RINGKASAN

EFEK ANTIGEN TERLARUT *Plasmodium falciparum* PADA PROSES FAGOSITOSIS MAKROFAG PERITONEUM MENCIT TERHADAP ERITROSIT NORMAL MENCIT *IN VITRO*

Lebih dari 2400 juta penduduk atau 40% dari penduduk dunia tinggal di daerah endemis malaria. Prevalensi penyakit malaria di seluruh dunia diperkirakan antara 300 – 500 juta kasus klinis setiap tahunnya, dengan angka kematian 1 – 1,5 juta penduduk per tahun. Di Indonesia sampai saat ini angka kesakitan malaria masih cukup tinggi, terutama di daerah luar Jawa dan Bali. Dari 300 – 500 juta kasus klinis malaria di dunia, terdapat sekitar 3 juta kasus malaria berat (komplikasi) dan kasus kematian akibat malaria, terutama disebabkan oleh *Plasmodium falciparum*. Salah satu komplikasi tersebut adalah anemia. Antigen terlarut *Plasmodium falciparum* ternyata mempunyai peran dalam proses terjadinya anemia pada malaria karena bisa meningkatkan aktivitas fagositosis makrofag terhadap eritrosit terinfeksi plasmodium maupun eritrosit normal.

Telah dilakukan penelitian terhadap 1 x 10^7/ml sel makrofag peritoneum mencit yang diisolasi dari 36 ekor mencit jantan, dengan tujuan untuk mengetahui kemampuan fagositosis makrofag peritoneum mencit terhadap eritrosit normal mencit secara *in vitro* setelah diimunisasi dengan antigen terlarut *Plasmodium falciparum*. Mencit dibagi menjadi 2 kelompok: kelompok I (18 ekor) sebagai kontrol dan kelompok II (18 ekor) diimunisasi dengan antigen terlarut *Plasmodium falciparum* sebanyak 3 kali dengan selang waktu satu minggu. Makrofag yang berasal dari kelompok II dilakukan 2 macam perlakuan, pertama: makrofag dipaparkan dengan eritrosit normal mencit yang sebelumnya telah diinkubasi dengan serum imun mencit; kedua: makrofag dipaparkan dengan eritrosit normal mencit yang sebelumnya telah diinkubasi dengan antigen terlarut *Plasmodium falciparum* dan serum imun mencit. Pada kelompok kontrol: makrofag dipaparkan dengan eritrosit normal mencit yang sebelumnya diinkubasi dengan serum non-imun mencit.

Hasil penelitian tersebut adalah: 1). pada kelompok kontrol didapatkan rata-rata persentase jumlah makrofag yang memfagositosis eritrosit adalah 1%; 2). pada kelompok perlakuan I didapatkan rata-rata persentase jumlah makrofag yang memfagositosis eritrosit adalah 7%; 3). pada kelompok perlakuan II didapatkan rata-rata persentase jumlah makrofag yang memfagositosis eritrosit adalah 22%. Dilakukan analisis varian terhadap hasil penelitian tersebut dimana didapatkan perbedaan yang bermakna antara masing-masing kelompok ($p < 0,05$). Dilakukan pula analisis lanjutan *Least Significant Difference* (LSD) dimana pada $p < 0,05$ didapatkan perbedaan yang bermakna antara kelompok kontrol dan kelompok perlakuan II; antara kelompok perlakuan I dan kelompok perlakuan II; namun tidak ada perbedaan bermakna antara kelompok kontrol dan kelompok perlakuan I. Akan tetapi, dengan uji lanjutan lain

seperti uji t dimana pada p < 0,01 didapatkan perbedaan yang sangat bermakna antara kelompok kontrol dan kelompok perlakuan I; antara kelompok kontrol dan kelompok perlakuan II; serta antara kelompok perlakuan I dan kelompok perlakuan II.

Dari hasil penelitian tersebut menunjukkan bahwa antigen terlarut *Plasmodium falciparum* dapat meningkatkan aktivitas fagositosis makrofag peritoneum mencit terhadap eritrosit normal mencit. Selain itu juga, antigen terlarut *Plasmodium falciparum* dapat teradsorbsi pada permukaan eritrosit normal mencit dan mampu menginduksi pembentukan antibodi spesifik dan autoantibodi. Semua komponen tersebut ikut terlibat dalam proses terjadinya anemia pada malaria.

ABSTRACT

Effect of *Plasmodium falciparum* Soluble Antigen on the Phagocytic Process of Mice Peritoneal Macrophages to Mice Normal Erithrocytes *In Vitro*

More than 2400 million or 40% people on the world live in the endemic area of malaria. The prevalence of malarial disease on the world is estimated between 300 – 500 million clinical cases every year, with the annual mortality rate are 1 – 1,5 million people. In Indonesia, the morbidity rate of malaria is still high, especially in the outside Java and Bali. There are about 3 million of 300 – 500 million clinical cases of malaria on the world are severe malaria (complication) and mortality cases of malaria, especially caused by *Plasmodium falciparum*. One of the complications is anemia. The *Plasmodium falciparum* soluble antigen has a play role in the pathogenesis of anemia in malaria because it can increase the phagocytic activity of macrophages to either infected erithrocytes of plasmodium or normal erithrocytes.

The research on 1 x 10^7/ml mice peritoneal macrophages were isolated from 36 male mice had been carried out, with the objective was to know the phagocytic ability of mice peritoneal macrophages to mice normal erithrocytes by *in vitro* observation after immunized by *Plasmodium falciparum* soluble antigen. Those mice were divided into 2 group: first group (18 mice) as controle; and second group (18 mice) was immunized by *Plasmodium falciparum* soluble antigen 3 times with interval for one week. The macrophages from second group were done two kind treatment, first: the macrophages were reacted with mice normal erithrocytes that had been incubated with mice immune serum previously; second: the macrophages were reacted with mice normal erithrocytes that had been incubated with *Plasmodium falciparum* soluble antigen and mice immune serum previously. In the controle group: the macrophages were reacted with mice normal erithrocytes that had been incubated with mice non-immune serum previously.

The result of this research were: 1). in controle group showed that average percentage of phagocytosis of erithrocytes by macropages were 1%; 2). in the first experimental group showed that average percentage of phagocytosis of erithrocytes by macrophages were 7%; 3). in the second experimental group showed that average percentage of phagocytosis of erithrocytes by macrophages were 22%. There was significant difference, using variance analysis, between each group at the level $p < 0,05$. The further test on the result of this research using Least Significant Difference (LSD) at the level $p < 0,05$, there was significant difference between controle group and second experimental group; between first experimental group and second experimental group; but there was not significant difference between controle group and first experimental group. But, using other further test such as t test at the level $p < 0,01$, there was very

significant difference between controle group and first experimental group; between controle group and second experimental group; and between first experimental group and second experimental group.

The result of this research showed that *Plasmodium falciparum* soluble antigen could increase phagocytic activity of mice peritoneal macrophages to mice normal erithrocytes. On the other hand, *Plasmodium falciparum* soluble antigen could be adsorbed on the surface of mice normal erithrocyte and induce formation of spesific antibody and autoantibody. All of those components had play role in the pathogenesis of anemia in malaria.

Key words: *Plasmodium falciparum* soluble antigen, mice peritoneal macrophages, phagocytic activity, mice normal erithrocytes.