

**THE EFFECT OF ANNONA MURICATA TO REDUCE PARASITEMIA,
INCREASE PHAGOCYTOSIS INDEX AND NITRIC OXIDE PRODUCTION
(STUDY IN CEREBRAL MALARIA PHASE OF SWISS MICE)**



**Thesis
For requirements master degrees**

Master of Biomedical Sciences

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**FACULTY OF MEDICINE
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2015**

APPROVAL PAGE

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DECLARATION

I hereby declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education, there are no elements belonging to plagiarism as defined in Decree No 17 of 2010. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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FOREWORD

Assalamu'alaikum Wr. Wb.

Praise to Allah Almighty for all grace and guidance that thesis with the title “The Effect *Annona muricata* to Reduce Parasitemia, Increase Phagocytosis Index And Nitric Oxide Production (Study in Cerebral Malaria Phase of Swiss Mice)” can be resolved. This thesis is structured to meet one of the requirements to obtain a Master degree in Biomedical Sciences (MSi. Med) in the field of Immunology at the Faculty of Medicine, University of Diponegoro.

I realized that without the help and guidance of the various parties, it is not easy for me to finish this thesis. Therefore, on this occasion, the author would like to express respect and gratitude as possible to:

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LIST OF ABBREVIATIONS

CD4	: <i>Cluster differentiation 4</i>
CD8	: <i>Cluster differentiation 8</i>
CD31	: <i>Cluster differentiation 31</i>
CD36	: <i>Cluster differentiation 36</i>
CM	: <i>Cerebral malaria</i>
CSA	: <i>Chondroitin sulphate A</i>
ECM	: <i>Experiment cerebral malaria</i>
EDRF	: <i>Endothelium-derived relaxing factor</i>
GSNO	: <i>S-nitrosoglutathione</i>
HCM	: <i>Human Cerebral Malaria</i>
IFN- α	: <i>Interferon-alpha</i>
IFN- β	: <i>Interferon-beta</i>
IFN- γ	: <i>Interferon-gamma</i>
IL-4	: <i>Interleukin 4</i>
IL-10	: <i>Interleukin 10</i>
iNOS	: <i>inducible nitric oxide synthase</i>
iRBC	: <i>infected red blood cell</i>
NO	: <i>Nitric oxide</i>
NOS	: <i>Nitric oxide synthase</i>
PbA	: <i>Plasmodium berghei ANKA</i>
PfEMP1	: <i>P. falciparum erythrocyte membrane protein 1</i>
p.i	: <i>Post inoculation</i>

pRBC : *Parasitized red blood cell*

RBCs : *Red blood cells*

TGF- β : *Transforming growth factor-beta*

TNF : *Tumor necrosis factor*

WHO : *World Health Organization*

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ABSTRACT

THE EFFECT OF ANNONA MURICATA TO REDUCE PARASITEMIA, INCREASE PHAGOCYTOSIS INDEX AND NITRIC OXIDE PRODUCTION (STUDY IN CEREBRAL MALARIA PHASE OF SWISS MICE)

Husen Mohamed Albakoush, RA. Kisdjamiatun, Tri Nur Kristina

BACKGROUND: Highest fatal case occurred in WHO data for African Region, where roughly 90% of all malaria deaths occur, and 78% of all deaths were children aged under 5 years. *Annona muricata* is commonly used for the treatment of malaria and/or fever. This research to prove that *Annona muricata* can reduce parasitemia, increase macrophages-phagocytic index and NO production of Swiss albino mice inoculated with PbA.

METHOD: Study design was experimental study using thirty six (36) swiss mice which divided into 6 groups were: healthy mice (C(-)), P1 and P2 with respectively without PbA inoculation but received *A. muricata* dosage 100 and 150 mg/kg BW; C(+) were group with inoculated PbA; P3 and P4 were group respectively inoculated PbA with received *A. muricata* dosage 100 and 150 mg/kg BW. Statistical analysis used One Way Anova for normality data distribution. Correlation test between two variables used Spearman Test.

RESULT: The highest parasitemia percentage was C(+), followed by P3 and P4 groups. The highest phagocytosis index was found in P1, followed by P2 and P3 group. C(-) showed a lower Phagocytosis index than C(+). P3 and P4 group demonstrated a lower phagocytosis index than C(+). The highest NO level in C(-). The highest NO level in inoculated group was found in C(+), followed by P4 and P3 group.

CONCLUSION: Non significant difference on the parasitemia was found among PbA-inoculated groups with or without *A. muricata* treatment. Non significant difference on the phagocytosis index was observed among six group studied with or without PbA inoculated and with or without *A. muricata* treatment. Significant effect on the NO level among PbA-inoculated groups with *A. muricata* treatment to reduce NO level.

Keywords: *A. muricata*, *P. berghei* ANKA, parasitemia, phagocytosis index, NO level.

ABSTRAK

PENGARUH SIRSAK UNTUK MENURUNKAN PARASITEMIA, MENINGKATKAN INDEKS PHAGOSITOSIS DAN PRODUKSI NITRIC OXIDE (STUDI PENYAKITMALARIA SEREBRAL PADA SWISS ALBINO MICE)

Husen Mohamed Albakoush, RA. Kisdjamiatun, Tri Nur Kristina

LATAR BELAKANG: Kasus yang fatal tertinggi pada data WHO di wilayah Afrika, di mana sekitar 90% dari seluruh kematian malaria terjadi, dan 78% dari seluruh kematian adalah anak-anak berusia di bawah 5 tahun. Sirsak umumnya digunakan untuk pengobatan malaria dan / atau demam. Penelitian ini membuktikan bahwa sirsak mengurangi parasitemia, meningkatkan indeks fagositik macrophages dan produksi NO mencit albino Swiss diinokulasi dengan PbA.

METODE: Desain penelitian adalah studi eksperimental menggunakan tiga puluh enam (36) tikus swiss yang terbagi menjadi 6 kelompok. K (-) adalah tikus yang sehat, P1 dan P2 adalah kelompok tanpa diinokulasi PbA dengan dosis *A. muricata* 100 dan 150 mg / kg BB. K (+) adalah grup dengan diinokulasi PbA, P3 dan P4 adalah kelompok dengan diinokulasi PbA dan dosis *A. muricata* 100 dan 150 mg / kg BB. Tes statistic menggunakan test Anova untu data yang terdistribusi normal. Untuk uji korelasi antar dua variabel menggunakan uji Spearman.

HASIL: Parasitemia paling tinggi ditemukan pada C(+) yang diikuti oleh kelompok P3 dan P4. Indeks phagositosis paling tinggi ditemukan pada P1, diikuti oleh P2 dan P3. C(-) mempunyai indeks phagositosis lebih rendah dari C(+). P3 dan P4 menunjukkan indeks phagositosis yang lebih rendah dari C(+). Level NO paling tinggi pada C(-). Level NO paling tinggi pada kelompok inokulasi ditemukan pada C(+) diikuti dengan kelompok P4 dan P3.

KESIMPULAN: Tidak terdapat perbedaan yang signifikan dari treatment *A. muricata* pada parasitemia pada kelompok inokulasi PbA. Tidak terdapat perbedaan yang signifikan terhadap indeks fagositosis pada enam kelompok dengan atau tanpa inokulasi PbA dan dengan atau tanpa treatment *A. muricata*. Pengaruh yang signifikan pada level NO pada kelompok dengan inokulasi PbA kelompok tidak PBA-diinokulasi dengan pengobatan *A. muricata* untuk menurunkan level NO.

Kata kunci: *A. muricata*, *P. berghei* ANKA, parasitemia, indeks phagositosis, level NO.