

Acetylcholinesterase Activity and Histopathological Effects of Caffeine in Liver of *Plasmodium berghei* ANKA-Infected ICR Mice

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Structured Abstract

Background: Malaria is a disease caused by infection of *Plasmodium* parasite through bites of infected female *Anopheles* mosquitoes, and can lead to several liver damage symptoms. In humans, acetylcholinesterase (AChE) activity was found to be affected by malarial infections. The resistance of *Plasmodium* parasites against existing anti-malarial drugs has led to an increasing number of malarial infections. Caffeine potential as an anti-malarial drug was seen from the presence of alkaloids in caffeine compound, that can act as anti-malarial. Therefore, this study was conducted to determine the effects of caffeine on AChE activity and histopathological analysis in the liver of *P. berghei* ANKA-infected ICR mice.

Methods: Male ICR mice aged 8 to 10 weeks were divided into four groups of normal control, *P. berghei* ANKA-infected, infected chloroquine-treated and infected caffeine-treated with 7 mice per group. Caffeine treatment of 5 mg/kg b.w. and standard chloroquine treatment of 10 mg/kg b.w. were administered until day 4. On day 4 post-infection, liver was collected from ICR mice, after being euthanized with carbon dioxide. The collected liver underwent histopathology analysis and AChE activity measurement by using Ellman 1961 method.

Results: This study shows reduction of AChE activity upon malarial infection. AChE activity showed lower activity of 2.65 U compared to normal AChE (4.34 U). Infected caffeine-treated mice liver showed slightly higher AChE activity of 3.00 U compared to *P. berghei* ANKA-infected. Histopathological analysis showed several symptoms of parasite infection such as presence of pRBCs and hemozoin pigments, after *P. berghei* ANKA infection. Additional symptoms of blood vessels obstruction and hyaline membrane formation were also seen in the treatment groups. Caffeine treatment showed reduction of pRBCs and hemozoin pigments in the liver.

Conclusion: In conclusion, findings from this study showed caffeine ability as anti-malarial by restoration of AChE activity and reduction of parasitic infection in the liver. Hence, caffeine compounds are a plausible candidate to be developed as anti-malarial drugs in the future.

Keywords: Malaria, caffeine, acetylcholinesterase activity, histopathology

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