

ABSTRAK

**KADAR TNF- α DAN IL-10 PADA MENCIT BALB/c TERINFEKSI
Plasmodium berghei ANKA YANG DIBERI PERLAKUAN CAIRAN
EMPEDU KAMBING**

Penelitian ini bertujuan mengetahui kadar TNF- α dan IL-10 pada mencit (*Mus musculus*) yang terinfeksi *Plasmodium berghei* yang diberi perlakuan CEK (cairan empedu kambing) pada dosis 25%, 50%, dan 100%. Metode: Parasitemia dihitung berdasarkan jumlah eritrosit terinfeksi per 1000 eritrosit pada apusan darah tipis. Tingkat TNF- α dan IL-10 dalam plasma diukur dengan menggunakan *Enzyme-Linked Immunosorbent Assay* (ELISA). Hasil: Rerata TNF- α pada mencit perlakuan CEK 25, 50, dan 100 secara berurutan yakni $83,09 \pm 20,65$; $72,43 \pm 15,84$; dan $43,17 \pm 22,09$. Rerata IL-10 pada mencit perlakuan CEK 25, 50, dan 100 secara berurutan yakni $17,84 \pm 3,14$; $20,89 \pm 6,64$; dan $10,52 \pm 1,82$. Kesimpulan: Terdapat penurunan kadar TNF- α pada perlakuan CEK dibandingkan dengan kontrol negatif. Tidak terdapat peningkatan IL-10 pada perlakuan CEK dibandingkan dengan kontrol negatif. Tidak terdapat korelasi antara kadar TNF- α dengan IL-10

ABSTRACT

**TNF- α AND IL-10 LEVELS IN BALB / c MICE INFECTED BY
Plasmodium berghei ANKA WITH GOAT BILE TREATMENT**

This study aims to determine the levels of TNF- α and IL-10 in mice (*Mus musculus*) infected with *Plasmodium berghei* who were treated with GB (goat's bile) at concentration of 25%, 50%, and 100%. Methods: Parasitemia was calculated based on the number of infected erythrocytes per 1000 erythrocytes on a thin blood smear. The level of TNF- α and IL-10 in plasma is measured using Enzyme-Linked Immunosorbent Assay (ELISA). Results: The mean of TNF- α from GB25, GB50, and GB100 are $83,09 \pm 20,65$; $72,43 \pm 15,84$; dan $43,17 \pm 22,09$ respectively. The mean of IL10 from GB25, GB50, and GB100 are $17,84 \pm 3,14$; $20,89 \pm 6,64$; dan $10,52 \pm 1,82$ respectively. Conclusion: There was an influence of GB on the percentage of parasitemia and TNF- α levels in infected mice compared to negative control. There was no significant influence of GB on IL-10 levels in infected mice compared to negative control. No correlation between TNF- α and IL 10 levels were found.

RINGKASAN

KADAR TNF- α DAN IL-10 PADA MENCIT BALB/c TERINFEKSI

***Plasmodium berghei* ANKA YANG DIBERI PERLAKUAN CAIRAN**

EMPEDU KAMBING

Indonesia merupakan salah satu negara dengan kasus malaria tertinggi di Asia Tenggara. Pengobatan malaria yang dilakukan di Indonesia menggunakan kombinasi obat *artemisinin-based combination therapy* (ACT) seperti dihidroartemisinin-piperaquin. Pengobatan alternatif yang digunakan oleh masyarakat adalah obat tradisional dari tanaman dan bagian tubuh hewan, di antaranya empedu kambing. Empedu kambing banyak digunakan karena mudah didapatkan dan harga yang relatif tidak mahal.

Eritrosit yang terinfeksi oleh malaria akan pecah mengeluarkan merozoit, hemozoin, serta *Glycosylphosphatidylinositol* (GPI) yang merupakan toksin yang dapat berinteraksi dengan *Toll-like Receptor* (TLR). Sel Th-1 akan aktif dan meningkatkan sekresi TNF- α , sementara sel Th-2 akan mensekresikan IL-10 untuk mengimbangi kadar TNF- α dalam melawan infeksi. Sitokin TNF- α akan mengaktifasi makrofag dalam proses fagositosis eritrosit terinfeksi serta parasit rusak di luar eritrosit.

Empedu kambing didapatkan dari Rumah Pematangan Hewan Pegirikan di Surabaya, Jawa Timur. Pemberian cairan empedu kambing dilakukan sebanyak satu kali sehari selama empat hari terhadap lima ekor mencit, dengan konsentrasi yakni 30%, 50%, dan 100%. Mencit kontrol negatif diberi 0,5 ml *aquadest* satu kali

selama empat hari. Persen parasitemia pada mencit yang terinfeksi *Plasmodium berghei* dihitung dengan berdasarkan jumlah eritrosit terinfeksi dalam 1000 eritrosit. Kadar TNF- α dan IL-10 pada mencit BALB/C yang diinfeksi *Plasmodium berghei* yang diberi perlakuan cairan empedu kambing diperiksa dengan menggunakan ELISA kit.

Rerata TNF- α pada mencit perlakuan CEK 25, 50, dan 100 secara berurutan yakni $83,09 \pm 20,65$; $72,43 \pm 15,84$; dan $43,17 \pm 22,09$. Rerata TNF- α pada mencit perlakuan K 25, 50, dan 100 secara berurutan yakni $45,30 \pm 3,28$; $45,54 \pm 9,26$; dan $78,04 \pm 17,44$. Rerata TNF- α pada mencit kontrol positif yakni sebesar $70,07 \pm 19,69$. Rerata IL-10 pada mencit kontrol negatif yakni sebesar $150,33 \pm 37,02$. Rerata IL-10 pada mencit normal yakni sebesar $14,55 \pm 1,77$. Rerata IL-10 pada mencit perlakuan CEK 25, 50, dan 100 secara berurutan yakni $17,84 \pm 3,14$; $20,89 \pm 6,64$; dan $10,52 \pm 1,82$. Rerata IL-10 pada mencit perlakuan K 25, 50, dan 100 secara berurutan yakni $15,04 \pm 3,22$; $11,25 \pm 2,42$; dan $11,72 \pm 5,62$. Rerata IL-10 pada mencit kontrol positif yakni sebesar $13,20 \pm 5,63$. Rerata IL-10 pada mencit kontrol negatif yakni sebesar $14,66 \pm 1,02$. Rerata IL-10 pada mencit normal yakni sebesar $14,68 \pm 1,94$. Hasil analisis statistik uji korelasi Pearson menunjukkan hubungan antara parasitemia dengan kadar TNF- α menunjukkan korelasi positif yang signifikan, sedangkan hubungan antara parasitemia dengan IL-10, serta hubungan antara TNF- α dan IL-10 tidak menunjukkan korelasi yang signifikan.

Kesimpulan yakni terdapat penurunan kadar TNF- α pada mencit terinfeksi *P.berghei* yang diberi perlakuan cairan empedu kambing dibandingkan dengan kontrol negatif tanpa pemberian cairan empedu kambing. Tidak terdapat perbedaan

bermakna antara kadar TNF- α pada mencit terinfeksi *P.berghei* yang diberi perlakuan cairan empedu kambing dengan kontrol positif. Tidak terdapat peningkatan kadar IL-10 pada mencit terinfeksi *P.berghei* yang diberi perlakuan cairan empedu kambing dibandingkan dengan kontrol negatif tanpa pemberian cairan empedu kambing. Tidak terdapat perbedaan bermakna antara kadar IL-10 pada mencit terinfeksi *P.berghei* yang diberi perlakuan cairan empedu kambing dengan kontrol positif. Tidak terdapat korelasi antara kadar TNF- α dengan kadar IL-10 pada mencit terinfeksi *P.berghei* yang diberi perlakuan cairan empedu kambing.

SUMMARY

TNF- α AND IL-10 LEVELS IN BALB / c MICE INFECTED BY *Plasmodium berghei* ANKA WITH GOAT BILE TREATMENT

Indonesia is one of the countries with the highest malaria cases in Southeast Asia. Malaria treatment in Indonesia uses a combination of artemisinin-based combination therapy (ACT) drugs such as dihydroartemisinin-piperaquin. Alternative medicine used by the community is traditional medicine from plants and animal body parts, including goat bile. Goat bile is widely used because it's easy to obtain and with a relatively inexpensive price.

Erythrocytes infected by malaria will rupture releasing merozoite, hemozoin, and Glycosylphosphatidylinositol (GPI) which is a toxin that can interact with Toll-like Receptors (TLR). Th-1 cells will be active and increase TNF- α secretion, while Th-2 cells will secrete IL-10 to compensate for TNF- α levels in fighting infection. TNF- α cytokines activate macrophages in the phagocytic process of infected erythrocytes and damaged parasites outside of erythrocytes.

Goat bile is obtained from the Pegirikan Animal Slaughter House in Surabaya, East Java. Goat bile liquid was given for four days to five mice, with concentrations of 30%, 50%, and 100%. Negative control mice were given 0.5 ml of aquadest once for four days. Percent parasitemia in mice infected with *Plasmodium berghei* is calculated based on the number of infected erythrocytes in 1000 erythrocytes. The levels of TNF- α and IL-10 in BALB / C mice infected by *Plasmodium berghei* treated with goat bile were examined using an ELISA kit.

The mean TNF- α in mice treated with CEK 25%, 50%, and 100% respectively were 83.09 ± 20.65 ; 72.43 ± 15.84 ; and 43.17 ± 22.09 . The mean TNF- α in mice K treatment 25%, 50%, and 100% respectively were 45.30 ± 3.28 ; 45.54 ± 9.26 ; and 78.04 ± 17.44 . The mean TNF- α in positive control mice was 70.07 ± 19.69 . The mean IL-10 in negative control mice was 150.33 ± 37.02 . The average IL-10 in normal mice was 14.55 ± 1.77 . The mean IL-10 in mice treated with CEK 25%, 50%, and 100% respectively were 17.84 ± 3.14 ; 20.89 ± 6.64 ; and 10.52 ± 1.82 . The mean IL-10 in mice K treatment 25%, 50%, and 100% respectively were 15.04 ± 3.22 ; 11.25 ± 2.42 ; and 11.72 ± 5.62 . The mean IL-10 in positive control mice was equal to 13.20 ± 5.63 . The mean IL-10 in negative control mice was 14.66 ± 1.02 . The average IL-10 in normal mice was 14.68 ± 1.94 . Statistical analysis of Pearson correlation test shows the relationship between parasitemia and TNF- α levels showed a significant positive correlation, while the relationship between parasitemia with IL-10, and the relationship between TNF- α and IL-10 did not show a significant correlation.

The conclusion is that there is a decrease in TNF- α levels in *P.berghei* infected mice treated with goat's bile compared with negative controls without goat's bile treatment. There was no significant difference between TNF- α levels in *P.berghei*-infected mice treated with goat bile with positive control. There was no increase in IL-10 levels in *P.berghei* infected mice treated with goat's bile compared with negative controls without administration of goat's bile. There was no significant difference between IL-10 levels in *P.berghei* infected mice treated with

goat's bile with positive controls. There was no correlation between TNF- α levels and IL-10 levels in *P.berghei*-infected mice treated with goat bile.