EVALUATION OF A MALARIA ANTIBODY ELISA AS A MALARIA SCREENING TEST FOR BLOOD DONORS

M. de S. WIJESUNDERA, R.L.A.R RANAWEERA, A VOLLER* AND D.E. BIDWELL*

Department of Parasitology, Faculty of Medicine, University of Peradeniya,
** Institute of Zoology, London, UK.*

ABSTRACT

A *Pf* Antibody ELISA was validated for local use in screening blood donors from blood banks at Kandy, Peradeniya and Matale. A total of 1181 donors were screened. The pooled results of Kandy-Peradeniya showed a 9.5% positivity and for Matale it was 28.2%. Of 62 antibody positive sera tested for *Pf* antigen carriage, 49(79%) were found positive. All donors from Peradeniya were negative for parasites on blood films. Results indicate a need for routine serological screening of donors to limit the risk of transfusion malaria.

Introduction

Transfusion malaria is now recognized as a serious health risk with the spread of drug resistant falciparum strains. In Sri Lanka, although it is likely that transfusion malaria occurs, up to now, it is neither investigated or documented. The simplest procedure of exclusion of risk donors is on a positive history of clinical malaria but this is often unreliable. Exclusion on microscopic examination of donor blood for presence of parasites is time consuming, require skilled personnel and further might not be sufficiently sensitive to detect low parasite carriage in asymptomatic donors. Therefore, in many countries the transfusion services have adopted serological techniques to exclude infective donors.

In non-endemic areas screening for antibodies could be appropriate but as antibody persists for long periods in endemic areas, antigen detection is indicated. In Sri Lanka the current practice is to exclude donors on a positive history of malaria dating back to two years. At the General Hospital Peradeniya (GHP), on a directive from the then Director of National Blood Transfusion Services, since mid 1992, thick film screening of donors is being carried out at an enormous time cost.

The objective of this study thus was to 1). adapt and standardize a malaria antibody ELISA assay for local laboratory conditions 2). to evaluate its use in screening donors at local blood banks and 3). if indicated, to evaluate the use of an antigen capture ELISA for donor screening (Voller, Bidwell & Chiodini, 1994).

Materials and Methods

The ELISA plates were coated with *Plasmodium falciparum (Pf)* antigen overnight at 4 C, blocked using 1% BSA and 2.5% sucrose and dried at 37 C. Plates were sealed and stored at -20 C until use. Tests were run in duplicate. The optical density (OD) was read at 490 nm. The coated plates were validated against commercially used plates using known test sera and was found to give comparable results. Thereafter all testing were carried out with locally adsorbed plates. The cut-off value for local population was established using 198 serum samples from Loolekondera Estate, obtained from persons with no history of malaria or travel to malarial areas. Sera were collected following prior informed consent.

Results and Discussion

The optimum dilution of test serum was established as 1/100 and the cut-off value as 0.4 at a 96.5% predictive negativity.

A total of 1181 donor samples from the blood banks at General Hospital Kandy (GHK), Peradeniya and Base Hospital Matale were screened during the period 1994-1995.

The pattern of antibody distribution in the donors at Kandy and Peradeniya were similar (Fig. 1), while that obtained for Matale donors was more widely distributed (Fig. 2).

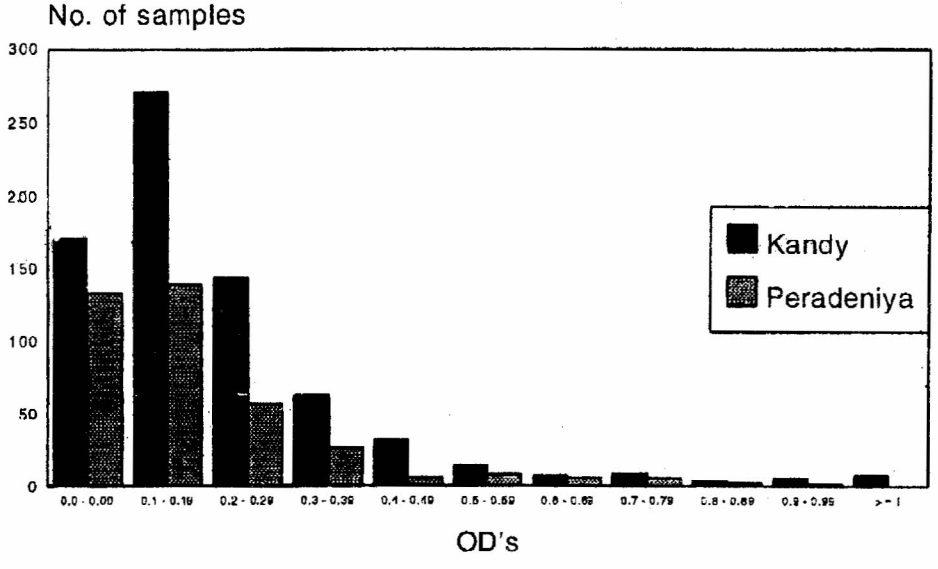

Fig. 1. Distribution of malaria antibody comparison of Kandy and Peradeniya.

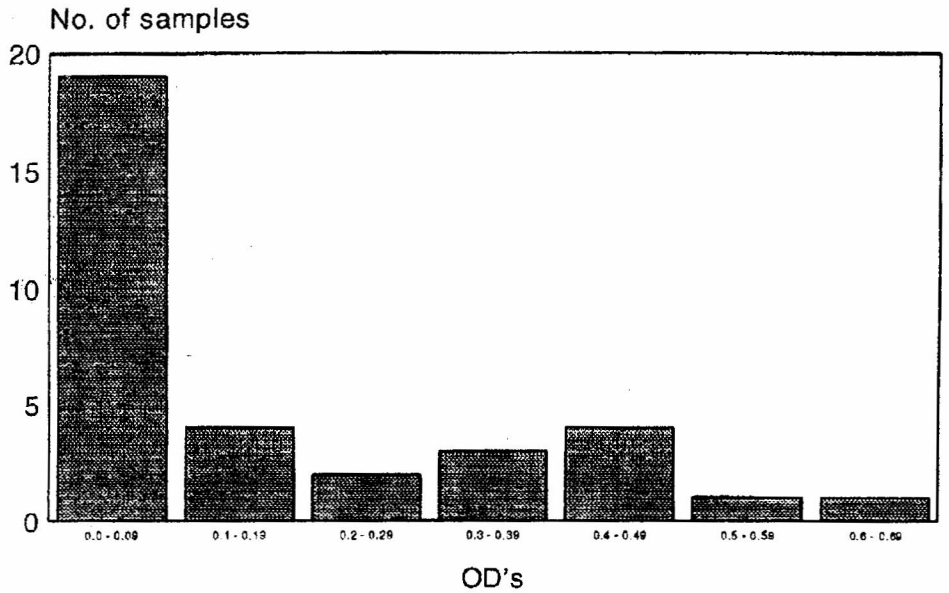

Fig. 2. Distribution of malaria antibody in Matale.

The pooled results of Kandy-Peradeniya showed a 9.5% positivity on ELISA antibody assay while at Matale the value was much higher, being 28.2%. This was to be expected as the blood bank at Matale would be drawing donors from endemic areas. The positive sera were then examined for *Pf* antigen carriage using an antigen capture ELISA assay. Of them 49 (79%) were positive. It is noteworthy that those positive for antigen carriage from the GHP were negative for parasites on the thick film. These results are similar to those reported in recent Indian and Thai studies (Choudhury et al, 1991 and Namsiriponpun et al, 1993). Because of this high risk of donor malaria, a limited study was carried out to assess the prior risk of malaria in donors at the GHK, in December 1995. This study showed a high percentage of donors (31%) having one or more risks of exposure to malaria although they were accepted as healthy donors on present criteria.

Conclusions

This study shows that there is a high degree of prior exposure to malaria and possible antigen carriage with the risk of transfusion malaria to recipients even in blood banks in the non endemic areas. This is to be expected with the increase in travel and the low persistence of parasite carriage reported in the presence of chloroquine resistance falciparum strains (Kodisinghe and Mendis, 1993). Thus clearly the current practice of exclusion on a history is inadequate to prevent transfusion malaria and routine serological screening of donors is indicated.

Acknowledgements

We wish to acknowledge the support and assistance of Dr. Nandrani de Soysa, Director National Blood Transfusion Services, the medical officers at the blood banks at Kandy, Peradeniya and Matale. Dr. C.S. Dunuwilla assisted in collection of sera and Dr. Vajira Weerasinghe in data analysis. We are thankful to the Superintendent and staff of Loolekondera Estate for their cooperation.

References

Choudhury N, Jolly J.G, Mahajan R.C, Ganguly N.K, Dubey M.L, Agnihotr S.K 1991 Malaria screening to prevent transmission by transfusions; an evaluation of techniques. Medical Laboratory Science 48, 206-211.

Kodisinghe H.M, Mendis K.M. 1993 Distribution of symptomatic and asymptomatic malaria in the Kurunegala District. Proceedings of the 49th Annual Session (Part 1) SLAAS 1993,15 (abstract)

Namsiriponpun V, Wilde H, Pamsanduan P, Tiersansern P. 1993 Field study of an antigen detection ELISA specific for *Plasmodium falciparum* malaria. Transactions of the Royal Society of Tropical Medicine & hygiene 87, 32-35.

Voller A, Bidwell D.E, Chiodini P.L. 1994. Evaluation of a malaria antigen ELISA. Transactions of the Royal Society of Tropical Medicine & Hygiene 88,188.