UNIVERSITI SAINS MALAYSIA
GERAN PENYELIDIKAN UNIVERSITI PENYELIDIKAN
LAPORAN AKHIR

EVALUATION OF NEUROPROTECTIVE EFFECTS OF TUALANG HONEY ON PARAQUAT-INDUCED OXIDATIVE STRESS & DOPAMINERGIC NEURON DAMAGE IN THE RAT BRAIN

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Project Code :
(for RCMO use only)

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FINAL REPORT FORM

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PROJECT DETAILS

Title of Research: Evaluation of neuroprotective effects of Tualang honey on paraquat-induced oxidative stress & dopaminergic neuron damage in the rats brain

Account Number:

Name of Research Leader: Prof Siti Amrah Sulaiman

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Duration of this research:

a) **Start Date** : **01 Julai 2012**

b) **Completion Date** : **30 Jun 2014**

c) **Duration** : **2 years**

d) **Revised Date** (*if any*) : **30 June 2015**

ABSTRACT OF RESEARCH

(An abstract of between 100 and 200 words must be prepared in Bahasa Malaysia and in English. This abstract will be included in the Report of the Research and Innovation Section at a later date as a means of presenting the project findings of the researcher/s to the University and the community at large)

Background: Paraquat is a dopaminergic neurotoxin and exerts its toxic effect via oxidative stress-mediated cellular injuries. The protective effects of Tualang honey on paraquat-induced toxicity in the midbrain and lungs of rats were investigated.

Methods: Male Sprague Dawley rats were randomly divided into five groups; : control (N), honey (TH), paraquat (PQ), paraquat + honey (PQ+TH) and paraquat + ubiquinol (PQ+QH). The rats were orally treated with distilled water (groups N & PQ, 2 mL/kg/day), Tualang honey (groups TH & PQ+TH, 1.0 g/kg/day) or ubiquinol (group PQ+QH, 0.2 g/kg/day) throughout the experimental period. Two weeks after the respective treatments, rats were administered intraperitoneal injections of saline (Groups N & TH; 1 mL/kg/week) or paraquat (10 mg/kg/week; groups PQ, PQ + TH & PQ + QH) once a week for four consecutive weeks. Animals were sacrificed a week after the last injection of saline/paraquat. The midbrain and lungs were collected for biochemical (n=8) and immunohistochemical (n=7) assessments.

Results: The present study showed that exposures to paraquat induced oxidative stress in both the midbrain and lung regions. In the midbrain region, the activity of glutathione peroxidase (GPx) and the amount of tyrosine-hydroxylase (TyrH)-immunopositive neurons were significantly reduced in animals from group PQ. However,treatment with Tualang honey ameliorated these toxic effects. The lungs of group PQ showed a statistically significant reduction in superoxide dismutase (SOD), glutathione-S-transferase (GST) and total glutathione (GSH) activities. Treatment with honey (group PQ+TH) significantly increased SOD activity in the lung ($p < 0.05$) and ameliorated the loss in GST activity and the total GSH concentration compared to group PQ. The beneficial effects of Tualang honey were comparable to ubiquinol, which was the control drug used in this study.

Conclusions: These findings suggest that Tualang honey may protect against paraquat-induced toxicity in rats.

Bahasa Malaysia

Latar Belakang: Paraquat adalah neurotoksin dopaminergik dan menyebabkan kesan toksik melalui kecederaan oksidatif stress pada sel. Kesan perlindungan madu Tualang ke atas ketoksikan diinduksi paraquat pada midbrain (otak tengah) dan paru-paru tikus akan dikaji.

Kaedah: Tikus Sprague Dawley jantan dibahagi secara rawak kepada lima Kumpulan; : kawalan (N), madu (TH), paraquat (PQ), madu + paraquat (PQ +TH) dan ubiquinol paraquat (PQ+ QH). Tikus secara oral telah diberi air suling (Kumpulan PQ& N, 2 mL/kg/hari), madu Tualang (Kumpulan TH& TH + PQ, 1.0 g/kg/hari) atau ubiquinol (Kumpulan QH+ PQ, 0.2 g/kg/hari) sepanjang tempoh percubaan. Dua minggu selepas rawatan masing-masing, tikus telah isi maklumat suntikan daripada saline (Kumpulan N TH; 1 mL/kg/minggu) atau paraquat (10 mg/kg/minggu; Kumpulan PQ, PQ +TH& PQ+ QH) sekali seminggu untuk empat minggu berturut-turut. Haiwan dikorbankan seminggu selepas suntikan terakhir daripada saline/paraquat. Midbrain dan paru-paru telah diambil untuk analisis biokimia (n = 8) dan immunohistockimia (n = 7) .

Keputusan: Kajian menunjukkan bahawa pendedahan kepada paraquat mewujudkan tekanan oksidatif di kawasan midbrain dan paru-paru. Di wilayah midbrain, aktiviti peroxidase glutathione (GPx) dan jumlah daripada tyrosine-hydroxylase (TyrH)-neuron immunopositive telah merosot dengan ketaranya dalam haiwan dari Kumpulan PQ. Walau bagaimanapun, rawatan dengan madu Tualang mengurangkan kesan-kesan toksik. Pada paru-paru Kumpulan PQ menunjukkan penurunan yang signifikan secara statistik dalam superoxide dismutase (SOD), glutathione-S-transferase (GST) dan aktiviti jumlah glutathione (GSH). Rawatan dengan madu (Kumpulan PQ +TH) dengan ketara meningkatkan aktiviti SOD dalam paru-paru ($p < 0.05$) dan amengurangkan kehilangan aktiviti GST dan jumlah kepekatan GSH berbanding Kumpulan PQ. Kesan-kesan berfaedah madu Tualang adalah setanding dengan ubiquinol, yang adalah ubat kawalan yang digunakan dalam kajian ini.

Kesimpulan: Kajian ini mencadangkan bahawa madu Tualang mungkin boleh melindungi ketoksikan paraquat-pada tikus.

C BUDGET & EXPENDITURE

i

Total Approved Budget :

Total Expenditure :

Balance :

Percentage of Amount Spent (%) :

 # Please attach final account statement (eStatement) to indicate the project expenditure