mohamed², Mohammed A Alshawsh², Won F Wong³ and Normadiah M Kassim¹

¹Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur 50603, Malaysia; ²Department of Pharmacology, Faculty of Medicine, University of Malaya, Kuala Lumpur 50603, Malaysia; ³Department of Medical Microbiology, Faculty of Medicine, University of Malaya, Kuala Lumpur 50603, Malaysia

Corresponding author: Mohammed A Alshawsh. Email: alshawashmam@um.edu.my

**Impact statement**

In this paper, we report on the mutagenicity evaluation of *Anastatica hierochuntica* aqueous extract. This is a significant research in view of the popularity of this herb consumption by the people across the globe despite the limited scientific evidence on its toxicity potential. This study is intended to encourage more extensive related research in order to provide sufficient evidence and guidance for determining its safe dosage.

**Abstract**

*Anastatica hierochuntica* L. (*A. hierochuntica*), a folk medicinal plant, was evaluated for mutagenic potential via *in vitro* and *in vivo* assays. The *in vitro* assay was conducted according to modified Ames test, while the *in vivo* study was performed according to Organisation for Economic Co-operation and Development guideline for mammalian erythrocyte micronucleus assay. Four groups (n=5 males and 5 females per group) Sprague Dawley rats were randomly chosen as the negative control, positive control (received a single intramuscular injection of cyclophosphamide 50 mg/kg), 1000 and 2000 mg/kg *A. hierochuntica* aqueous extracts. All groups except the positive control were treated orally for three days. Findings of the *in vitro* assay showed mutagenic potential of AHAEE at 0.04 and 0.2 mg/ml. However, no mutagenic effect was demonstrated in the *in vivo* study up to 2000 mg/kg. No significant reduction in the polychromatic and normochromatic erythrocytes ratio was noted in any of the groups. Meanwhile, high micronucleated polychromatic erythrocytes frequency was seen in cyclophosphamide-treated group only. These findings could perhaps be due to insufficient dosage of *A. hierochuntica* aqueous extracts to cause genetic damage on the bone marrow target cells. Further acute and chronic *in vivo* toxicity studies may be required to draw pertinent conclusion on the safety aspect of *A. hierochuntica* aqueous extracts consumption.

**Keywords**: *Anastatica hierochuntica*, mutagenicity, genotoxicity, Ames test, mammalian erythrocyte micronucleus assay, reverse mutation assay

*Experimental Biology and Medicine* 2017; 0: 1–11. DOI: 10.1177/1535370217748574

**Introduction**

Herbal products are gaining increasing popularity among consumers in developing and industrialized countries. This is shown by the rapid growth of the total global herbal market. According to the 2015 report by Global Industry Analyst (GIA) on herbal supplements and remedies, Europe represents the largest market worldwide. Meanwhile, Asia-Pacific has emerged as the fastest growing market with a compound annual growth rate (CAGR) of 9% over the analysis period. China is one of the main suppliers of herbal supplements to the United States and West European markets. The global herbal supplements and remedies market are projected to be worth US$115 billion by 2020.

The increasing demand for herbal products is believed to be due to many factors. These include cultural and historical influences and the inherent perception that such products are safer and more efficient compared with modern medicine. Despite the claims of medical benefits of natural products, there have been many reports on various toxicity effects following prolonged consumption of herbal medicines. In addition, several studies have shown a relationship between herbal products consumption and the development of kidney problems.